M-14P
MAITENANCE MANUAL

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INTRODUCTION

The M-14P engine Maintenance Manual is a one-book publication comprising description and operating instructions, including data on the construction, purpose, arrangement and. operating principle of engine systems (Ref. 073.00.00, 074.00.00, 080.00.00), as well as all the information necessary for proper operation, storage and maintenance of the engine. The present Manual includes Maintenance Manuals of some accessories installed on the engine (Ref. 024.30.01, 061.20.01).

The text uses the following abbreviations and symbols of technical values:

BDC (HMT) - bottom dead center.
TDC (SKIT) - top dead center.
POL (K!M) - petrol, oil, lubricants.
PP (BMT) - powerplant.
P_c - excessive pressure (or rarefaction) behind engine blower, mm Hg.
E - compression ratio, which is ratio of cylinder total volume to volume of combustion chamber.
Ne_r - reduced engine power, i.e. power reduced to standard atmospheric conditions (Pa= 760 mm Hg, t = 20 °C).
P_a - atmospheric pressure, mm Hg.

"Front view" implies that the observer is in front of the airscrew shaft of the engine assembly.

"Rear view" implies that the observer is at the rear cover of the engine.

"RH rotation" implies that the direction of rotation of the part coincides with that of clock hands for the observer staying behind the engine.

"LH rotation" implies that the direction of rotation is opposite to that of clock hands for the observer staying behind the engine.

"Left" and "right" relate to the observer staying in the pilot's cabin behind the engine.

ENGINE M-14P - DESCRIPTION AND OPERATION

1. DESCRIPTION

1.1. GENERAL

The M-14P airplane engine (Ref., Figs 1 and 2) is a piston, fourstroke, air-cooled gasoline, nine-cylinder carburetor, single-row radial engine.

The M-14P engine is not of a high-altitude type, but to improve performance it is provided with one-speed centrifugal blower.

The engine is cooled by air fed through the intake in the front part of the airplane cowling. Uniform cooling of the cylinders is ensured by deflectors located on each cylinder. Main assemblies and parts of the engine are lubricated by oil under pressure.

The engine is started by compressed air. Air is distributed among the cylinders according to the required sequence by the compressed air distributor.

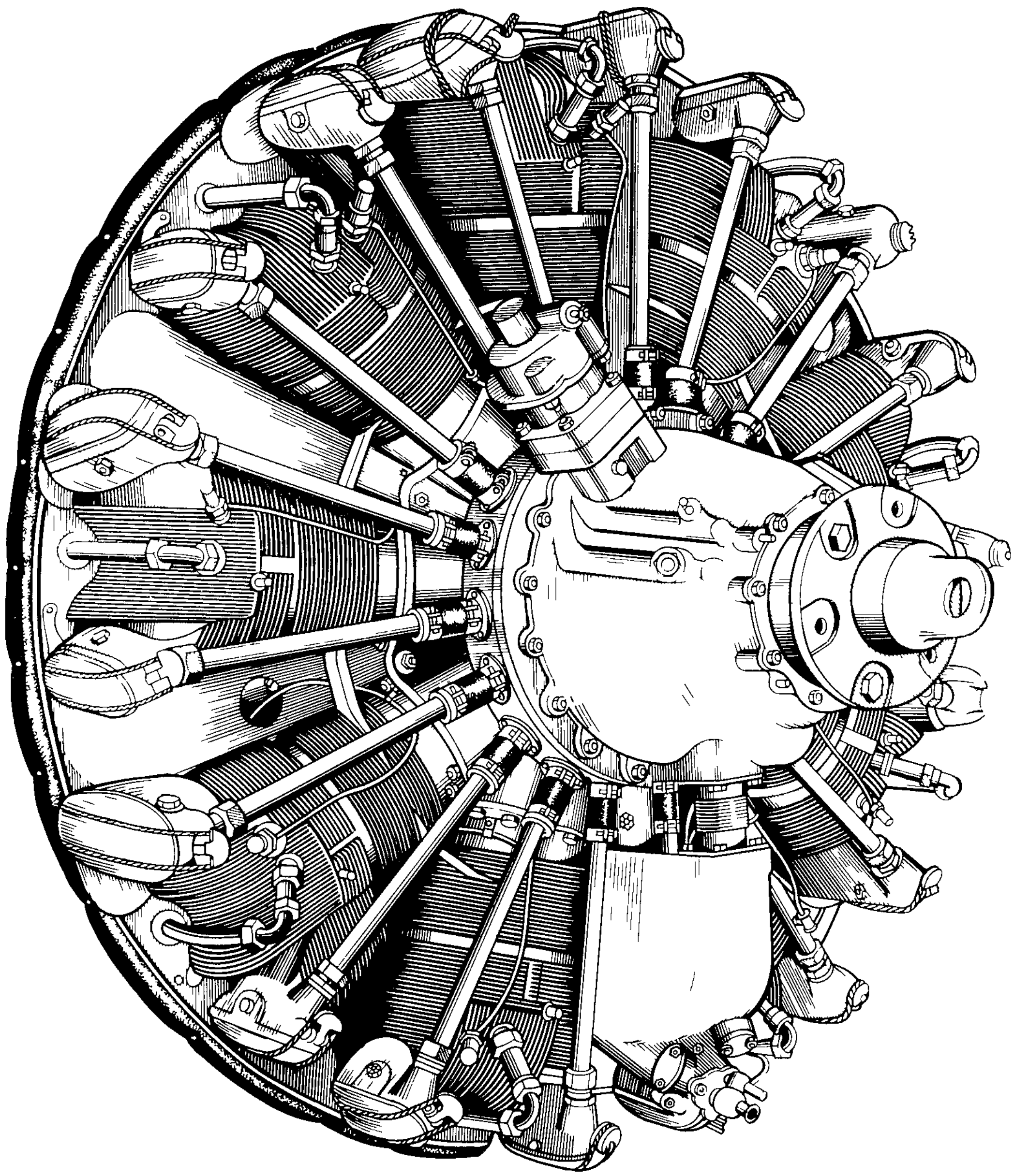
Puel-air mixture is ignited in the cylinders by high-tension electric spark generated in two magnetos operating in parallel. Two spark plugs and a starting valve are installed in each cylinder.

The engine is secured to the engine frame ring by eight bolts extending through the holes of the mixture collector bosses.

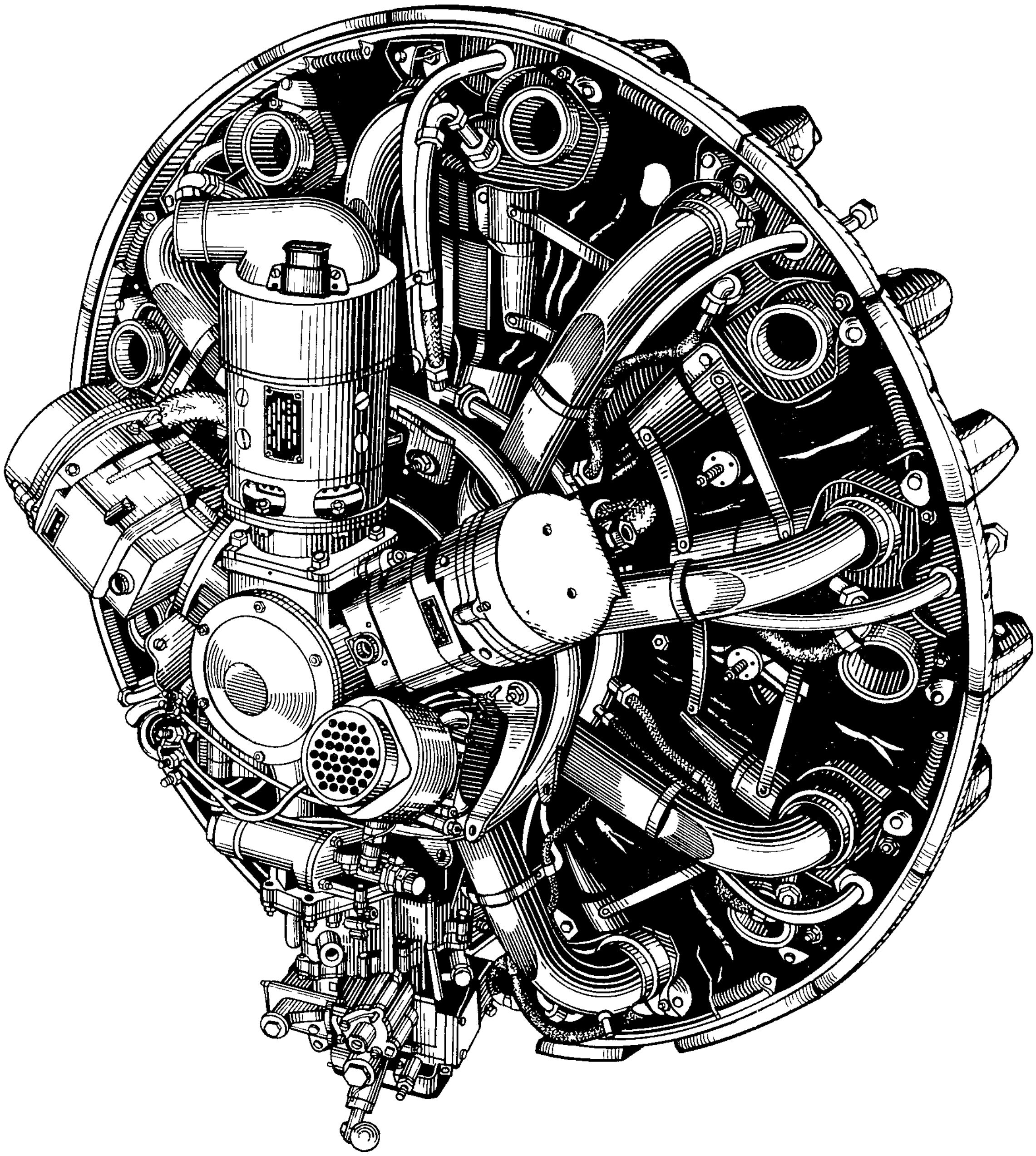
The M-14P engine carries the following accessories:

The V530TA-D35 variable-pitch airscrew	- on the airscrew shaft
The R-2, series 04, speed governor	- on the gearbox housing
The AK-14P carburetor	- on the mixture collector
Two M-9P magnetos, generator GSR-3000M, series 4 (Ref. 024.30.01), compressed air distributor, compressor AK-50A, series 3, DTE-1 tachometer generator, MM-14A oil pump, 702ML fuel pump	- on the crankcase rear cover

The engine gearbox decreases the crankshaft speed relative to the speed of rotation of the airscrew shaft.



Engine M-14P. Front View Figure 1



Engine M-14P. Rear View Figure 2

1.2. SPECIFICATIONS

1.2.1. Engine

Designation.. M-14P
Cooling system .... Air-type
Engine starting system .... Air-type
Engine continuous operation time:
At take-off rating .... Up to 5 min
At maximum permissible speed, of rotation .... Up to 1 min
At other ratings .... Not limited
Iverted engine operation:
Ratings .... Nominal
Continuous operation time .... Up to 2 min
Total time within service life .... Up to 18 %
Maximum permissible speed of rotation .... 2950 (101 %) r/min
Acceleration (pickup) from 760 r/min (idle) to take-off
rating on stationary airplane .... Up to 3 s
Maximum permissible crankshaft speed drop when
changing over to one-magneto operation at nominal
rating II and cruise rating I (low-pitch airscrew) .. .. 85 r/min (3 %)
Number and arrangement of cylinders .... 9, radial, single-row
Cylinder numbering .... Countercio ckwise if viewed from rear cover side, top cylinder is Ho. 1
Cylinder bore .... 105 mm
Piston stroke:
Cylinder No. 4 .... 130 mm
Cylinders Nos 3 and 5 .... 130.15 mm
Cylinders Nos 2 and 6 .... 130.23 mm
Cylinders Nos 8 and 9 .... 130.39 mm
Cylinders Nos 1 and 7 .... 131.25 mm
Total displacement 10.161 1
Compression ratio .... 6.3±0.1
Direction of rotation of crankshaft and airscrew shaft ....LH
Engine dry mass .... 214 kg$^{+2\%}$

NOTE: Engine dry mass does not include mass of the generator, compressor, fine filter with pipelines, engine frame ring, exhaust manifold parts, tachometer generator.

Engine overall dimensions:
Diameter (over valve mechanism case covers) .... (985±3) mm
length .... (924±3) mm

1.2.2. Gearbox

Type ....six-sateliite, planetary, single-stage
Transmission ratio 0. 658

1.2.3. Airscrew

Designation V530TA-D35
Type ....Variable-pitch, push-type

1.2.4. Blower

Type ....Centrifugal, single-stage, single-speed, mechanical drive
Drive transmission ratio 8.16

1.2.5. Carburetor

Designation AK-14P
Type ....Floatless
Humber per engine 1
Carburetor fuel inlet pressure:
At operating ratings ....(0.2 to 0.5) kgf/cm
At minimum speed of rotation ....Hot less than 0.15 kgf/cm
Air temperature at carburetor inlet ....10 to 45 °C
Fuel grade and octane rating ....Gasoline B91/115 GOST 1012-72, octane rating at least 91 (Ref. Appendix 1)

NOTE: Foreign-made fuel and oil grades allowed for use witn the engine and their physical and chemical properties are given in Appendix 1.

1.2.6. Fuel Pump

Designation 70ML
Type ....Rotary-type
Number per engine 1
Drive transmission ratio 1.125
Drive direction of rotation ....LH

1.2.7. Fine Fuel Filter

Designation 8D2.966.064
Type ....Sump-type

Number per engine 1
Working fluid .... Gasoline B91/115 GOST 1012-72
g Working pressure .... 0.2 to 0.5 kgf/cm
Maximum throughput 5 1/min
Filtering fineness .... 36 to 40//m

1.2.8. Oil Pump

Designation ....…................... .... W-14A
Type .... Gear-type, with delivery and scavenging sections
Number per engine 1
Drive transmission ratio 1.125
Drive direction of ro tation .... LH
Main line oil pressure (measured through special connection on oil pump):
Operating ratings .... 4 to 6 kgf/cm
Minimum speed of rotation .... Hot less than 1 kgf/cm
Engine inlet oil temperature:
Recommended .... 50 to 65 °C
Minimum permissible .... 40 °C
Maximum at prolonged operation .... Up to 75 °G
Maximum permissible for up to 15 min of continuous operation .... Up to 85 °C
Maximum permissible engine outlet oil temperature .... Up to 125 °C
Maximum temperature difference between engine inlet and outlet oil .... 50 °C

Cylinder head temperature measured by thermocouples installed under rear spark plugs of hottest and coldest cylinders:

Recommended .... 140 to 190 °C
Minimum permissible for normal operation of engine .... 120 °C
Minimum at prolonged operation .... 140 °C
Maximum at prolonged operation .... 220 °C
Maximum permissible at take-off and climbing for up to 15 min and not more than 5 % of service life .... 240 °C
Oil flow rate through engine at inlet oil temperature of 50 to 65 °C at nominal rating I .... Up to 13.5 kg/min
Heat transfer to oil at nominal rating I .... 225 kcal/min
Summer and winter oil grades .... MS-20 GOST 21743-76

NOTE: Foreign fuel and oil grades allowed for use with engine and their physical and chemical properties are given in Appendix 1.

1.2.9. Magneto

Designation M-9F
Type .... Pour-spark, shielded
Number per engine 2
Drive transmission ratio 1.125
Drive direction of rotation .... LH
Ignition cable system and type .... Shielded harness PVS-5

1.2.10. Spark Plug

Designation SD-49SMM
Type .... Ceramic-insulator
Number per cylinder 2
Firing order 1-3-5-7-9-2-4-6-8

1.2.11. Compressed Air Distributor

Type .... Slide-valve
Drive transmission ratio 0.5
Drive direction of rotation .... LH

Compressed air distributor is adjusted with cylinder No. 4 piston being at 12° (with respect to crankshaft angle) after TDC in expansion stroke

Distributor slide valve hole should open hole for supply of air to cylinder No. 4 by 1 mm, maximum, (down slide valve rotation)

Timing angle (cylinder No. 4) (Ref. Fig. 3):
Beginning of admission before TDC .... (20±4)°
End of admission after BDC .... (54±4)°
Beginning of exhaust before BDC .... (65±4)°
End of exhaust after TDC .... (25±4)°
Clearance between rocker roller and valve stem
(adjusted on cold engine for checking timing):
Inlet valve .... 1.1 mm
Exhaust valve .... 1.1 mm
Clearance between rocker roller and valve stem (adjusted on cold engine for operation):
Inlet valve .... ($0{,}3_{-0{,}1}^{+0{,}15}$) mm
Exhaust valve .... ($0{,}3_{-0{,}1}^{+0{,}15}$) mm

Advance angle for LH and BH magneto
(before TDC at end of compression stroke) .... (23±1)°

1.2.12. Air Compressor

Designation AK-50A
Type .... Piston-type
Number per engine 1
Drive transmission ratio 0.9
Drive direction of rotation .... RH

1.2.13. Generator

Designation .... GSR-3000M, series 4
Type .... DC
Number per engine 1
Drive transmission ratio 2.5
Drive direction of rotation .... LH

1.2.14. Speed Governor

Designation .... R-2, series 04
Type .... Centrifugal
Drive transmission ratio 1.045
Drive direction of rotation .... RH

1.2.15. Engine Tachometer Generator

Designation DTE-1
Type .... Electric
Number per engine 1
Drive transmission ratio 0.9
Drive direction of rotation .... LH

1.2.16. Pilfer with Chip Detector

Type .... Electric with plate element
Number per engine 1
Operating voltage .... Up to 29 V
Current .... 0.15 to 0.25 A
Location .... Oil pump
Chip warning device .... Warning lamp on pilot's instrument board

Operating ratings of the M-14P engine are given in the Table, the throttle characteristic is shown in Fig. 3, external and altitude characteristics, in Figs 4 and 5, while the timing diagram is represented in Fig. 6.

Rating	Reduced power near ground	Crankshaft speed of rotation, r/min	Specific fuel consumption, g/hp•h	Blower outlet pressure, mm Hg
Take-off	360 $hp_{-2\%}$	2900±1 (99%)	285-315	125_{-15} (surplus)
Nominal I	290 $hp_{-2\%}$	2400±1(82%)	280-310	95_{-15} (surplus)
Nominal II	240 $hp_{-2\%}$	2050±1(70%)	265-300	75_{-15} (surplus)
Cruise I	0.75 of measured power at nominal rating II	1860 ±1(64%)	210 to 230	735±15 (absolute)
Cruise II	0.6 of measured power at nominal rating II	1730 ±1(59%)	215 to 235	670±15 (absolute)
Idle	-	Up to 760 (26%)	-	-

NOTES: *1. Engine power and fuel specific consumption rates for all the ratings shall be ensured at non-loaded generator and compressor.*

2. Upper power limit and blowpr outlet supercharged pressure at take-off, nominal I and nominal II ratings are not limited.

3. Given in brackets are nominal values of the crankshaft speed of rotation in percent against the unified tachometer (99.4 % corresponds to 2900 r/min of the crankshaft).

1.3. CONSTRUCTION

For engine construction (its longitudinal section) refer to Fig. 7.

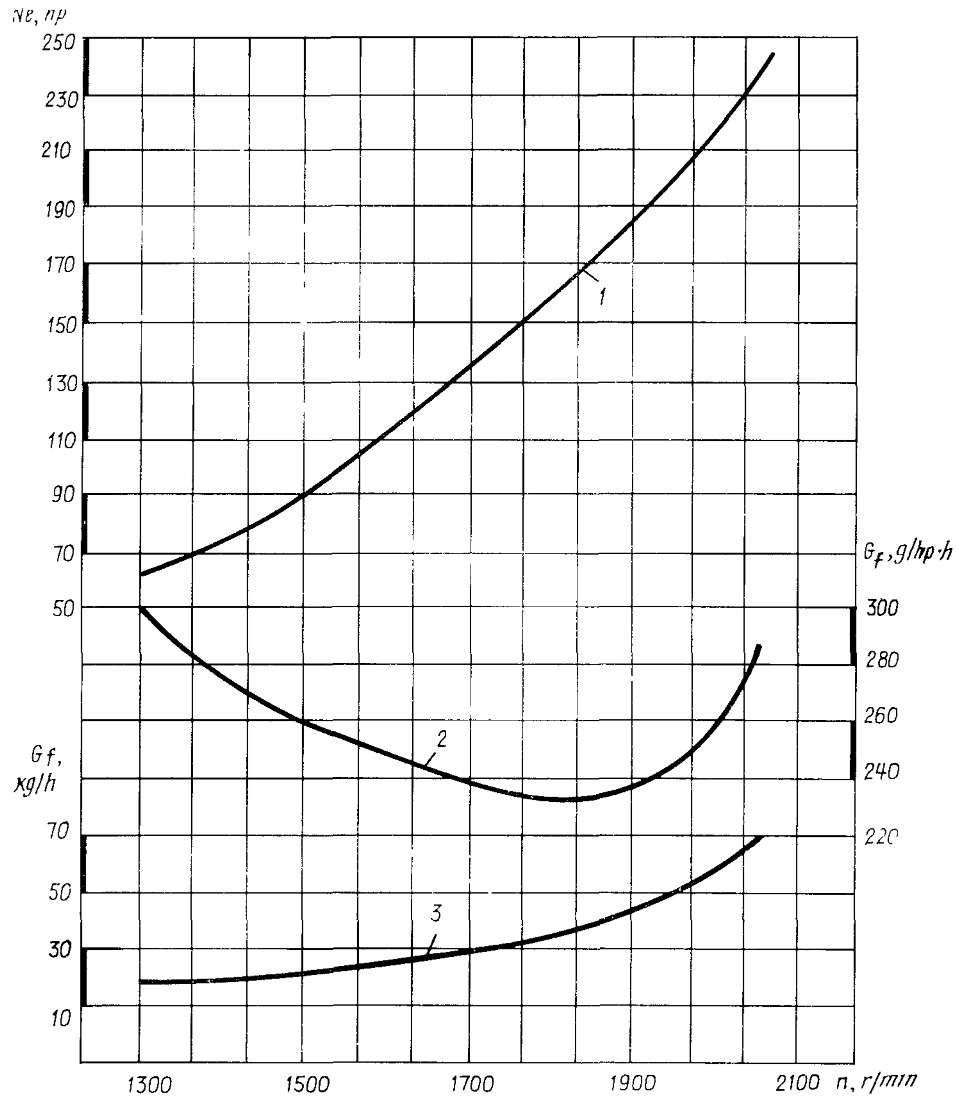
2 OPERATION

2.1. GENERAL

The engine should be operated by skilled personnel after special training in aviation equipment maintenance.

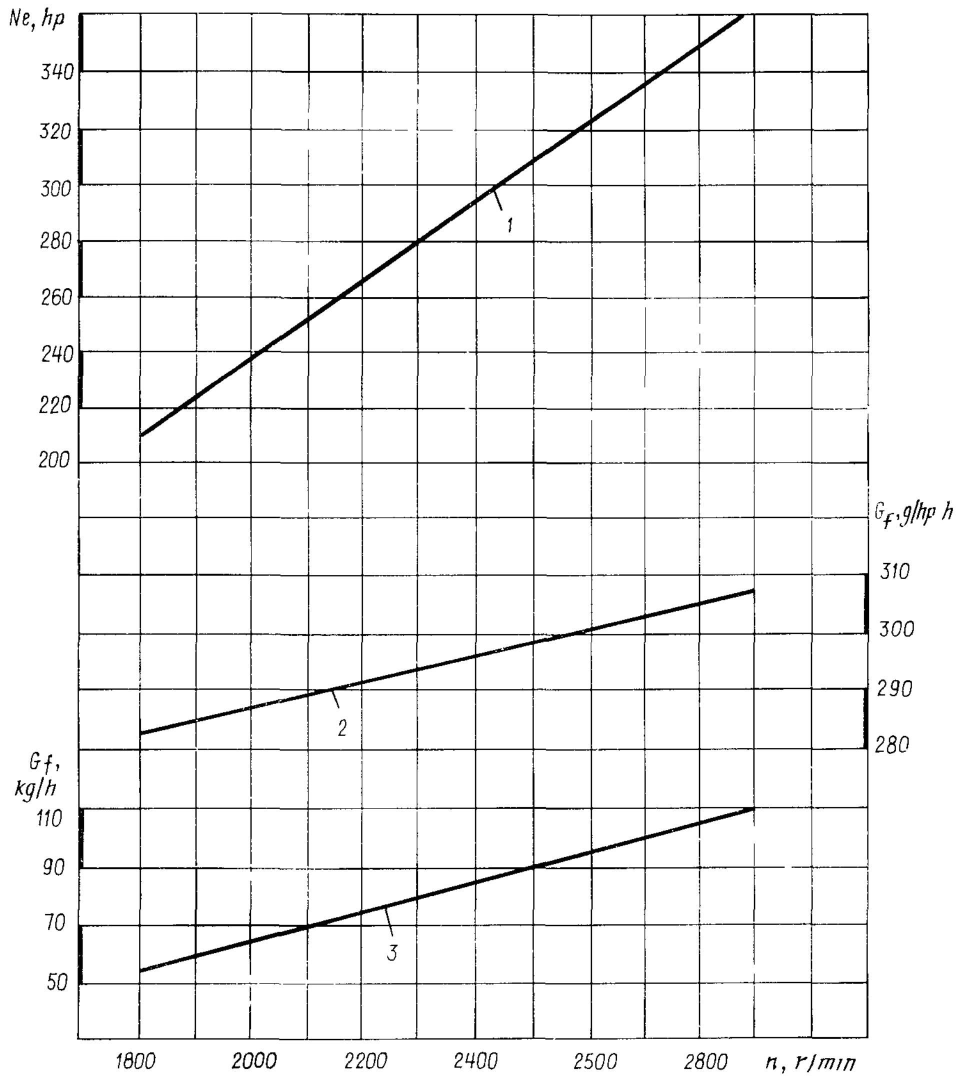
rrior to operating the engine, check complezenesa of the technical publications and get familiar with the documents.

All operations performed on the engine and its accessories in service shall be written in the engine Log Book and in accessory Certificates.



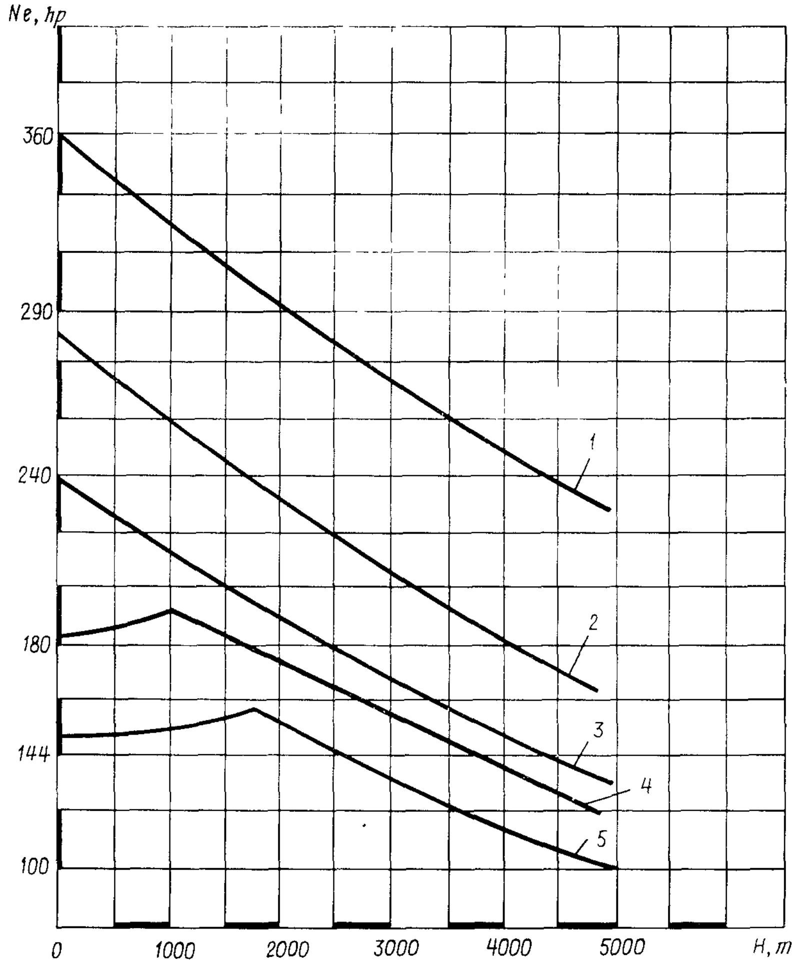
1 - power curve
2 - specific fuel consumption curve
3 - per-hour fuel consumption curve

Throttle Characteristics Figure 3



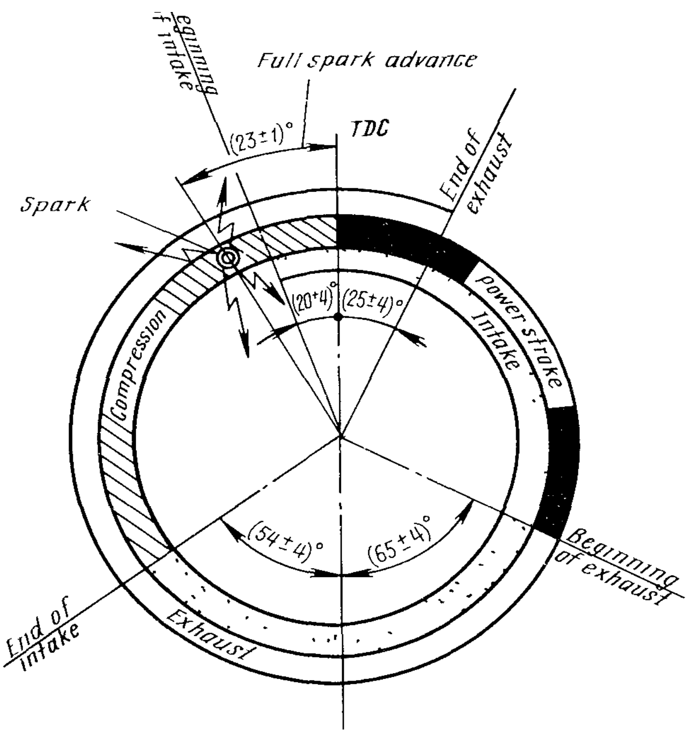
1 - power line
2 - specific fuel consumption line
3 - per-hour fuel consumption line

External Characteristics Figure 4



1 -	at	take-off rating (n = 2900 r/min)
2 -	at	nominal rating I (n = 2400 r/min)
3 -	at	nominal rating II (n = 2050 r/min)
4 -	at	cruise rating I (n = 1860 r/min)
5 -	at	cruise rating II (n = 1730 r/min)

Design Altitude-Performance Characteristics Figure 5



Timing Diagram Figure 6

<u>CAUTION:</u> WHEN OPERATING THE ENGINE, IT IS PROHIBITED TO DO THE FOLLOWING:

(1) USE FUEL, OIL, GREASE GRADES AND COMPRESSED GASES WHICH ARE NOT SPECIFIED IN THIS MANUAL.

(2) USE OTHER TOOLS THAN INDICATED IN APPENDIX 2. TO PERFORM MAINTENANCE OF THE CARBURETOR, LAGNETO AND SPEED GOVERNOR USE THE TOOLS INCLUDED IN THE INDIVIDUAL SPTA SETS FOR THESE UNITS.

(3) CHANGE THE SPECIFIED SEQUENCE OF OPERATION J PERFORMED ON THE ENGIin

(4) CUT OUT TWO MAGNETOJ SH ULTAHEOUSLY i/ITH THE CARBURETOR THROTTLE OPEN FULLY ON THE OPERATING ENGINE,

(5) PERFORM FLIGHT 3 BEFORE DETECTION U'TD ELIMINATION OF THE CAUS'. OF ILLUMINATION OF THE "CHIP IN LIIGIITE" YARNING LAI.IP. IF THE "CHIP IN .NC.INT' .

LAMP COMES ON, CONCENTRATE YOUR ATTENTION ON READINGS OF ENGINE IIirTKU MENTS AND ACCORDING TO TIL. .jitlation, TAKE A DECISION FOR LANDING.

(6) ROTATE THE ENGINE AIR"CRE,/ SHAFT BEFORE DEPRESERVATION OF THE.SO COMPRESSOR TO PRECLUDE DAMAGE TO I.IAGNETO PARIS AITO COMPRi.S,,CR COUPLING.

The carburetor air intake shall be provided, with a dust filter installed by the Supplier.

2.2. IN-PLIGHT OPERATION OF ENGINE

2.2.1. Taxiing

After starting, warming up and test running the engine and. in the course of taxiing, watch engine instruments to avoid, overheating or overcooling of the engine.

When air temperature at carburetor inlet is below zero, perform taxiing with heater engaged so that the carburetor inlet air temperature is not less than 10 °C.

To avoid overheating, perform taxiing at engine low ratings with cowling and oil cooler shutters fully open.

2.2.2. Take-Off and Climbing

Prior to taking off, make sure the engine is warmed up, operates without pops or vibration, and the instruments read normally. It is recommended to start taking off at cylinder head temperature of 140 to 190 °C and engine inlet oil temperature of

40 to 65 °C.

Make sure the speed governor control lever is in the LOW PITCH (A3) position. Prior to taking off« check operation of the airscrew by shifting it from low pitch to high pitch at a speed of 70 % (2050 r/min) till the speed drops to 53 % (1550 r/min) and back.

If the powerplant is in good repair and everything is ready for take-off, smoothly open the carburetor throttle, bring the rotation speed and boost to nominal or take-off ratine (depending on the selected rating) and start taking off.

The take-off rating may be engaged for up to 5 min running.

It is allowed to take off with the heater disengaged if the carburetor inlet air temperature is not less than 10 °C

After taking off (in climbing), select nominal rating 1 or nominal rating 11 hy the speed governor control lever and climb to the desired altitude (climbing may be also performed at cruise rating I).

If when climbing the oil and cylinder head temperature exceeds the permissible limits, lower the rating or level the airplane (flatten out).

If after levelling the airplane the engine temperature keeps on increasing, discontinue the flight, detect the cause and eliminate the defects.

To change the engine rating to cruise one in flight, first decrease boost, bring the engine speed to the desired one by simultaneously moving the carburetor throttle and speed governor control levers. Do not set the airscrew to higher pitch before decreasing boost, otherwise the crank mechanism of the engine may be heavily overloaded.

To increase engine rating, first increase its speed to the desired one (relieve the airscrew) and then increase boosting.

Rotational speed rise to 109 % for up to 1 s can be tolerated in flight, the total time of operation at a speed of 109 % shall not exceed 30 min during service life.

2.2.3. Level Flight

Level flight can be performed at the following ratings:

Nominal rating I Nominal rating II Cruise rating I Cruise rating II.

Optimal engine ratings in level flight depending on loading, speed and altitude of flying are indicated in the special Instructions for calculating distance and endurance of flight.

When performing prolonged flight under steady conditions at low ambient temperatures, change over the airscrew from low pitch to high pitch in every 20 to 30 min of flight by varying the speed of rotation within 67 to 55 % (1950 to 1650 r/min) and then returning it back to the original value to preclude thickening of oil in the air

screw cylinder. A short-time drop of engine inlet oil pressure to 2 kgf/cm is tolerable (followed by restoration for 8 to 11 s).

Check oil pressure in flight which should be not less than 4 kgf/cm .

When the CHIPS IN ENGINE (CTPTSKA B JWTATME) warning lamp cornea on, concentrate on readings of engine instruments and depending on the situation, take a decision to land.

CAUTION: *IT IS PROHIBITED TO PLY BEFORE DETECTING AND ELIMINATING THE CAUSE OF IL-LUMINATION OF THE WARNING LAMP.*

2.2.4. Diving, Glinding and Landing

Engine speed at diving, steep gliding should not exceed 86 % (2500 r/min) at continuous operation of the engine for up to 1 min.

Cylinder head minimum temperature should be not below 120 °C, oil temperature, not below 40 °C.

When gliding at idle rating or flaring out from dive, it is not recommended to give full throttle by abrupt shifting of the throttle quadrant. Change over from idle to full throttle smoothly (during 2 to 3 s) since abrupt acceleration may lead to airscrew spinning and high dynamic loading of the engine parts.

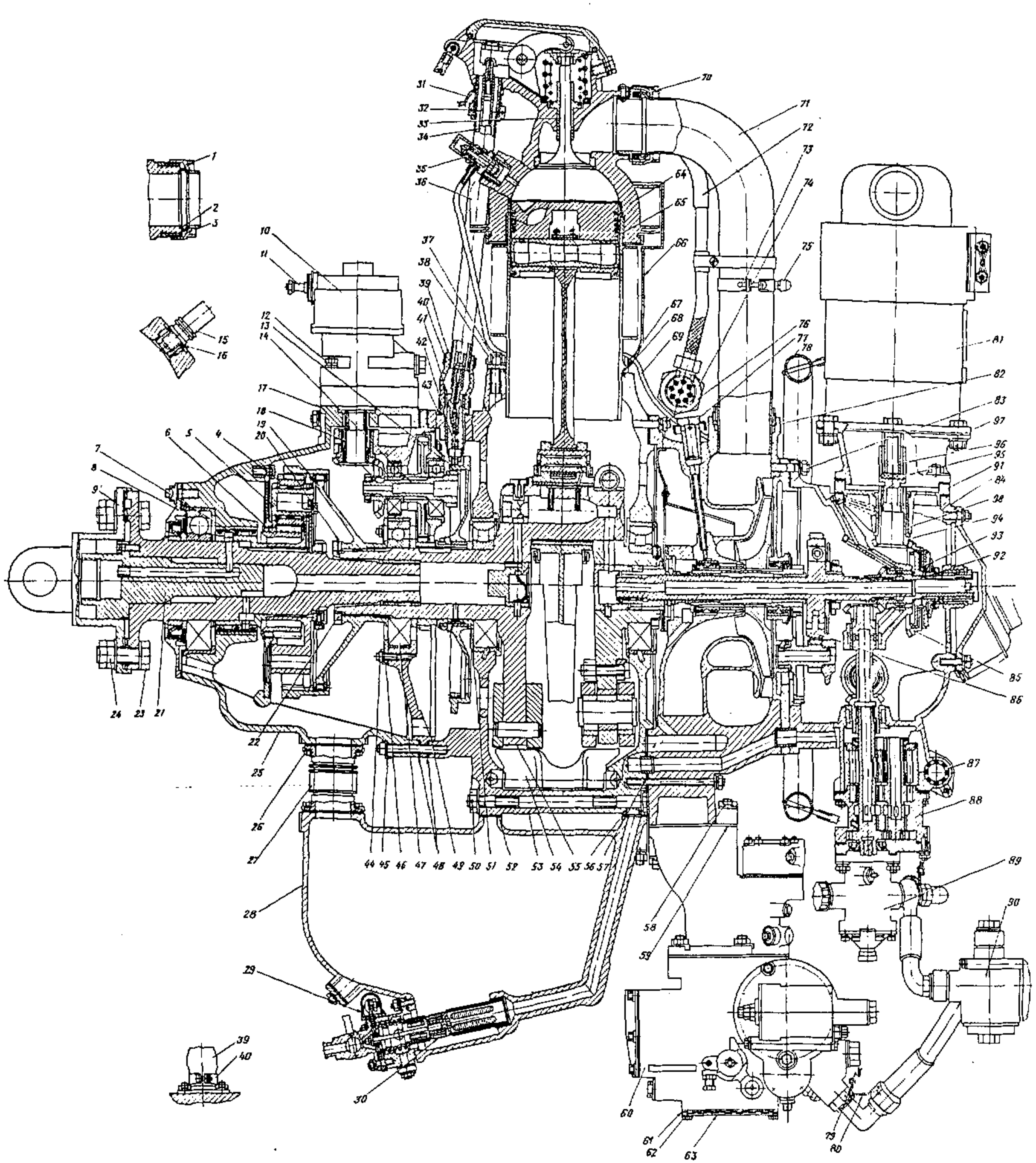


Figure 7.

1. Nut
2. Sealing Ring
3. Exhaust Pipe Connection
4. Satellite
5. Satellite Pivot
6. Sun Gear
7. Sealing Ring Bushing
8. Thrust Bearing Cover
9. Shipping Shackle
10. Speed Governor
11. Speed Governor Manual Control Shaft
12. Nut
13. Cam Plate
14. Speed Governor and Cam Plate Drive Shaft
15. Spark Plug
16. Gasket
17. Gasket
18. Adapter
19. Drive Gear
20. Cotter Pin
21. Airscrew Shaft
22. Nut
23. Bolt
24. Nut
25. Gearbox Housing
26. Bolt
27. Bellows
28. Oil Sump
29. Gap
30. Filter with Chip Detector
31. Locking Wire
32. Nut
33. Inlet Valve
34. Tappet Push Rod
35. Starting Valve
36. Tappet Push Rod Casing
37. Lock
38. Nut
39. Rubberized Fabric Hose
40. Clamp
41. Guide Bushing
42. Tappet Roller
43. Gasket
44. Nut
45. Lock
46. Cover
47. Bearing
48. Gasket
49. Front Cover
50. Stud
51. Ring
52. Gasket
53. Crankcase
54. Oil Baffle
55. Crankshaft
56. Gasket
57. Gasket
58. Lock
59. Gasket
60. Carburetor
61. Strainer
62. Bolt
63. Gasket
64. Cylinder Head
65. Piston
66. Cylinder Deflector
67. Starting Pipe Mounting Stud
68. Rubber Sealing Ring
69. Starting Pipe
70. Attachment Nut
71. Intake Pipe
72. Spark Plug Cable
73. Mixture Collector Priming Connection Attachment Clamp
74. Ignition Harness
75. Connection for Pilling fuel into Mixture Collector
76. Nut
77. Blower Breather
78. Engine Frame Ring
79. Locking Seal
80. Locking Wire
81. Generator
82. Mixture Collector
83. Nut
84. Rear Cover
85. Generator Drive Gear
86. Blower Drive Coupling
87. Oil Pump Filter
88. Oil Pump
89. Fuel Pump
90. Fine Fuel Filter
91. Generator Drive Housing
92. Drive Shaft
93. Generator Drive Friction Coupling
94. Driven Shaft
95. Rubber Insert
96. Adapter Shaft
97. Adapter
98. Bushing

To preclude overcooling of the engine in cold weather or at prolonged gliding, close shutters of the cowling and oil cooler or periodically warm up the engine by giving throttle.

When gliding before landing shift the speed governor control lever to the LOW PITCH poaition so that in case of necessity (faulty landing planning, etc.) it would be possible to select take-off rating.

When gliding at idle rating, oil pressure should not drop below 1 kgf/cm , Short-time

(up to 0.5 s) engine inlet oil pressure drop to 0.5 to 1 kgf/cm at near-zero and

negative accelerations as well as to a pressure of 1.8 kgf/cm for up to 5 s is allowed in flight. The total time of engine operation under such conditions shall not exceed 5 min during service life.

To preclude overheating, taxi at low ratings with shutters of the cowling and oil cooler fully open.

2.2.5. In-Flight engine Operation at Low Ambient Temperatures

Engine ratings at take-off, climbing, level flight and descent in winter are similar to those of summer time; however, when operating the engine in winter, it is necessary to take into account the following notes:

(1) Take-off and climbing may be performed with air heater disengaged when the carburetor inlet air temperature is from 10 to 45 °C. If icing is possible, fully engage carburetor inlet air heating.

(2) To preclude freezing of oil in the airscrew cylinder during level flight periodically (in 20 to 30 min) change over the airscrew from low pitch to high one and back and then reset the original speed of rotation.

(3) When gliding from high altitude in cold weather, engage the carburetor inlet air heating and close the cowling shutters to preclude overcooliiif; of the cylinders and periodically warm up the engine so that the cylinder head temperature does not drop below 120 °C.

ENGINE M-14P - APPENDICES

Appendix 1

FUEL AND LUBRICANTS

1. FUEL

Engine M-14P should be operated on gasoline B91/115. Physical and chemical properties of gasoline B91/115:

Octane rating .... Not less than 91
Gasoline rating (rich mixture) .... Not less than 115
Lead tetraethyl content .... Up to 2.5 g/kg
Low heat value .... Not less than 10,300 kcal/kg
Fractional composition:
Beginning of distillation .... Not below 40 °C
10 % distillation .... Not above 82 °C
50 % distillation .... Not above 105 °C
90 % distillation .... Not above 145 °C
97.5 % distillation .... Not above 180 °C
Residue and losses .... Up to 2.5 ^
Vapor pressure .... From at least 200 to 360 mm Hg, maximum
Acidity .... Up to 1 mg KOH per 100 ml
Initial solidification temperature .... Not above minus 60 °C
Iodine value .... Not over 10 g iodine per 100 ml
Sulfur content .... Up to 0.05 %
Actual resins .... Up to 2 mg per 100 ml
Aromati c carbohydrate content .... None
Stability period .... Not- leas than 8 h
Paraoxidiphenyl amine content .... 0.004 to 0.005 %
Content of water-soluble acids and alkalis .... None
Water and mechanical impurities .... None
Copper plate test .... Withstands
Transparency .... Transparent
Color .... Green

It is allowed, to operate the engine on gasolines whose physical and chemical properties correspond to those of gasoline B91/115. Their physical and chemical properties:

Specific gravity .... 0,718 g/cm^3
Lead tetraethyl content .... 1.2 g/kg
Octane rating (engine method) 95.5
Heat value .... 10,430 kcal/kg
Gasoline rating (rich mixture) 126
Fractional composition:
10 % distillation .... 44 °C
50 % distillation .... 102 °C
90 % distillation .... 124 °C
98 % distillation .... 143 °C
Final boiling point .... 148 °C
Residue and losses .... 2 %
Vapor pressure .... 248 mm Hg
Acidity .... 1 mg KOH per 100 ml
Actual resins .... 0.5 mg of resins per 100 ml
Iodine value .... 0.5 g iodine per 100 ml
Sulfur content .... 0.01 %
Copper plate test .... Withstands
Solidiflcation temperature .... Minus 60 °C
Water content .... None
Content of water-soluble acids and. alkalis .... None
Aromatic carbohydrate content .... 25.1 %

To wash engine parts, preserve and. depreserve the engine,use unleaded gasolines indicated in Table 1.

Table 1

Parameter	Characteristics		
	B-70 TU 38.101913-82 (USSR)	Grades 73 and 80 DERD-2485 (England)	Grade 80 Mil-F-5572B (USA)
Saturated vapor pressure Fraction distillation temperature:	Up to 360 mm Hg	Up to 380 mm Hg	Up to 380 mm Hg
Beginning of distillation	Not below 40 °C		
10 % distillation	Not above 88 °C	Not above 75 °C	Not above 75 °C
50 % distillation	Not above 105 °C	Not above 105 °C	Not above 105 °C
90 % distillation	Not above 145 °C	Not above 133 °C	Not above 125 °C
97.5 % distillation	Not above 180 °C	Not above 170 °C	Not above 170 °C
Ethyl fluid content	None	None	None

NOTE: *It is allowed to use gasoline Nefras-S 50/170 GOST 8505-80 for washing and wiping during scheduled maintenance of the engine, replacement and depreservation of accessories, spares and the engine, as well as during washing of airplane oil tanks and lines. Using gasoline Nefras-S 50/170 as fuel Instead of gasoline B-70 and its substitutes at preservation and depreservation of the engine is PROHIBITED.*

2.LUBRICANTS

The M-14P engines use oil MS-20. Specifications of oil MS-20 GOST 21743-76.
Kinematic viscosity at 100 °C .... Not less than 20 cSt
Ratio of 50 °C viscosity to 100 °C viscosity .... Not more than 7.85
Conradson carbon value .... Not more than 0.3 %
Acidity .... Not more than 0.05 mg KOH per 1 g of oil
Ash content .... Not more than 0.003 %
Content:
Selective solvents .... None
Water-soluble acids and alkalis .... None
Mechanical impurities .... None
Water .... None
Flashing point .... Not less than 250 °C
Difference between Brenken and Martens-Pensky flashing points ....Not more than 20 °C
Freezing point .... Not above minus 18 °G
Papok thermooxidatlon stability at 250 °C in oil .... Not less than 17
Viscosity coefficient .... Not more than 55
Specific gravity .... Not more than 0.985 g/cm^3

NOTE: *Oil MS-20 may be replaced with other oils of grades B/0 (England) and 1100 (USA) whose physical and chemical properties are indicated in Table 2.*

Table 2

Parameter	Characteristics	
	DEngRD-2472 grade B/0 (England) 1950	Mil-L-6082B grade 1100 (USA) 1955
Kinematic viscosity at 98.9 °C	Not less than 18.80 cSt	Not less than 18.9 cSt
Dyne and Devine viscosity index at 37.8 °C	Up to 95	Up to 95
Acidity	Up to 0.1 mg KOH per 1 g of oil	Up to 0.1 mg KOH per 1 g of oil
Coking power	Up to 0.95 %	Up to 1. 2 %
Ash content	0.5 mg per 20 g of oil	0.0025 mg per 20 g of oil
Flashing point	Not below 243 °C	Not below 243.3 °C
Freezing point	Not above minus 12 °C	Not above minus 12.2 °C
Content:		
Water-soluble acids and alkalis		
Mechanical impurities		
Water		
Working factor characterising operation properties of oils	0.85	0.85
Sulfur content		0.5 %
Copper plate corrosion(at 100 °C)		Light darkening is allowed
Saponification number		Not more than 0.5 mg KOH

NOTES: *1. It is allowed to use other grades of fuel and oil whose physical and chemical properties are in line with the values given in Tables 1, 2.*

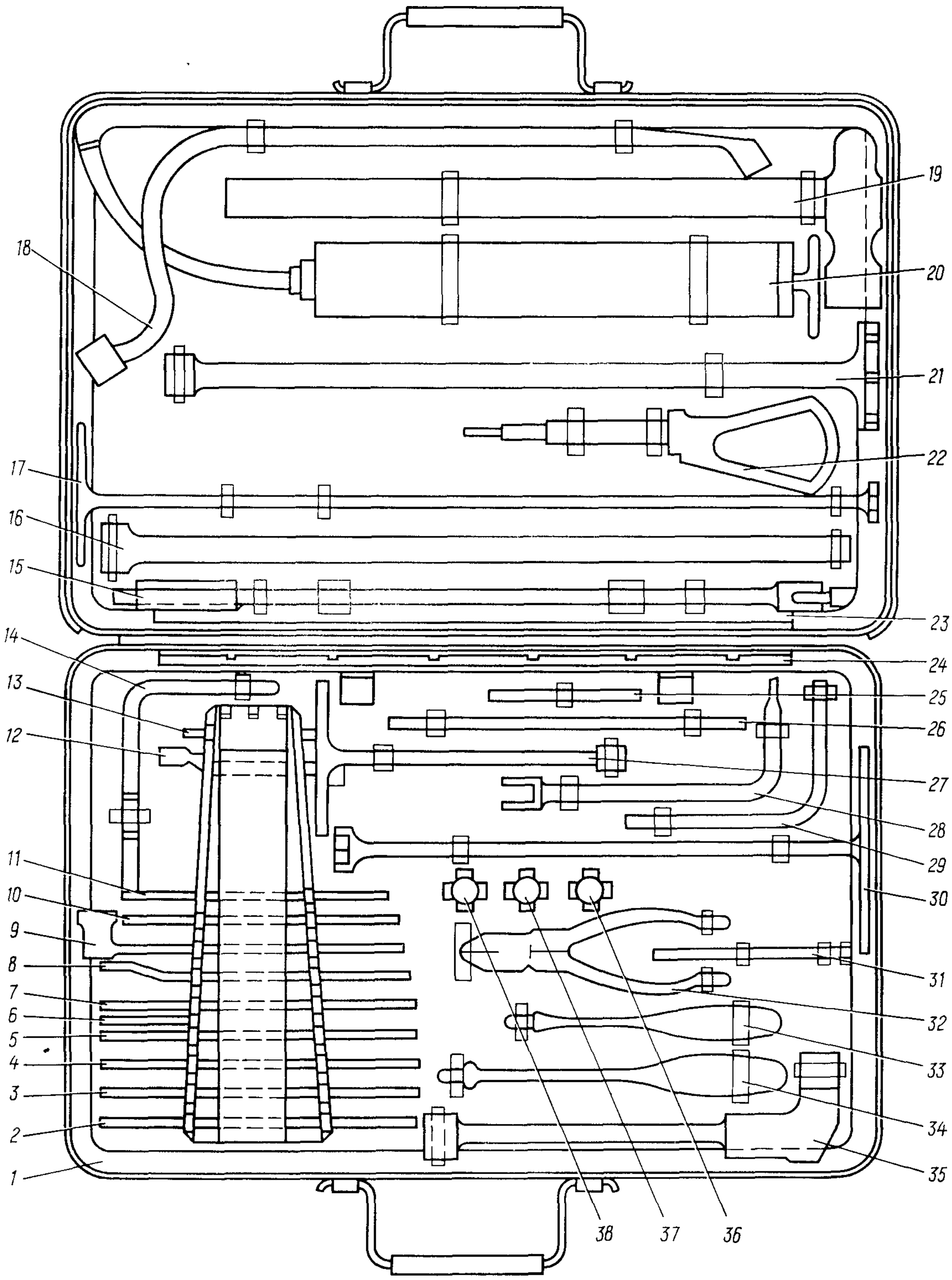
2. Specifications and grades of oils used should be entered in the engine Log Book.

Appendix 2

Place in case (Fig. 1)	Designation	Description	Purpose
1	14-024-020	Case (empty)	For placing airborne tools
2	10-32-12	Wrench for intake pipe connection nut	For removing and installing intake pipe
3	700880-8	Flat wrench 24x27	For oil pump reducing valve cap, for attaching rod covers
4	14-32-21	Flat wrench 36x41	For ignition harness nuts
5	7811-0041 PD1.Ts15.ohr&03T 2839-80	Wrench 27x30	For oil pump reducing valve body
6	700880-7	Flat wrench 19x22	For ignition harness detachable conductor union nuts, spark plug elbow union nuts
7	14-624-08	Socket wrench	For compressor attachment nuts
8	UB-24-07	Flat wrench 17x19	For installing and removing nut and cap of oil pump reducing valve, oil filter of speed governor oil line, compressor delivery valve connection nut, filling line connection nut, nuts of ignition harness braid and elbow and generator attachment nuts
9	14-24-660	Wrench for valve rocker adjustment screw locking nuts	For locking valve rocker adjustment screw
10	14-24-861	Flat wrench 11x14	For engine frame nuts, drain plugs, speed governor, oil pump, oil sump, compressor, fuel pump, generator and magneto attachment nuts
11	700002	Two-head box wrench 9x11	For tappet guide attachment nuts, for deflector-to-cylinder head attachment bolt, for nut securing shroud to deflector, for nut securing rear breather to mixture collector

Place in case (Fig. 1)	Designation	Description	Purpose
12	14-232-03	Two-head box wrench 14x17	For securing generator, carburetor, speed governor and engine frame bolts
13	700880-2	Flat wrench 7x9	For attachment nuts of compressed air distributor, filter with chip detector and air pipe clamps
14	14-324-10	Universal wrench handle	For universal wrench 14-324-101
15	14-324-101	Universal wrench	For hex nuts of 9,11 and 14 mm
16	14-24-620	Socket wrench 36	For removing and installing rear cover oil filter
17	14-624-09	Box wrench. 11	For attachment nuts of deflectors, compressor and tachometer generator body
18	14-24-538	Wrench for cylinder attachment nuts	For cylinder attachment nuts
19	700016	Hammer	For hammering
20	UB-24-05	Syringe	For filling oil to cylinders,in preservation and depreservation of engine
21	14-24-571	Wrench for intake pipe nut	For removing and installing intake pipe
22	10-24-72	Fixture for finding piston TDC (top dead center indicator) -one per 10 engines	For timing, setting magneto and compressed air distributor
23	14-24-533	Handle bar 10x200	For spark plug wrench and oil sump filter wrench
24	UB-24-53	Handle bar 12x350	For intake pipe nut wrench and cylinder attachment nut wrench
25	14-324-13	Flat wrench 14	For carburetor attachment nuts
26	14-324-09	Handle bar 8x200	For universal wrench 14-324-101
27	14-24-640	Socket wrench 9	For front and rear breather and tappet guide attachment nuts
28	10-32-07	Valve rocker adjustment screw wrench	For adjusting clearance betweea valve stem and valve rocker roller, for removing and installing valve mechanism case covers
29	14-324-100	Socket wrench 7	For deflector nuts

Place in case (Fig. 1)	Designation	Description	Purpose
30	UB-24-16	Socket wrench 14	For securing magneto, carburetor and generator
31		Feeler gauge L = 100 mm, set 2, ccuracy class 2 GOST 882-75	For checking clearance between valve stem and rocker roller
32	7814-0091x9 GOST 5547-75	Flat-nosed, pliers	For locking and coffering bolts, nuts, plugs
33	700345	Small screwdriver	For ignition harness and air pipe clamps For adjusting oil pump reducing valve, attaching rod casings and magneto covers
34	700346	Large screwdriver	
35	15-32-173	Spark plug wrench 22	For installing and removing apark plugs
36	14-324-08	Wrench socket 9	For universal wrench 14-324-101
37	14-324-06	Wrench socket 11	For universal wrench 14-324-101
38	14-324-07	Wrench socket 14	For universal wrench 14-324-101



Arrangement of Airborne Tools in Case Figure 1

ENGINE M-14P - TROUBLE SHOOTING

Troubles -that may be encountered, during starting and. operation of the M-14P engine at different ratings, their causes and remedies are presented in the Table in the order of probability of their appearance.

Troubles and remedies of engine assemblies and systems are given in the respective sections of this Maintenance Manual.

Trouble	Possible cause	Correction
1. Engine won't start	(1) Throttle is opened too wide or narrow	Set throttle to position corresponding to 28 to 38 /a (800 to 1100 r/min)
	(2) Engine is underprimed	Prime engine through filling system (Task Card ITo. 201)
	(3) engine is overprimed	Turn airscrew through 3 to 5 revolutions with throttle open fully
	(4) Fouling or wetting of spark plugs	Drive out spark plugs, wash and dry them (Ref. 074.20.02, Task Card Ifo. 201)
	(5) Loss of compression	Fill 30 to 40 g of oil into cylinders through spark plug holes and turn shaft. If trouble persists, check piston rings and cylinder surface for condition, carry out operations under 072.30.00, "Trouble uhooting"
	(6) Coil KP-4716 is faulty, wire is shorted to frame	Check wiring, replace coil KP-4716
	(7) Engine is too cold (in winter)	Warm up engine from external heat source
	(8) k/eak storage battery	Replace storage battery
	(9) Priming system is in-operative	Check operation of priming system and eliminate defects
	(10) Magneto breaker point gap is too small or too large	Adjust gap to be from 0.25 to 0.35 mm

Trouble	Possible cause	Correction
	(11) Oiled or burnt magneto breaker points	Burnish and wash points with alcohol
2. Engine starts but stalls after several firings	(1) Fuel shut-off valve is closed	Open fuel shut-off valve
	(2) No fuel in carburetor or water got into fuel	Drive out fuel chamber plug and check if carburetor is filled with fuel. Make sure no air is sucked in inlet gasoline line, drain sediment from sump
	(3) No fuel pressure at carburetor inlet	Check operability of fuel pump by disconnecting fuel pipe from fine filter and rotate airscrew sharply by hands; if pump is OK, fuel flows from pipe in shots
	(4) Clogged carburetor jets	Drive out, wash and blow jets
	(5) Clogged fine filter	Replace filtering element
	(6) Magneto low-tension circuit is periodically snorted to frame	Check low-tension wiring from selector switch to magneto and eliminate trouble
	(7) Magneto breaker gap is too small or too large	Adjust gap to be from 0.25 to 0.35 mm
	(8) Oiled or non-depreserved magneto breaker points	Clean points of oil and dirt
	(9) Magneto wires are mixed or incorrectly connected	Check proper connection of spark plug cables
	(10) Clogged fuel line or tank filter	Blow fuel line, wash filter
	(11) Leaks in suction system (suction pipe nuts are loose, leaky connection for measuring pressure after blower and in pilot nozzle)	Check all joints of suction system for tightening and presence of seals. Eliminate leakage
	(12) Engine is not warm enough in winter	Warm up engine to recommended temperature
3. When starting engine, airscrew makes several reverse revolutions	(1) Excessive spark advance	Check and adjust spark advance angle
	(2) Incorrect setting of compressed air distributor	Adjust compressed air distributor
	(3) Engine is too hot	Cool down engine

Trouble	Possible cause	Correction
4. Engine misses or shakes	(1) Damaged, wires	Replace defective wires
	(2) Poor contact with spark plug center electrode	Check attachment of elbows to apark Plugs
	(3) Fouled or damaged spark plugs	Check spark plugs under pressure, replace defective plugs. If spark plugs are fouled, check cylinder compression. In case of compression leaks, inspect cylinders, pistons and rings. Replace defective parts. Carry out operations under 072.30.00, "Trouble Shooting"
	(4) Poor seating of valves	Inspect clearance between stems and rollers, adjust if necessary
	(5) Water got into gasoline	Drain water from sump
	(6) Leaky suction pipes	Check tightness of flange joints
	(7) Mixture is too rich or lean	Adjust mixture
	(8) Overcooled mixture	Adjust heating
	(9) Icing of throttle, venturi or nozzle of carburetor	Check operability of air heating system and adjust it
	(10) Incorrect magneto breaker point gap	Adjust gap to be from 0.25 to 0.35 mm
	(11) Low or fluctuating pres-sure of gasoline	Adjust gasoline pressure to be from 0.2 to 0.5 kgf/cm . Eliminate leaks
	(12) Clogged fuel filters and lines	Check and clean all fuel lines and filters
	(13) Defective attachment of engine to its frame or of frame to airplane	Check attachment of engine and its frame
	(14) Non-balanced airscrew, or improperly set airscrew blades	Check airscrew balancing, ariachment, setting and runout of blades
	(15) Loosened attachment screws of magneto breaker, rotor or wear of carbon knob	Tighten screws, check breaker point gap, replace carbon knob
	(16) Water or oil got onto magneto distribution block	Remove water or oil from magneto distribution block

Trouble	Possible cause	Correction
5. Engine shuts down when selecting idle	(1) Idle rating is maladjusted	Adjust carburetor throttle by its stop screw to size D indicated in carburetor Certificate to accuracy of ±1. 5 mm
	(2) Incorrect mixture at idling	Adjust mixture by idle needle
	(3) ouction system leaks (auction pipe nuts are loose, gaskets are missing, connections are leaky)	Check all joints of suction system, their tightening, presence of gaskets, eliminate trouble
6. Excessive idle speed	(1) Carburetor idle atop is maladjusted	Adjust carburetor throttle by stop screw to size D indicated in carburetor Certificate to accuracy of ±1.5 mm
	(2) Excessive opening of throttle caused by incorrect length of control rod	Adjust rod length
	(3) Plays in airplane throttle control linkage	Eliminate plays
7. Poor pickup	(1) Engine is underheated or over coo led	Warm up engine to cylinder head temperature of at least 120 °C
	(2) Throttle control rods are maladjusted	Adjust rods so as to ensure opening and closing of throttle without play or jamming
	(3) Lean mixture	Wash filters, fuel and air jets and air passages of carburetor, if necessary, adjust fuel flow rate
	(4) Incorrect jet in acceleration pump	Select and replace jet
8. Engine knocks	(1) Excessive spark advance	Check timing, replace magneto if necessary
	(2) Low-octane fuel	Check fuel for octane rating which should be at least 91
	(3) Excessive clearances between valve items and rocker rollers	Adjust clearances (Ref. Task Card No. 247)
9. Engine overheats, excessive temperature of oil and cylinder heads	(1) Insufficient oil cooling in oil cooler, low oil level in oil tank	Check to see that oil cooler shutter is fully opened. Add oil to tank

Trouble	Possible cause	Correction
	(2) Clogged oil cooler honeycombs	Clean honeycombs of soil
	(3) Congealed, oil in oil cooler	Heat oil cooler
	(4) Poor scavenging of oil from engine (leaks, clogging, air lock in pump)	Check cleanliness of filter in oil sump, rear cover, attachment of oil pump to rear cover
	(5) Gases blow-by into crankcase	Remove cylinders, replace piston rings sentatives
	(6) Jean mixture	Wash fuel and air filters, carburetor jets and air passages, if necessary, adjust fuel flow rate
	(7) Failure of bearings	Check oil filters for chips
	(8) Faulty thermocouple or wiring	Check, calibrate or replace indicator
	(9) Prolonged operation of engine at high pitch	Change over airscrew to low pitch
	(10) Overheating of carburetor inlet air caused by incorrect use of heating	Decrease or turn off air heating. llake sure heating is not turned on occasionally
	(11) Incorrect seating of valves	Check cylinder compression. If compression is low, lap or replace valves
	(12) Valves are burnt through	Replace valves
	(13) Incorrect valve clearances	Adjust valve clearances (Ref. Task Card IJo. 247)
	(14) Incorrect magneto timing (15) Low-octane fuel	Adjust spark advance (Ref. 074.10.01, Task Card No. 202)
	(16) Exhaust gases blow-by to thermocouple	Check fuel octane rating which should be not less than 91
	(17) Exhaust gas blow-by from exhaust manifold to cylinder heads	Eliminate blow-by

Trouble	Possible cause	Correction
	(18) Blow-by of gases in crankcase	Remove cylinders, replace piston rings sentatives.
10. Engine is smoky	(1) Piston is burnt through or scored, cylinder oval	Check compression, find defective piston, remove cylinder. If piston is scored and cylinder is oval, replace piston and cylinder, if piston is burnt through, remove engine for overhaul
	(2) Mixture is too rich	Wash air jets and passages of carbu-retor, lean out mixture, if necessary
	(3) Insufficient oil scavenging	Check scavenging oil line, oil sump and rear cover filters, pipelines, oil cooler
	(4) Crankcase ia overfilled with oil	Check operation of engine scavenging system and oil pump
	(5) Poor blower oil seal	Inspect mixture collector. If mixture collector is oiled, send engine for repair
	(6) Poor contact or exces-sive wear of piston rings	Replace defective rings
	(7) Excessive cylinder oval (surface wear)	Send cylinders for repair
11. Engine does not acquire full speed	(1) Airscrew pitch is too high or speed governor is maladjusted	Check and adjust according to air-screw Maintenance Manual
	(2) Defective tachometer or its wires (reads incorrect RPM)	Check indicator and inspect wiring
	(3) Engine is overheated	Ref. Item 9
	(4) Clogged carburetor strainer	Wash carburetor strainer
	(5) Throttle does not open fully or excessive play in control linkage	Eliminate troubles in control linkage
	(6) Low fuel supply to carburetor	Check if fuel cock is fully opened, check condition of carburetor filter
	(7) Defecting ignition	Check spark plugs, wires, magneto

Trouble	Possible cause	Correction
	(8) Incorrect spark advance	Adjust spark advance (Ref. 074.10.01, Task Card No. 202)
	(9) Carburetor is mal-adjusted. or needle sticks	Check carburetor adjustment, smooth movement of needle
	(10) Exhaust valves are burnt through	Replace valves
	(11) Incorrect clearances between rocker roller and exhaust valve stem	Adjust clearances (Ref. Task Card No. 247)
12. Oil is ejected. from breather	(1) Engine is overheated	Ref. Item 9
	(2) Blow-by of gases through piston rings	Find defective cylinder and replace rings
	(3) Degraded breathing of engine	Remove and wash engine breathers
	(4) Water in oil	Replace oil

ENGINE M-14P - MAINTENANCE PRACTICED

1. LIST OF TASK CARDS

	Task Card No.
Engine Starting	**201**

CAUTION: COLLECTION OF OIL AMD GASOLINE CAN BE ENCOUNTERED IN ENGINE LOWER CYLINDERS, THEIR INTAKE PIPES AMD EXHAUST MANIFOLD.

TO PRECLUDE HYDRAULIC SHOCK, PRIOR TO STARTING WHILE IGNITION IS SWITCHED OFF, TURN AIRSCREW MANUALLY IN ITS NORMAL DIRECTION FOR 3 TO 4 TURNS. IP TURNING THE AIRSCREW REQUIRES GREAT FORCE OR IT CANNOT BE TURNED AT ALL, AS WELL AS AFTER A PARKING PERIOD OF M3RE THAN 3 DAYS, AFTER DEPRESERVATION OF THE ENGINE, IN CASE OF OVERPRIMING AND AFTER TWO UNSUCCESSFUL ATTEMPTS TO START THE ENGINE, CARRY OUT THE FOLLOWING OEERATIONS:

(1) DRIVE OUT DRAIN PLUGS OF THE INTAKE PIPES OF CYLINDERS NOS 4, 5, 6 AND ONE SPARK PLUG FROM EACH OF THESE CYLINDERS, REMOVE PLUGS FROM THE EXHAUST MANIFOLDS.

(2) TURN THE AIRSCREW MANUALLY FOR 3 TO 4 TURNS IN ITS NORMAL TURNING DIRECTION, ACCUMULATED OIL OR MIXTURE OF OIL AND FUEL SHOULD DRAIN FULLY FROM THE INTAKE PIPES, EXHAUST MANIFOLD AND CYLINDERS (AT A TEMPERATURE OF 5 °C AND BELOW, IT IS RECOMMENDED TO PERFORM THIS OPERATION AFTER HEATING THE ENGINE AND INTAKE PIPES OF THE LOWER CYLINDERS). WHEN TURNIHG THE AIRSCREW MANUALLY KNOCKS MAY BE HEARD IN THE ENGINE WHICH ARE CAUSED BY THE COUNTERWEIGHT WITH THE LOCK STRIP ON THE WEB AND ARE REGARDED NORMAL.

(3) REINSTALL AND TIGHTEN THE SPARK PLUGS.

(4) INSTALL AND LOCK THE DRAIN PLUGS.

Engine Wann-Up and Test Run	**202**
Engine Shutdown	**203**

Engine Maintenance at Low Ambient Temperatures

NOTE: *Preparation for starting and starting of the engine are very important for its reliable operation.*

At ambient temperatures of 5 °G and below, oil viscosity increases, which impedes starting of non-warmed-up engine and may lead to rapid wear of parta and assemblies on turning the engine crankshaft.

Heating and winterization of the engine, dilution of oil with gasoline facilitate starting, decreases wear of parts, particularly of cylinders and pistons.

Perform engine maintenance under low ambient temperatures according to the following

Task Cards:

Title	Task Card No.
Winterization of Powerplant	204
Dilution of Oil with Gasoline	205
Maintenance of Engine Operating on Diluted Oil	206
Preparation of Engine for Starting	207
Engine Starting	208
Engine Warm-Up and Test Run	209
Engine Shutdown	210

Flight Preparation (Line Maintenance Checks)

NOTE: *Line maintenance checks incorporate the preflight maintenance and postflight action*.

Title	Task Card No.
Obtaining Pilot's Complaints on Engine Troubles in Flight	211
Visual External Inspection of Engine and Leakage Check of Engine Assembly and Accessory Joints	212
Inspection and Check of Reliability of Engine Mounting	213
Gleaning of Engine	214
Drainage of Oil for Inspecting It for Metal Particles	215
Engine Test Run before Shutdown to Determine Troubles	216
Dilution of Oil with Gasoline	217
Engine Covering after Inspection and Elimination of Troubles	218
External Inspection of Speed Governor	219
Check of Reliable Attachment and Operability of Speed Governor Control System	220
Inspection of Cylinders, Exhaust Manifold, Its Pipes at Joints with Cylinders	221
Check of Cylinder Intake Pipes for Condition	222
Checking of Deflectors for Condition and Reliable Attachment	223
Check of Covers and Gables of Valve Mechanism Case Cables for Condition	224

Scheduled Maintenance Operations (Periodic Maintenance)

NOTE: *Periodic maintenance operations include:*

Maintenance after the first flight of the airplane with newly installed engine. Maintenance after first 5 h. of engine operation. Maintenance after every (100±10) h of engine operation. Maintenance after (200±10) h. of engine operation. Maintenance after (300±10) h of engine operation.

TO M-14P MS	**TASK CARD No. 201**		
M.S. ITEM	PROCEDURE: Engine Starting		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Shift the speed governor lever to the LOW PITCH position. ***NOTE: At a carburetor inlet air temperature of below 10 °C, open the air heating shutter at the carburetor inlet.*** 2. Set the carburetor throttle control lever to the position corresponding to a speed of 28 to 38 % (800 to 1100 r/min). 3. Cut in all the engine instruments. **CAUTION:** DO NOT FILL MORE GASOLINE THAN SPECIFIED, OTHERWISE IT CAN WASH DOWN OIL FROM THE CYLINDER WALLS AND CAUSE SCORING OF PISTONS, WHILE ACCUMULATION OF GASOLINE IN LOWER CYLINDERS AND SUCTION PIPES MAY CAUSE HYDRAULIC SHOCK. 4. Make sure the ignition is switched on, prime the engine mixture collector by the hand priming pump with 8 to 12 shots in summer and 15 to 20 shots in winter, simultaneously turning the airscrew manually in its normal direction. 5. Allow gasoline vapors evaporate, for 1 to 2 min in summer and 3 to 5 min in winter. 6. Operate the hand pump to build up gasoline pressure of 0.2 to 0.5 kgf/cm before the carburetor inlet.			

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
7. Give command "Clear off" and on receiving "Cleared" reply, open the onboard bottle valve and push the START () button. **CAUTION:** DO HOT DEPRESS THE "START" () BUTTON FOR MORE THAN 30 s CONTINUOUSLY, INTERVALS BETWEEN DEPRESSIONS SHALL BE AT LEAST 3 min AND AFTER 10 DEPRESSIONS AT LEAST 10 min. 8. Cut in the magneto by setting selector switch PM-1 to position "1+ 2" as soon as the engine starts running steadily from the starting coil (12 to 14 %). **NOTES:** 1. For better starting the engine, supply additional shots of fuel with priming pump after first firings. 2. In the course of starting as firing appears in the cylinders, it is allowed to assist engine acceleration to steady RPM by moving to and fro the carburetor throttle control lever within the speed range of 28 to 60 %, the rate of movement is 2 to 3 s. 9. Cut out the ignition by setting the selector switch to position "0" if the engine does not fire for 30 s. 10. Turn the airscrew manually with the throttle fully open for 8 to 10 turns in its normal direction and without priming the engine repeat starting. 11. If the engine fails to start after two attempts, cease starting and carry out the following operations: (1) Turn off the ignition. (2) Drive out the drain plugs of the intake pipes of cylinders Nos 4, 5, 6. (3) Drive out one spark plug from each cylinder. (4) Pill 30 to 40 g of fresh oil heated to 75 to 80 °C into the cylinders using a pump.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
(5) Turn the airscrew manually for 3 to 4 turns in its normal direction to drain accumulated oil or mixture of gasoline and oil from the intake pipes, exhaust manifold and cylinders. (6) Reinstall the spark plugs and drain plugs. (7) Lock the plugs and repeat starting as instructed in Items 1 through 7. 12. Set the throttle control lever to a position of 38 to 41 % (1100 to 1200 r/min) as soon as the engine starts operating steadily. 13. Set the priming pump knob to neutral, engage the start button lock simultaneously checking engine inlet oil pressure. 14. Immediately shut down the engine if 15 to 20 s after starting the oil pressure does not reach 1.0 kgf/cm . 15. Find and eliminate the cause of oil low pressure. 16. Repeat starting after eliminating the trouble.		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Pump, priming 740400	

<table>
<tr><td>TO M-14P MS</td><td colspan="2">T A S K C A R D No. 202</td><td></td></tr>
<tr><td>MS ITEM</td><td colspan="3">PROCEDURE Engine Warm-up and Test Run</td></tr>
<tr><td colspan="2">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="2">1. Warm up the engine at a speed of 41 to 44 % (1200 to 1300 r/min) in 0.5 to 1 min after starting till engine inlet oil temperature starts rising (the engine test run chart is given in Pig. 201).
2. Increase engine rotational speed by carburetor throttle control lever to 44 to 48 % (1300 to 1400 r/min) in summer and up to 51 % (1500 r/min) in winter and keep on warming the engine at this speed till the cylinder head temperature is at least 120 °C and engine inlet oil temperature is not below 40 °C.
<u>T.R.</u> The engine is considered warm if the temperature of the heads of the coldest cylinders is not below 120 °C and engine inlet oil temperature is not below 40 °C.
3. Maintain the required temperature conditions of the engine by opening or closing shutters of the cowling and oil cooler.
4. Warm up the airscrew hub by changing its pitch two times.
5. Check engine operation at different ratings by smoothly moving the carburetor throttle control lever to the stop and increasing the airscrew pitch simultaneously, change over the engine to nominal rating II.
<u>T.R.</u> The engine should run steadily and without vibration.</td><td>In case of unsteady running or vibration, refer to Section "Trouble Shooting", Item 4</td><td></td></tr>
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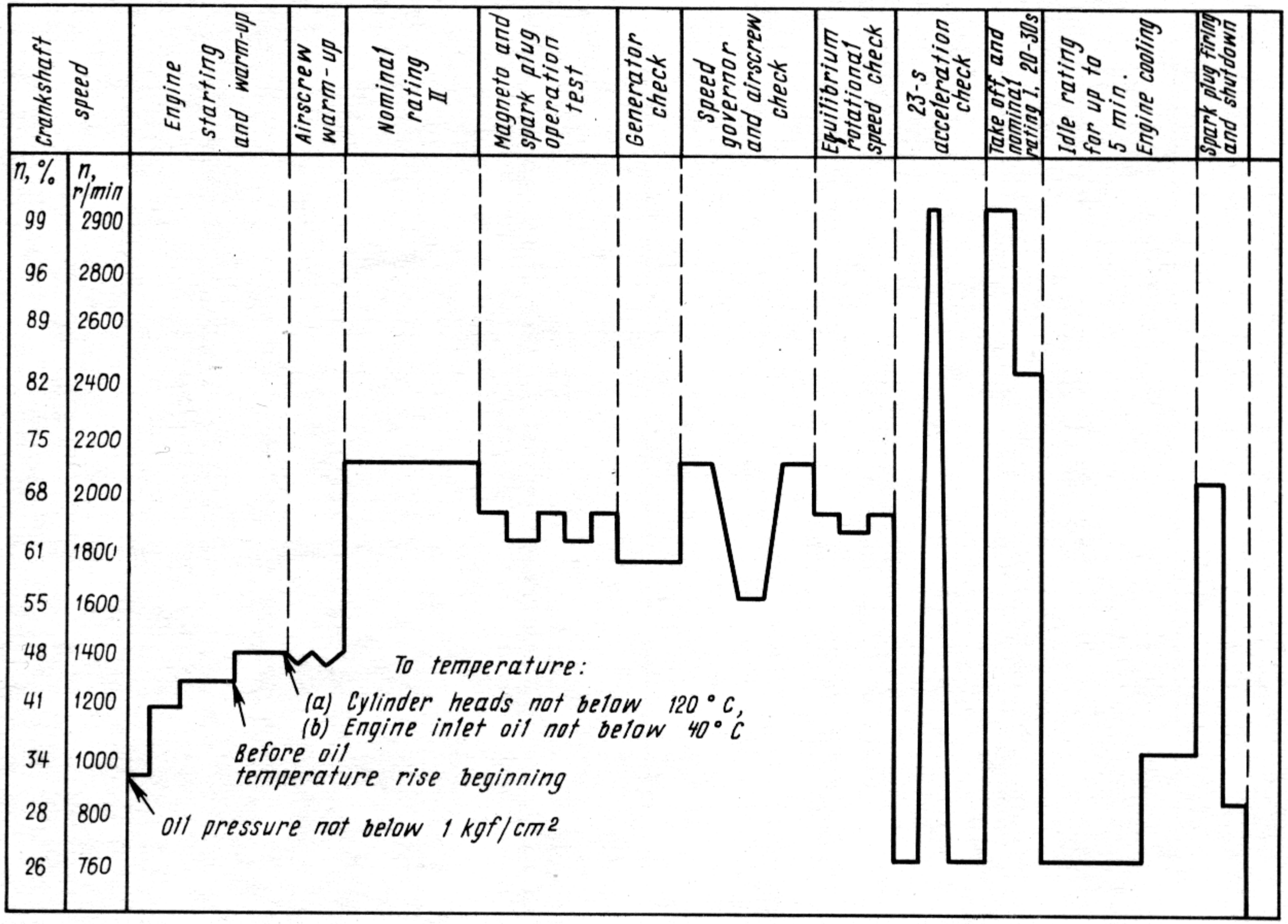


Engine M-14P Test Run Chart Figure 201

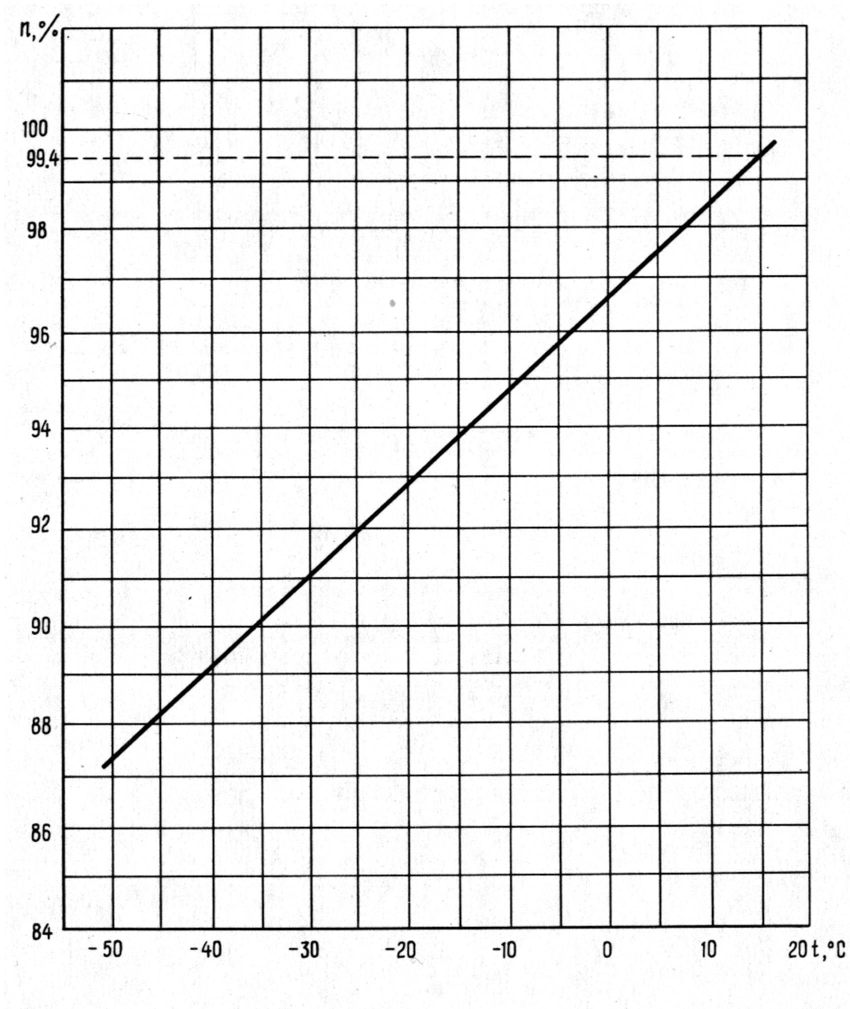
OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
6. Check engine instrument readings for correspondence to the Specification. **CAUTION:** TO AVOID OVERHEATING BECAUSE OF INSUFFICIENT BLOWING, DO NOT OPERATE THE ENGINE FOR A LONG TIME AT NOMINAL RATING II ON GROUND. 7. Check operation of the magneto and spark plugs at a speed of 64 % and then 70 % using the following procedure: (1) Use the carburetor throttle control lever to set a speed of 64 to 70 % (1860 to 2050 r/min) having set the airscrew to the LOW PITCH stop. (2) Cut out each magneto alternately for 15 to 20 s. **T.R.** Speed drop should not exceed 3 % (85 r/min) when operating with one magneto. (3) Cut in both magnetos for 20 to 30 s when changing over from one of them to the other to avoid spark plug fouling.	If speed drops for more than 3 %, proceed as follows: (1) Check attachment of spark plug elbows (Ref. 074.20.02, Task Card No. 202). (2) Check operability of spark plugs (Ref. 074.20.02, Task Card No. 202). (3) Check magneto point gap (Ref. 074.10.01, Task Card No. 202). (4) Check shielding of ignition wires	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
8. Check operation of the generator at engine rotational speed of 57 to 58 % (1680 to 1700 r/min). T.R. When pushing the voltmeter button, voltage should be 27 to 27.5 V with power consumers switched on. 9. Check operation of the airscrew mechanism and speed governor as follows: (1) Set the speed governor control lever .to the LOW PITCH position. (2) Set the carburetor throttle control lever to a rotational speed of 70 %. (3) Smoothly shift the speed governor control lever to the HIGH PITCH position without touching the carburetor throttle control lever. T.R. The speed should drop to 53 % (1550 r/min). (4) Shift the speed governor control lever back to the LOW PITCH position. T.R. The rotational speed should rise to initial one of 70 % (2050 r/min). **NOTE:** *Short-time drop of engine inlet oil pressure -co 2 kgf/cm with subsequent restoration during 8 to 11 s is tolerable.* 10. Check operation of the airscrew and speed governor at equilibrium speed using the following procedure: (1) Set the speed governor control lever to the LOW PITCH position.	If voltage drops below 27 to 27.5 V, proceed as instructed in generator Certificate or replace generator For cause of speed deviation from 53 % and initial one, refer to Section "Trouble Shooting", Item 11	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
(2) Set engine rotational speed of 70 % (2050 r/min) using the carburetor throttle control lever. (3) Increase the airscrew pitch to a speed of 64 % (1860 r/min) by the speed governor control lever. (4) Without touching the speed governor control lever, smoothly open and close (not fully) the carburetor throttle with somewhat varying the blower outlet pressure, T.R. The engine rotational speed should not change. ***<u>NOTE:</u> At a sharp opening and closing of the carburetor throttle, the engine rotational speed may increase or decrease for 2 to 4 % (60 to 120 r/min), respectively and be restored in 2 to 3 s to the equilibrium speed.*** 11. Check engine pickup as follows: (1) Lower the engine rating to IDLE by simultaneously shifting the throttle control lever to the IDLE position and the speed governor control lever to the LOW PITCH position. (2) Shift the carburetor throttle control lever to the TAKE-OFF position within 0.5 to 3 s. **<u>T.R.</u>** The engine should change over to the take-off rating from the idle one smoothly without flats for a time of up to 3 s. (3) Repeat the pickup test by combining it with engine test at take-off and nominal I ratings. As the engine accelerates to the speed of take-off rating 99 % (2900 r/min), make a delay at this rating for 20 to 30 s, then increase the airscrew pitch to set a speed of 82 % (2400 r/min) and check operation of the engine for 20 to 30 s at nominal rating I.	For cause of speed variation, refer to Section "Trouble Shooting", Item 11 In case of troubles, refer to Section "Trouble Shooting" In case of troubles, refer to Section "Trouble Shooting"	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
(4) Note engine instrument readings and make sure they are in line with the Specification. **T.R**. The engine rotational speed, the blower outlet pressure and oil pressure should correspond to the Specification. **CAUTION:** 1. TO ENSURE NORMAL PICKUP, THE CYLINDER HEAD TEMPERATURE SHOULD BE NOT BELOW THAN 120 °C AND ENGINE INLET OIL TEMPERATURE, NOT BELOW THAN 40 °C. 2. WHEN GROUND TESTING THE ENGINE AT SUBZERO TEMPERATURES, IT IS ALLOWED TO DECREASE SPEED AT TAKE-OFF RATING. THE SPEED DROP IS DETERMINED ACCORDING TO THE ENGINE SPEED VERSUS ATMOSPHERIC CONDITIONS GRAPH AND SHOULD NOT EXCEED THE VALUES INDICATED IN PIG. 202. 12. Check operation of the engine at the IDLE rating with setting the airscrew in the LOW PITCH position. **T.R.** The engine should run steadily. **NOTES:** 1. Do not run the engine idle for more than 5 min, otherwise spark plugs will foul. 2. When operating the engine with compressor loaded, the tachometer indicator pointer may hunt within +3 % (up to 100 r/min), while the pointer of the boost pressure indicator remains steady which indicates that the crankshaft speed is constant. Such a hunting does not indicate engine malfunctions. At no-load operation of the compressor, the tachometer pointer ceases hunting. 3. When shifting the throttle control lever to the IDLE position, a short-time drop of idle speed with engine operating steadily is allowed.	In case of troubles, refer to Section "Trouble Shooting", Item 11; 072.50.00, "Trouble Shooting" If engine runs non-steadily, refer to Section "Trouble Shooting", Item 4	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
Take-Off Rotational Speed of Engine M-14P with Alracrew V530TA-D35 on Airplanes (on Groun) Versus Ambient Temperature at Atmospheric Pressure P = 720 to 770 mm Hg Figure 202		



TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS	

TO M-14P M.S.	**TASK CARD No. 203**		
M.S. ITEM	procedure: Engine Shutdown		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Prior to shutdown, cool the engine as follows: (1) Fully open the cowling and oil cooler shutters. (2) Decrease engine speed to 28 to 34 % (800 to 1000 r/min) (the airscrew is in the LOW PITCH and run the engine at this rating till cylinder head temperature drops to 140 to 150 °C. **CAUTION:** 1. IT IS ALLOWED TO SHUT DOWN THE ENGINE AT A CYLINDER HEAD TEMPERATURE OF UP TO 170 °C AS READ BY THE INDICATOR IN THE PILOT'S CABIN IF THEY CANNOT BE COOLED DOWN TO 140 TO 150 °C. THE NUMBER OP SHUTDOWNS AT ELEVATED CYLINDER HEAD TEMPERATURES SHOULD BE INDICATED IN THE ENGINE LOG BOOK. 2. IT IS PROHIBITED TO RUN THE ENGINE IDLE FOR A LONG TIME BEFORE SHUTDOWN, OTHERWISE SPARK PLUG FOULING, OVERFILLING OF CRANKCASE WITH OIL MAY RESULT, WHICH IN TURN MAY LEAD TO HYDRAULIC SHOCK AT SUBSEQUENT STARTING. 2. After cooling down the cylinder heads, increase engine rotational speed to 65 to 68 % (1900 to 2000 r/min) by the carburetor throttle control lever. 3. Fire the spark plugs at a speed of 65 to 68 % (1900 to 2000 r/min) during 20 to 30 s. 4. Decrease the rotational speed to 28 to 34 % (800 to 1000 r/min), turn off the ignition and smoothly open fully the carburetor throttle.			

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
CAUTION: 1. TO AVOID SCORING OF PISTONS AND CYLINDER SURFACE AT SUB-CAUSE OF RAPID FLOW DOWN OF OIL FROM CYLINDER WALLS AT HIGH HEAD TEMPERATURES, NEVER SHUT DOWN THE ENGINE DIRECTLY FROM CRUISE AND HIGHER RATINGS. 2. NEVER SHUT DOWN THE ENGINE BY CLOSING THE FUEL SHUT-OFF VALVE WITH CONSUMING FUEL FROM THE CARBURETOR TO AVOID BACK- FIRE AND FIRE OF THE AIRPLANE. 5. After shutting down the engine, shift the carburetor throttle control lever to the IDLE po sition and close the fuel shut-off valve. 6. Fill in the engine Log Book after each flight, enter notes on engine malfunctions and elapsed time, including time of operation at take-off and nominal ratings.		

TEST EQUIPMENT	FOOLS AND FIXTURES	MATERIALS

TO M-14P M.S.	**TASK CARD No. 204**		
m.s. item	procedure: Winterization of Powerplant		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Install covers on the R-2, series 04, speed governor, oil cooler and. oil tank. ***NOTES:*** ***1. Arrange the covers so that it is possible to fill oil into the tank and warm the engine with hot air from ground heaters without removing the covers.*** 2. If the oil tank is not heat-insulated on the airplane, heat-insulate it with a special cover which tightly closes the entire surface of the tank and has a hole for the filler. 2. Wrap the covers at points of passing of the heater pipes with heat insulation material. 3. Insulate rubberized fabric hoses, flexible hoses, electric wires with asbestos or cover with shields to protect them against hot air at heating. 4. Insulate metal oil lines with two layers of heat insulation material: the first layer of asbestos cord and the other layer of calico tape. 5. Sew the calico tape with threads at both ends of wrapping. 6. Paint insulation material with enamel to fit the oil system color and coat with water glass. **CAUTION:** DO NOT HEAT-INSULATE FLEXIBLE HOSES. 7. Make sure oil can be fully drained from the oil system through drain cocks.			

OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CHECKED BY
NOTES: 1. If oil trapping is detected, replace the pipes where pockets are formed. 2. Check drainage of oil from the oil cooler.			
TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**	
		Needle Threads, coarse,flax No. 105x6 Tape,calico, cotton 16x0.22, grade 1 Enamel, brown PP-223 Glass, water sodium	

TO M-14P MS	**TASK CARD No. 205**		
MS ITEM	PROCEDURE Dilution of Oil with Gasoline		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
At an ambient temperature below+ 5 °C, dilute oil with gasoline as follows: (1) Heat the engine with a ground heater to a cylinder head temperature of 30 °C. (2) Start and warm up the engine to an inlet oil temperature of 40 to 45 °C (Kef. Task Card No. 201). (3) Set the airscrew to the LOW PITCH position and the carburetor throttle control lever to a speed of 54 % (1600 r/min). (4) Push the button of solenoid valve EKR-3 and keep it depressed throughout the time of dilution. **T.R.** Oil pressure during dilution should drop for not more than 1.0 kgf/cm from the specified value. **NOTES:** 1. The time of opening of the solenoid valve is determined depending on the amount of oil in the tank and elapsed time of engine operation after recent dilution according to the Table located on board the airplane. 2. The amount of gasoline required for diluting oil MS-20 is found on the basic of 10 to 12 % of the amount of oil in the oil system and engine (by volume). (5) Release the button of solenoid valve EKR-3 without changing the engine rating, and run the engine for 3 min to mix gasoline with oil. (6) Shift the airscrew from low pitch to high one 3 or 4 times to fill the airscrew cylinder with diluted oil.		If oil pressure drops below 1 kgf/cm, cease dilution	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
NOTE: Perform dilution at the end of the flying day or in case of engine dead periods when engine oil may cool down below+ 5 °C. (7) Shut down the engine (Ref. Task Card No. 203).		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS

TO M-14P M.S.	**TASK CARD No. 206**		
M.S. ITEM	PROCEDURE: Maintenance of Engine Operating on Diluted Oil		
OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CHECKED BY
1. Warm up the engine for 5 to 6 min at a speed of 41 to 44 % (1200 to 1300 r/min). NOTE: The engine with diluted oil is regarded warmed up and ready for flight, if the cylinder head temperature is at least 120 °C and engine inlet oil temperature is not below 25 °C. 2. Gradually increase rotational speed to 51 % (1500 r/min) and see to it that the oil pressure in the main line is 4 to 6 kgf/cm . NOTE: If oil pressure drops below 1.0 kgf/cm owing to excessive dilution with gasoline during engine idling on the ground, drain diluted oil from the oil system and fill it with anon-diluted fresh oil with subsequently checking pressure with the engine running. 3. Wash all oil filters after first dilution. **CAUTION:** IN THE COURSE OF DILUTION. AVOID ENGINE INLET OIL TEMPERATURE RISE ABOVE 50 °C AND CYLINDER HEAD TEMPERATURE ABOVE 160 °C.			

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**

TO M-14P M.S.	**TASK CARD No. 207**		
M.S. ITEM	PROCEDURE: Preparation of Engine for Starting		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY
1. Warm up the engine, airscrew cylinder and oil system with hot air from a ground heater so that the cylinder head temperature is at least 30 °C as read off the indicator if the ambient temperature is below minus 10 °C. **CAUTION:** HOT AIR TEMPERATURE AT OUTLET FROM THE HEATER HOSE SHOULD NOT EXCEED 100 to 120 °C TO AVOID WARPAGE OF RUBBER ITEMS. 2. Turn off the ignition. 3. Turn the airscrew shaft for 3 to 4 turns in its normal direction. **NOTES:** 1. The airscrew shaft should turn easily, while oil in the oil tank is regarded heated if it flows down freely from the dipstick. 2. At ambient temperatures from 5 to minus 10 °C it is allowed to start the engine without preheating if oil in the engine and oil system is diluted with gasoline. 4. Pill the oil system with oil heated to a temperature of 75 to 80 °C, if oil was drained from the oil system. 5. Fill 2 to 3 lit of oil heated to 75 to 80 °C through the rear breather. 6. Drain mud from the oil tank. 7 Disconnect the hose from the oil pump flange and drain up to 3 lit of heated oil to a clean vessel to heat the oil line running from the tank to the engine at a subzero ambient temperature.		

TO M-14P MS	**T A S K C A R D No. 208**		
MS ITEM	procedure Engine Starting		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CH ECKED BY**
Start as indicated in Task Card No. 201 the engine preheated according to Item 1, Task Card No. 207.			

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**

TO M-14P MS	**TASK CARD No. 209**		
M.S ITEM	PROCEDURE: Engine Warm-up and Test Run		
OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CH ECKED BY
1. Warm-up and test run the engine as instructed in Task Card No. 202. ***NOTE: To ensure appropriate mixing and preclude icing of carburetor venture, the carburetor inlet air temperature should not be less than 10 °C.*** 2. Close the cowling and oil cooler shutters to speed up warming-up. 3. Before take-off, change over the airscrew from the LOW PITCH to HIGH PITCH position two or three times and back to warm oil in the airscrew cylinder.			

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**

TO M-14P M.S.	**TASK CARD No. 210**		
M.S. ITEM	procedure: Engine Shutdown		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CH ECKED BY**
1. Dilute oil with gasoline (Ref. Task Card No. 205). 2. Shut down the engine (Ref. Task Card No. 203). 3, Drain oil from the airplane and engine oil system, if oil was not diluted with gasoline and ambient temperature is 5 °C and less. ***NOTES:*** 1. Drain oil at an oil temperature of not less than 30 °C through the oil tank cock, oil sump drain cock and oil cooler cock. 2. Leave all the cocks open after draining oil.			

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**

TO M-14P M.S.	**TASK CARD No. 211**	
M.S. ITEM 072.00.00a	PROCEDURE: Obtaining Pilot's Complaints on Engine Troubles in Plight	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
1. Listen to pilot's complaints on engine troubles encountered in flight. 2. Enter the information in the airplane preparation Register.		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS

<table>
<tr><td>TO M-14P M.S.</td><td colspan="2">TASK CARD No. 212</td><td colspan="2"></td></tr>
<tr><td>MS ITEM
072.00.00b, 0'77.00.00c</td><td colspan="4">Procedure: Visual External Inspection of Engine and Leakage Check of Engine Assembly and Accessory Joints</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="3">1. Check the engine for external condition and tightness of joints of assemblies and accessories.
<u>T.R.</u> leakage of fuel and oil through joints of assemblies and accessories is not allowed.
Damaged locking, loosened attachment are not allowed.
<u>NOTE:</u>
Tighten nuts for attachment of the gearbox to the intermediate crankcase by torque wrench 14-024-260 with socket 14-324-06. Tightening torque $M_t = (1.5^{+0,3})$ kgf-m. At locations of the oil sump bellows, boss of the passage for supply of oil to the R-2, series 04, speed governor, boss for the R-2, series 04i governor attachment and boss for the centrifuge (on engines M-14P, series 2) where torque wrench cannot be used, tighten the nuts with the wrench.</td><td>Detect and eliminate cause of fuel and oil leakage
Tighten nuts and replace locking</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td>Wrench, torque 14-024-260
Socket set
Wrench 700002</td><td colspan="2"></td></tr>
</table>

TO M-14P M.S.	**T A S K C A R D No. 213**	
M S ITEM 072.00.00d, 072.20.00a	Procedure: Inspection and Check of Reliability of Engine Mounting	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Inspect the engine crankcase-to-frame attachment bosses. 2. Inspect rubber shock absorbers for proper condition. 3. Check reliable attachment of the engine to its frame. 4. Inspect the units for attachment of the engine frame to the fuselage. 5. Inspect the frame bars and ring. 6. Make sure they are free from deformation or cracks. 7. Check reliability of bolted joints and make sure locking is Intact. **T.R.** Deformations and cracks are not allowed. Bolted joints should be tightened and locked.	Replace defective frame Tighten and lock inspected bolted joints	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Pliers, flat-nosed 150 Wrench 14x17 14-232-03	

<table>
<tr><td>TO M-14P M.S.</td><td colspan="2">TASK CARD No. 214</td><td colspan="2"></td></tr>
<tr><td>M.S. ITEM
072.00.00e</td><td colspan="2">PROCEDURE: Cleaning of Engine</td><td colspan="2"></td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="3">Clean the engine of dust, dirt, runs of oil and fuel. T.R. Soiling of the engine is not allowed.
<u>CAUTION</u>: CLEAN THE ENGINE AFTER COOLING IT DOWN.</td><td>If soiling is detected, wash engine with clean gasoline and wipe with dry rags</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td>Syringe UB-24-05</td><td colspan="2">Gasoline Nefrae-S 50/170 or BR-1, BR-2
Rags Clo-fcha Brush, hair</td></tr>
</table>

TO M-14P MS	**TASKCARD No. 215**		
MS ITEM 072.00.00f	PROCEDURE: Drainage of Oil for Inspecting It for Metal Particles		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CH ECKED BY**
1. Drain 0.5 lit of oil from the engine oil sump as follows: (1) Unlock and. drive out the filter with chip detector (Ref. Task Card TSo. 212). (2) Drain 0.5 lit of oil through fine-mesh funnel. (3) Make sure the funnel mesh, filter with chip detector and its seat are free from metal particles. T.R. Presence of metal particles on the funnel mesh and filter with chip detector cannot be tolerated. 2. Wash the filter with chip detector and funnel with clean gasoline. 3. Make sure the filter with chip detector is not damaged. T.R. Damage to the filter with chip detector is not allowed. 4. Check the filter gasket for condition. T.R. Damage to the gasket is not allowed. 5. Reinstall the filter with chip detector. 6. Lock the filter with chip detector. 7. Pill fresh oil.		If metal particles are detected, trace cause of their getting in oil Replace or repair filter with chip detector Replace damaged gasket	

OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CHECKED BY

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Wrench 7x9 700880-2 Wrench 9x11 700002 Funnel, fine-mesh	Gasoline Nefras-S 50/170 or BR-1, BR-2

TO M-14P M.S.	**TASK CARD No. 216**	
M.S. ITEM 072.00.00g	PROCEDURE: Engine Test Run before Shutdown to Determine Troubles	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Taxi the airplane to the parking ground. 2. Listen to engine operation before shutdown. Make sure the engine does not miss, there are no pops in suction and exhaust systems. **T.R.** Missing and pops are not allowed. 3. Test run the engine at all ratings if troubles were encountered in flight (Ref. Task Card No. 202). 4. Eliminate all troubles detected.	Determine and eliminate cause of missing and pops	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**	

TO M-14P MS	**TASK CARD No. 217**		
MS ITEM 072.00.00h	PROCEDURE: Dilution of Oil with Gasoline		

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE**	**ACTIONS**	**CHECKED BY**
Dilute oil with gasoline if ambient temperature drops below 5 °C (Ref. Task Card No. 205).			

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**

TO M-14P MS	**TASK CARD No. 218**	
MS ITEM 072.00.001	procedure: Engine Covering after Inspection and Elimination of Troubles	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Eliminate defects detected in flight and in the course of inspection. 2. Cover the engine as follows: (1) Put folded cover on the engine and spread it. (2) Fasten the cover straps. (3) Install blanking covers on the exhaust pipes.		

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**

<table>
<tr><td>TO M-14P MS</td><td colspan="2">TASK CARD No. 219</td><td colspan="2"></td></tr>
<tr><td>MS ITEM
072.10.00a</td><td colspan="4">procedure: External Inspection of Speed Governor</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH ECKED BY</td></tr>
<tr><td colspan="3">Inspect the speed governor externally to make sure it is free from defects, plays in the roller, damaged locking.
T.R. Damage, plays, broken locking cannot be allowed.</td><td>(1) Replace damaged governor (Ref. 061.20.01, Task Cards Nos 201 through 204).
(2)' Eliminate play by tightening attachment nut.
(3) Lock roller attachment nut anew.</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td>Wrench 9x11 700002 Wrench 11x14 14-24-861 Pliers, flat-nosed 150</td><td colspan="2"></td></tr>
</table>

<table>
<tr><td>TO M-14P M.S.</td><td colspan="3">T A S K C A R D No. 220</td><td colspan="2"></td></tr>
<tr><td>M.S. ITEM
072.10.00b</td><td colspan="5">procedure; Check of Reliable Attachment and Operability of Speed Governor Control System</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td colspan="2">CORRECTIVE ACTIONS</td><td>CH
ECKED BY</td></tr>
<tr><td colspan="3">1. Inspect the speed governor location. T.R. Oil leakage is not allowed.
2. Check attachment of the governor control roller.
<u>T.R</u>. Loose attachment of the roller is not allowed. Roller attachment nut locking should be intact.
3. Check easy movement of the airscrew pitch control lever.</td><td colspan="2">Find and eliminate leakage by replacing gasket or tightening governor attachment nuts
Eliminate play by tightening nut, replace damaged locking</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="3">MATERIALS</td></tr>
<tr><td colspan="2"></td><td></td><td colspan="3"></td></tr>
</table>

<table>
<tr><td>TO M-14P MS</td><td colspan="2">TASK CARD No. 221</td><td colspan="2"></td></tr>
<tr><td>MS ITEM
072.30.00a</td><td colspan="4">procedure: Inspection of Cylinders, Exhaust Manifold, Its Pipes at Joints with Cylinders</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="3">1. Inspect the cylinders.
2. Inspect the exhaust manifold and its pipes at joints with the engine cylinders.
3. Make sure gases do not escape through the seals, there are no traces of overheating or cracks on the exhaust manifold.
<u>T.R.</u> Overheating, warpage of fins and gas blow-by are not allowed.
4. Perform sampling inspection of pipe attachment nuts for proper tightening. 5. Tighten the loose attachment nuts.</td><td>(1) Replace cylinder with traces of overheating and warpage.
(2) Eliminate cause of gas blow-by</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td>Wrench 14-24-538 for cylinder attachment nuts</td><td colspan="2"></td></tr>
</table>

<table>
<tr><td>TO M-14P MS</td><td colspan="3">TASK CARD No. 222</td><td></td></tr>
<tr><td>MS ITEM
072.30.00b</td><td colspan="4">PROCEDURE: Check of Cylinder Intake Pipes for Condition</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH ECKED BY</td></tr>
<tr><td colspan="3">1. Check condition and attachment of the cylinder intake pipes.
<u>T.R.</u> Loosening of cylinder intake pipe attachment nuts is not allowed.
Dents, cracks on cylinder intake pipes are not allowed. Traces of fuel leakage are not allowed.
2. Make sure the drain plugs of the intake pipes of cylinders Nos 4, 5, 6 are reliably installed and locked.
<u>T.R.</u> Damaged locking, loosening of drain plugs are not allowed.
Leakage of fuel through plugs is not allowed.</td><td>Tighten loose attachment nuts of pipes. Replace damaged intake pipes. Eliminate fuel leakage through joints by re-placing gaskets and tightening nuts
Tighten loose drain plugs. Eliminate leakage, replace locking</td><td></td></tr>
<tr><td>TEST EQUIPMENT</td><td colspan="2">TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td></td><td colspan="2">Wrench 14-24-571 Pliers, flat-nosed 150 Pin Bar, handle 12x350 UB-24-53 Wrench 11x14 14-24-861 Wrench 10-32-12</td><td colspan="2"></td></tr>
</table>

<table>
<tr><td colspan="2">TO M 14P MS</td><td colspan="2">TASK CARD No. 223</td><td colspan="2"></td></tr>
<tr><td colspan="2">MS ITEM
072.30.00c</td><td colspan="4">procedure Check of Deflectors for Condition and Reliable Attachment</td></tr>
<tr><td colspan="4">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH ECKED BY</td></tr>
<tr><td colspan="4">Check the engine deflectors for condition and reliable attachment. T.R. The deflectors should be fully tightened.
Deflector damage, dents, and cracks are not allowed.</td><td>Tighten deflector attach-ment bolts and nuts Replace defective deflectors</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td colspan="2">TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td colspan="2">Wrench 7 14-324-100
Wrench 11 14-624-09</td><td colspan="2"></td></tr>
</table>

TO M-14P M.S.	TASK CARD No. 224	
M.S ITEM 072.30.00d	PROCEDURE: Check of Covers and Cables of Valve Mechanism Case Cables for Condition	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
1. Check the valve mechanism caae covers for condition. **T.R**. Damage is not allowed. Leakage of oil from under the covers is not allowed. 2. Check the valve mechanism cage cover attachment cables for condition. **T.R.** Damage of cable is not allowed. Cable loosening is not allowed.	Replace damaged cover Replace gasket and tighten attachment cable Replace damaged cable Tighten cable (Ref. Task Card No. 247)	

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Wrench 10-32-07 Screwdriver 700346 A200x1	

<table>
<tr><td colspan="2">TO M-14P M.S.</td><td colspan="2">TASK CARD No. 225</td><td colspan="2"></td></tr>
<tr><td colspan="2">M.S ITEM
072.50.00a.
072.50.00b</td><td colspan="4">procedure: Check of Reliable Attachment and Locking of Oil Line Joints, Drain Cocks and Plugs and Visual Inspection of Oil System for Leakage</td></tr>
<tr><td colspan="4">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="4">1. Inspect the oil hoses, pipelines of the oil system, connections, locking of nuts and drain plugs.
T.R. Leakage of pipeline and hose joints is not allowed.
Chafing of hoses and pipelines is not allowed. Joints should be reliably locked.
2. Check cleanliness of the oil tank vent pipe. T.R. Clogging is not allowed.</td><td>Eliminate leakage by tightening connections and nuts Replace damaged hoses Lock joints properly
Wash pipe with gasoline</td><td></td></tr>
<tr><td>TEST EQUIPMENT</td><td colspan="3">TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td></td><td colspan="3">Pliers, flat-nosed 150 Wrench 27x30 7811-0041 Wrench 14x17 14-232-03 Wrench 17x19 UB-24-07</td><td colspan="2">Gasoline Nefras-S 50/170 or BR-1, BR-2</td></tr>
</table>

<table>
<tr><td>TO M-14P MS</td><td colspan="3">TASK CARD No. 226</td><td colspan="2"></td></tr>
<tr><td>MS ITEM
072.50.00c</td><td colspan="5">procedure: Check of Filter with Chip Detector Circuit for Continuity</td></tr>
<tr><td colspan="4">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH ECKED BY</td></tr>
<tr><td colspan="4">1. Remove the rubber cap from the filter terminal.
2. Close the filter terminal to ground by pressing it to the oil sump. T.R. Warning lamp on the panel should come on.</td><td>Detect fault in external electric circuit and eliminate it</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td colspan="2">TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td></tr>
</table>

TO M-14P MS	TASK CARD No. 227		
MS ITEM 073.00.00a	PROCEDURE Check of Fuel Line Joints, Drain Cocks and Plugs for Reliable Attachment and Locking		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
Check condition and locking of the fuel lines, hoses, connections and plugs. **T.R.** Fuel hoses and lines should be intact. Connections and plugs should be reliably tightened and locked.		Replace damaged fuel hoses and lines Tighten and lock connection nuts	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Pliers, flat-nosed 150 Wrench 14x17 14-232-03 Wrench 11x14 14-24-861	Wire, locking KO-0.8

TO M-14P M.S.	**TASK CARD No. 228**	
M.S. ITEM 073.00.00b, 073.00.00d	PROCEDURE: Check of Fuel Line for Leakage under Pressure of 0.2 to 0.5 kgf/cm	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Build up a pressure of 0.2 to 0.5 kgf/cm with a priming pump. 2. Inspect the pipelines and hoses, make sure there are no leaks and the joints are reliably tightened. 3. Inspect the fuel system units, their connections and make sure there are no fuel leaks. ***T.R.*** Joint leakage is not allowed.	Eliminate leakage of fuel	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Wrench 17x19 UB-24-07 . Wrench 19x22 700880-7 Wrench 27x30 7811-0041 Wrench 24x27 700880-8 Pliers, flat-nosed 150	

TO M-14P MS	TASK CARD No. 229		
MS ITEM 073.00.00b, 073.00.00c	PROCEDURE. Check of Fuel Line and Membrane Mechanism Fuel Valve for Leakage under Pressure of 0.12 to 0.15 kgf/cm^2		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
1. Open the fuel shut-off valve. 2. Fill the fuel line with fuel by building up pressure of 0.12 to 0 0.15 kgf/cm with a hand priming pump and wait for several minutes. 3. Check the fuel line for leakage at joints of connections, pipes, filters and fuel pressure measuring pipe and at locations of drain plug and jet plug seals. **T.R.** Leaky joints are not allowed. 4. Inspect atomizing pipe of the membrane mechanism valve. **T.R.** Leakage of fuel from atomizing pipe is not allowed.	Eliminate fuel leakage by tightening connection nuts or replacing sealing rings In case of fuel leakage, replace carburetor (Ref. 073.10.03, Task Cards Mos 201 through 207)	

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Wrench 17x19 UB-24-07 Wrench 19x22 700880-7 Wrench 27x30 7811-0041 Wrench 14x17 14-232-03 Pliers, flat-nosed 150	Wire, locking KO-0.8

<table>
<tr><td>TO M-14P MS</td><td colspan="2">TASK CARD No. 230</td><td colspan="2"></td></tr>
<tr><td>M S ITEM
073.00.00d</td><td colspan="4">PROCEDURE: Visual Check of Fuel System for Leakage of Gasoline</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH
ECKED BY</td></tr>
<tr><td colspan="3">Check the pipeline and unit joints of the fuel system visually for leakage.
<u>T.R.</u> Leakage or sweating of fuel through the joints is not allowed.</td><td>Eliminate leakage of fuel by tightening joint nuts</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td>Wrench 17x19 UB-24-07 Wrench 24x27 700880-8 Wrench 27x30 7811-0041</td><td colspan="2"></td></tr>
</table>

<table>
<tr><td>TO M-14P MS</td><td colspan="2">TASK CARD No. 231</td><td colspan="2"></td></tr>
<tr><td>MS ITEM
073.00.00e,
073.00.03a</td><td colspan="4">procedure: Check of Fuel System and Carburetor for Leakage under Fuel Pressure of 0.4 to 0.5 kgf/cm2</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH ECKED BY</td></tr>
<tr><td colspan="3">1. Start and test tvs. the engine (Ref. Task Card. No. 201). 2. Shut down the engine (Ref. Task Card No. 203).
3. Inspect joints of fuel system pipelines and units. T.R. No fuel leakage is allowed.
4. Inspect the carburetor, drain plugs, jet plugs. T.R. Traces of sweating and leakage of fuel are not allowed.</td><td>Eliminate fuel leakage by tightening connection nuts or replacing sealing rings
Eliminate leakage by re-placing gaskets and tightening plugs and connections</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td>Wrench 17x19 UB-24-07 Wrench 14x17 14-232-03 Pliers, flat-nosed 150 Wrench 27x30 7811-0041</td><td colspan="2">Wire, locking KO-0.8</td></tr>
</table>

<table>
<tr><td>TO M-14P M.S.</td><td colspan="3">TASK CARD No. 232</td><td colspan="2"></td></tr>
<tr><td>M S ITEM
073.00.00f</td><td colspan="5">procedure: Check of Fuel lines for Proper Attachment</td></tr>
<tr><td colspan="4">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH ECKED BY</td></tr>
<tr><td colspan="4">Check reliable attachment of fuel lines excluding their contact with other parts of the engine.
T.R. Contact between the fuel lines and. other parts is not allowed. Chafing of fuel lines is not allowed.</td><td>Bend away and reattach fuel line Replace chafed fuel line</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td colspan="2">TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td colspan="2">Pliers, flat-nosed 150 Screwdriver 700345 At 50x0.5</td><td colspan="2"></td></tr>
</table>

TO M-14P MS	**TASK CARD No. 233**	
M S ITEM 073.00.01a	PROCEDURE: Check of Fuel Pump Attachment	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
Inspect the fuel pump attachment place, make sure its attachment and locking are in good repair. **T.R.** Loosened attachment and locking are not allowed.	Tighten attachment nuts and lock fuel pump	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Wrench 11x14 14-24-861 Screwdriver 700345 A 150x0.5 Pliers, flat-nosed 150	Locks, safety

TO M-14P M.S.	**TASK CARD No. 234**		
M.S. ITEM 073.00.02a	PROCEDURE: Check of Pine Fuel Filter Joints for Leakage		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
Make sure there is no leakage through the joints of the fine fuel filter. **T.R.** Fuel leakage or sweating are not allowed.		Tighten filter attachment nuts	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
Set, ultrasonic	Pliers, flat-nosed 150 Wrench 17x19 UB-24-07 Wrench 19x22 700880-7 Wrench 24x27 700880-8	Wire, locking KO-0.8

<table>
<tr><td>TO M-14P MS</td><td colspan="2">TASK CARD No. 236</td><td colspan="2"></td></tr>
<tr><td>M S ITEM
074.10.01a</td><td colspan="4">PROCEDURE: Check of Attachment of Magneto to Engine and Wires to Magneto and Spark Plugs</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH
ECKED BY</td></tr>
<tr><td colspan="3">Check attachment of the magneto to the engine, wires to the magneto and spark plugs.
<u>T.R.</u> Loosening of magneto attachment is not allowed.
Loosening of attachment of wires to the magneto and spark plugs is not allowed.</td><td>Tighten magneto attach-ment nuts Tighten wire fasteners</td><td></td></tr>
<tr><td>TEST EQUIPMENT</td><td colspan="2">TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td></td><td colspan="2">Wrench, socket 14 TJB-24-16 Wrench 17x19 UB-24-07 Screwdriver 700346 A200x1 Wrench 19x22 700880-7</td><td colspan="2"></td></tr>
</table>

TO M-14P MS	TASK CARD No. 237	
M S ITEM 074.20.01a	PROCEDURE: Check of Ignition Cable Braids for Condition	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
Make sure the ignition cable shielding is not chafed or damaged. T.R. Chafing of and damage to cable shielding are not allowed.	Replace damaged ignition cables	

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Wrench 19x22 700880-7	

TO M-14P M.S.	**TASK CARD No. 238**	
M.S. ITEM 074.20.01b	PROCEDURE: Check of Routing of Ignition Harness	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CH ECKED BY**
Check routing of ignition harness paying special attention to the contacts with the other parts and gaps between the harness and cylinder cooling fins. **T.R.** Harness touching the cylinder fins is not allowed.	Turn and secure the harness so that they do not touch cylinder fins	-

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Wrench 19x22 700880-7 Wrench 17x19 UB-24-07 Screwdriver 700345 A150x0.5	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
17. Pit the cover attachment cables and lower the wing nuts with the stops downwards using a special wrench. **T.R.** The valve case cover cables should be properly tightened. 18. Install the front spark plugs (Ref. 074.20.02, Task Card No. 202). 19. Connect the elbows to the front spark plugs (Ref. 074.20.02, Task Card No. 202).	If the cables sag, lift the wing nut upwards to the stop, unscrew it to obtain required tension of the cable and lower the wing nut from the stop	

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Pliers, flat-nosed 150 Wrench, adjustment 10-32-07 Peeler gauge No. 2 Wrench 17x19 UB-24-07 Wrench 14x17 14-232-03 Wrench 19x22 700880-7 Wrench 22 15-32-173 Screwdriver 700346 A200x1	Gasoline Nefras-S 50/170 or BR-1, BR-2 Cloths

TO M-14P M.S.	**TASK CARD No. 239**		
M.S. ITEM 074.20.02a	procedure: Sampling Inspection of Spark Plug Tightening Using Wrench		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Perform sampling inspection of spark plug tightening using a wrench according to the following procedure: (1) Undo the elbows from the spark plugs to be checked (Ref. 074.20.02, Task Card No. 201). (2) Check spark plug tightening with the help of a wrench. T.R. The spark plugs should be reliably tightened. 2. Install the elbows on the spark plugs and tighten them (Ref. 074.20.02, Task Card No. 202). **CAUTION:** CHECK SPARK PLUG TIGHTENING ON THE GOLD ENGINE.		Tighten loosened spark plugs (Ref. 074.20.02, Task Card No. 202)	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Wrench, plug 22 15-32-173 Wrench 19x22 700880-7	

TO M-14P MS	**TASK CARD No. 240**		
MS ITEM 080.00.00a	procedure: Check of Air Line Joints, Drain Cocks and Plugs for Reliable Attachment and Locking		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CH ECKED BY**
Check reliable attachment and locking of the air line joints, drain cocks and plugs. T.R. Chafing and traces of leakage are not allowed.		Replace chafed pipeline. Eliminate leakage by tightening connections	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Pliers, flat-nosed 150 Wrench 11x14 14-24-861 Wrench 14x17 14-232-03 Wrench 17x19 UB-24-07	Wire, locking KO-0,8

TO M-14P M.S.	**TASK CARD No. 241**	
M.S. ITEM 080.10.00a	PROCEDURE: Check of Reliable Attachment of Compressed Air Distributor, Pipes and Connections for Supply and Discharge of Compressed Air	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
Check reliable attachment of the compressed air distributor, pipes and connections for supply and discharge of compressed air. **T.R.** The compressed air distributor should be reliably attached. Compressed air supply and discharge pipes and connections should be reliably secured.	Secure the compressed air distributor Tighten and secure compressed air supply and discharge pipes and connections	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Wrench 9x11 700002 Wrench 11x14 14-24-861 Wrench 14x17 14-232-03 Wrench 19x22 700880-7 Pliers, flat-nosed 150	Wire, locking KO-0.8

TO M-14P M.S.	**TASK CARD No. 242**	
MS ITEM 080.00.00b	procedure: Check of Compressor for Good Repair and Reliable Attachment	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Check the compressor for good. repair. o T.R. The bottle air- pressure should be at least 50.kgf/cm . 2. Check the compressor attachment. T.R. The compressor should be properly attached.	(1) Wash compressor filter (Ref. Task Card No. 263). (2) Check inlet valve for easy travel (Ref. Task Card No. 264) (3) Tighten compressor connections Tighten compressor attachment nuts	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Wrench 11x14 14-24-861 Wrench 9x11 700002	

<table>
<tr><td>TO M-14P MS</td><td colspan="3">TASK CARD No. 243</td><td colspan="2"></td></tr>
<tr><td>M S ITEM
080.10.00b</td><td colspan="5">procedure Check of Starting Valves for Reliable Attachment</td></tr>
<tr><td colspan="4">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="4">Check attachment of the starting valves and. make sure the valves and pipes are free from traces of overheating.
T.R. The starting valves should be reliably attached.. Traces of overheating on the starting valves and pipes are not allowed.</td><td>Secure starting valves Replace starting valves and pipes with traces of overheating</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td colspan="2">TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td colspan="2">Pliers, flat-nosed 150 Wrench 11x14 14-24-861 Wrench 14x17 14-232-03 Wrench 19x22 700880-7</td><td colspan="2">Wire, locking KO-0.8</td></tr>
</table>

TO M-14P M.S.	**TASK CARD No. 244**	
M.S. ITEM 072.00.00j	PROCEDURE: Change of Oil	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Unlock and open the cock for draining oil from the oil sump, having fitted a rubber hose to it. 2. Drain oil from the engine to a special vessel. 3. Unlock and open the oil tank drain cock. ***NOTE: At an ambient temperature of 5 °C and below, heat the engine and oil tank to facilitate oil draining.*** 4. Close and lock the oil drain cocks. 5. Pill fresh oil. 6. Inspect the oil system visually. T.R. Leakage of oil is not allowed.	Eliminate oil leakage	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Pliers, flat-nosed 150 Vessel for oil drain Hose, rubber	Wire, locking KO-0.8

<table>
<tr><td>TO M-14P M.S.</td><td colspan="2">TASK CARD NO. 245</td><td colspan="2"></td></tr>
<tr><td>M.S. ITEM
072.00.00k</td><td colspan="4">PROCEDURE: Test Run of Engine after Scheduled Maintenance Operations</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH
ECKED BY</td></tr>
<tr><td colspan="3">1. After accomplishment of scheduled maintenance, start and warm up the engine (Ref. Task Card No. 201
2. Test run the engine (Ref. Task Card No. 202). 3. Eliminate all troubles detected at test run of the engine.</td><td></td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td></td><td colspan="2"></td></tr>
</table>

<table>
<tr><td>TO M-14P MS</td><td>TASK CARD No. 246</td><td colspan="2"></td></tr>
<tr><td>M S ITEM
072.30.00e</td><td colspan="3">PROCEDURE: Check of Valve Mechanism Parts for Condition</td></tr>
<tr><td colspan="2">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH
ECKED BY</td></tr>
<tr><td colspan="2">1. Move the cable tensioning wing nuts upwards. 2. Remove the cables and valve case covers. 3. Check valve springs for condition.
4. Visually inspect the valve springs to make sure they are serviceable. T.R. Broken springs are not allowed.
5. Check manually the roller on the rocker axle for smooth rotation.
<u>T.R.</u> The rollers should rotate smoothly without jamming.
6. Check tightening of washers of the valve rocker needle bearings by turning the washers with a screwdriver.
<u>T.R.</u> The washers should not turn on the rocker axle.</td><td>Replace broken springs
If there is gap between roller and valve stem, replace rocker
If washer turns, uncotter and tighten nut on rocker axle. Cotterpin nut</td><td></td></tr>
</table>

<table>
<tr><td>TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td>MATERIALS</td></tr>
<tr><td></td><td>Wrench 19x22 700880-7 Wrench 17x19 UB-24-07 Wrench, spark plug 22 15-32-173 Screwdriver 700346 A200x1</td><td>Rings, sealing Locks from individual SPTA set</td></tr>
</table>

TO M-14P M.S.	**TASK CARD No. 247**		
M.S ITEM 072.30.00f	procedure: Check of Clearance between Rocker Rollers and Valve Stem Ends		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Lift the cable tensioning wing nuts upwards. 2. Remove the cables and. valve case covers. 3. Undo the union nuts for attachment of ignition cable elbows to front spark plugs. 4. Drive out the front spark plugs (Ref. 074.20.02, Task Card Ho. 201). 5. Turn the engine crankshaft by the airscrew in its normal direction. 6, Set the piston to the compression stroke TDC in cylinder Mo. 1. ***NOTE: With such a position of the piston in cylinder No. 1 both valves should be closed and the rockers should move easily by hand.*** 7. Push the rocker arm on the adjustment screw side and check clearance between the rocker roller and the inlet valve stem with a feeler gauge. 8. Also check a clearance between the roller and the stem of the exhaust valve« T.R. Clearance should be ($0,3^{+0,15}_{-0,10}$) mm on the cold engine. If clearance is more than 0.45 mm or less than 0.2 mm, readjust it to set 0.3 mm, 9. Undo the adjustment screw locking nut for 1 to 1.5 turns.		Adjust clearance as instructed in Items 9 through 12	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY
10. Install wrench 10-32-07 in the adjustment screw slot and while turning it clockwise or counterclockwise, set clearance indicated in Item 8. 11. Tighten the locking nut with wrench 14-24-660 supporting the adjustment screw with wrench 10-32-07. 12. Recheck clearance between the rocker roller and the valve stem. 13. Turn the engine crankshaft and repeat operations under Items 6 through 12 for cylinders Nos 2 through 9. **CAUTION:** 1. WHEN PERFORMING OPERATIONS. PAY SPECIAL ATTENTION TO RELIABLE LOCKING OF THE ROCKER ADJUSTMENT SCREWS. LOOSENING OF LOCKING WILL INCREASE THE CLEARANCES WHICH MAY CAUSE FAILURE OF THE TIMING MECHANISM PARTS. 2. WHEN UNDOING AND TIGHTENING THE ROCKER ADJUSTMENT SCREW NUT WITH THE VALVE IN THE CLOSED POSITION, THE VALVE MAY SINK AND THE TAPPET END MAY LEAVE ITS SEAT. TO AVOID FALLING OUT OF THE TAPPET END FROM THE SEAT, UNDO AND TIGHTEN THE ROCKER ADJUSTMENT SCREW LOCKING NUTS OF THE INLET AND EXHAUST VALVES WITH THE LATTER BEING IN THE FULLY OPEN POSITION. 3. NEVER TURN THE ENGINE CRANKSHAFT WITH THE ROCKER SCREWS DRIVEN OUT FOR MORE THAN A HALF OF THREADED PART (10 mm FROM THE ROCKER SURFACE) TO AVOID BREAKAGE OF THE TAPPET ENDS. 14. Wash the valve case covers in clean gasoline. 15. Install sealing gaskets on the valve case covers. 16. Install the covers on the cylinder valve cases.		

<table>
<tr><td>TO M-14P M.S.</td><td colspan="2">TASK CARD No. 248</td><td colspan="2"></td></tr>
<tr><td>M.S. ITEM
072.30.00g</td><td colspan="4">procedure: Check of Cylinder Compression</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH
ECKED BY</td></tr>
<tr><td colspan="3">1. Remove all the front spark plugs (Ref. 074.20.02, Task Card No. 201).
2. Screw the pressure gauge into the spark plug hole of the cylinder under check.
3. Turn the airscrew smoothly without jerks.
4. Watch pressure gauge readings.
T.R. If compression is normal, the pressure gauge should read 3.5 to 5 kgf/cm2.
NOTE: Check compression on a warm engine at a cylinder head temperature of 40 to 60°C
5. Repeat operations under Items 2 through 4 for all the cylinders. 6. Drive out the pressure gauge. 7. Install all the front spark plugs (Ref. 074.20,02, Task Card No. 202).</td><td>If compression is less than 3.5 kgf/cm , replace cylinder or worn piston rings</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2">Pressure gauge</td><td>Wrench 19x22 700880-7 Wrench, spark plug 22 15-32-173
Wrench 17x19 UB-24-07</td><td colspan="2"></td></tr>
</table>

TO M-14P M.S.	**TASK CARD No. 249**		
M.S. ITEM 072.50.00d	procedure: Inspection and Washing of Engine Rear Cover Mesh Filter		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Unlock the mesh filter on the engine rear cover. 2. Undo the filter. 3. Check the filter for condition by external inspection. T.R. Damage to the filter is not allowed. 4. Make sure oil is free from metal particles. T.R. Presence of metal particles in oil is not allowed. 5. Wash the filter in clean gasoline and blow with dry compressed air. 6. Reinstall the filter. 7. Tighten and lock the filter. 8. Inspect the filter location places. T.R. Oil leakage is not allowed.		Replace the filter with damaged mesh Find and eliminate the cause of metal particles getting in oil Tighten and re lock the filter	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Pliers, flat-nosed 150 Wrench, socket 36 14-24-620	Gasoline Nefras-S 50/170 or BR-1, BR-2 Air, compressed Wire, locking KO-0.8

<table>
<tr><td>TO M-14P M.S.</td><td>TASK CARD No. 250</td><td colspan="2"></td></tr>
<tr><td>M.S. ITEM
072.50.00e</td><td colspan="3">PROCEDURE: Inspection and Washing of Filter with Chip Detector</td></tr>
<tr><td colspan="2">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>C
HECKED
BY</td></tr>
<tr><td colspan="2">1. Drain oil from the engine and oil sump (Ref. Task Card No. 215). 2. Unlock and undo the filter wire attachment nut. 3. Unlock and undo three filter with chip detector attachment nuts. 4. Remove the filter with chip detector.
5. Inspect the filter with chip detector to make sure it is free from metallic particles.
T.R. Metallic particles on the filter are not allowed.
6. Wash the filter with chip detector with clean unleaded gasoline and then in a special solution of 80 % alcohol and 20 % glycerine.
7. Clean the filter with a brush and blow with dry compressed air. 8. Reinstall the filter with chip detector. 9. Install and lock the filter attachment nuts.
10. Install and lock the wire attachment nut,
NOTE: Prior to installing the filter, check the filter with chip detector internal and external circuits for continuity (Ref. Task Card No. 253).</td><td>Detect and eliminate the cause of metallic particles getting in oil</td><td></td></tr>
</table>

OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CHECKED BY
11. Pill fresh oil into the engine (Ref. Task Card No, 215). 12. Start and test run the engine (Ref. Task Card No. 201). 13 Check the filter with chip detector joints for leakage. T.R. Oil leakage is not allowed.		Eliminate oil leakage	
TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**	
	Pliers, flat-nosed 150 Wrench 9x11 700002	Gasoline Nefras-S 50/170 or BR-1, BR-2 Mixture, alcohol-glycerine Brush, hair Air, compressed	

TO M-14P MS	**TASK CARD No. 251**	
MS ITEM 072.50.00f	procedure Inspection and Washing of Speed Governor C	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Unlock and undo the speed governor oil supply filter. 2. Inspect the filter and make sure it is free from metallic particles. T.R. Metallic particles are not allowed. 3. Wash the filter in clean gasoline and blow with dry compressed air. 4. Screw on and lock the filter. 5. Start and test run the engine (Ref. Task Card No. 201). 6. Check filter joints for leakage. T.R. Leakage of oil through filter joint is not allowed.	Detect and eliminate the cause of metallic particles getting in oil Eliminate leakage by tightening filter or replacing gasket	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Pliers, flat-nosed 150 Wrench 17x19 UB-24-07	Gasoline Nefras-S 50/170 or BR-1, BR-2 Air, compressed Wire, locking KO-0.8

<table>
<tr><td>TO M-14P M.S.</td><td colspan="2">TASK CARD No. 252</td><td colspan="2"></td></tr>
<tr><td>M.S. ITEM
072.50.00g</td><td colspan="4">PROCEDURE: Washing of Inlet Oil Pilfer</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH
ECKED BY</td></tr>
<tr><td colspan="3">1. Unlock and undo the filter.
2. Inspect the filter to make sure it is free from metallic particles.
<u>T.R.</u> Metallic particles in oil are not allowed.
3. Wash the filter in clean gasoline and blow with dry compressed air.
4. Screw on and lock the filter.</td><td>Detect and eliminate the cause of metallic particles getting in oil</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td>Pliers, flat-nosed 150 Wrench 36 14-24-620</td><td colspan="2">Gasoline Nefras-S 50/170 or BR-1, BR-2
Air, compressed Wire, locking KO-0.8</td></tr>
</table>

<table>
<tr><td>TO M-14P MS</td><td colspan="2">TASK CARD No. 253</td><td colspan="2"></td></tr>
<tr><td>MS ITEM
072.50.00h</td><td colspan="4">procedure; Check of Filter with Chip Detector Internal Circuit for Continuity</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH ECKED BY</td></tr>
<tr><td colspan="3">1. Remove the filter with chip detector from the engine: (1) Open the oil sump drain cock and drain oil. (2) Undo three filter with chip detector body attachment nuts. (3) Wash the filter with chip detector with clean unleaded gasoline.
(4) Connect the terminal to the filter, interconnect the plate set arid close the filter mesh to ground.
T.R. The warning lamp on the panel should come on.
2. Reinstall the filter with chip detector and screw on its attachment nuts. 3. Connect the terminal and fit rubber boot.</td><td>Replace defective filter with chip detector or detect and eliminate trouble in filter circuit</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td>Wrench 9x11 700002 Pliers, flat-nosed 150</td><td colspan="2">Gasoline Nefras-S 50/170 or BR-1, BR-2
Wire, locking KO-0.8 Brush, hair</td></tr>
</table>

TO M-14P M.S.	**TASK CARD No. 254**	
M.S. ITEM 072.50.001	PROCEDURE: Washing of Engine Oil Lines with Clean Unleaded Gasoline	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
1. Drain oil from the engine and oil tank (Ref. Task Card No. 244). 2. Unlock and- disconnect the supply and return oil hoses from the engine oil pump. 3. Wash the oil lines, oil tank and oil cooler after draining oil with clean unleaded gasoline. 4. Connect the oil hoses to the oil pump and lock them, 5. Pill fresh oil in the oil tank and engine. 6. Start the engine (Ref. Task Card No. 201). 7. Inspect the oil line joints. **T.R.** Oil leakage is not allowed.	Eliminate leakage	

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Pliers, flat-nosed 150	Gasoline Nefras-S 50/170 or BR-1, BR-2 Wire, locking KO-0.8

<table>
<tr><td>TO M-14P MS</td><td colspan="2">TASK CARD No. 255</td><td colspan="2"></td></tr>
<tr><td>MS ITEM
072.70.00a</td><td colspan="4">procedure: Drainage of Oil from Generator Drive</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH
ECKED BY</td></tr>
<tr><td colspan="3">1. Unlock and. drive the plug out of the generator drive body. 2. Drain oil from the drive.
3. Reinstall and lock the plug. NOTE; Drain oil from the generator drive on a warm engine.
4. Start and test run the engine (Ref. Task Card No. 201).
5. Inspect the plug location place. T.R. Oil leakage is not allowed.</td><td>Eliminate leakage by tightening plug</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td>Wrench, flat 11x14 14-24-861 Screwdriver 700345 Al50x0.5 Pliers, flat-nosed 150</td><td colspan="2">Wire, locking KO-0.8</td></tr>
</table>

TO M-14P M.S.	**TASK CARD No. 256**		
M.S. ITEM 072.70.00b	PROCEDURE: Drainage of Oil from Magneto Drives		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CH ECKED BY**
Unlock and drive out the plugs on the rear cover near the magneto drives, Drain oil. Reinstall and lock the plugs. 4. Start and test run the engine. 5. Check the plugs for leakage. **T.R.** Oil leakage is not allowed. ***NOTE: Drain oil from the magneto drives on a warm engine.***		Tighten and re lock the plugs to eliminate leakage	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Pliers, flat-nosed 150 Screwdriver 700345 Al50x0.5 Wrench 11x14 14-24-861	Wire, locking KO-0, 8

<table>
<tr><td>TO M-14P M.S.</td><td>TASK CARD No. 257</td><td colspan="2"></td></tr>
<tr><td>M.S. ITEM
073.00.03c</td><td colspan="3">PROCEDURE: Replacement of Filtering Element in Fuel Pine Filter 8D5.886.027</td></tr>
<tr><td colspan="2">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH
ECKED BY</td></tr>
<tr><td colspan="2"><u>CAUTION:</u> WHEN PERFORMING SCHEDULED MAINTENANCE. PRECLUDE CONTAMINATION OF THE FILTER INTERIOR. IT IS STRICTLY PROHIBITED TO DISASSEMBLE THE FILTER UNLESS FOR REPLACING THE FILTERING ELEMENT.
1. Make sure there is no gasoline pressure in the fuel system, 2. Unlock and undo cover (2) of the filter (Ref. 073.10.02, Fig. 1).
3. Remove filtering element (3) from the filter body, protecting it against knocks.
4. Wash the filter body interior with working fluid.
5. Depreserve (Ref. 073.10.02, Task Card No. 201) and install a clean filtering element from the individual SPTA set.
6. Replace rubber sealing rings (4), (8), (10) with new ones taken from the SPTA set.
7. Install the cover, lock and seal it.
8. Check the fuel for leakage by filling fuel system with fuel, building up operating pressure in it and inspecting the joint externally. Determine tightness by absence of stains on filtering paper.
9. Place the removed filtering element in PVC bag, pack in a cardboard box and send for ultrasonic cleaning.</td><td></td><td></td></tr>
</table>

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
10. Wash the filtering element soiled in operation and check it for leakage according to the effective instructions. 11. Check the filtering element for leakage at an air pressure of 120 mm of water column. 12. Check quality of filtering element washing. The time of filtering element filling with gasoline Nefras-S 50/170 or BR-1, BR-2 is not above 3 s as against instrument PKP,		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
Instrument PKF	Bath Stopwatch Pliers, flat-nosed 150 Wrench, box 9x11 700002 Wrench, socket 9 14-24-640 Wrench, flat 24x27 700880-8 Adapter 600/015-47 Plug 8D8.632.203 Ring, sealing 2262A-16-2	Wire, locking KO-0.8 Filtering element with Certificate Ring, sealing, from individual SPTA set Gasoline Nefras-S 50/170 or BR-1, BR-2 Paper, filtering

<table>
<tr><td>TO M-14P M.S.</td><td colspan="3">TASK CARD No. 258</td><td colspan="2"></td></tr>
<tr><td>M.S ITEM
073.00.03d</td><td colspan="5">PROCEDURE: Inspection and Washing of Carburetor Fuel Filter</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td colspan="2">CORRECTIVE ACTIONS</td><td>CH ECKED BY</td></tr>
<tr><td colspan="3">1. Close the fuel shut-off valve. 2. Unlock and undo the carburetor fuel filter. 3. Wash the filter in clean gaaoline. 4. Blow the filter with dry compressed air. 5. Install and lock the carburetor fuel filter, 6, Check the fuel system for leakage (Ref. Task Card No. 231).</td><td colspan="2"></td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="3">MATERIALS</td></tr>
<tr><td colspan="2"></td><td>Pliers, flat-nosed 150 Wrench 11x14 14-24-861</td><td colspan="3">Gasoline Nefras-S 50/170 or BR-1, BR-2
Wire, locking KO-0.8 Air, compressed</td></tr>
</table>

TO M-14P M.S.	**TASK CARD No. 259**		
M.S. ITEM 073.00.03e	procedure.: Accomplishment of Carburetor Scheduled Maintenance according to Carburetor Maintenance Manual		

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Close the fuel shut-off valve in the pilot's cabin, 2. Unlock and undo the fuel filter. 3. Check the fuel filter for cleanliness. 4. Wash the filter in clean gasoline and blow it with dry compressed air. 5. Install and lock the fuel filter. 6. Unlock and undo the carburetor air filter (Ref. 073.10.03, Fig. 202). 7. Wash the filter in clean gasoline and blow it with dry compressed air. 8. Install and lock the air filter. 9. Unlock and drive out the fuel chamber drain plugs (Ref. 073.10.03, Figs 201, 202). 10. Drain sediment from the fuel chamber through the drain plugs. 11. Install and lock the drain plugs. 12. Unlock and undo the suction jet plug. 13. Drive out the suction jet. 14. V/ash the suction jet with gasoline and blow with compressed air.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
15. Reinstall the suction jet. 16. Install and lock the suction jet plug. 17. Measure the initial position of the altitude control needle and adjust it if necessary (Ref. 073.10.03, Task Card Ho. 206). 18. Unlock and undo the plugs of the breathing holes in the aneroid space and acceleration pump (Ref. 073.10.03, Fig. 202). 19. Check breathing hole cleanliness. T.R. Clogging of the breathing holes is not allowed. 20. Tighten and lock the breathing hole plugs. 21. Check and restore all broken locks of the carburetor. 22. Start and test run the engine (Ref. Task Card No. 201). 23. Inspect the carburetor and its joints visually. T.R. Fuel leakage is not allowed.	Clean and wash breathing holes with clean gasoline Detect and eliminate fuel leakage	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Pliers, flat-nosed 150 Wrench 14x17 14-232-03 Wrench 19x22 700880-7 Screwdriver Syringe UB-24-05 Wrench 11x14 14-24-861 Template Wrench 7x9 700880-2	Gasoline Nefras-S 50/170 or BR-1, BR-2 Brush, hair Wire, locking KO-0.8

TO M-14P M.S.	**TASK CARD No. 260**		
M S ITEM 074.10.01b	procedure: Accomplishment of Magneto Scheduled Maintenance according to Magneto Maintenance Manual		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Drive out three magneto shield attachment screws. 2. Drive out four magneto pipe attachment screws. 3. Remove the distributor and carefully move it aside so as not to damage high-tension cable. 4. Carry out the following operations to check operability of the magneto assemblies. (1) Check all screw joints of the breaker. T.R. Breaker screw joints should be reliably tightened. (2) Check rotation of the breaker mechanism arm on its pivot. T.R. The arm should rotate smoothly without jamming. (3) Measure the breaker contacts gap (Ref. 074.10.01, Task Card STo. 203). T.R. The gap should be from 0.25 to 0.35 mm. (4) Burnish the contacts in case of soiling or oiling, wipe them with chamois or clean cloth moistened in clean alcohol. T.R. Oiling and soiling of contacts are not allowed. (5) Adjust the gap to be from 0.25 to 0.35 mm (Ref. 074.10.01, Task Card No. 203). ***<u>NOTE:</u> Make an entry in the magneto Certificate after each adjustment of breaker contacts.***		Tighten loosened screws of breaker mechanism Eliminate jamming of arm on its pivot Adjust gap to be from 0.25 to 0.35 mm Burnish and wipe contacts	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
(6) Inspect metal surfaces of parts and assemblies located in the breaker mechanism space. If runs of oil or oil films are detected, remove them with a clean cloth moistened in clean rectified alcohol and squeezed dry. (7) Coat the breaker spring with a thin layer of turbine oil avoiding runs, **<u>CAUTION:</u>** 1. SEE TO IT THAT OIL DOES NOT GET ONTO THE BREAKER CONTACTS. 2. LUBRICATE THE SPRING ALSO AFTER DEPRESERVING THE MAGNETO. (8) Check presence and intactness of distribution mechanism contact spring in the distributor cover seat for leading of high tension. (9) Check the carbon knob with spring for condition. T.R. Contact spring should be free from damage. Soiling of the distributor and rotor is not allowed. (10) Check high-tension leads and terminals in the upper cover. T.R. Damage is not allowed. (11) Check the transformer: (a) Drive out the upper cover attachment screws and remove it. (b) Make sure the transformer does not move and check quality of transformer attachment screw tightening with a screwdriver. If the transformer attachment screws are loosened, perform the following operations: Unbend the lock \,asher tab from the screw face, undo the screw, replace the lock washer.	Ref. Item (13) Replace damaged parts with new ones taken from individual SPTA set. Remove soiling from rotor and distributor with clean dry chamois Replace damaged parts with new ones taken from individual SPTA set	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY
Tighten the screw fully with a screwdriver. Bend one of the lock washer tabs so that it tightly contacts the screw face. (c) Install the upper cover on the magneto, secure its attachment screws to the body. If transformer attachment screw thread is stripped, replace the screw. T.R. Stripping of thread on attachment screws cannot be tolerated. (12) Check attachment of the rotor to the cam. T.R. Stripping of thread on attachment screws is not allowed. (13) Inspect the cam. T.R. Soiling of the cam surface is not allowed. (14) Apply a thin layer of turbine oil T22 to the working surface of the cam. T.R. Runs of oil and getting of it onto contacts, surfaces of other parts cannot be allowed. (15) Fill two droplets of turbine oil T22 into the lubricator.	Replace screws with stripped thread with new ones from individual SPTA set Replace screws with stripped thread with new ones taken from individual SPTA set Wipe cam with chamois or clean calico cloth moistened in clean rectified alcohol Remove oil runs with chamois or clean calico cloth	

TO M-14P M.S.	**TASK CARD No. 261**	
M.S. ITEM 074.20.02b	procedure: Accomplishment of Spark Plug Scheduled Maintenance according to Spark Plug Maintenance Manual	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. On expiration of spark plug life till first regapping, remove the spark plugs from the engine (Ref. 074.20.02, Task Card No. 201). 2. Wash the spark plug center electrode space with clean gasoline and dry in air. When washing, immerse only spark plug threaded portion into gasoline. 3. Clean the spark plug center electrode space of carbon deposit and lead fouling on sandblasting device OSP-1 of tester "Iskra" according to the tester Operating Instructions. 4. After sandblasting the spark plug center electrode space blow it with 0 clean dry air at a pressure of 4 to 5 kgf/cm . 5. Wipe the inner surface of the shield of the wet spark plug with a clean dry cloth and dry the spark plug at a temperature of 120 to 130 °C for 1.5 h. 6. Check the plug for spark and leakage on unit PFE-1 of tester "Iskra" according to the tester Operating Instructions or on a special set, ***<u>NOTE:</u> Spark plug damping resistance is not subject to test in service.*** 7. Carefully inspect the insulator tip. T.R. Cracked tips are not allowed.	Replace spark plugs with cracked tips	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
8. Check the gap between the central and side electrode with a 0.4-nnn feeler gauge and regap the spark plug if necessary. Carry out regapping only on special fixture RIP-1 of tester "Iskra". Wo other regapping methods are allowed. **<u>CAUTION:</u>** WHEN REGAPPING, NEVER INSERT THE GAUGE INTO THE GAP AND PRESS THE CENTRAL ELECTRODE, OTHERWISE DAMAGE TO THE CENTRAL ELECTRODE OR CERAMIC INSULATOR NOSE MAY RESULT. 9. Install the tested spark plugs on the engine (Ref. 074.20.02, Task Card No. 202). *<u>NOTE:</u> The spark plugs removed from the engine can be reinstalled on the engine till complete expiration of service life if they operate on ^ the tester at a pressure of at least 8 kgf/cm without regapping.* 10. Install the plug elbows (Ref. 074.20.02, Task Card No. 202).		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
Tester "Iskra"	Wrench, spark plug 22 15-32-173 Wrench 19x22 700880-7 Peeler gauge, special	Gasoline Nefras-S 50/170 or BR-1, BR-2 Cloths

<table>
<tr><td>TO M-14P M.S.</td><td colspan="3">TASK CARD No. 262</td><td colspan="2"></td></tr>
<tr><td>M.S. ITEM
080.00.00c</td><td colspan="5">procedure: Check of Compressor Attachment</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td colspan="2">CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="3">1. Check compressor attachment. T.R. The compressor should be reliably attached.
2. Drain condensate from the air system filter sump (blow the pipe in cold weather).</td><td colspan="2">Tighten compressor attach-ment nuts</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="3">MATERIALS</td></tr>
<tr><td colspan="2"></td><td>Wrench 11x14 14-24-861 Wrench 9x11 700002
Wrench 17x19 UB-24-07</td><td colspan="3"></td></tr>
</table>

<table>
<tr><td>TO M-14P M.S.</td><td>TASK CARD No. 263</td><td></td></tr>
<tr><td>M.S. ITEM
080.00.00d</td><td colspan="2">procedure: Replacement of Compressor Filtering Element</td></tr>
</table>

<table>
<tr><th colspan="2">OPERATIONS AND TECHNICAL REQUIREMENTS</th><th>CORRECTIVE ACTIONS</th><th>CHECKED BY</th></tr>
<tr><td colspan="2">1. Remove the spring lock and hold-down mesh. 2. Remove the filtering element and the other mesh of the compressor. 3. Wash all the removed parts in clean unleaded gasoline. 4. Dry the parts with dry compressed air. 5. Reinstall the meshes and new filtering element taken from the SPTA. set.
6. Lock the meshes and filtering element with a spring lock; place the lock with convex part facing the mesh.
7. Make sure of reliable locking.</td><td></td><td></td></tr>
<tr><th>TEST EQUIPMENT</th><th>TOOLS AND FIXTURES</th><th colspan="2">MATERIALS</th></tr>
<tr><td></td><td>Screwdriver 700346 A200x1</td><td colspan="2">Gasoline Hefras-S 50/170 or BR-1, BR-2
Air, compressed Element, filtering</td></tr>
</table>

TO M-14P M.S	**TASK CARD No. 264**		
M.S. ITEM 080.00.00e	procedure: Check of Compressor Inlet Valve for Easy Travel		

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Carry out operations under Task Card No. 263, Items 1 through 4. 2. Push the compressor inlet valve with hand. ***<u>NOTE:</u> The inlet valve should move freely without jamming.*** 3. Carry out operations under Task Card No. 263, Items 5 through 7.		

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Screwdriver 700345	

<table>
<tr><td>TO M-14P MS</td><td colspan="2">TASK CARD No. 265</td><td colspan="2"></td></tr>
<tr><td>M.S. ITEM 080.00.00f</td><td colspan="4">procedure: Washing of Compressor Delivery Valve</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="3">1. Remove the compressor delivery valve.
2. Disassemble the valve and clean the valve parts of coking products. Wash with gasoline and blow with dry compressed air.
3. Assemble the valve and reinstall it.
Install new gaskets AK-05001, AK-05002 and AK-05003 taken from the individual SPTA set.</td><td></td><td></td></tr>
</table>

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Wrench 700880-7	Gasoline Nefras-S 50/170 or BR-1, BR-2 Gaskets from individual SPTA set Air, compressed

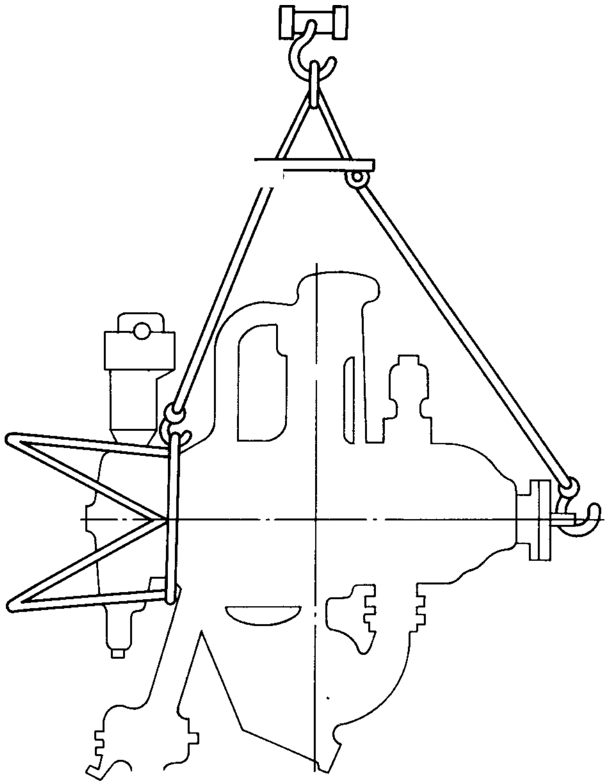
ENGINE M-14P - REMOVAL/INSTALLATION

1. LIST OF TASK CARDS

<table>
<tr><td>TO M-14P MS</td><td colspan="2">T A S K C A R D No. 401</td><td></td></tr>
<tr><td>MS ITEM</td><td colspan="3">PROCEDURE: Unpackaging of New Engine</td></tr>
<tr><td colspan="2">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CH
ECKED BY</td></tr>
<tr><td colspan="2">1. Prepare the working place, handling equipment, tools.
2. Inspect the container, packaging, intactness of seals. T.R. Distortion of packaging, damage to container are not allowed.
3. Remove seals from the container, unlock and remove the dowel pins which secure the cover to the bottom.
<u>CAUTION:</u> WHEN REMOVING THE COVER, TAKE CARE NOT TO DAMAGE THE ENGINE.
4. Remove the cover from the engine by engaging the hooks with the crane cables.
5. Remove the slip cover (if provided) or paper packaging from the engine.
6. Open the airborne tool case and remove paraffined paper from tools.
NOTE: The airborne tools are not subject to depreservation.
7. Open the container. 8. Check the airborne tools, spares and units against the list.</td><td>If packaging defects are detected, draw external inspection statement and send one copy to engine Supplier</td><td></td></tr>
</table>

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY
9. Inspect the engine. NOTE: When detecting engine defects, damaged packaging or missing parts, accessories and tools of the engine set, draw the external inspection statement. Send a copy of the statement to the Supplier. 10. Undo three lower bolts which secure the struts to the container. 11. Connect the lifting mechanism cable to the shackle installed on the airscrew shaft. **NOTES:** 1. Attach the slings according to the diagram shown in Fig. 401, 2. Handling device lifting capacity should be at least 500 kg. **CAUTION:** WHEN LIFTING THE ENGINE ENSURE AGAINST DAMAGE TO THE ENGINE AND ACCESSORIES. 12. Remove the engine from the container. 13. Install the engine on the support. 14. Secure the engine on the support.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY



Engine Slinging Diagram Figure 401

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Cable Crane or hoist at least 500 kg in capacity Hammer 700016 Pliers, flat-nosed 150 Wrench 19x22 700880-7	Gasoline Nefras-S 50/170 or BR-1, BR-2 Brush, hair

TO M-14P M.S.	**TASK CARD No. 402**	
M.S. ITEM	PROCEDURE: Depreserration of Engine under Field Conditions	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CH ECKED BY**
1. Place a tray for draining grease under the support with the engine. 2. Perform external depreservation of the engine and its accessories by removing grease from their surfaces with a hair brush moistened in gasoline Nefras-S 50/170 or BR-1, BR-2. **NOTES:** 1. It is recommended to depreserve the engine at an ambient temperature of at least 10 °C. 2. In winter or in a cold room the engine should be warmed up to a temperature of 40 °C and be kept at this temperature for at least one hour. 3. Remove the plug from the tachometer generator drive. 4. Wash the drive space with a hair brush moistened in gasoline Nefras-S 50/170 or BR-1, BR-2 and blow with dry compressed air. 5. Install the plug on the drive. **CAUTION:** 1. AVOID GETTING OF GASOLINE ON IGNITION CABLES, INSIDE THE ENGINE, ON RUBBERIZED FABRIC HOSES OF THE ROD CASINGS, IN THE MAGNETO OR GENERATOR. 2. BEFORE DEPRESERVING THE MAGNETO AND REMOVING THE PLUG FROM THE AIR COMPRESSOR DELIVERY VALVE CONNECTION, IT IS PROHIBITED TO ROTATE THE AIRSCREW SHAFT NOT TO DAMAGE MAGNETO PARTS AND TO CAUSE OPERATION OF THE COMPRESSOR COUPLING.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
6. Perform internal depreservation of the magneto (Ref. 074.10.01, Task Card No. 201). 7 Drive out dehydrators and adapters to them from the spark plug holes. 8. Drive out all plugs from the cylinder exhaust ports. 9. Inlock and drive out drain plugs from the suction pipes of cylinders Nos 4 through 6, remove covera of the valve mechanism cases of cylinders Nos 3 through 8. 10. Remove the filter with chip detector (Ref. Task Card No. 250). 11. Remove the plug from the compressor delivery valve, the lock, meah, filtering element and the second mesh, 12. Drain preservation grease from the lower cylinders, valve mechanism cases of cylinders Nos 3 through 8, from the engine crankcase and de-preserve the compressor by turning the airscrew shaft clockwise if viewed from the engine front. 13. Remove grease from the upper and side cylinders: (1) Turn the airscrew shaft and set the piston to the TDC. (2) Collect grease with a syringe. NOTE: Turn the airscrew shaft with a handle bar inserted in the shackle lug, till all grease is removed from the cylinders and compressor cylinder. 14. Wash the filter with chip detector in clean gasoline Nefras-S 50/170 or BR-1, BR-2. 15. Keep the filter with chip detector in a special solution (80 % alcohol and 20 % glycerine).		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY
16. Blow the filter with chip detector with compressed air. 17. Reinstall the filter with chip detector (Ref. Task Card No. 250). 18. Reinstall the spark plugs (Ref. 074.20.02, Task Card No. 202). 19. Install and lock the drain plugs of suction pipes of cylinders Nos 4 through 6. 20. Remove the plug from the generator drive. 21. Wash the generator drive space with clean gasoline. 22. Unlock and drive out the generator drive plug and drain remaining grease (Ref. Task Card No. 256). 23. Install the generator on the engine (Ref. 024.30.01, Task Card No. 201). 24. Install the air compressor filtering element, meahes and spring. 25. Install plugs on the cylinder exhaust ports. 26. Perform internal depreservation of the carburetor (Ref. 073.10.03, Task Card No. 202). 27. Drain oil from the fuel pump interior: (1) Connect a hose of the engine preservation unit filled with clean gasoline B-70 to the inlet connection of the gasoline pump. (2) Create a pressure of 0.15 to 0.25 kgf/cm in the unit. (3) Turn the airscrew shaft till preservation grease is fully removed. 28. Disconnect the hose from the fuel pump inlet connection.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY
29. Connect the fuel line and fuel pressure measuring pipe to the carburetor. 30. Connect the fuel line to the fuel pump. 31. Tighten and lock all the fuel pump joints. NOTE: Other accessories mounted on the engine are not subject to internal depreservation. 32. Wipe all outer surfaces of the engine and accessories with a clean cloth slightly moistened in clean gasoline Nefras-S 50/170 or BR-1, BR-2. 33. Make an entry on depreservation and indicate the depreservation date in the engine Log Book and in the accessory Certificates.		

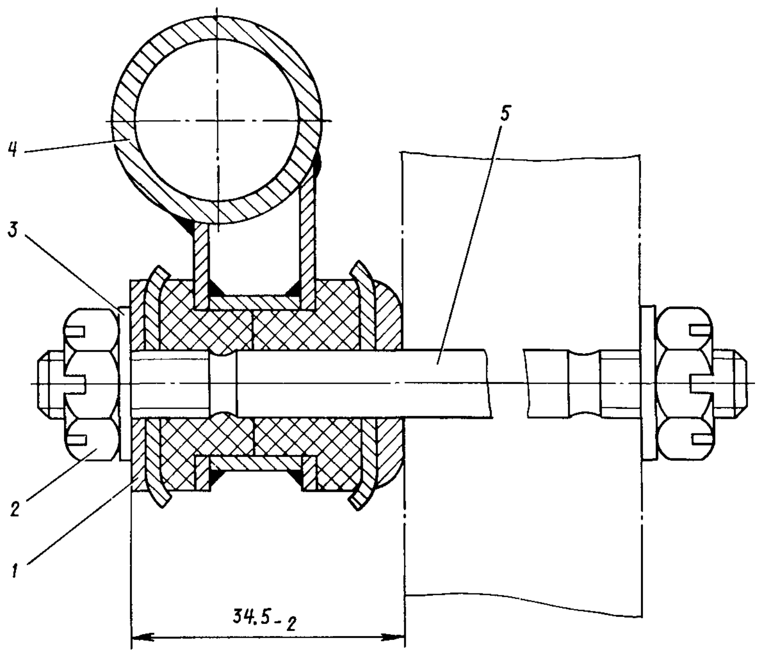
TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Unit, engine preservation Pliers, flat-nosed 150 Screwdriver 700346 A200x1 Hammer 700016 Wrench 19x22 700880-7 Support, engine Tray for grease draining Wrench 17x19 UB-24-07 Wrench 11x14 14-24-861 Wrench 14x17 14-232-03 Wrench 7x9 700880-2 Syringe UB-24-05 Handle bar 12x350 UB-24-53 Wrench, spark plug 22 15-32-173	Gasoline Nefras-S 50/170 or BR-1, BR-2 Brush, hair Cloths Brush, hair Wire, locking KO-0.8 Air, compressed Mixture, alcohol-glycerine

OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CHECKED BY
35. Install and lock the filter with chip detector and the rear cover oil filter. 36. Fill fresh oil, *NOTE: Do not re-use or recycle the drained oil*. 37. Check presence of locking on the nuts of connections, pipelines, drain cocks and plugs,			
TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**	
	Syringe UB-24-05 Wrench 14x17 14-232-03 Pliers, flat-nosed 150 Screwdriver 700345 A150x0.5 Crane Hoist Tray for oil draining Wrench 27x30 7811-0041 Wrench 24x27 700880-8 Wrench 17x19 UB-24-07 Shackle, engine mounting Hammer 700016 Wrench 11x14 14-24-861 Wrench, spark plug 22 15-32-173 Wrench 19x22 700880-7 Wrench 14-024-260 Set of sockets	Oil MS-20 Alcohol, rectified Cloths Grease ST (NK-50) Paper, paraffined Twine Gasoline Nefras-S 50/170 or BR-1, BR-2	

TO M-14P M.S.	**TASK CARD No. 403**		
M.S. ITEM	procedure: Removal of Engine from Airplane		

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Warm up the engine at a speed of 35 to 41 % on gasoline B-70 till the oil inlet temperature is 50 °C (Ref. Task Card Ho. 202). 2. Drain oil from the engine (Ref. Task Card Ho. 244). NOTE: If the engine cannot be warmed up, fill 150 to 200 g of grease K-17 heated to a temperature of 40 to 50 °C to each cylinder through the spark plug holes using a syringe and generously coat the exhaust valve stems and seats with grease K-17. 3. Remove the airscrew from its shaft (Ref. airscrew Operating Instructions). 4. Install the protective shackle on the airscrew shaft. 5. Remove the engine cowling. 6. Unlock and disconnect the speed governor control rod. 7. Disconnect the exhaust manifold and the air intake with carburetor inlet air heater and remove them from the engine. 8. Disconnect the wire from starting coil KP-4716. 9. Unlock and disconnect the pipelines from the fuel pump, the pipe from the filling system and the pipe from the fuel pressure measuring connection. 10. Unlock and drive out the pipe from the compressed air distributor, air system pipe from compressor AK-50T.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
11. Unlock and undo the oil system pipelines. 12. Disconnect wires from the generator, thermocouple of the cylinder rear spark plug, wires of the tachometer generator. 13. Unlock and disconnect the carburetor throttle control rod. 14. Suspend the engine by a hoist on a special cable secured to the shackle and two upper points of the engine frame (Ref. Fig. 401). 15. Lift the engine so as to relieve studs (5) (Ref. Fig. 402) of engine frame ring (4). 16. Unlock and undo nuts (2) of the engine frame ring studs. 17. Drive out the studs by a special drift with an end—piece. 18. Separate the engine from the airplane by moving the engine forward or the airplane backward. NOTE: When removing the engine, pay attention so that the ignition cable sheath and accessories are not damaged. 19. Install the engine on the support and secure it. 20. Preserve the engine (Ref. Section "Storage Instructions"),		



1. Shock-Absorbing Stack Washer
2. Hut
3. Washer
4. Engine Frame Ring
5. Stud

Engine Frame Installation Diagram Figure

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OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Crane Hoist Tray for oil draining Shackle, engine mounting Syringe UB-24-05 Wrench 14x17 14-232-03 Pliers, flat-nosed 150 Screwdriver 700345 A150x0.5 Wrench 27x30 7811-0041 Wrench 24x27 700880-8 Wrench 17x19 UB-24-07 Hammer 700016 Wrench	Oil MS-20 Grease K-17 Gasoline Hefras-S 50/170 or BR-1, BR-2

TO M-14P MS	**TASK CARD No. 404**	
MS ITEM 072.00.00	procedure Installation of Engine on Airplane	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY

1. Unpackage the engine (Ref. Task Card No. 401). 2.
Depreserve the engine (Ref. Task Card Ho. 402).

3. Read the engine Log Book.

4. Lift the engine by a steel cable attached to the shackle mounted on the airscrew shaft and to the engine frame ring (Ref. Pigs 401, 402).

5. Remove the shipping braces and brackets, proceeding as follows:

(1) Unlock and undo aix nuts (2) (Ref. Pig. 402) for attachment of three shipping brackets installed on the ring of the engine frame.

(2) Remove the shipping brackets with braces.

(3) Install six washers (1) and (3) to each stud of the engine frame ring instead of the shipping brackets.

NOTE: The washers and cotterpins are suspended from the engine frame ring.

(4) Install six nuts (2) on the studs.

(5) Tighten the nuts so that a shock-absorbing stack (34.5o) nun thick is obtained and cotterpin the nuts.

NOTES: 1. Preserve all the removed parts with grease, wrap with paraffined paper and pack in the generator container.

2. Prior to sending the engine for repair, reinstall the removed shipping brackets.

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
6. Install the engine on the airplane: (1) Install the airplane braces on the engine frame ring. (2) Bring the engine with braces to the airplane. (3) Insert four brace-to-airplane attachment bolts having made sure they are intact, (4) Install the washers. Screw on and. uniformly tighten the nuts; cotterpin them. 7. Install the airscrew pitch control brackets on the engine, using the following procedure: (1) Undo the gearbox-to-intermediate crackcase attachment nuts near the airscrew pitch control brackets and two nuts for attachment of the R-2, series 04 speed governor. (2) Install the airscrew pitch control brackets on the studs, place spring washers, install and tighten the attachment nuts of the gearbox and R-2, series 04 speed governor. ***NOTE: Tighten the nuts for attachment of the gearbox to the intermediate crankcase and fastening the airscrew pitch control brackets with a torque wrench 14-024-260 with socket 14-324-06. Tightening torque is ($1,5^{+0,3}$) kgf-cm.*** 8. Install the airplane lever on the control shaft of the R-2, series 04 speed governor to which end: (1) Undo the nut and remove the washer from the governor control shaft* (2) Install the lever and washer on the governor control shaft. (3) Install and tighten the nut, lock it with a cotter pin. 9. Connect the oil, fuel and air lines with the respective connections on the engine and lock them.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
10. Connect the pipes to the oil and fuel pressure transmitters. 11. Lock the pipes. 12. Connect and lock the control rods of the carburetor, speed governor, cowling shutters. 13. Connect primary circuits of both magnetos with the selector switch. Connect the high-tension wire from starting coil KP-4716 to jack S (starting) of the LH magneto distributor. 14. Install the tachometer generator. 15. Install the temperature pickup for measuring the engine inlet oil temperature . 16. Connect wires to the generator. 17. Cut in the filter with chip detector to the electric circuit. 18. Install thermocouples under rear spark plugs of cylinders Nos 2 and 6 and connect by thermocouple wires according to the airplane Operating Instructions. 19. Connect ignition sables to the spark plugs (Ref. 074.20.02, Task Card No. 202). 20. Remove the plug from the carburetor lower flange. 21. Install the mesh on the carburetor lower flange. 22. Install and secure the air intake pipe with air heater at the carburetor inlet.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
23. Remove plugs from the exhaust porta of all the cylinders. 24. Install the exhaust manifold having coated thread of its nuts with grease ST (NK-50). 25. Install the airscrew on its shaft (Ref. airscrew Operating Instructions). 26. Pill the airplane with fuel, oil, air. 27. Prepare the engine for starting (Ref. Task Card Ho. 201). 28. Start the engine (Ref. Task Card No. 201). 29. Run the engine at a speed of 24 to 44 % for 10 to 15 min till the engine inlet oil temperature rises to at least 40 °C. 30. Shut down the engine (Ref. Task Card No. 203). 31. Drain oil from the tank and engine (Ref. Task Card No. 244). 32. Check joints for leakage. T.R. Leaky joints are not allowed. 33. Remove the oil sump filter with chip detector and the rear cover oil filter. 34. Inspect and wash the filters. **T.R.** Damage to filters is not allowed. Metal particles in oil are not allowed.	Detect and eliminate cause of leakage Replace damaged filter Detect and eliminate cause of metal particles getting into oil	

OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CH ECKED BY
35. Install and lock the filter with chip detector and the rear cover oil filter. 36. Fill fresh oil, ***NOTE: Do not re-use or recycle the drained oil*.** 37. Check presence of locking on the nuts of connections, pipelines, drain cocks and plugs,			
TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**	
	Syringe UB-24-05 Wrench 14x17 14-232-03 Pliers, flat-nosed 150 Screwdriver 700345 A150x0.5 Crane Hoist Tray for oil draining Wrench 27x30 7811-0041 Wrench 24x27 700880-8 Wrench 17x19 UB-24-07 Shackle, engine mounting Hammer 700016 Wrench 11x14 14-24-861 Wrench, spark plug 22 15-32-173 Wrench 19x22 700880-7 Wrench 14-024-260 Set of sockets	Oil MS-20 Alcohol, rectified Cloths Grease ST (NK-50) Paper, paraffined Twine Gasoline Nefras-S 50/170 or BR-1, BR-2	

ENGINE M-14P - STORAGE INSTRUCTIONS

1. MATERIALS AND CONTAINERS USED FOR PRESERVING ENGINE

To preserve the engines which are temporarily withdrawn from service and their spares, use is made of the following compounds:

Aviation oil MS-20 for internal preservation of the engine and accessories for up to 30 days, the carburetor and fuel pump, for up to 6 years.

Gun grease (neutral dehydrated) or grease PVK for internal preservation of the magneto and external preservation of the fuel fine filter for up to 6 years.

Preservation oil K-17 for internal and external preservation of the engine and accessories, except the carburetor and fuel pump for a period of 60 and 90 days, one year and six years.

CAUTION: 1. NEVER PRESERVE THE CARBURETOR AND FUEL PUMP INTERIOR WITH PRESERVATION OIL K-17.

2. GREASES USED FOR PRESERVATION, GASOLINE AND PARAFFINED PAPER SHOULD BE REGULARLY CHECKED FOR FITNESS IN THE LABORATORY.

3. TO FULLY REMOVE MOISTURE, HEAT GUN GREASE AND GREASE PVK BEFORE USE TO 110 TO 120 °C TILL FOAMING CEASES.

When preserving the engine it is allowed to replace the above-listed greases, with greases produced under specifications of British and US companies (Ref. Table 901).

Table 901

Description of grease		
USSR	England	USA
Aviation oil MS-20 GOST 21743-76 Gun grease GOST 19537-74 Preservation oil K-17 GOST 10877-76	B/0 DEngRD-2472 (1950) Shell Otina compound Shell Ensis compound	1100 M1L-L-6082B (1955) AN-W-576

Engine M-14P is delivered in a wooden container comprising a bottom and a detachable cover. The overall dimensions of the packaging container are 1350x1250x1360 mm.The engine is attached to the container bottom by braces and shipping brackets installed on the engine frame. All fasteners are painted red and should be removed when installing the engine on the airplane.

The generator, individual engine and accessory SPTA set, case with airborne tools and fuel fine filter are packaged in separate boxes attached to the engine container bottom.

2. PRESERVATION AND STORAGE OF ENGINE INSTALLED ON AIRPLANE

2.1. STORAGE OF ENGINE INSTALLED ON AIRPLANE

(1) The airplane with engines installed may be stored both in hangars and on the airfields. In both cases the engine should be subject to anticorrosion treatment depending on the expected dead period,

(2) If a prolonged dead period of the engine is expected, the engine should be preserved not later than in seven days of parking depending on the predicted interval by one of the methods indicated below.

CAUTION: NEVER PRESERVE THE ENGINE IN RAIN OR SNOW.

(3) When storing the airplane with engine installed outdoors, tightly cover the engine to protect against snow, rain and dust.

(3) Mark the preservation date and cases of detection of corrosion in the engine Log Book and accessory Certificates.

2.2. PRESERVATION OF ENGINE INSTALLED ON AIRPLANE FOR PERIOD OF UP TO 20 DAYS

(1) Start and warm up the engine (Ref. Task Card No. 201).

(2) Run the engine for 10 to 15 min at a speed of 35 to 41 % (1000 to 1200 r/min) on gasoline B-70 with 10 % oil MS-20 and on oil used to operate it.

(3) Stop the engine and cool it down to the cylinder head temperature of 30 to 40 °C.

(4) Drive out the front spark plugs.

Turn the airscrew shaft for 8 to 10 turns with the carburetor throttle fully open to scavenge the cylinders of exhaust gases,

(5) Pill 70 to 100 g of clean dehydrated oil MS-20 heated to 60 to 80 °C or 70 to

100 g of preservation oil K-17 heated to 40 °C with the piston at the TDC through the spark plug holes of each cylinder using a syringe. Turn the airscrew for 1 to 2 turns. Reinstall the spark plugs.

(6) Wipe the engine outer surfaces with a clean cloth (or rags) moistened in gasoline Nefras-S 50/170 or BR-1, BR-2, clean the rubberized fabric hoses with a clean dry cloth.

(7) At above-zero ambient temperature, turn the airscrew shaft 6 to 8 turns each 10 days with the carburetor throttle fully opened.

(8) If the dead period exceeds 20 days, represerve the engine according to Items 1 through 7.

(9) The engine preserved for 20 days is not subject to depreservation.

NOTE; It is allowed to perform up to three represervation cycles after which the engine should be preserved for a storage period of 30 or 90 days.

2.3. PRESERVATION AMD DEPRESERVATION OF ENGINE INSTALLED ON AIRPLANE FOR STORAGE PERIOD OP UP TO 30 DAYS

(1) Start and warm up the engine (Ref. Task Card No. 201).

(2) Stop the engine, drain oil from the oil tank and engine immediately after shutdown. Fill the oil tank with fresh oil, the fuel tank with gasoline B-70 with 10 % oil MS-20.

(3) Start the engine and run it for 10 to 15 min at a speed of 35 to 41 % (1000 to 1200 r/min),

(4) Stop the engine, cool it down to a cylinder head temperature of 30 to 40 °C.

(5) Drive out the front spark plugs. Disconnect the pipe from the compressor delivery valve connection. Remove the spring lock, mesh, filtering element, second mesh, Fill clean oil MS-20 heated to a temperature of 60 to 80 °C through the suction valve of the compressor, turning the airscrew shaft simultaneously till oil emerges from the delivery valve.

(6) Using a syringe fill 70 to 100 g of clean dehydrated oil MS-20 heated to a temperature of 60 to 80 °C or 70 to 100 g of preservation oil K-17 heated to a temperature of 40 °C into each cylinder through the spark plug holes with the piston at the BDC; lubricate the seats and heads of the exhaust valves, turn the airscrew shaft for 2 to 3 turns. Reinstall the mesh, filtering element, second mesh, spring lock of the compressor. Connect the pipe of the delivery valve connection of the compressor.

(7) Again fill 70 to 100 g of clean dehydrated oil MS-20 heated to a temperature of 60 to 80 °C or 70 to 100 g of preservation oil K-17 heated to a temperature of 40 °C into each cylinder using a syringe without turning the airscrew shaft.

(8) Perform internal preservation of the fine fuel filter with pipelines disconnected by filling or forcing oil MS-20 heated to a temperature of 60 to 70 °C till the interior spaces are filled and air bubbles are removed. Drain oil from the interior. Connect the pipelines.

(9) Preserve the carburetor, using the following procedure:

(a) Set the carburetor throttle lever to the full-open stop.

(b) Drive out plug (3) (Ref. 073.10.03, Pig. 202) of the automatic mixture control and drain plug (2) (Ref. 073.10.03, Fig. 201).

(c) Disconnect the pipelines from connection (6) for feeding fuel to the carburetor and from connection (7) for measuring fuel pressure at the carburetor inlet.

(d) Screw a shipping cap on connection (7) and connect to connection (6) a hand pump pipe filled with oil MS-20 heated to a temperature of 60 to 70 °C.

(e) Open the fuel valve by unscrewing plug (6) (Ref. 073.10.03, Fig. 202) for

measuring air pressure in the governor air space and supply air at a pressure of 0.3 to 0.5 kgf/cm2.

(f) Plush the carburetor with oil heated to a temperature of 60 to 70 °C at a

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pressure of 0.2 to 0.5 kgf/cm till it appears in the hole for plug (2), install the plug and keep on pumping till oil emerges from the hole of plug (3)» install this plug and keep on pumping till oil appears in emulsion holes of the nozzle.

(g) Stop pumping as soon as oil starts flowing from the nozzle holes and perform two or three energetic turns of the throttle lever from stop to stop.

(h) Drive out the pipe from connection (6) (Ref. 073.10.03, Pig. 201), remove the cap from connection (7), drive out lower drain plug (5) (Ref. 073.10.03, Pig. 202) and upper drain plug (2) (Ref. 073.10.03, Pig. 201) and drain oil from the carburetor through the open holes.

(1) Reinstall the plugs, connect fuel pipes to connections (6) and (7) and lock the plugs and nipples with wire.

(10) Wipe the engine outer surfaces with a clean cloth (or rags) moistened in gasoline Hefras-S 50/170 or BR-1, BR-2 and the rubberized fabric hoses with a clean dry cloth.

(11) Carefully inspect the engine externally, dress corrosion and coat with preservation oil K-17.

(12) Coat the outer surfaces of the engine and accessories which have no paint coating with preservation oil K-17.

(13) In case of prolonged dead periods, preserve the engine each month for up to two times, then perform preservation for a storage period of 90 days.

(14) Prior to starting the engines preserved for a period of 30 days, depreserve them using the following procedure:

(a) Drain oil from the lower cylinders and remove oil from cylinders Nos 1, 2, 3» 7, 8, 4 and 9 through spark plug holes using a syringe.

(b) Depreserve the compressor (Ref. 080.00.00, Task Card No. 202) having disconnected the air pipe from the delivery valve.

CAUTION: 1. WHEN PRESERVING AND DEFRESERVING THE CARBURETOR, PROTECT BREATHER HOLE IN PLUG (4) AGAINST CLOGGING WITH GREASE (REP. 073.10.03, FIG. 202).

2. DO NOT CRANK THE ENGINE BEFORE DEPRESERVING THE COMPRESSOR.

(c) Depreserve the carburetor (Ref. 073.10.03, Task No, 202). When depreserving the engine, crank it to fully remove preservation grease from the compressor interior.

(d) Wipe the engine externally dry with a cloth moistened in gasoline Nefras-S 50/170 or BR-1, BR-2 and blow with compressed air; ensure against getting of gasoline and oil into the magneto and generator interior.

(e) Start and test run the engine (Ref. Task Card No. 201):

2.4. PRESERVATION AND DEPRESERVATION OF ENGINE INSTALLED ON AIRPLANE FOR STORAGE PERIOD OF UP TO 90 DAYS

(1) Carry out operations under Items 2.3(1) through 2.3(5).

(2) Drain oil from the engine and oil tank, drain gasoline from the tank and carburetor.

(3) Pill 3 to 4 lit of clean dehydrated preservation oil K-17 into the engine crank-case through the rear breather and turn the airscrew ahaft through 8 to 10 turns.

(4) Using a syringe, fill 70 to 100 g of oil K-17 heated to a temperature of 40 °G

through the spark plug holes into each cylinder with the piston in the BDC, lubricate the seats, stems and mushroom heads of the exhaust valves with oil K-17, turn the airscrew shaft for 2 to 3 turns.

(5) Again fill 70 to 100 g of oil K-17 heated to a temperature of 40 °G into each cylinder through the spark plug holes using a syringe; do not turn the airscrew shaft. Reinstall the spark plugs and delivery valve pipe of the compressor.

(6) Preserve the carburetor as instructed under Items 2.3(9) and 2.3 (12).

(7) Preserve the fine fuel filter according to Item 2.3(8).

(8) Perform external preservation of the filter non-painted surface with gun grease heated to a temperature of 105 to 110 °C. Apply grease with a brush.

(9) Wipe the engine outer surfaces with a clean cloth (or rags) moistened in gasoline Nefras-S 50/170 or BR-1, BR-2 and the rubberized fabric hoses with a clean dry cloth.

(10) Carefully inspect the engine externally, dress corrosion with sandpaper No. 170 or 230 and coat with preservation oil K-17.

(11) Coat the non-painted outer parts of the engine and accessories with oil K-17.

Close the exhaust pipe (or manifold) holes with polyethylene film, install shipping covers on breather holes.

(12) On expiration of the preservation term the engine may be preserved again for a

storage period of from 20 to 90 days. Depreserve the engine before represervation.

For represervation, remove the airscrew from the engine, wash the airscrew shaft end and the airscrew hub assembly with gasoline Nefras-S 50/170 or BR-1, BR-2;

remove corrosion, carefully wipe, coat with gun grease and reinstall the airscrew.

(13) To depreserve the engine, proceed as follows:

(a) Wipe the engine exterior dry with a cloth moistened in gasoline Nefras-S 50/170 or BK-1, HR-2 and blow with compressed air.

(b) Drive out spark plugs from all the cylinders and plugs of the intake pipes of cylinders Nos 4 through 6 and drain grease from the lower cylinders, turning the airscrew shaft for 8 to 10 turns; remove oil from cylinders Nos 1, 2, 3» 7, 8 and 9 using a syringe.

At an ambient temperature below 10 °C, drain oil after heating the engine.

(c) Depreserve the compressor (Ref. 080.00.00, Task Card No. 202). Carry out this operation simultaneously with operations under Item 2.4(13)(b).

(d) Depreserve the carburetor (Ref. 073.10.03, Task Card No. 202).

(14) Repeat preservation of the engine for a period of 90 days only once. On expiration of the second preservation term, fully depreserve the engine and test run it for 30 min at all ratings after which preserve the engine again for the required storage period.

NOTE: If oil sprayer 77MR-1, preservation tanks 77BK-1, engine oil flushing unit 77PD-1 are available at the User's, it is recommended to preserve the engine with the aid of this equipment in accordance with the Instructions.

3.PRESERVATION OF ENGINE FOR STORAGE PERIOD OF UP TO ONE YEAR

Subject to preservation for a storage period of up to one year are the engines removed from the airplane and directed to prolonged storage or for repair.

(1) Prior to removing the engine from the airplane, carry out operations indicated in Items 2.3(1) through 2.3(4) for preserving the engine for a storage period of up to 30 days,

(2) Drain oil from the engine and oil tank (Ref. Task Card No. 244).

(3) Remove the engine from the airplane and arrange it on the support (Ref. Task Card No. 403).

C4) Remove the generator from the engine and install a blanking cover in its place (Ref. 024.30.01, Task Card No. 201).

(5) Fill preservation oil K-17 heated to a temperature of 40 °G into the engine crank-case through the rear breather hole till oil appears in the front breather hole. Install auxiliary covers on the flanges of the front and rear breather holes.

(6) Fill oil MS-20 heated to a temperature of 60 to 80 °C into the fuel pump through the fuel supply connection and turn the airscrew shaft till it appears in the outlet connection.

(7) Using a syringe, fill 60 g of oil K-17 heated to a temperature of 40 °C in the compressed air distributor through the air supply connection, turning the airscrew shaft through 3 to 4 turns.

(8) Preserve the compressor as follows:

(a) Remove the spring lock, mesh, filter and the second mesh.

(b) Charge oil K-17 heated to a temperature of 40 °C through the suction valve turning the airscrew till oil appears in the delivery valve connection.

(9) Remove excessive grease from the fuel pump and compressor interior, to which end turn the airscrew shaft for 3 to 4 turns. Install the mesh, filter, the second mesh and the spring lock after accomplishing operations under Item 3(12).

(10) Perform internal preservation of the carburetor as instructed under Item 2.3(9).

(11) Remove the valve case covers, apply preservation oil K-17 heated to a temperature of 40 °C to the valve springs, cylinder exhaust ports, mushroom heads and stems of the valves.

(12) Using a syringe, fill 150 to 200 g of oil K-17 heated to a temperature of 40 °C into each cylinder through the spark plug holes with the piston being at the BDC turning the airscrew shaft for 3 to 4 turns, then refill the oil into the cylinders without turning the airscrew shaft. Fill the oil using a syringe with a special tip. Turn the shaft with the compressor inlet valve being depressed.

(13) Brain oil K-17 from the engine crankcase through the oil sump drain cock.

(14) Remove excessive oil from the cylinders through the spark plug holes using a syringe, then drive plugs or spark plugs into the spark plug holes.

Install covers with paraffined paper gaskets on the cylinder exhaust ports.

(15) Install caps on the fuel pump connections and stop the compressor delivery valve.

(16) Preserve the magneto internally using the following procedure:

(a) Drive out four pipe attachment screws, remove the shield and distributor taking care not to damage the high-tension terminal socket and the central electrode.

(b) Clean the cam, coupling bolt crown nuts, breaker mechanism parts of soil. Clean these parts with chamois or coarse calico cloth slightly moistened in clean alcohol.

(c) Wrap the cam profile working surface with one layer of calico or tafetta tape, . (16^2) mm wide, (140^2) mm long, 0.2 to 0.3 mm thick, impregnated with gun grease or grease PVK heated to a temperature of 105 to 110 °C.

(d) Using a brush, coat the breaker spring and arm with a thin layer of turbine oil T22, avoiding runs.

CAUTION: AFTER INSTALLING THE COVER ON THE COMPRESSOR DELIVERY VALVE AND PRESERVING THE MAGNETO, NEVER TURN THE ENGINE AIRSCREW SHAFT.

(e) Reinstall the removed parts, seeing to it that the distributor, high-tension terminal socket, central electrode and the shield are properly arranged.

(17) Preserve the generator, using the following procedure:

(a) Wash the generator shank and flange with gasoline Nefras-S 50/170 or BR-1, BR-2.

(b) Make sure there are not traces of corrosion. If corrosion is detected, remove it with sandpaper No. 230 moistened in oil.

(c) Lubricate the casing, shank, flange, heads of screws and bolts securing pole shoes and terminals with oil K-17, avoiding getting of lubricant inside the generator.

(d) Wrap the generator in paraffined paper and pack in a separate box.(18) Remove the engine from the support, place it on the bottom of the packaging container and. secure by braces using the following procedure:

(a) Uncotterpin and undo six nuts (2) (Ref. Fig. 402) of the engine frame ring.

(b) Remove six washers (3) and (1) each.

(c) Install three shipping brackets instead of the removed washers.

(d) Install six nuts (2) on the engine frame studs, tighten and cotterpin them.

(e) Install the braces and secure them to the container bottom.

(19) Perform external preservation of the engine and its accessories using the following procedure:

(a) Wipe the engine with a cloth moistened in gasoline Nefras-S 50/170 or BR-1, BR-2 and blow with compressed air. See to it that gasoline does not get inside the engine, in the thrust bearing and rubberized fabric hoses of the tappet

rod casings.

(b) Inspect the engine and touch up having degreased the damaged paintwork spots with gasoline. Use a spray gun or a brush to touch up.

NOTES: 1. Touch up the damaged engine surfaces painted khaki with epoxy enamel EP-140, the surfaces painted black, with black nitrocellulose varnish ITTs-286. To obtain the required color it is allowed to add up to 30 % black enamel ?-163 to nitrocellulose varnish NTs-286.

2. Touch up the silver color accessories with aluminium powder nitrocellulose varnish.

3. Dry the engine after touch up for 30 to 60 min at a temperature of 10 to 30 °C, protecting the touched up areas against grease at external preservation of the engine.

(c) Remove the fine fuel filter and its pipelines from the airplane. Perform internal preservation of the filter with oil MS-20 heated to a temperature of 60 to 70 °C. Do not subject the fine fuel filter to external preservation.

(d) Coat non-painted steel parts of the engine and its accessories with oil K-17 (the painted parts may be left unpreserved).

(e) Generously coat the airscrew shaft end with oil K-17, attach the shackle to it, wrap with two or three layers of paraffined paper and fix with twine.

(20) Wrap the engine with 2 or 3 layers of paraffined paper, secure with twine which should not touch the unpreserved places.

(21) Preserve the engine spares (except for gaskets and rubber parts) and airborne tools with oil K-17 at a room temperature. Wrap the preserved spares in paraffined paper, prepare the box for packaging, insert spares into it and secure the box cover.

(22) Package the airborne tools into the case using the following procedure:

(a) Carefully inspect the case, clean it of soil by blowing with dry clean compressed air or wipe with clean dry cloths.

(b) Place the airborne tools into the case. The tools should be securely fixed in the clamps.

NOTE: Never touch the tools with ungloved hands.

(c) Dry the case with airborne tools with dry compressed air passed through the oil/moisture separator heated to a temperature of 60 °G and dried to a dew point of not above minus 20 °C.

(d) Insert the first bag with silica-gel dehydrator, grade KSMG and ShSMG (500 g) with up to 2 % moisture in the case.

(e) Place the airborne tool list in the case, close and seal the latter. The locks should be positively fixed.

(f) Wrap the case with two layers of paraffined paper and fix with twine. Wrap the handles with paper and tie with twine additionally.

(g) Secure the second bag with ailica-gel dehydrator (500 g) and the silica-gel indicator cartridge to the case by Mac-Key threads folded six or with twine,

(h) Make a cover of polyethylene film.

(i) Place the case in the cover and fuse its edges. Evacuate air from the cover through the valve so that the cover presses to the case and ensure tightness of the valve.

Accurately position the case in the packaging box and close the box cover,

(j) Store and check condition of the silica-gel indicator as instructed in Section 8.

(23) Enter the preservation date, operation description, preservation term, name of person in charge of preservation and place of preservation in the engine Log Book and accessory Certificate.

(24) Install and secure the individual SPTA set box and airborne tool case on the bottom of the packaging box.

(25) Insert the engine Log Book, accessory Certificates and engine Packaging List in a special box.

(26) Close the engine with the packaging container cover, secure the cover to the bottom by four dowel pins and seal it (the packaging container should be cleaned of dust and soil beforehand). Erase inscriptions which do not pertain to the given engine and apply new ones.

(27) Send the engine to the addresses.

4. REMOVAL OF CORROSION FROM ENGINE PARTS

Preserve the engine for prolonged storage only after removing corrosion from parts.

(1) Remove corrosion from steel parts with sandpaper No. 170 or 230 moistened in oil MS-20 and polish with paste GOI.

After polishing the surface, wipe it with a clean cloth moistened in gasoline, then with dry cloth and coat with preservation grease, selected depending on the preservation term (Ref. Table 901).

(2) Remove corrosion from aluminium parts by a scraper, then dress the area with

powdered pumice or sandpaper not coarser than No. 230; wipe the parts with a cloth moistened in gasoline, then with a dry cloth and paint the matching color or coat with preservation grease.

(3) Corrosion spreads quickly on magnesium alloy parts; therefore, immediately dress the affected areas with a scraper, then with sandpaper not coarser than No. 230, wash with gasoline and wipe dry.

Oxidize the dressed magnesium alloy parts.

It is recommended to oxidize the parts at a room temperature in the solution of the -following formula:

Selenic acid .... 20 g

Sodium bichromate .... 10 g

Water .... 1000 ml

Exposure - 1 to 2 min.

If the parts cannot be removed from the engine, they may be oxidized by lightly rubbing with cotton wool moistened in the solution. After oxidizing the magnesium alloy parts, dry them blowing with clean dry air and paint the matching color or coat with preservation grease.

5. LOADING OF DEHYDRATOR CARTRIDGE WITH SILICA-GEL INDICATOR

(1) To load the dehydrator cartridge with silica-gel indicator, use the following procedure:

(a) Insert a disk of filtering paper inside the dehydrator cartridge onto its perforated bottom.

(b) Wrap the perforated 'bottom of the dehydrator cartridge in polyethylene film and secure with a rubber ring.

(c) Fill the cartridge with silica-gel indicator.

(d) Glue the cartridge cover to its body by 2 to 3 % solution of polystyrene in dichloroethane.

(2) Prepare the adhesive by dissolving crushed polystyrene in organic solvent dichloroethane (2 to 3 % polystyrene, 97 to 98 % dichloroethane).

Keep ready adhesive in a glass ware with ground plug. The adhesive shelf life is one month.

(4) Keep the loaded cartridge in the cartridge loading room for 10 to 15 min, place in sets in polyethylene film bags and fuse the latter. The storage term is up to 3 days.

6. REQUIREMENTS FOR PRESERVATION/DEPRESERVATION ROOM

The room temperature should be from 10 to 30 °C.

The room should be dried, heated and well ventilated. Room air relative humidity should be from 45 to 70 %.

Avoid sharp fluctuations of temperature and humidity. Temperature fluctuations should not exceed 6 °C. The room floor should be of painted timber, tiles or xylolite.

Earthen and cement floors are not allowed.

It is strictly prohibited to store corrosive materials in the room: acids, alkalis, salts and other chemicals, storage batteries and rubber items.

Keep the room clean. Sweep the floors using wet sawdust or a vacuum cleaner.

When preserving and packaging the engine, the personnel should wear clean overcoats, knitted or cotton gloves and use cloths.

7.REQUIREMENTS FOR STOREROOMS

Storeroom for the engine, accessories and spares should be dry, ventilated and heated.

The room air temperature should be from 10 to 30 °C, relative humidity from 45 to 70 %• Sharp fluctuations of temperature and humidity are not allowed.

Temperature fluctuations during 24 h should not exceed 6 °C.

Determine temperature and relative humidity each morning and evening. Enter the data into a Register.

The storeroom floors should be of painted timber, xylolite, tiles or asphalt. Cement and earthen floors are not allowed.

The racks for spare parts should be made of timer with a moisture content of up to 18 %. The shelves of timber and metal racks should be painted with oil paint and kept clean.

The racks should be so arranged that the distance from the rack lower shelf to the floor and wall is at least 400 mm.

The racks should be closed with light fabric curtains to protect the spares against dust and sun rays.

Room cleaning should preclude dusting, the shelves should be wiped with slightly oiled cloth, the floor should be swept with wet sawdust or be cleaned with a vacuum cleaner.

NEVER sweep the dry floor or pour or sprinkle it with water. The storeroom should be separated from the external yard with a tambour.

The items to be stored should be unloaded and loaded in the tambour or at sheltered grounds.

Unloading at open grounds is strictly prohibited. Storage of engines and spares in the tambour is strictly prohibited.

A special room separated from the other storage area with a solid partition should be provided behind the tambour in the storage area.

The incoming engines, accessories and spares should be kept to gain the room temperature. Engines, accessories and spares should be unpackaged, packaged and treated in this room.

As regards humidity, temperature and equipment, this room should meet the requirements of storerooms.

The storeroom for the engine, accessories and spares should be absolutely isolated against various gases (smoke, chemical plant flue gases, sulfur oxide, ammonia, chlorine , etc.).

It is prohibited to store chemicals, acids, alkalis, storage batteries and hygroscopic materials (cotton, paper, rags, etc.) in one room with the engines and spares.

8. STORAGE OF ENGINE AND SPARES AT DEPOTS

Mark the time of arrival of the engine, the date and term of original preservation (to be taken from the engine Log Book) in the Register.

Keep boxes with spares in a separate pile (in set with engines); indicate the time of arrival, date and term of original preservation on the pile.

Spares delivered by the Supplier are preserved for a term indicated in the accompanying documents. This term is effective provided the Supplier's preservation is completely intact, therefore the boxes should not be open throughout this term unless urgently necessary.

Cured parts should be stored only packed.

NOTE: When sending the spares from depot, it is not recommended to violate the Supplier's preservation. It is recommended to check the package contents against the Data Sheets which should indicate the part TSos and their quantities in the package.

The engine preserved for one year may be stored unpackaging, covered with a tight fabric cover on supports allowing external inspection and lubrication.

The supports should be made of wood with a moisture content of up to 18 % and painted at points of contact with the engine. Besides, these points should be lined with paraffined paper.

Individual SPTA sets for the engine should be stored on supports so that the distance from the box base to the floor is at least 400 mm.

It is strictly prohibited to keep any items directly on the floor.

When transporting from depots, the items should be protected against precipitation (snow, rain).

Systematic inspections should be carried out for the engine and spares kept in the storeroom.

The storeroom should have a special Register for recording the procedure and terms of inspection of the engine and spares.Besides, each unit should have a tag reading the date of the last inspection and the date of the next one as well as the name of person in charge of its condition and inspection.

All operations relating to the engine should be also entered into its Log Book, in addition to the Register and tag.

When keeping the engine packaged for one-year storage, subject it to inspection once in six months using the following procedure:

(a) Make sure through the spark plug holes that grease is present on the cylinder sleeves and there is no corrosion.

(b) Make sure the airscrew shaft splines are free of corrosion.

(c) Remove covers from the exhaust ports and check condition of the valves.

When storing the engine packaged for 4-year storage, inspect it through the film every month throughout the storage period.

If silica-gel indicator turns pink, proceed as follows:

(a) Cut the cover upper seams (near the edge) with scissors.

(b) Carefully roll out the cover.

(c) If the silica gel in cartridges is pink, drive out the cartridges and make sure the cylinder sleeves are greased; use an electric lamp for the purpose.

Replace dehydrator cartridges with pinky silica-gel indicator with new cartridges loaded with blue silica-gel indicator.

(d) If silica gel in the indicator or check cartridges turned pinky, replace all silica-gel dehydrator and silica-gel indicator.

(e) Wrap with paraffined paper the engine parts that were wrapped originally with paper.

(f) Close the engine with the same cover, evacuate air and fuse it.

Never touch metal parts with ungloved hands. Never take the metal parts by painted or dressed surfaces (chrome-plated, varnished or cadmium-plated, etc.). If this cannot be avoided, use knitted gloves or appropriate appliances (tongs, etc.), oiled rags or tight paper (waxed, paraffined, etc.).

On expiration of every six months after original preservation, open the individual SPTA set boxes and inspect the parts using the following procedure:

Make sure, without touching by hands or damaging the grease coat, that there is no corrosion under the grease coat. If no corrosion traces are detected, wrap the parts in paper again and place in the boxes.

When inspecting, do not remove the parts from paper, only unwrap them and inspect, carefully turning on paper.

If spares in the opened boxes are in satisfactory condition, do not open other boxes with the same date of original preservation.

If random inspection detects heavy corrosion which precludes further storage of parts, draw a bilateral statement and submit a claim to the Supplier.

After drawing the bilateral statement, depreserve all the SPTA sets of the same original preservation date as the set where corrosion was detected. Depreservation consists in washing with clean gasoline to fully remove grease.

After eliminating corrosion, the parts are washed, inspected, dried, preserved and packaged. The parts free of corrosion are represerved and packaged.

When corrosion is detected on engine parts before the guaranteed storage term and is the fault of the Supplier, the latter must restore or replace the corroded parts and perform represervation by his labour and at his expense after the Customer presents the bilateral statement to the Supplier.

Perform in-storage depreservation and preservation of the engine and renew protective grease on parts, whenever necessary according to the present Manual.

All greases and oils used for preserving the engine and spares should be stored in a special depot in a sealed container with grease Certificate.

NEVER store greases and oil at unsheltered outdoors grounds.

Greases and oils should fully meet the specifications. It is prohibited to use greases and oils without preliminary chemical tests.

Prior to use, the preservation greases should be subject to a repeated analysis for acidity and moisture content. Enter the analysis results in a special Register.

After partial usage of grease or oil, apply seals to baths with grease and oil and special vessels (flasks).

The vessels intended to carry greases and oils should be absolutely clean and dry.

To avoid ingress of water and foreign admixtures, the vessels should be tightly closed and sealed.

Paraffined paper used for packaging should arrive with the Supplier's seal.

A sample should be taken from each paper lot for testing it for mineral acids, alkalis and salts.

9. PREPARATION OF ENGINE FOR SENDING FOR REPAIR OR TO SUPPLIER UNDER CLAIM SUBMITTED

The engines forwarded to repair or to the Supplier should be fully completed with all accessories according to the engine Log Book and accompanying documents* preserved and packaged according to Section 3 (less Item (19)(b)).

10.REQUIREMENTS FOR ENGINES STORED AT OPEN GROUNDS

Inspect the container with engines, accessories and spares to be stored.

The wooden box should be free from slots, cracks, ruptured roofing paper. Eliminate container defects before placing the engines in open ground storage.

Remove the cover of the packaging container and check condition of the engine film cover, silica-gel indicator and container cover. To preclude damage to the film cover, remove the container cover with a crane or other hoisting appliances.

NOTE: If the cover has a detachable wall, remove it first and then detach the cover.

The polyethylene film cover and its seams should have no mechanical defects (punctures, breaks, etc.).

Inspect the engine outdoors with the film cover removed at an ambient temperature of not below 5 °C. At an air temperature below 5 °C, inspect the engine film cover only in a heated room.

In case of rainfalls, remove the container cover to inspect the film cover only in the storeroom or under a shed.

Check packaging of the units and spares by condition of silica-gel indicator through the inspection ports.

Silica-gel indicator on the engines, accessories and spares to be placed in storage should be blue or violet.

It is prohibited to place the engines in storage outside the storerooms in damaged packaging containers or film covers or with pinky silica-gel indicator.

Repair the covers and replace silica gel according to the effective Instructions.

When moving the engines from open grounds to storerooms, it is prohibited to keep the engines in wet containers.

11. REQUIREMENTS FOR STORAGE GROUNDS

Arrange the engines prepared for storage on specially equipped grounds.

The engine storage grounds should be organized on dry non-flooded areas, cleaned of grass and litter and be provided with drainage facilities.

The grounds should be equipped with special supports to protect the engines against ingress of water and ensure ventilation of the container lower portion. The support height depends on the local climatic and soil conditions but should not be less than 300 nun.

Arrange the containers with engines on the ground so as to allow free access to them for inspection.

When storing the engines on grounds under sheds, the latter should protect the containers with engines against direct sun rays and rainfalls.

The shed may be of any construction and material. The shed construction should provide for drain of water to the drain ducts.

The clearance of at least 50 mm should be left between the boxes placed in storage and the shed.

12. INSPECTION AND CARE OF ENGINES IN STORAGE

Inspect all the containers in storage and check color of silica-gel indicator through the container inspection ports once in three months. When silica-gel indicator turns fully pink, replace silica-gel dehydrator and silica-gel indicator and inspect the film cover.

Replace silica gel and repair the damaged cover indoors according to the effective Instructions. The room temperature should not be below 10 °C.

Clean the engine storage grounds and their drainage system regularly of grass and litter.

At snow thawing, remove snow from and around the containers.

13. FORMALIZING OF TECHNICAL DOCUMENTS IN STORAGE

Enter the following information in the Log Books of engines and accessories and in the inspection Register (for spares and accessories without Log Books):

Date of engine placement in storage.

Results of periodic engine inspections in storage.

Date of repair of the film cover.

Condition of silica-gel indicator and date of silica gel replacement.Each move of the engines, accessories and spares during the entire storage period from the outdoor storage place to indoor storage and back.

All entries should be made by the head of storage department (section) or senior technician of the department with applying a stamp.

ENGINE FRONT - DESCRIPTION AND OPERATION

1. GENERAL

The engine front comprises gearbox (Ref. Pig. 1), gearbox housing (10) (Ref. Pig. 2) accommodating airscrew shaft (1) and the planetary train.

The engine gearbox is intended to reduce the crankshaft speed to the airscrew shaft speed.

the required airscrew speed is obtained by using a spur gear planetary train between the crankshaft and the airscrew shaft (Ref. Fig. 1).

The gearbox increases engine power by increasing crankshaft speed while maintaining moderate peripheral velocity of the airscrew blades. At take-off rating the crankshaft rotates at a speed of 2900 r/min while the airscrew makes 1908 r/min.

When the crankshaft rotates, drive gear ring (17) (Ref. Fig. 2) turns satellites (15). Meshing with sun gear (29) of the gearbox, the satellites roll around it and move the airscrew shaft in the direction of crankshaft rotation.

The M-14P engine gearbox transmission ratio is 0.658.

The gearbox housing carries the airscrew speed governor. The speed governor drive is located on the bracket of the crankshaft thrust bearing front cover.

2. CONSTRUCTION

2.1. GEARBOX HOUSING

Gearbox housing (10) (Ref. Pig. 2) is adapted to accommodate the gearbox parts and is cast of magnesium alloy ML-5. It is a truncated cone attached to the engine intermediate crankcase with its rear flange by means of studs driven into the intermediate crankcase front part.

The gearbox housing takes up load created by the airscrew and transmits it to the crankcase attachment units and engine frame.

The front part of the housing has a hub with an outer flange with fourteen bosses receiving thirteen threaded studs and three milled flats for the thrust bearing front cover puller. Nine studs are used to secure cover (6) of radial ball bearing (8) of airscrew shaft (1) and four studs attach the inner ring of the engine cowling louvers.

The lower boss has a through inclined hole transforming into an open passage for draining oil from the cover space of the airscrew shaft radial ball bearing.

Bushing (7) for mounting the airacrew shaft ball bearing is press-fit in the front bore of the hub. Mounted on the front flange of the housing is ball bearing cover (6) whose aligning collar doubles as a front stop for the ball bearing.

Steel cover (6) has a flange with nine holes for installing on the housing studs and an annular recess on the flange side. Disposed between the ball bearing and the cover aligning collar is steel oil baffle (4). A paronite gasket is arranged between the cover and the housing. Sealing rubber collar (3) is installed in the central bore of cover (6).

Steel bushing (11) is pressed in a hole turned in the housing hub concentrically with the radial ball bearing seat. The inner surface of the bushing carries oil sealing rings (32). The bushing is fixed by set screw (27) driven into the gearbox housing hub. The screw is safetied with a plate lock.

Driven into the gearbox housing hub threaded hole is a jet for lubricating the radial ball bearing of the airscrew shaft.

Made in the middle inner part of the housing are bores and a flange with bosses for mounting and securing hub (12) of the gearbox sun gear. Screwed into each boss is a steel threaded bushing with left-hand thread. Hub (12) is secured to the housing flange by bolts (13) driven in the threaded bushings.

The housing lower part has a flange with a central hole and four threaded holes receiving threaded bushings for mounting the bellows. The bellows is used to drain oil from the gearbox housing through a circular central hole of the flange to the oil sump.

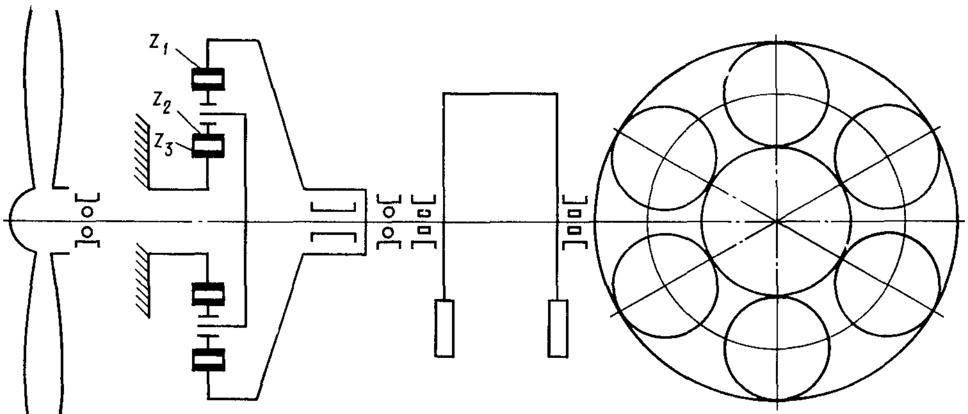
A boss with a flange and four studs for attachment of the airscrew speed governor is made on the outside upper RH part of the gearbox housing. A through hole is made in the flange to pass the shank of the speed governor drive shaft; an inclined lateral hole is intended to drain'oil from the speed governor.

Provided in the upper LH part of the gearbox housing is a boss with a machined flange having a through hole and two studs for attachment of auxiliary blanking cover (24) of the gearbox breather.

The housing has two bosses with holes serving as passages to supply oil from the engine main gallery to the speed governor and from the governor to the airscrew.

These passages interconnect two holes on the speed governor mounting flange and two respective holes in the oil sealing ring bushing.

The passage supplying oil from the engine main gallery to the speed governor features a boss with a threaded hole receiving steel adapter bushing (22), fixed against turning with a retainer. Oil mesh filter (23) is driven into the adapter bushing. The filter comprises two parts: a casing and a mesh brazed to it. A fiber gasket is placed between the filter casing and the adapter bushing end face. The filter is safetied with a spring lock.The passage for supplying oil to the airscrew speed governor is connected to an additional passage drilled in parallel with the gearbox housing center line and further through the oil transfer bushing to the middle part of the crankcase for lubricating the valve mechanisms of the cylinder head cases.



Z_1 - number of drive gear ring teeth
Z_2 - number of satellite teeth
Z_3 - number of sun gear teeth

Gearbox Power Train Figure 1

2.2. AIRSCREW SHAFT

Airscrew shaft (1) (Ref. Fig. 2) is made of heat-treated high-grade alloyed steel. The hollow shaft has at its front end a round flange with end face splines and six holes for airscrew attachment bolts.

The shaft is installed with its rear cylindrical shank in the bushing of the crankshaft front end bearing the rear support for the airscrew shaft.

Arranged on the outer cylindrical surface of the airscrew shaft are steel bushing (2), sealing collar (3) oil baffle (4) radial ball bearing (8), thrust ring (9) and spacer (31). The spacer carries bushing (11) of oil sealing rings with rings (32).

Satellite cage (28) is installed on the airscrew shaft longitudinal splines.

Three splines of the airscrew shaft has longitudinal grooves to supply oil to satellite pivots.

All these parts are braced by nut (20) and are safetied with a lock which is secured to the nut by screw (21).

Two holes are drilled on cylindrical portions of the airscrew shaft for transfer of oil to the airscrew hub and back through the speed governor to the engine oil system.

Aluminium plug (33) is pressed. Into the front end of the airscrew shaft hollow. The plug has a hole communicating with the airscrew shaft hole. The hole serves to supply oil from the speed governor to the airscrew hub. The longitudinal slot in the plug rear part communicates the airscrew shaft hollow with the rear annular space of oil sealing ring bushing (11).

The oil supply holes of the plug and airscrew shaft are aligned by the match marks. Three set screws extending through threaded holes in the front part of the airscrew shaft and holes in the plug secure the latter in a strictly definite position relative to the shaft.

Steel adapter bushing (34) is pressed into the oil supply hole from the plug front side. The oil supply system of the gearbox ensures one-passage operation of the airscrew. The airscrew shaft plug internal thread, is intended to connect the airscrew oil line.

Steel spacer (31) has a copper plated inner surface. The spacer is provided with two oil supply holea whose ends brought to the inner surface have semi-circular depressions to compensate for partial misalignment between the holes of the airscrew shaft and the spacer. Provided at the rear part of the spacer is an inner collar with splines for fixing it on the airscrew shaft.

The steel oil sealing ring bushing is floating along the spacer and is intended to transfer oil to the speed governor and airscrew through the appropriate oil passages in the airscrew shaft and crankcase.

Two inner annular grooves with elongated holes serve to pass oil flowing to the airscrew through the speed governor and back.

Three annular grooves for cast iron oil sealing rings are made on the outer surface of the bushing. Each groove receives two rings.

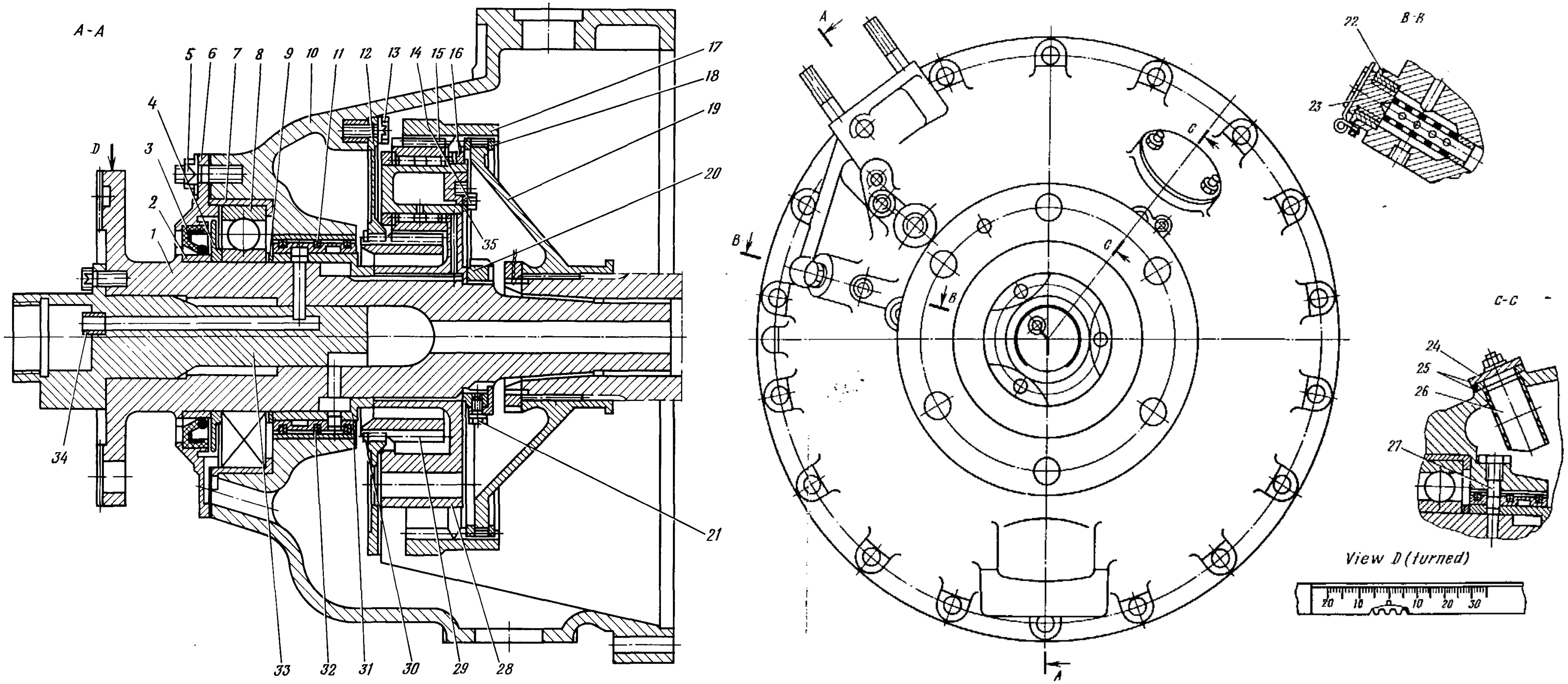
Oil sealing rings (32) rest on the inner surface of the steel bushing pressed in the gearbox housing.

The oil seal bushing is free fit in the bushing of the crankcase front end. To align oil supply holes, the bushing is fixed through its round hole with set screw (27) driven into the threaded hole of the gearbox housing and safetied with a plate lock.

A thin layer of babbit is applied to the inner working surface of the bushing.

Thrust ring (9) is made of steel and has four oil slots uniformly arranged on the front side opposite to the chamfer.

Radial ball bearing (8) is the front support of the airscrew shaft and takes up the airscrew loads.



1. Airscrew Shaft
2. Bushing
3. Sealing Collar
4. Oil Baffle
5. Hut
6. Cover
7. Bushing
8. Ball Bearing
9. Thrust Ring
10. Housing
11. Oil Sealing Ring Bushing
12. Sun Gear Hub
13. Bolt
14. Screw
15. Satellite
16. Satellite Pivot
17. Drive Gear Ring
18. Retaining Ring
19. Drive Gear Ring Hub
20. Nut
21. Screw
22. Bushing
23. Oil Line Filter
24.Blanking Cover
25.Gasket
26.Breather Mesh
27.Set Screw
28.Satellite Cage
29.Sun Gear
30.Retaining Ring
31.Spacer
32.Oil Sealing

Oil baffle (4) is made of steel. It is intended, to restrict flow of oil to oil sealing collar (3) of the airscrew shaft.

The rubber oil sealing collar with metal insert is intended for sealing the airscrew shaft. Oil flows from the radial ball bearing cover space and through the hole in the crankcase front end to the crankcase space. To preclude wear of the airscrew shaft, steel bushing (2) is arranged under the sealing collar working lip.

Radial ball bearing cover (6) is installed in the front bore of the gearbox housing, is attached by nine studa and serves to press the ball bearing to the gearbox housing and take up axial load of the airscrew.

2.3. GEARBOX PLANETARY TRAIN

The gearbox planetary train comprises the following main parts: drive gear ring (17) mounted on hub (19), gearbox sun gear (29), six satellites (15) installed in satellite cage (28) on pivots (16).

Drive gear ring (17) is made of high-grade steel in the form of internally toothed ring; the teeth mean with the satellites.

The drive ring have teeth with portions of decreased height serving as splines for mating the ring with the hub and two grooves for retaining rings.

The splined joint of the drive gear ring and the hub has clearances between splines which allows the ring to self-align with the satellite gears.

Drive gear ring hub (19) is made of high-grade steel integrally with the splined bushing having involute splines by which the hub is fitted to the crankshaft front end. External cemented splines are made on the hub for coupling with the drive gear ring. Drive gear ring steel retaining rings (18) are of a rectangular cross section; they are installed in the drive gear ring annular grooves and serve to limit its axial displacement in the hub.

Sun gear (29) of the gearbox comprises hub (12) with internal involute splined and retaining ring (30).

The sun gear is made of high-grade steel. Gear tooth portions of reduced height serve for splining it on the hub. The gear splined joint with the hub has a clearance between splines for self-aligning on the satellite teeth.

The annular recess made on the gear splines is intended to receive the retaining ring. The gear teeth are cemented.

The steel hub of the sun gear is a disk with internal involute splines. Fifteen holes uniformly spaced around the hub flange are designed to receive bolts (13) tor attachment of the hub to the crankcaae front and smaller adjacent holes are used to receive plate lock tabs for safetying the bolts.

Pour holes in the hub disk are intended, to breath the craiikcase front end space and decrease weight of the part.

Steel resilient retaining ring (30) is of a rectangular cross section and it intended to limit longitudinal displacement of the gear along the hub.

Gearbox satellites (15) are cemented-tooth gears with an internal cylindrical hole serving as a support surface for a needle roller bearing. Aligning circular recesses for thrust washers are made on both sides of the satellites.

Satellites rotate on double-row needle roller bearings having 33 rollers per row each. The rows are separated by a ring. When assembling the bearings, the rollers are divided into two groups with a diameter difference of up to 0.005 mm.

Rollers of only one group are installed in one bearing; changing separate rollers between the bearings is not allowed.

Satellite pivots (16) are hollow pins with a solid rear wall. They are made of high-grade steel and are interchangeable. The outer cylindrical surface of the pivot has steps of three different diameters to simplify installation and protect against scores in re-pressing.

The pivots are pressed with outer copper-plated necks into the satellite cage holes, the satellite rotates on the middle neck of the pivot.

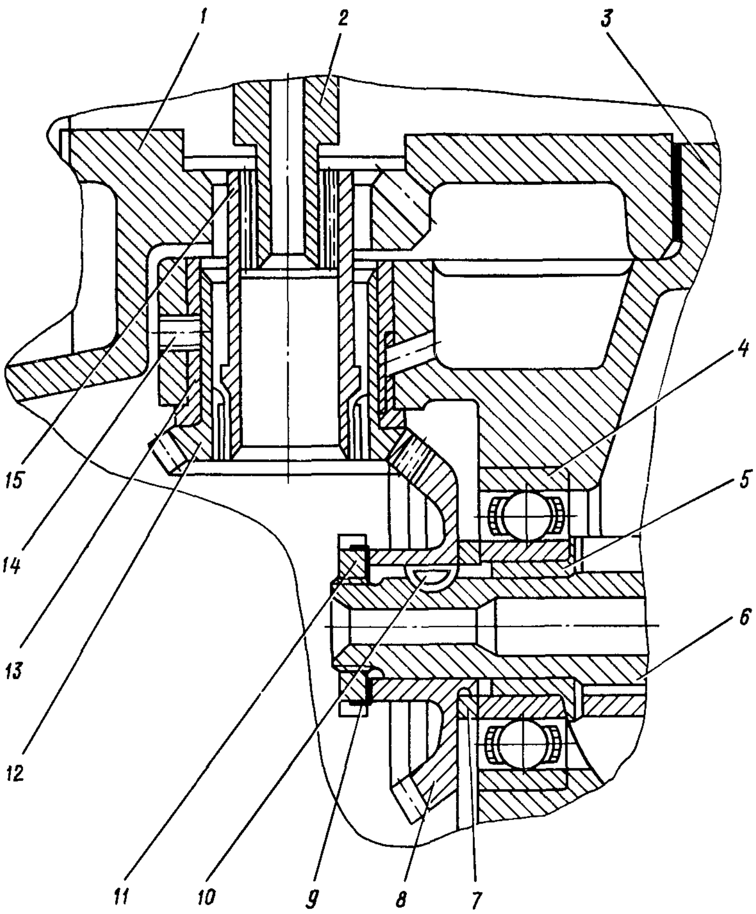
Provided on the pivot on the larger neck side is a collar limiting longitudinal dis"-placement of the pivot. Two holes are drilled to the cylindrical surfaces of the pivot. The hole with groove is intended to supply oil to the pivot space; another hole made in the middle part of the pivot supplies oil to the needle roller bearing of the satellite. An aluminium plug with a threaded hole for the puller is pressed in a special bore in the pivot end. Locking strip (35) pressed to the flat on the pivot collar and is secured by two screws (14) to the satellite cage is intended to prevent the pivot against turning and longitudinal displacement. The screws are locked with wire.

Satellite cage (28) is made of steel in the form of a hexagonal box with a hub integrated with one lateral wall and six side ports for satellites and six holes for satellite pivots.

Holes for decreasing cage weight are drilled in the bridges between the ports. The hub has rectangular splines for fitting the satellite cage onto the airscrew shaft. Milled flats are made at the spline ends on the solid wall side and the wall is provided with six oil passages to supply oil to the needle roller bearings of the satellites. To secure locking strips of the satellite pivots, the solid side wall has twelve threaded holes.

2.4. SPEED GOVERNOR DRIVE

The speed governor drive (Ref. Pig. 3) is located on the bracket of front cover (3) of the crankshaft thrust bearing.



1. Gearbox Housing
2. Speed Governor Shank
3. Crankshaft Front Thrust Ball Bearing Cover
4. Ball Bearing
5. Bushing
6. Intermediate Timing Shaft 7» Adjustment Washer
8. Speed Governor Drive Bevel Gear
9. Lock
10. Woodruff Key
11. Nut
12. Speed Governor Driven Gear
13. Bushing of Thrust Ball Bearing Front Cover
14. Retainer
15. Speed Governor Coupling

Speed Governor Drive Figure 3

Arranged on timing intermediate shaft (6) by Woodruff key (10) is drive level gear (8) of the speed governor drive, made of cemented steel. The drive gear meshes with driven gear (12) of the speed governor drive.

The driven gear is made of cemented steel and transforms into a hollow shank, with internal splines. The shank rotates in vertical bushing (13). Drive gear (8) of the speed governor drive precludes the driven gear from dropping out from the bushing.

Coupling (15) of the speed governor drive is connected with internal splines of driven gear (12). The coupling is made of cemented steel as a hollow shaft.

One end of the coupling is internally splined for mating with shank (2) of the speed governor. The coupling shank is arranged in a hole provided on the pad for the speed governor on the crankshaft front end.

The outer surface of the coupling has a collar to thrust against the inner splines of the gear which preclude the coupling from dropping out.

CRANK MECHANISM ASSEMBLY - DESCRIPTION AND OPERATION

1. GENERAL

The crank mechanism assembly of the engine comprises a front cover of the crankshaft thrust ball bearing (Ref. Pig. 1) and intermediate crankcase (Ref. Pig. 2) which accommodates crankshaft (Ref. Pig. 5) and connecting rod assembly (Ref. Pig. 6) parts.

The front cover of the crankshaft thrust ball bearing and the intermediate crankcase take up various forces acting on the crank mechanism in operation.

The crankshaft with connecting rods convert work of reciprocating pistons into rotary energy of the airscrew. Besides it causes piston travel during non-working strokes and actuates the timing mechanism, blower and accessories mounted on the engine.

2. CONSTRUCTION

The front cover (Ref. Pig. 1) is cast of magnesium alloy in the form of a truncated cone whose larger base transforms into an annular flange with holes for studs intended to secure the cover to the intermediate crankcase. The flange has two shoulders: the front shoulder is used to align the gearbox housing and the rear to align the cover on the front part of the intermediate crankcase.

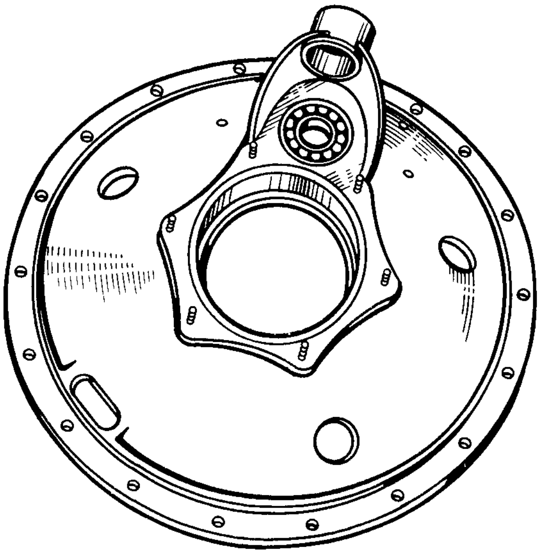
Pressed in one hole of the flange is an adapter bushing for supply oil from the gearbox housing to the guide bushings of the upper cylinder tappets. The cover has a boas at its center for pressing in steel holder for the crankshaft ball bearing. The holder is locked with three retainers. The boss has a flange at the front with three studs for attaching the ball bearing steel washer. The seat collar is the rear abutment surface for the ball bearing.

Made in the front part of the cover top is a bracket supported by two stiffening ribs. The bracket has a hole where a bronze bushing is pressed to serve as a bearing for the bevel gear of the speed governor drive. The bushing is secured against turning with a

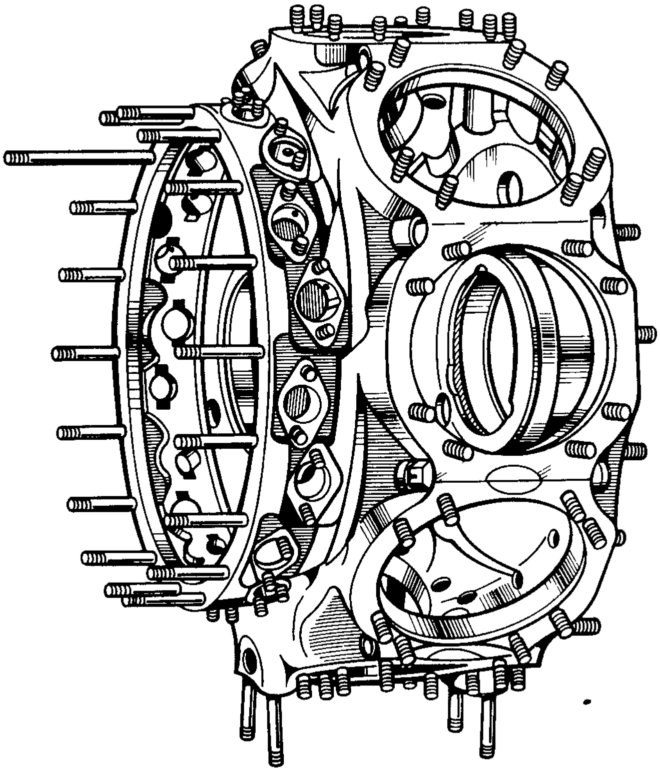
retainer. Oil is fed to the bushing from the pocket in the bracket through two drilled passages.

Made in.the front part of the cover is a boss with pressed-in steel bushing for the ball bearing of the timing mechanism intermediate shaft. The bushing is fixed with two retainers.

A horse-shoe shaped lug on the rear part is intended to mount timing drive gears. The timing cover is attached by studs to the lug flange.



Crankshaft Thrust Ball Bearing Front Cover
Figure 1



Intermediate Crankcase Figure 2

Three holes provided in the conical wall of the front cover are intended to breath internal spaces of the crankcase and a hole for draining oil from the gearbox housing to the intermediate crankcase.

2.2. INTERMEDIATE CRANKSHAFT

The engine intermediate crankcase is adapted to accommodate the parts of the crank mechanism, timing mechanism and to mount the cylinders.

The intermediate crankcase (Ref. Fig. 2) also referred to as crankcase main section comprises two sections: front and rear, stamped of aluminium alloy and machined jointly.

The crankcase joint is in the cylinder center line plane. Both sections of the intermediate crankcase are interconnected and mutually aligned by nine coupling bolts extending through the holes in bridges between the cylinder mounting flanges.

Eight coupling bolts are interchangeable. The nineth bolt installed in the crankcaae lower hole has a different head, smaller thickness between the aligning collars and greater length than the other bolts.

Nine flanges with eight studs each are uniformly spaced around the crankcase. The studs are intended to attach the cylinders.

The intermediate crankcase has a front flange with studs for mounting the front cover and the gearbox housing and a rear flange with studs for attachment of the mixture collector and two lower flanges with two studs each for mounting the oil sump.

Provided in the lower part of the intermediate crankcase are holes for installing the oil baffle. The baffle decreases bubbling of oil carried by the crankshaft counterweights and decreases drain of oil to the oil sump.

The front portion of the intermediate crankcase (Ref. Pig. 3) has an annular projection with a machined flange. Located on the outer side of the projection are eighteen flanges with holes for installing tappet guide bushings.

Drilled in the holes for the guide bushings of the inlet valve tappets of cylinders Nos 1, 2, 8 and 9 and exhaust valves of cylinders Nos 1, 2, 3» 8 and 9 are passages to supply oil to the tappets and slots for draining oil.

The stepped oil passage connects the main gallery with a hole on the flange of the front cover.

The central hole in the vertical part of intermediate crankcase front portion ia intended for pressing in the bronze holder of the front roller bearing of the crankshaft. The holder is secured by three retainers pressed into the central boss of the front portion of the intermediate crankcase.

The roller bearing is precluded against longitudinal displacement by the crankcase holder internal collar at the front and by a spring ring lodged in the crankcase holder recess at the rear.

In addition to the central hole, the vertical wall has four more holes: three holes for breathing and one hole for fixing the cam plate when timing the engine.

Two holes for draining oil to the oil sump, leading to the bored seat for the oil baffle are made in the lower flange of the intermediate crankcase front portion.

Nine inter-flange bridges are made at the intermediate cranlccase front portion (Ref. Pig. 3). The bridges have holes for coupling bolts. Nine semi-flanges with four cylinder attachment studs each are also arranged there.

The vertical wall of the intermediate crankcase rear portion (Ref. Fig. 4) has a central hole for pressing in the bronze holder of the rear roller bearing of the crankshaft and three breathing holes. The holder and the bearing are locked likewise in the front portion of the intermediate crankcase.

Two holes are made in a rectangular projection of the rear flange lower part. One hole is used to drain oil from the rear cover to the crankcase and leads to the bored seat for the oil baffle, the other (with oil transfer bushing), for scavenging oil from the oil sump to the oil tank. The oil sump attachment flange has a hole for draining oil from the crankcase and another hole for scavenging oil from the oil sump.

The intermediate crankcase rear portion likewise the front portion has nine inter-flange bridges and nine semi-flangea with four cylinder attachment studs each.

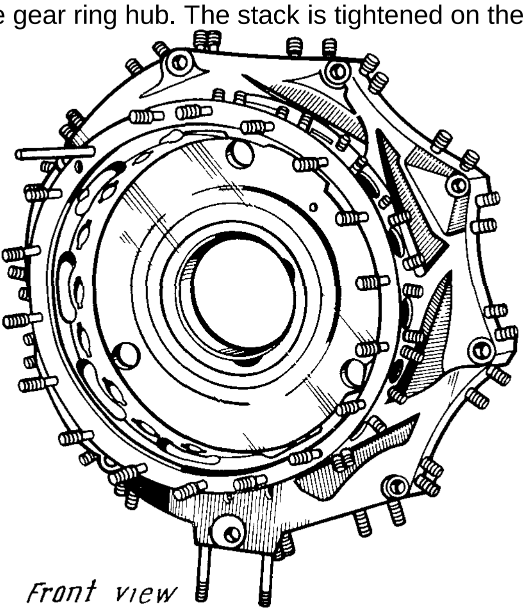
2.3. CRANKSHAFT

The split-type single-throw crankshaft of the engine (Ref. Pig. 5) comprises front and rear sections interconnected by a coupling bolt. The front and rear sections of the crankshaft are made of heat-treated high-grade steel. Front section (11) includes a front end, web, main journal and crank pin making up one integral part.

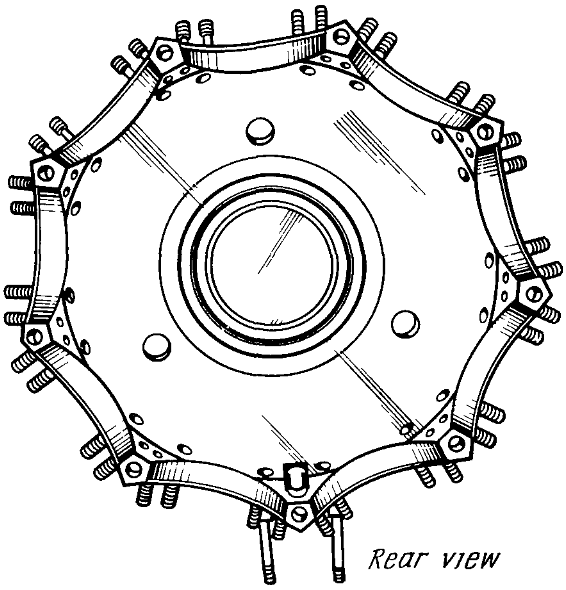
The front part of the crankshaft hollow end has pressed-in steel bushing (8) potted with lead bronze. The bushing is a rear support for the airscrew shaft. The rear of the end space is closed with aluminium alloy plug (30). The plug is locked with retainer (32).

The end front has splines for mounting the gearbox drive gear hub; the crankshaft front main journal is located closer to the web. A groove for key (10) of the timing drive gear is made between them on the shaft outer surface.

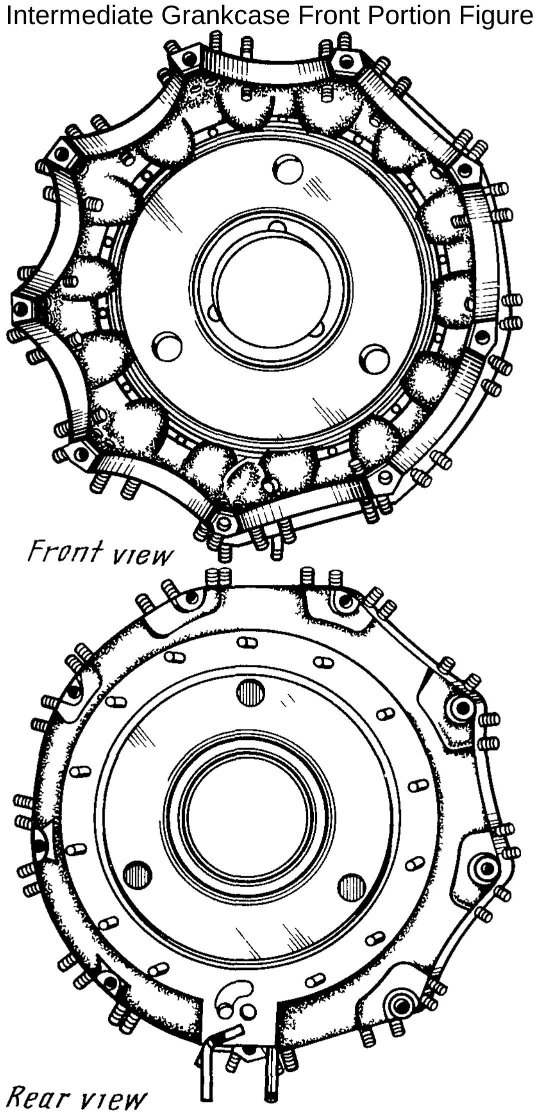
Arranged on the crankshaft front end after the web are roller bearing (7), adjustment ring (6), spacer (5) of the cam plate, timing drive gear (4), adjustment ring (3), thrust bearing and gearbox drive gear ring hub. The stack is tightened on the shaft by nut (2). The nut is locked with



cotter pin (1). *Front view*

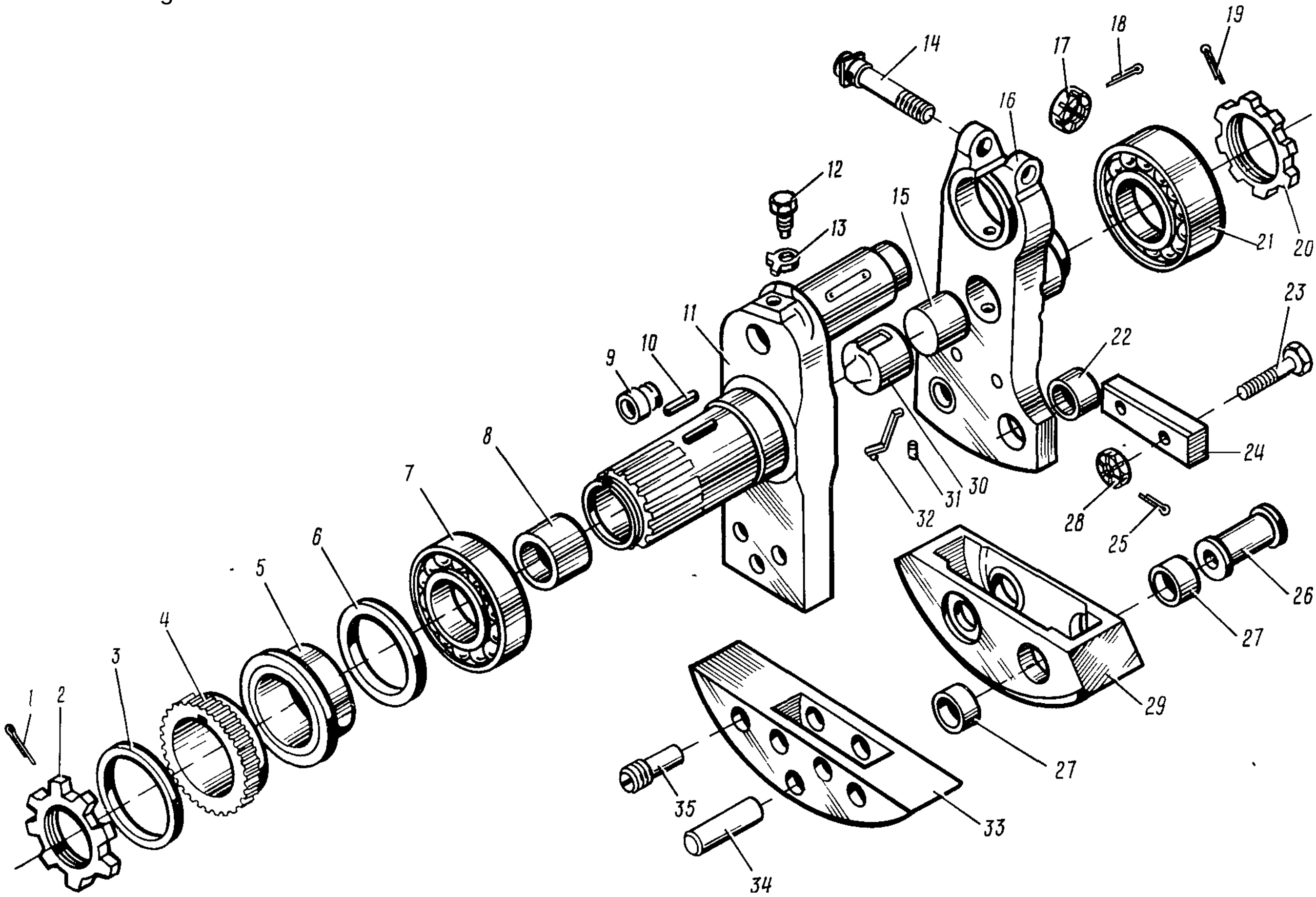


Intermediate Grankcase Front Portion Figure 3



Intermediate Crankcase Rear Portion Figure 4

Crankshaft Figure 5



1. Cotter Pin
2. Nut
3. King
4. Drive Gear
5. Spacer
6. Ring
7. Front Main Roller Bearing
8. Bushing
9. Plug
10. Key
11. Crankshaft Front Section
12. Oil Jet
13. Lock
14. Coupling Bolt
15. Plug
16. Crankshaft Rear Section
17. Nut
18. Cotter Pin
19. Cotter Pin
20. Nut
21. Rear Main Roller Bearing
22. Crankshaft Rear Section Web Bushing
23. Bolt
24. Thrust Strip
25. Cotter Pin
26. Rear Counterweight Pin
27. Rear Counterweight Bushing
28. Nut
29. Rear Counterweight
30. Crankshaft Front Section Plug
31. Retainer
32. Plug Retainer
33. Front Counterweight
34. Pin
35. Balancing Plug

Front counterweight (33) is immovably fixed, on the web of the crankshaft front section by three pins (34).

The web and crankpin have a space closed at the front with steel plug (9) and at the rear by the crankpin plane. The space is connected with the shaft front end by a drilled passage. The upper part of the web is provided with a threaded hole receiving jet (12) for squirting oil to lubricate the cylinders and pistons. The jet is safetied with lock (13).

The crankshaft crankpin is externally nitrated to increase wear resistance. The orank-pin has a radial hole to supply oil from the crankshaft rear to its front section and two radial holes to feed oil to the master connecting rod bushing which are at an angle of 60° from the axis of symmetry in the direction of crankshaft rotation. Two copper pipes are inserted into these holes and flared to preclude dropping out. The pipe ends project inside the crankpin and serve as oil filter operating aa a centrifuge during rotation of the crankshaft.

Crankshaft rear section (16) has a web and a main journal. The upper part of the web has a split lug embracing the crankpin and a hole for coupling bolt (14). The coupling bolt tightening the lug by nut (17)» rigidly interconnects the front and rear sections of the crankshaft.

The web lower part has two holes with bushings (22) pressed in them. The bushings receive pins (26) whereby pendulum counterweight (29) with four bushings (27) pressed in it is suspended from the web. The pins are kept against axial displacement by collars and strip (24) secured by two bolts (23).

Rear roller bearing (21) secured with nut (20) is press-fitted to the main journal of the crankshaft.

The surfaces of the front and rear roller bearing inner races contacting the crankcase journals are brass plated to preclude cold hardening.

The rear main journal has a through hole with internal splines whereby the crankshaft is connected through a coupling with the accessory drive shaft. The journal hole has press-fitted plug (15) copper plated on the outside diameter surface; the accessory drive shaft splined coupling is aligned inside the plug. The plug is kept against displacement with a pin. The web has a passage interconnecting the spaces of the main journal and crankpin.

The crankshaft is balanced by selecting weight of two plugs (35) threaded in the front counterweight. The plugs are made of steel or aluminium, depending on balancing requirements.

The rear counterweight is a segment with a through slot at the middle for passing the crankshaft web and two holes for the bushings. The slot inner surface is copper plated to preclude cold hardening.

2.4. CONMECTING ROD ASSEMBLY

Connecting rod assembly (Ref. Fig. 6) of the M-14P engine comprises one master connecting rod (1) and eight articulated connecting rods (5) which are hinged to the master rod by steel pins (7).

The master connecting rod is arranged in cylinder No. 4.

The connecting rods are forged of nickel-chrome steel and heat-treated. The connecting rod surfaces are polished.

The master and articulated connecting rods comprise small and big ends interconnected by an I-section stem. Pressed in the master connecting rod big end is steel bushing (9) potted with lead bronze and locked by two set screws (8). A thin layer of lead-tin plating is applied to the inner friction surface of the bushing after machining. Bushings (2), (6) and (4) made of bronze band are press-fitted in the small end of the master connecting rod and in the ends of all articulated connecting rods, respectively. The bushings are compacted by broaching and their edges are flared.

Two through holes for feeding oil, squirted during operation, to bushing friction surfaces are made in the lower parts of the small ends of all the connecting rods.

The cross section of the master connecting rod decreases from the small end to the big one, while the articulated rods have equal cross section throughout the length.

The master connecting rod big end has two side plates with eight brass plated holes each, to receive pins of the articulated connecting rods. The pins carry eight articulated connecting rods. Oil is fed to them under pressure from the crankpin through the drillings in the rear side plate and pins.

The articulated connecting rod pins are made of steel and cemented for surface hardness. Each pin has a through cylindrical hole with a spool-shaped aluminium alloy plug pressed in. The space between the plug and inner surface of the pin serves to pass oil to the articulated connecting rod bushings.

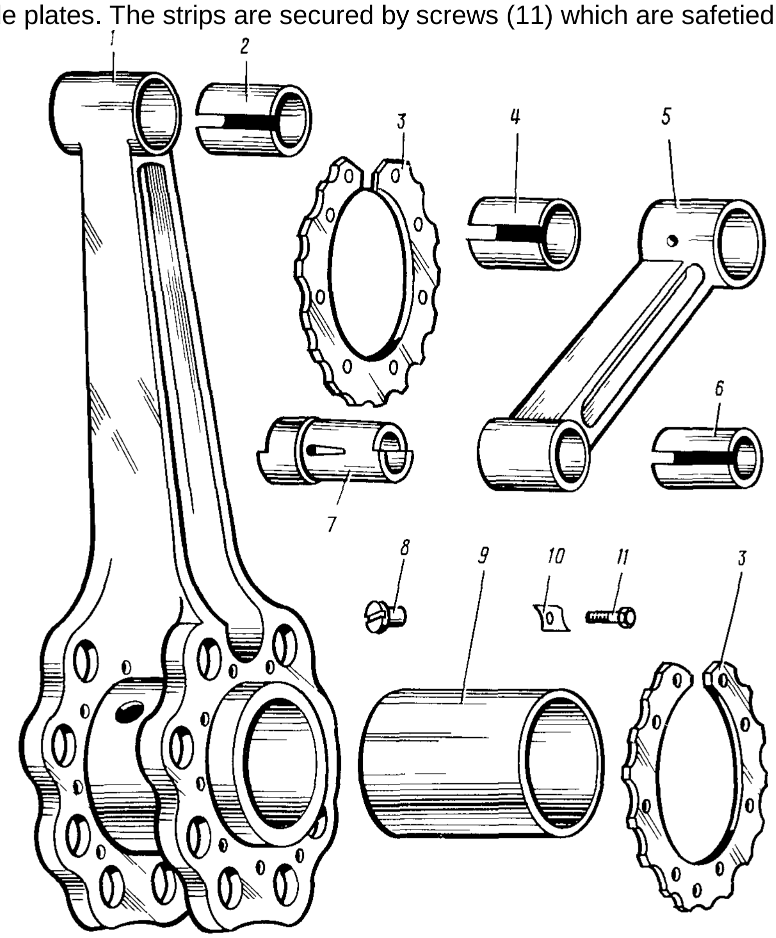
The pin outer surface is stepped.

The front part diameter exceeds that of the other portion of the pin. The steps of the pin outer surface ensure equal-interference fit in both side plates of the master connecting rod. The pin middle part surface is a working portion for the articulated connecting rod bushing; the outer portions are support necks for the pin in the master connecting rod.

Two diametrically opposed flats are made on the pin working surface. Oil is fed to them through the holes drilled in the pin wall from the pin inner space to its friction surface. For uniform distribution of oil over the pin surface, one hole is located closer to the front end and the other hole closer to the rear end. The rear cylindrical part of the pin has an inclined through hole connecting the pin inner space with the oil supply hole in the master connecting rod side plate.

Provided on both end faces of the pin is a straight cutout forming a projection to which the projection of strip (3) adjoins. The strip prevents the pin against longitudinal displacement.

The pin attachment strips are identical and are installed on outer sides of the master connecting rod side plates. The strips are secured by screws (11) which are safetied with plate locks (10).



1. Master Connecting Rod
2. Master Connecting Rod Small End Bushing
3. Articulated Connecting Rod Attachment Strip
4. Small End Bushing
5. Articulated Connecting Rod
6. Articulated Connecting Rod Big End Bushing
7. Articulated Connecting Rod Pin
8. Set Screw
9. Master Connecting Rod Big End Bushing
10. Lock
11. Screw

Connecting Rod Assembly Figure 6

CRANKSHAFT ASSEMBLY - TROUBLE SHOOTING

For mostly often encountered troubles and their remedies refer to the Table given below.

Trouble	Possible cause	Correction
Impeded rotation or crankshaft	(1) Oil accumulated in lower cylinders at prolonged engine dead period or because of incomplete depreservation	Drive out one lower spark plug from each of cylinders Nos 4, 5, 6 and drain plugs from intake pipes of these cylinders and plugs of exhaust manifold, drain oil, reinstall spark plugs and turn airscrew manually 3 to 5 turns with ignition turned off. Make sure oil is drained fully. Reinstall and lock plugs (Ref. 072.00.00, Task Card Mo. 201).
	(2) Engine is underwarmed in winter	Warm up engine and fill 2 to 3 lit of hot oil in crankcase

CYLINDER ASSEMBLY - DESCRIPTION AND OPERATION

1. GENERAL

The engine cylinder assembly comprises cylinders with valve mechanisms, pistons, timing mechanism parts, intake pipes and deflectors.

The engine cylinder with its bottom forms a chamber where fuel-air mixture is combusted and thermal energy is converted into mechanical work.

To ensure well-timed opening and closing of inlet and exhaust valves according to the timing chart, the timing mechanism is used.

Normal operation of the engine is achieved at uniform cooling of its cylinders. The engine is cooled by on-coming air stream created by the airscrew.

2. CONSTRUCTION

2.1. CYLINDER WITH VALVE MECHANISM

Engine cylinder (Ref. Pig. 1) comprises two main parts: a steel machined sleeve and an aluminium alloy head screwed on it when hot. The head lower collar has press-fitted steel shroud ring.

The cylinder sleeve is made of an alloyed steel forging, heat-treated, its internal surface is nitrated, ground and honed. The sleeve has cooling outside ribs and a flange with holes for securing the cylinder to the intermediate crankcase. The cylindrical part below the flange (skirt) ensures alignment of the sleeve relative to the crankcase port.

The sleeve top is provided with a thrust thread having a sealing band for coupling with the cylinder head.

The cylinder head is cast of aluminium alloy integrally with two valve cases. The outer surface of the head is provided with vertical and horizontal ribs cast integrally with the head. The cylinder head inner space is machined, has a thrust thread for mating with the sleeve and defines together with the piston the dome combustion chamber.

Seats for inlet and exhaust valves are pressed at the inner aide of the cylinder head. The upper bands of the seat are flared in the head.

The inlet valve seat land is machined at an an^le of 30°, the exhaust valve land at an angle of 45° relative to the seat lower end face plane.

The valve case bottoms located on the outer top side of the sleeve have drilled, holes where bronze guide bushings of the valves are press-fitted. The bushings are arranged at an angle of 75° symmetrically to the axis of the cylinder. Holes for valve rocker axles with outer recesses for sealing washers are machined in the thickened portion of the valve case side walls. Connections for attachment of rod covers are driven into the front bottom part of the valve cases; air deflector attachment studs are driven in the rear part.

The case front'portions have lugs whose holes receive flared axles suspending stops of tensioning wing nuts. A cover attachment screw is driven into a boss provided at the rear part of the cases. A ring cable run in the grooves of the valve case cover is fitted to the screw neck. The other side of the cable is fitted to the tensioning wing nut and on being tightened with a special wrench, tightly presses the cover to the valve case.

The valve cover is sealed with a rubber ring.

Located at the rear of the head are: at the LH side - an inlet branch pipe with a steel copper-plated connection screwed into it, at the RH side - an exhaust branch pipe with a bronze ring screwed on it. The intake pipe (Ref. Fig. 4) is attached to the LH branch pipe and the exhaust manifold branch pipe is connected to the RH branch pipe.

Three bronze bushings with internal thread are driven into the front and rear parts of the cylinder head threaded holes. Two bushings located symmetrically to the cylinder axis serve for receiving the front and rear spark plugs. The third bushing driven in a boss located at the front under the inlet valve case serves for driving in the starting system valve. Located under the front spark plug hole is the louver mounting bracket attachment stud.

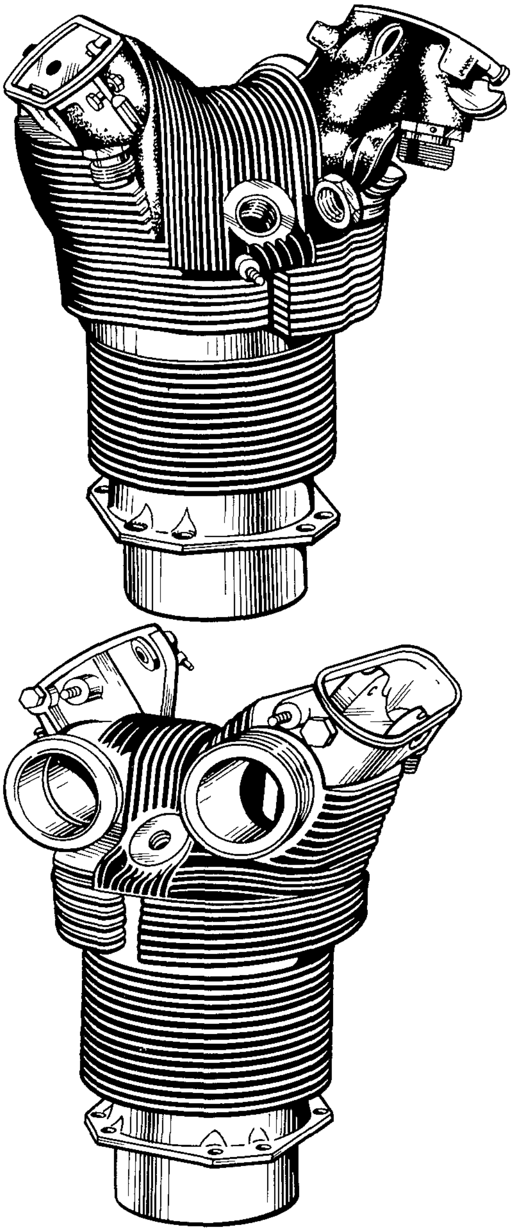
Each cylinder has one inlet valve (1) (Ref. Pig. 2) and one exhaust valve (1) (Ref. Pig. 3) made of heat-resistant steel forgings.

The valves admit mixture to the cylinders and release gases from them during inlet and exhaust strokes and seal the cylinders during compression and expansion strokes.

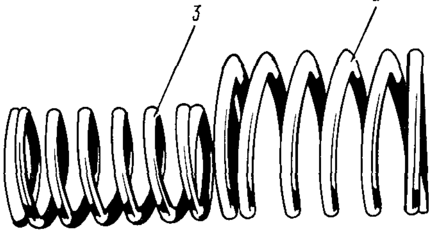
The inlet valve (Ref. Pig. 2) is made of steel Ch12M; its mushroom-type head on the side opposite to the stem is concaved; the mushroom-type head diameter is larger and the stem diameter is smaller than those of the exhaust valve. The inlet valve stem friction surface and tip are hardened with high-frequency currents while the mushroom-type head and a part of the stem (except the land) are subjected to anti-corrosive chemical nickel plating and heat treatment.

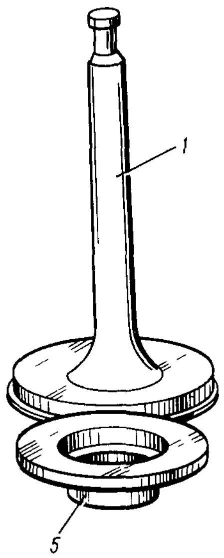
The inlet valve is pressed to the seat by two helical springs: outer spring (2) (Ref. Pig. 2) and inner spring (3).

The lower end of the outer spring rests on a washer arranged in the cylinder valve case and the inner spring lower end on the collar of the valve guide bushing.



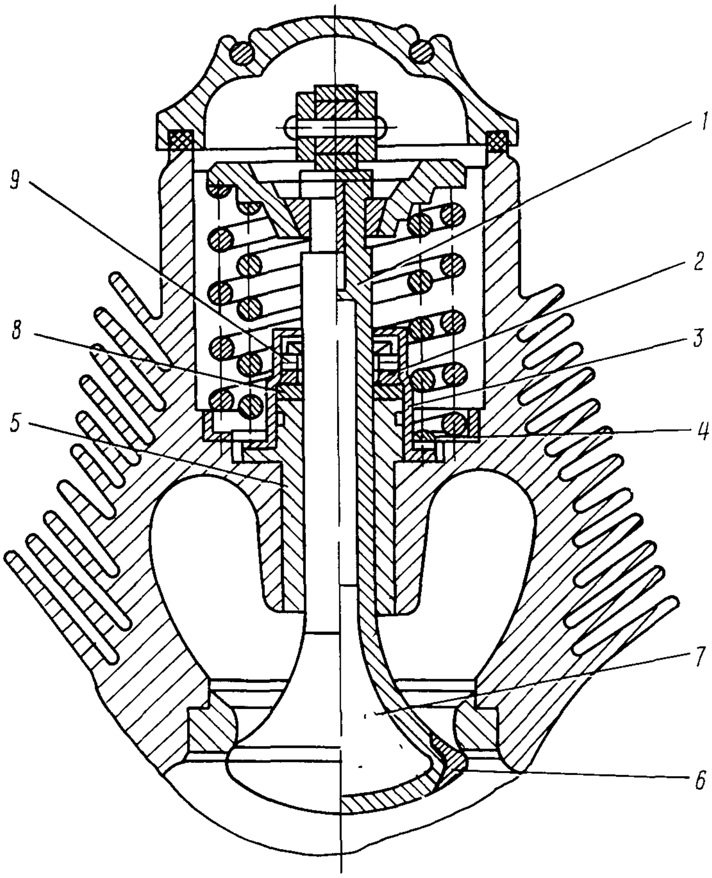
Front view
Cylinder Figure 1
Rear view





1. Inlet Valve
2. Outer Spring
3. Inner Spring
4. Split Retainer
5. Valve Plate

Inlet Valve Figure 2



1. Exhaust Valve
2. Sealing Ring
3. Bushing
4. Inner Spring
5. Guide Bushing
6. Satellite Facing
7. Metallic Sodium
8. Washer
9. Spacing Washer

Sealing and Scraping Device of Exhaust Valve
Figure 3

The upper ends of both springs thrust against plate (5) which in its turn rest on split taper copper-plated retainer (4) entering the groove in the valve stem. The inlet valve retainer surface is copper plated, that of the exhaust valve is brass plated.

The exhaust valve is made of steel 4Ch14N14V2M and its mushroom-type head is convened towards the combustion chamber. The exhaust valve stem and mushroom-type head are filled to 2/3 its interior with metallic sodium which melts on heating thug promoting heat transfer from hotter valve mushroom-type head to its stem, and then through the stem guide bushing and cylinder head to the atmosphere.

Welded to the stem end of this valve is a piece of a more wear-resistant material, while the land is surfaced with stellite VChN-1. The inlet valve land is made at an angle of 30° to the mushroom-type head plane, that of the exhaust valve at an angle of 46°15«.

To preclude carbon deposit on the exhaust valve stem and valve sticking, a sealing and scraping device is provided. The sealing and scraping device (Ref. Fig. 3) of exhaust valve (1) comprises two steel sealing rings (2), spacing washer (9) located in steel bushing (3)«

Sealing rings (2) are split, thermally stabilized for constant compression of the stem, have an internal tapered surface and are installed on the stem with the larger base of the tapered surface towards the mushroom-type head of valve (1).

Longitudinal displacement of rings (2) is limited at the top with the shoulder of bushing (3) and at the bottom with washer (8) pressed in bushing (3) whose flange is a support surface for inner spring (4) which constantly presa the entire stack to guide bushing (5) of the valve. When the valve opens, sealing rinys (2) scrape off oil from the step of valve (1) thus precluding formation of carbon, hence "hang-up" of the valve.

2.2. INTAKE PIPES

Intake pipes (Ref. Fig. 4) serves to -supply mixture from the blower to the cylinders. The intake pipes are made of seamless pipe with flaring of the short elbow.

The intake pipe is attached to the cylinder by a nut screwed on the external connection. The pipe is sealed with paronite gaskets installed in the end face groove in the connection.

The pipe lower end is installed in the mixture collector pipe, is attached by a nut and sealed with a rubber ring.

Welded to the intake pipes of lower cylinders Hbs 4^5 and 6 are threaded bosses for plugs intended to drain oil or gasoline from the pipes to preclude hydraulic shock.

2.3. PISTON

The piston (Ref. Fig. 5) takes up gas pressure and transmits it through the connecting rod to the crankshaft.

The pistons are stamped of aluminium alloy, machined externally and partially inside.

The piston head is flat and polished on the outside. The outer surface of the head is provided with two recesses under the valves to preclude collision of the piston with the valves in case the latter stick in the open position and when the crankshaft is turned at maladjusted timing mechanism of the engine.

The side outer surface of the piston has five turned grooves: four grooves in the top band and one in the lower band. The grooves are intended to receive piston rings.

Three top grooves receive keystone compression rings chrome-plated on the external diameter, while the fourth groove receives an oil ring with slots and channel, and the fifth ring receives a bevelled oil slinger.

The fourth groove has oil drain holes through which the oil scraped off the cylinder walls is drained to the crankcase.

Arranged inside the piston are two diametrically opposite bosses with holes to receive a piston pin. Depressions are milled near the boss holes on the outer surface to decrease piston weight; holes are drilled in the depressions for additional removal of oil from the cylinder walls.

The piston pin is made of chrome-nickel-tungsten steel. It is hollow and heat-treated to high surface hardness. The pin floats in the piston bosses and in the connecting rod small end.

The pin is precluded against longitudinal displacement in the piaton by two aluminium plugs. Each plug has six drain holes and three holes for lubricating plug outer surface.

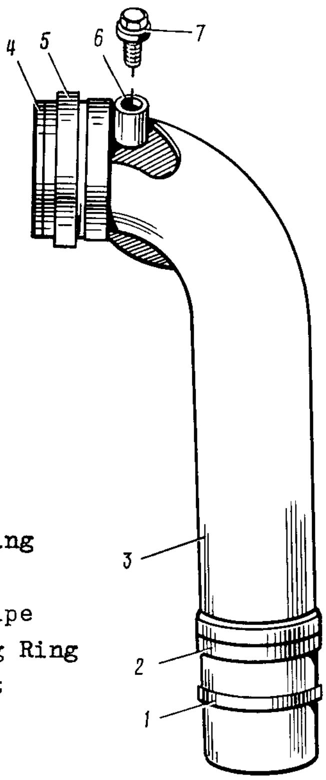
Piston rings are made of alloyed cast iron. The key-atone compression rings feature a cylindrical generatrix with porous chrome plating. Turned along the outer generatrix of the oil control ring is a groove with twelve slots to drain oil.

The oil slinger has a bevelled outer generating surface. The oil slinger is installed on the piston with the cone smaller base towards the piston head.

The pistons with rings and pins as well as working surfaces of cylinder sleeves are lubricated by squirting oil through a jet driven into the web of the crankshaft front section and through gaps in the crank mechanism.

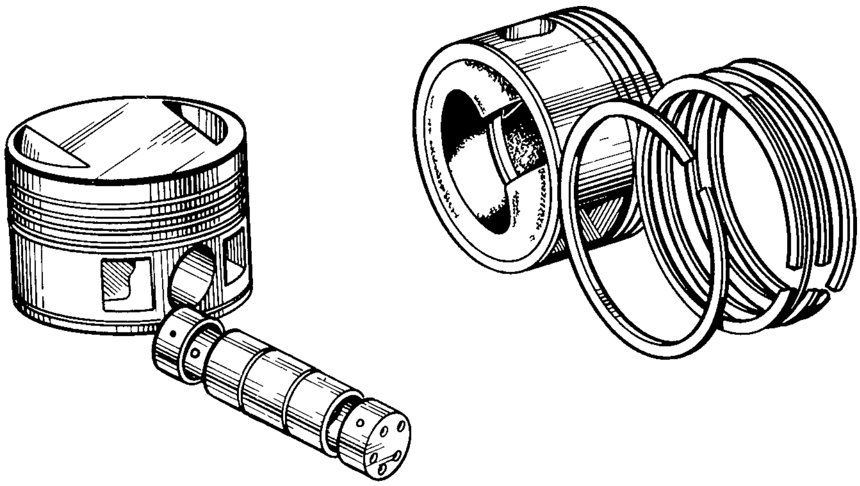
2.4. TIMING MECHANISM

The timing mechanism ensures periodic admission of fuel-air mixture into the engine cylinders and exhaust of combustion products to the atmosphere.



1. Rubber Ring
2. Nut
3. Intake Pipe
4. Retaining Ring
5. Union Nut
6. Boss
7. Plug

Intake Pipe of Cylinders Nos 4, 5 and. 6 Figure 4



Piston, Piston Rings and Piston Pin
with Plugs
Figure 5

The timing mechaniam comprises a cam plate, a cam plate drive, tappet guide bushings, tappets with rollers, push rods in casings, valve rockers with adjustment screws and rollers, inlet valves and exhaust valves with springs, plates and retainers.

The valve mechanism is described in Section 2.1. The schematic diagram of the timing mechanism is given in Pig. 6.

The cam plate is rotated from the crankshaft through a gear train. The cam plate lobes contacting the tappet rollers move the tappets in the guides away from the crankshaft axis. The tappets move the push rods installed between the tappet seats and adjustment screws of the valve rockers. The push rod displaces the front arm of the rocker away from the crankshaft axis, the rear arm approaches to it thrusting with the roller against the end of the valve stem, compresses the valve springs and opens the valve to admit fresh mixture and release exhaust gases. The valve closure is determined by the profile and location of the lobes on the cam plate.

The cam plate (Ref. Pig. 7) is a steel disk with a hub, having two rows of lobes on the outer cemented surface: four lobes per row. The front row of the lobes serve the rollers of the inlet valve tappets, the rear row, the rollers of the exhaust valve tappets. A bronze bushing locked against turning with two retainers is pressed in the hub. Provided on the inner surface of the cam plate is an internal gear rim meshing with the gear rim of the intermediate timing shuft.

The cam plate drive (Ref. Pig. 8) comprises drive timing gear (1), intermediate gear (7), intermediate timing shaft (4), two ball bearings (6) and (9) and other minor components..

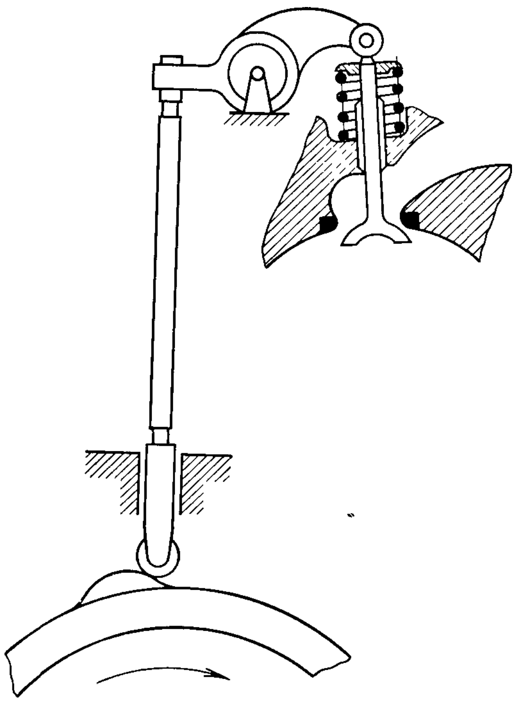
The drive gear is installed on the end of the crankshaft front section and is secured against turning with a sunk key.

Intermediate timing gear (7) is made of steel and has an outer gear rim and a hub. The inner surface of the hub is made with rectangular splines to install intermediate timing shaft (4).

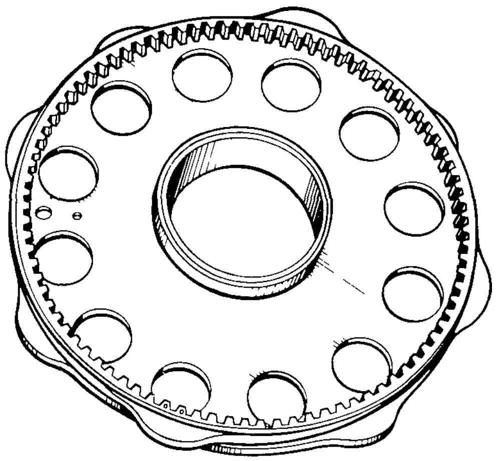
Steel intermediate timing shaft (4) consists of a gear rim made integral with the hollow shaft supported on two ball bearings.

The shaft middle portion is splined externally to receive gear (7) and has two locating cylindrical seats for the ball bearings. The front ball bearing outer race is pressed in the seat of the crankshaft thrust ball bearing front cover. The rear ball bearing outer race is installed in the seat of the timing drive cover. When assembled the shaft carries, starting from the gear rim: rear ball bearing (6), intermediate gear (7), bushing (8) with front ball bearing (9), adjustment washer (10) and drive bevel gear (11) of the speed governor drive, which is secured on the shaft by Woodruff key (5). All the parts on the shaft are tightened with nut (13) and safetied with lock (12).

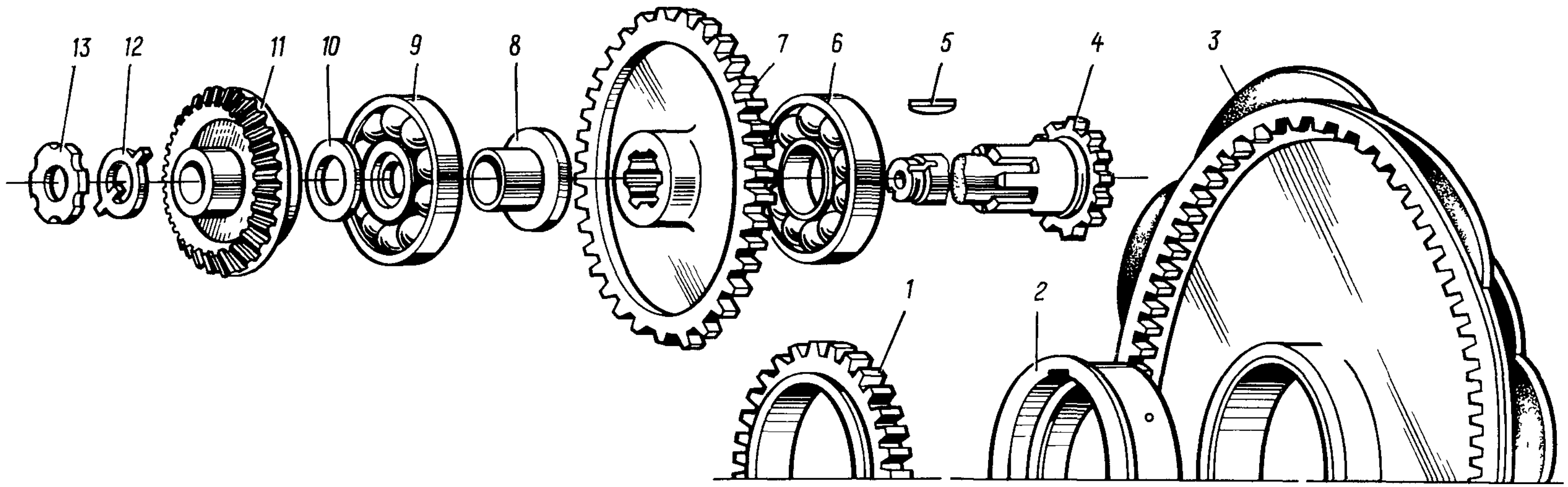
The cam plate rotates opposite to the crankshaft. The engine timing is ensured by getting the cam plate drive and the cam plate by the timing marks and do not require special adjustments.



Timing Mechanism Schematic Diagram
Figure 6



Cam Plate
Figure 7



1. Drive Timing Gear
2. Spacer
3. Cam Plate
4. Intermediate Timing Shaft
5. Key
6. Rear Ball Bearing
7. Intermediate Timing Gear
8. Ball Bearing Bushing
9. Front Ball Bearing
10. Adjustment Washer
11. Speed Governor Drive Gear
12. Plate Lock
13. Nut

The set of a tappet (Ref. Pig. 9) includes guide bushing (3), tappet (4), tappet end piece (2), spring (1), roller (5), roller bushing (6), roller pivot (7).

Tappet (4) is a steel cylindrical rod having a slot, in its lower part with holes for the pivot carrying a floating bronze bushing and the roller. Installed in the upper part of the tappet is a spring and end piece with spherical recess for the push rod end.

The tappets, push rod ends, adjustment screws and valve rockers have passages to supply oil to the valve case mechanisms.

Tappet guide bushing (3) is made of steel, has an oval flange with two holes for securing to the intermediate crankcase. The guide bushing lower part is made with a slot equal in width to that of the roller and fixing the latter relative to the cam plate raceway.

The guide bushings of the tappets of inlet valves in cylinders Kos 1, 2, 8 and 9, as well as of the exhaust valves in cylinders Nos 1, 2, 3, 8 and 9 have slots and holes to supply oil under pressure.

Tappet push rod (1) (Ref. Pig. 10) is made of a seamless steel pipe with steel end pieces having spherical ends pressed into its bored ends.

Spherical ends of the push rods enter respective recesses of the rocker adjustment screw and the tappet. Each push rod is arranged in casing (4).

The push rod casing is a thin-walled aluminium pipe flared at one end and having a bead at the other.

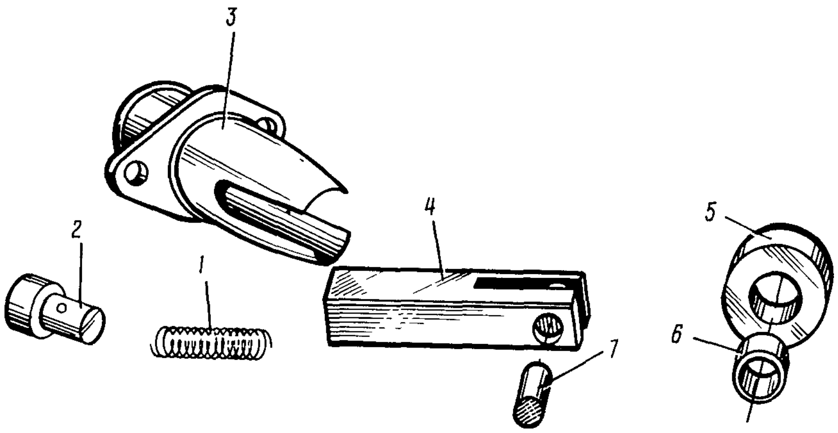
All casings and push rods are interchangeable.

The flared end of the push rod casing is attached by union nut (5) to the connection on the cylinder valve case, while its other end is attached by rubberized fabric hose (2) with the guide bushing of the tappet.

Thrust tapered ring (6) is installed under nut (5) to press by its surface the end of casing (4) to the connection. The rubberized fabric hoses are fastened with clamps (3).

Valve rockers (Ref. Pig. 11) serve to transmit motion from the push rods to the valves at opening and from the valves to the rods at closing of the valves.

The rockers are made of steel forgings and are installed on needle rollers (8) which rest on steel axle (10) inserted in the cylinder valve case holes. One end of the rocker is forked. The fork has roller (2) mounted on pivot (3) to transmit force to the valve stem during operation of the engine. The other end of the rocker has an adjustment screw which is secured by lock nut (7) after the required clearance between the rocker roller and the valve stem is adjusted.

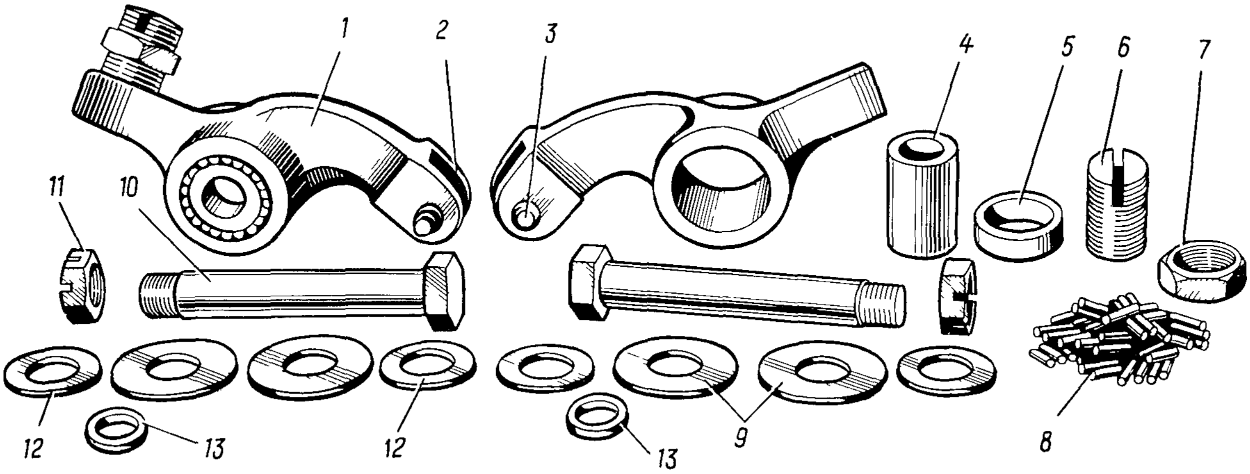


1. Spring
2. Tappet End Piece
3. Tappet Guide Bushing
4. Tappet
5. Roller
6. Roller Bushing
7. Roller Pivot

Set of Tappet Figure 9

1. Push Rod
2. Rubberized Fabric Hose
3. Clamp
4. Push Rod Casing
5. Union Nut
6. Thrust Ring

Push Rod and Push Rod Casing Figure 10



1.Rocker
2.Roller
3.Roller Pivot
4.Needle Roller Bearing Bushing
5.Ring
6.Adjustment Screw
7.Lock Nut
8.Needle Roller
9.Needle Roller Bearing Washer
10.Rocker Axle
11.Rocker Axle Nut
12.Washer
13.Washer

Valve Rockers Figure 11

Needle rollers are mounted on axle (10) by bushing (4), ring (5) and nitrated washers (9). To seal axle (10) of the rocker, aluminium washers (13) are installed on both sides of the valve case in special recesses and steel washers (12) are placed under the axle head and nut (11).

Rocker needle rollers of the valve mechanisms of cylinders TSoa 1, 2, 3, 8 and'9 are lubricated under pressure. Oil is fed to them through the oil passages in the valve

rockers.

2.5. DEFLECTORS

The cylinder deflectors (Ref. Pig. 12) are intended to direct cooling air stream to the less-blown rear surfaces of the cylinder sleeve and head. The deflectors improve intensity and uniformity of cylinder cooling. The engine carries eight side inter-cylinder deflectors (1) and nine upper (head) deflectors (5).

The deflectors are stamped of sheet aluminium.

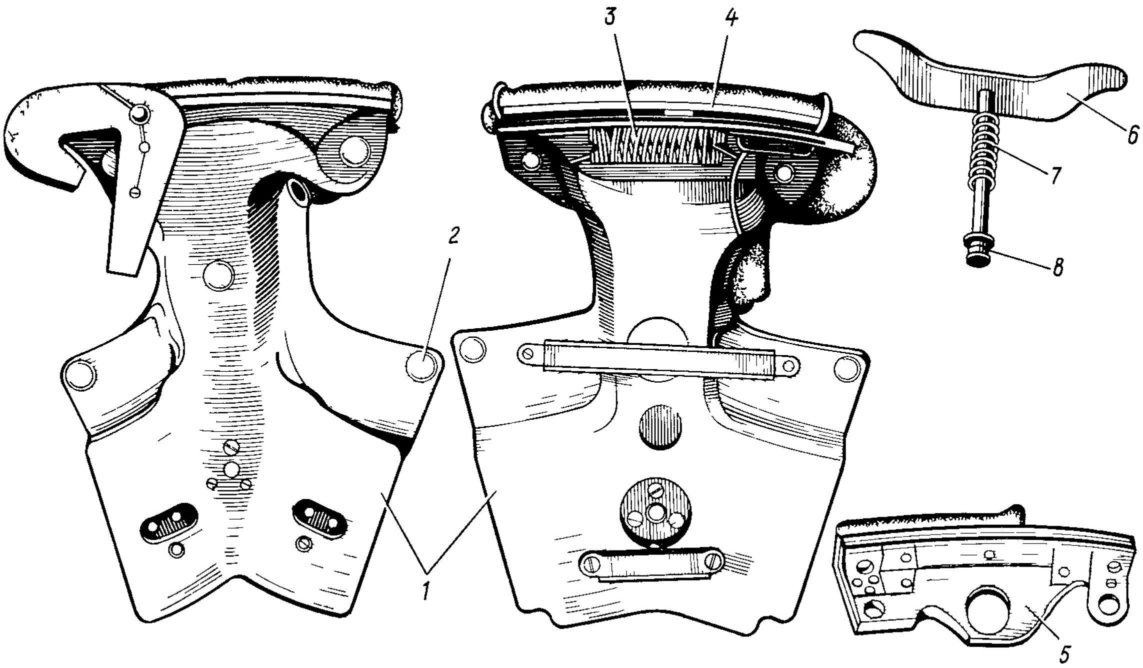
The upper deflectors are secured to each cylinder head by two studs and nuts. They have holes with rubber grommets for passing ignition cables.

Inter-cylinder deflectors (1) are secured at the top to two deflectors of the adjacent cylinders by locks (3) and at the bottom to the cylinder sleeves by clamp (6) disposed between the cooling ribs of two adjacent cylinders.

The deflectors have rubber stops (2) to preclude touching the cylinder ribs.

The engine is cooled by air fed through the controlled louvers in the cowling front portion (Ref. Pig. 13).

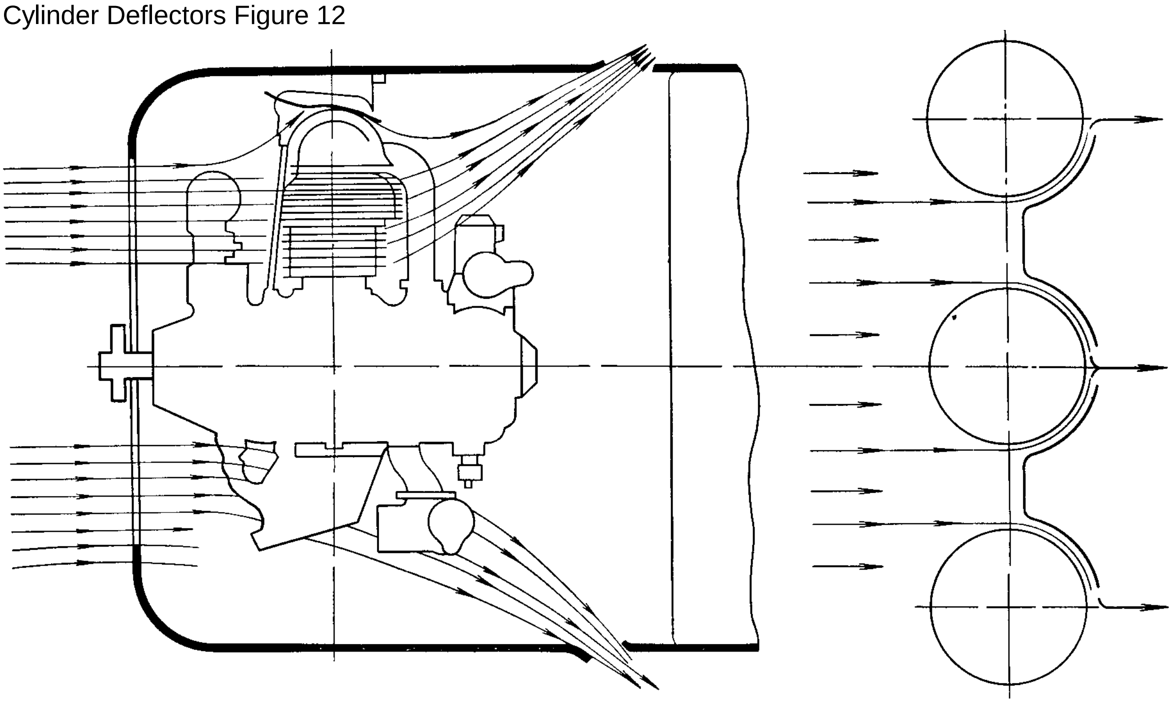
The cylinder head•deflectors form a continuous ring with soft gaskets to pack the space between the deflectors and engine cowling. The deflector of cylinders Nos 5 and 6 is not secured to the engine. Cooling air is released through the gap between the rear edge of the cowling and the fuselage surface.



1. Inter-Cylinder Deflector
2. Rubber Stop
3. Lock
4. Rubber Stop

5. Upper Deflector
6. Clamp
7. Spring
8. Nut

Cylinder Deflectors Figure 12



Engine Cooling Diagram Figure 13

CYLINDER ASSEMBLY - TROUBLE SHOOTING

For mostly often encountered troubles and their remedies refer to the Table given below.

Trouble	Possible cause	Correction
Loss of compression	(1) Incomplete closing of valves (2) Leaky spark plugs or starting valves (3) Sticking, wear or breakage of piston rings (4) Burn-through of valve	Check clearances between rocker roller and valve stem, adjust them (Ref. 072.00.00, Task Card No. 247) lighten spark plugs and valves. Check starting valves Remove cylinder with poor compression and eliminate troubles Replace valve

NOTE: Operations under Items (3), (4) are to be carried out by the Supplier's representatives.

SUPERCHARGING - DESCRIPTION AND OPERATION

1. GENERAL

Ambient air density drops with altitude which decreases mass of air supplied to the cylinders, hence engine power at constant speed and constant position of the carburetor throttles.

To increase engine power to the desired level near the ground and maintain nominal power up to the design altitude, the M-14P engine is equipped with a centrifugal blower with positive one-speed drive.

Apart from increasing power, the blower promotes mixing of fuel with air and more uniform distribution of the mixture among the engine cylinders, which is particular important when starting the engine.

During operation of the engine, the working mixture from the carburetor is sucked into the blower space through an oval port in the lower boss of the mixture collector, is directed to the impeller blades and is urged by centrifugal forces to flow at a high velocity through the passages defined by the impeller blades and mixture collector wall from the center to periphery and then to the diffuser.

2. CONSTRUCTION

The blower comprises mixture collector (1) (Ref. Pig. 1), diffuser (24), impeller (5)» drive with coupling (29) and sealing parts.

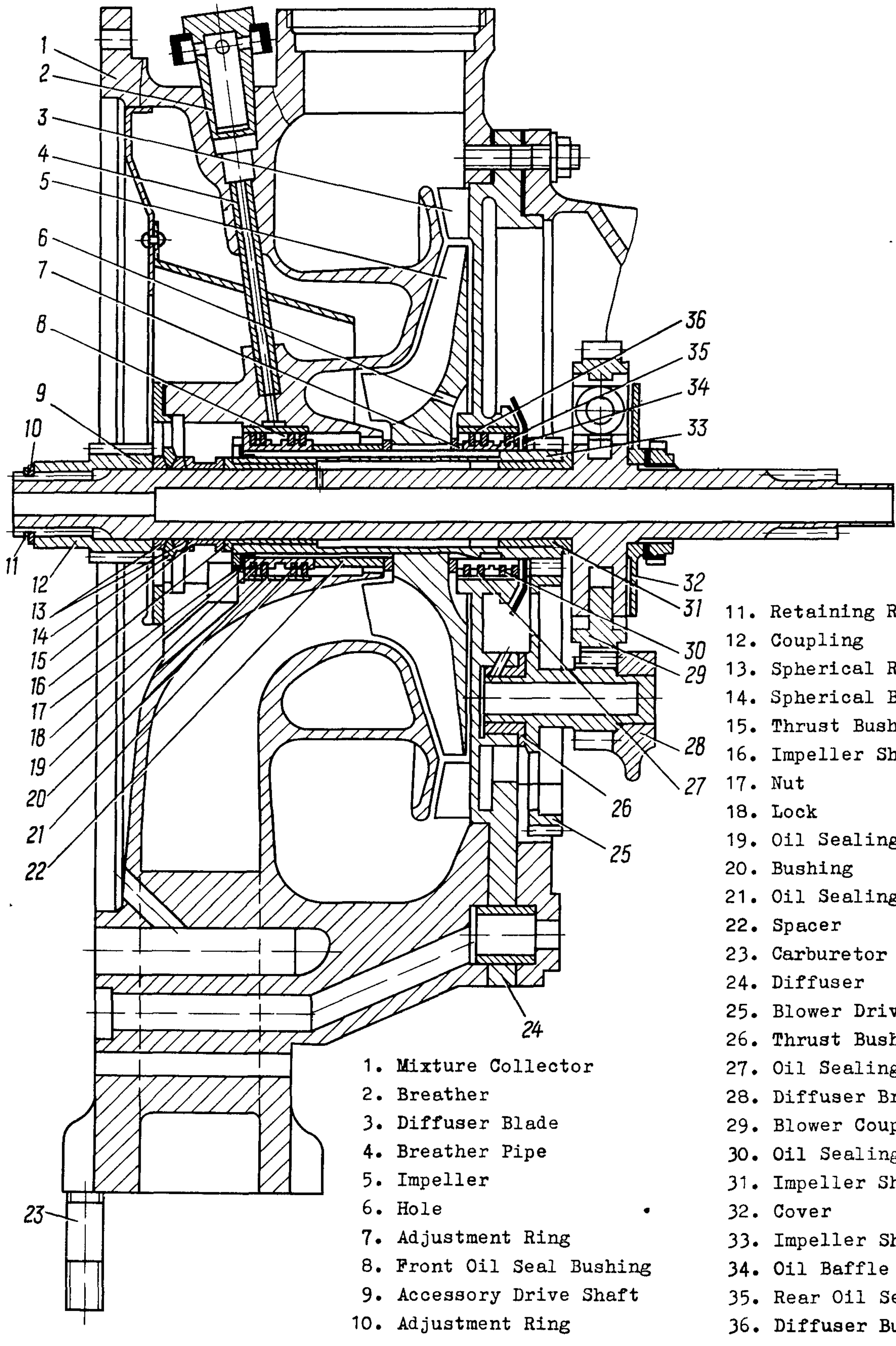
2.1. MIXTURE COLLECTOR

The blower mixture collector (Ref. Pig. 2) cast of aluminium alloy is attached to the rear part of the intermediate casing by studs driven into the latter. The mixture collector has a cast space (release manifold with nine equally spaced release branch pipes) with grooves for rubber sealing rings and thread for the intake pipe sealing nuts.

Eight bosses forming the branch pipes have lugs with holes for engine-to-frame attachment bolts. The thrust bearing of the accessory drive shaft and blower deflector are attached by four studs at the center of the mixture collector front wall.

Pressed in the central hole of the mixture collector is a steel bushing serving to support the rings of the oil seal bushing of the blower front seal assembly.

The blower seal assembly is used to preclude ingress of oil into the suction system of the engine.



1. Mixture Collector
2. Breather
3. Diffuser Blade
4. Breather Pipe
5. Impeller
6. Hole
7. Adjustment Ring
8. Front Oil Seal Bushing
9. Accessory Drive Shaft
10. Adjustment Ring
11. Retaining Ring
12. Coupling
13. Spherical Ring
14. Spherical Bearing
15. Thrust Bushing
16. Impeller Shaft Bushing
17. Nut
18. Lock
19. Oil Sealing Ring
20. Bushing
21. Oil Sealing Ring
22. Spacer
23. Carburetor Attachment Stud
24. Diffuser
25. Blower Drive Twin Gear
26. Thrust Bushing
27. Oil Sealing Ring
28. Diffuser Bracket
29. Blower Coupling
30. Oil Sealing Ring
31. Impeller Shaft Bushing
32. Cover
33. Impeller Shaft
34. Oil Baffle
35. Rear Oil Seal Bushing
36. Diffuser Bushing

The front part of the steel bushing has drilled holes communicating with the atmosphere through the annular recess, passage in the vertical wall and a steel pipe.

A boss with passage to supply mixture from the carburetor to the blower impeller is located in the lower part of the mixture collector.

The boss end face is provided with a flange having two threaded holes with studs for attachment of the carburetor.

The boss of the intake branch pipe of cylinder No. 1 is provided with a flange having two studs to mount the engine rear breather.

The boss of the branch pipe of cylinder Ho. 2 has a threaded hole for the mixture pressure measuring connection; the threaded hole made in the boss of the branch pipe of cylinder No. 9 is intended to receive ,the starting nozzle.

To drain oil from the rear cover and ensure inverted-flight breathing through the oil sump, and to supply oil to the oil pump scavenging section, holes are made in the mixture collector lower part extending through the web in the passage for supply of mixture to the blower impeller.

The diffuser of the blower and rear cover are attached to the rear flange of the mixture collector by ten studs.

2.2. DIPPUSER

The blower diffuser (Ref. Fig. 3) is cast of aluminium alloy, has front and rear flanges with collars to be aligned on the mixture collector and rear cover of the crankcase.

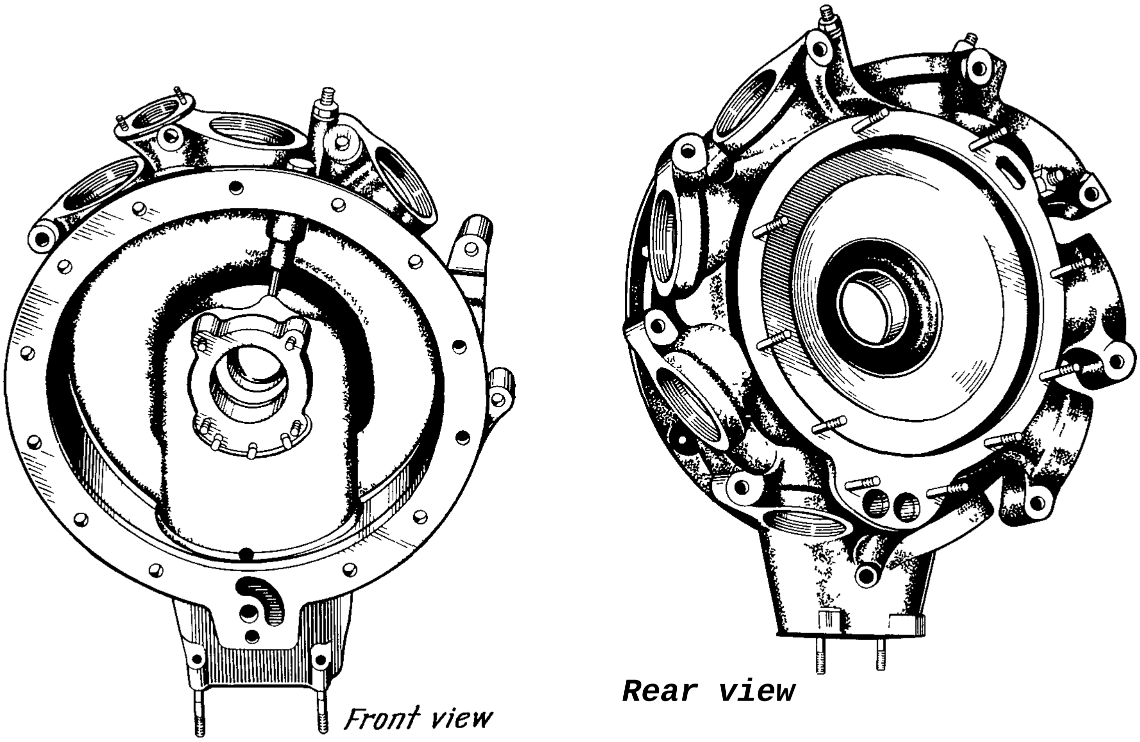
Fifteen shaped blades are made on the diffuser annular surface at the front side which form passages gradually expanding from the center towards periphery.

The flange has ten drilled holes to secure the diffuser, two holes in the diffuser lower part for draining and scavenging oil (the latter hole has a pressed-in steel transfer bushing) and one hole in the upper part for breathing the space of the rear cover in normal flight and draining oil from the rear cover space in inverted flight.

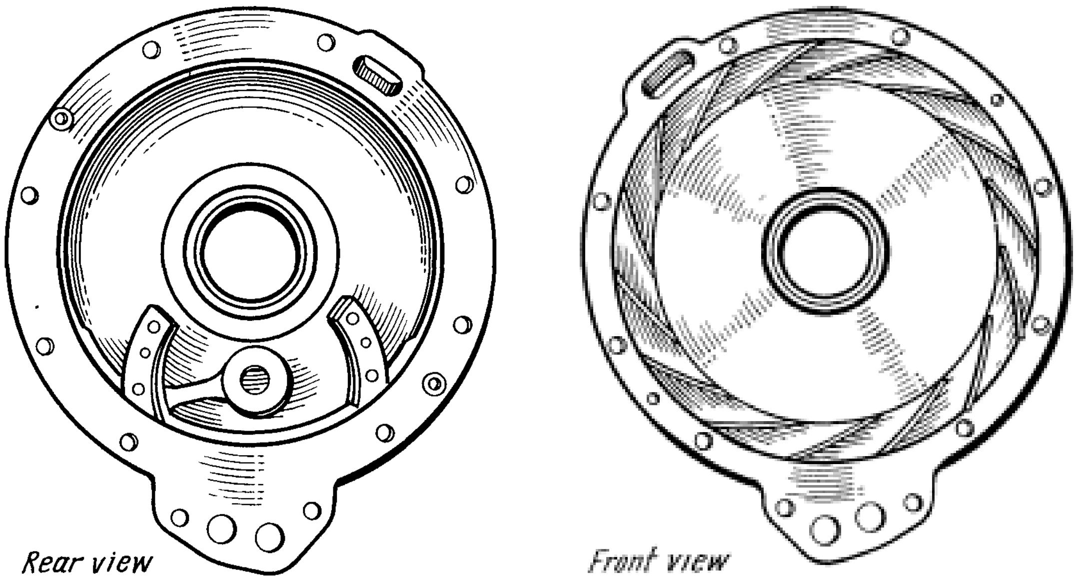
The blower rear seal assembly steel bushing is pressed in the diffuser central hole.

Provided in the lower part of the rear flange is a boss whose bore has pressed-in aluminium bushing. The bushing is a front support for a twin gear of the blower drive. Two bosses in the rear flange lower part are intended to mount the twin gear rear support cover with the aid of four studs.

A hole of the oil passage for lubricating the twin gear supports is made in the rear flange.



Mixture Collector Figure 2



Diffuser Figure 3

2.3. IMPELLER

Impeller (5) (Ref. Pig. 1) is the most stressed part of the blower. At take-off rating of the engine its rotational speed reaches as high as 23,700 r/min. To decrease inertia forces and dynamic loads on the impeller drive shaft bearings, the impeller is stati-cally balanced before installing in the engine by removing metal from the surface between the blades.

The blower impeller is stamped from aluminium alloy and comprises a hub and a disk with fourteen radial blades.

To ensure smooth entrance of mixture in the impeller passages, the blade leading edges are curved in the direction of the impeller rotation.

The impeller disk has fourteen inclined through holes (6) connecting the Impeller passages with the annular space defined by the conical surface of the impeller disk recess and the diffuser surface. These holes are intended for equalizing pressures on both sides of the impeller, thus decreasing axial pressure on the Impeller.

The impeller hub has six internal rectangular splines to mount it on the blower shaft. The Impeller is anodized for protection against corrosion.

Impeller shaft (33) is a hollow cemented steel part having an integral gear rim at the rear.

The shaft outer surface features a cylindrical band, annular groove, six splines, a cylindrical surface with an annular groove and thread for nut (17) intended to secure the parts on the shaft.

Two longitudinal grooves extending through two opposite splines are made between the annular grooves. The grooves interconnect front (8) and rear (35) blower seal bushings.

Bronze bushings (16) and (31) pressed in both ends of the shaft'are used to support the impeller shaft on the necks of accessory drive shaft (9).

The blower impeller shaft mounts: oil baffle (34), rear bushing (35) with four bronze oil sealing rings (27) and (30), adjustment ring (7), impeller (5), spacer (22), front bushing (8) with four bronze oil sealing rings (19) and (21) and lock (18) which locks nut (17) securing the stack on the shaft.

Adjustment ring (7) is intended to set the impeller for the required gap between it and the walls of the mixture collector and diffuser.

2.4. BLOWER IMPELLER DRIVE

The blower impeller drive comprises drive shaft (9) (Ref. Fig. 1) of the accessory drive with blower coupling (29), twin gear (25) and impeller shaft (33).

The accessory drive shaft is a hollow cemented steel part. The rear part of the shaft has involute splines whereby it is connected with the internal splines of the drive bevel gear of the rear cover drive.

Two copper-plated bands in the rear part of the shaft are intended for aligning the shaft relative to the drive bevel gear of the rear cover drive (the rear band) and for sealing the oil gallery (the front band).

Three through radial holes on the rear cylindrical band serve to supply oil from the rear cover oil passage to the shaft space being a part of the engine oil gallery.

The middle part of the shaft has a disk with five double projections to mount the blower coupling. Two support necks on the middle part of the shaft are supports for the impeller shaft.

One radial hole for supply of oil to the impeller shaft sliding bearings is made between the necks.

The accessory drive front portion has involute splines for mounting the drive shaft coupling provided with internal and external splines; the coupling is fixed with retaining ring (11) against lateral displacement.

The external involute splines of the coupling enter the rear main journal of the crankshaft and is aligned on the latter by the locating band with sealing the oil gallery joint.

Adjustment ring (10) disposed between the coupling front end and retaining ring is needed to obtain required axial clearance between the blower drive parts.

The rear end of the coupling thrusts through a spherical bronze ring against a spherical bearing secured on the mixture collector, while the accessory drive shaft bears against the coupling through the adjustment ring.

Thus, axial displacement of the accessory drive shaft towards the rear cover ia limited;

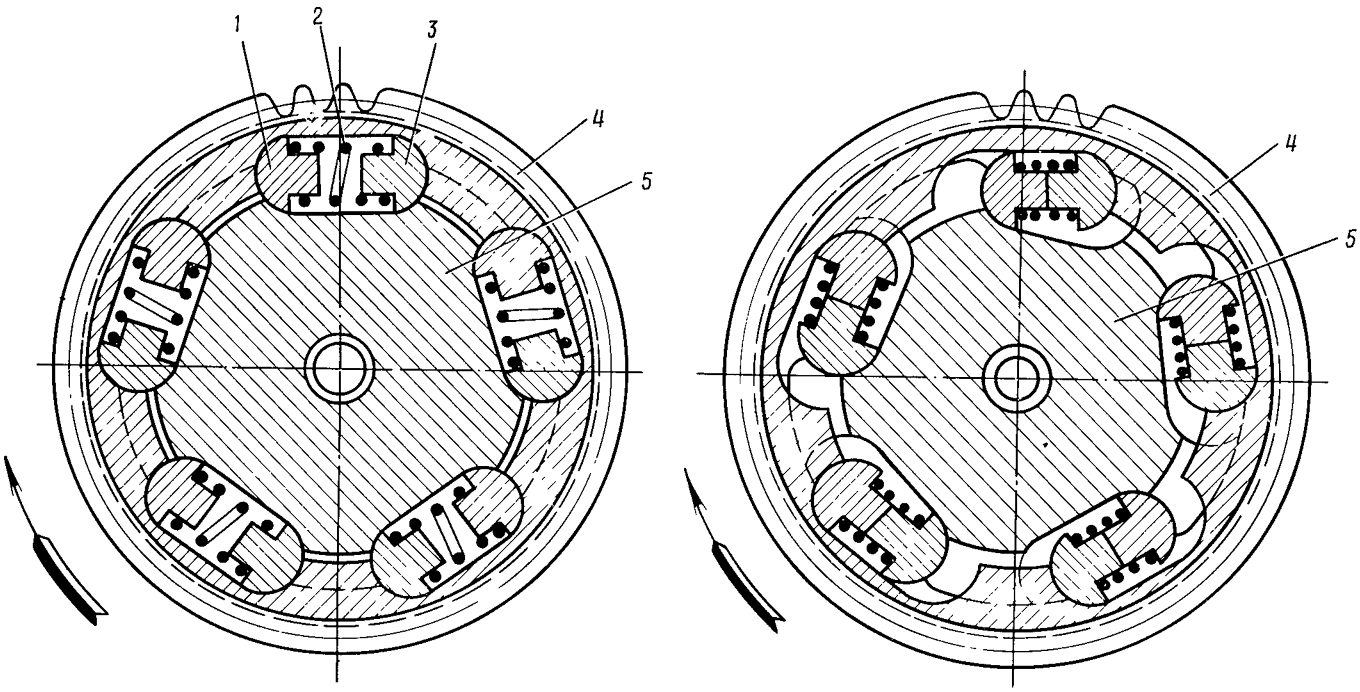
displacement towards the intermediate crankcase is restricted by the impeller shaft which bears through the spacer and spherical bronze ring against the spherical bearing of the mixture collector.

The working end faces of the blower drive parts (coupling, spacer, spherical ring and impeller shaft) are grooved to improve lubrication of friction surfaces.

The blower coupling (Ref. Fig. 4) is assembled on the accessory drive shaft.

The coupling protects the drive parts against overloads at abrupt changes in engine operating conditions and serves to decrease torsional stresses in the drive parts.

The blower drive coupling comprises the following parts: gear (4), five cylindrical helical springs (2), five pairs of plates (1) and (3) and fasteners.



1. Plate
2. Spring
3. Plate
4. Gear
5. Accessory Drive Shaft

Blower Coupling Figure 4

Gear (4) is made of alloyed steel and has five internal projections.

When the coupling is assembled, the gear internal projections are in the slots of the drive shaft disk which excludes axial displacement of gear (4) relative to the shaft. Two plates (1) and (3) and one spring (2) are installed in each space between the projections of the gear and shaft disk.

To fix the plates and springs in the axial direction relative to the accessory drive use is made of plate collars at the front side and cover (32) (Ref. Pig. 1) at the rear side; the cover is secured on the shaft with a nut.

The spring compression force presses the plates to the end surfaces of the gear and disk projections which precludes free-wheeling of gear (4) (Ref. Pig. 4) on the accessory drive shaft.

During clockwise rotation the projections of shaft (5) act on plates (1) which transmit torque to the projections of gear (4) through springs (2) and plates (3). Under steady operating conditions of the engine, when imparted torque is less than that of pre-com-pressed springs (2), gear (4) does not turn relative to drive shaft (5).

As operating conditions change, when moments exceeding those of pre-compressed springs nay be transmitted to the blower drive, the springs compress and the gear turns relative to the drive shaft through a certain angle precluding high impact loads on the blower drive parts, hence their breakage.

Twin gear (25) (Ref. Fig. 1) of the blower drive comprises two spur gears made as one piece of cemented ateel and has two support necks.

The twin gear rests with its front neck in bushing (26) of diffuser (24), with the rear one, in the hole of diffuser bracket (28). Oil is fed to the bushings under pressure through holes in the necks.

Torque is imparted to the blower Impeller through the train: from the accessory drive shaft through the blower drive coupling gear of blower coupling (29), small rim of twin gear (25). The large rim of the twin gear meshes with the gear rim of blower impeller shaft (33).

The crankshaft-to-impeller transmission ration is 8.160.

To preclude ingress of oil from the space defined by the front wall of the mixture collector and rear wall of the crankcase, as well as from the rear cover to the fuel mixture, the blower is provided with a sealing system comprising oil baffle (34) and two oil seal bushings (8) and (35) with rings (27) and (30) communicating with the atmosphere through breather (2).

The ateel oil baffle installed between the impeller shaft gear rim and oil seal bushing keeps oil off the blower impeller on the rear side of the crankcase cover.

Oil seal bushings (8) and (35) are made of steel and have four grooves each to receive rings contacting with their outer surfaces bushings (20) and (36), pressed in mixture collector (1) and diffuser (24).

The oil sealing rings are made of bronze. Each bushing receives four rings.

A wide annular groove with radial holes emerging to the annular spaces defined by the bushings and the shaft is made at the middle of the oil seal bushing surface. These spaces are interconnected by two passages milled in two opposite splines of the blower impeller shaft.

Radial holes in bushing (20) emerge into an annular space formed by the bushing and the mixture collector. The space is connected to the atmosphere through a passage defined by breather pipe (4) pressed in the mixture collector, and breather (2) driven into the upper part of mixture collector (1).

Atmospheric air getting into the annular grooves of the oil seal bushings decreases rarefaction in them, thus decreasing suction of oil to the blower space and precluding ingress of oil to the fuel-air mixture.

LUBRICATION - DESCRIPTION AND OPERATION

1. GENERAL

Lubrication is intended to decrease friction and transfer heat from friction surface's of the operating engine parts.

The oil system (Ref. Fig. 1) includes: the oil pump, oil sump, filter with chip detector, mesh filters.

The friction surfaces of the engine are lubricated under pressure and by splashing of oil. Oil under pressure is fed to all main friction surfaces through internal passages. The cylinder walls, pistons, antifriction bearings, gear teeth are lubricated by oil splashing.

Apart from decreasing friction and removing heat from friction surfaces, oil protects engine internal parts against corrosion and carries away metal particles separated from friction surfaces as a result of wear to the oil sump.

The oil sump is used to collect, settle and filter oil flowing down from the engine parts.

The filter with chip detector detects metal chips in the oil sump at breakage or intensive wear of operating engine parts.

The mesh filters installed upstream of oil pump MN-14A and of the speed governor clean oil of mechanical impurities.

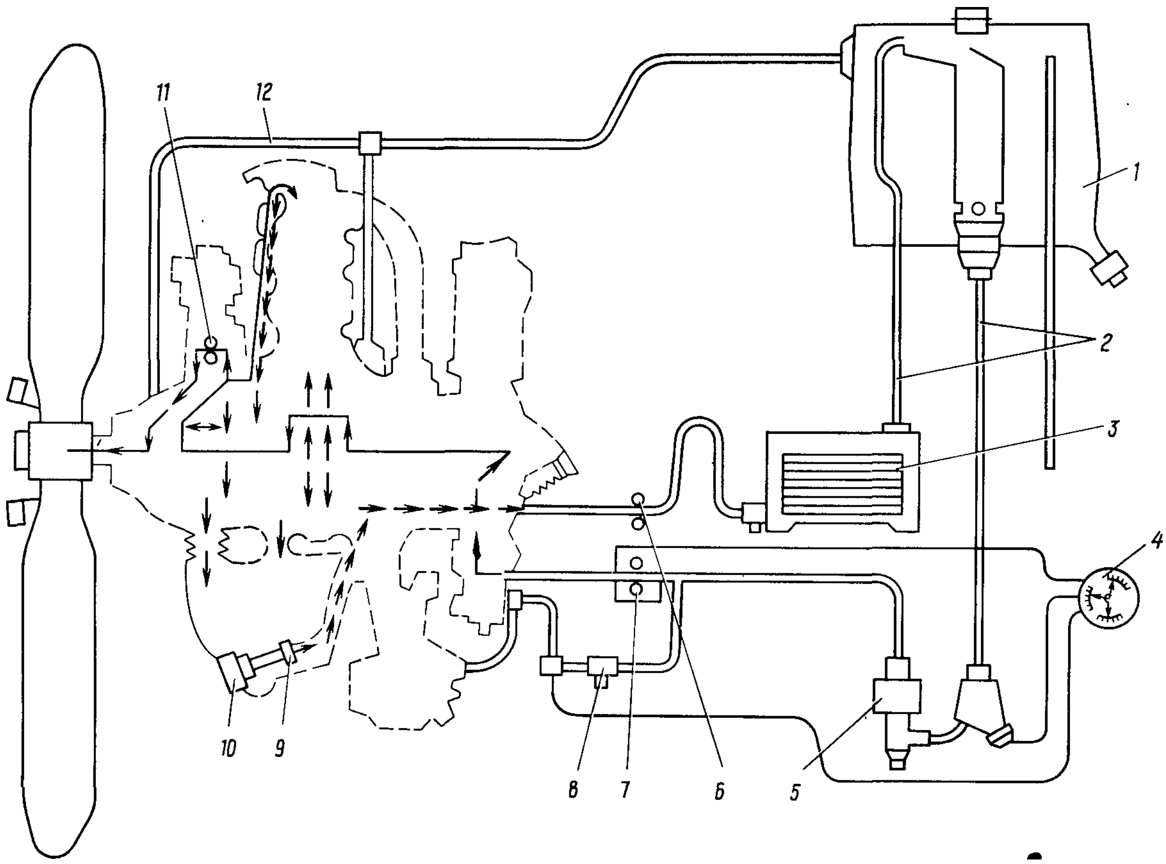
Oil from the sump is scavenged through the oil cooler to the oil tank. The engine oil system construction does not provide for scavenging oil from the engine in inverted flight because specified inverted flight duration does not exceed 2 min.

The engine is not flooded with oil since the latter partially is drained to the oil tank through the engine breathing system.

The engine oil system includes the following test instruments:

Temperature gauges for checking oil temperature at engine inlet and outlet. Oil pressure gauge for measuring engine inlet oil pressure.

Oil is fed to all forced-lubrication parts of the engine by the MN-14A oil pump including delivery and scavenging sections.



1.Oil Tank
2.Oil Line
3.Oil Cooler
4.Oil Temperature and Pressure Gauge
5.Oil Filter
6.Oil Pump
7.Oil Pump Delivery Section
8.Dilution Cock
9.Oil Sump
10.Pilfer with Chip Detector
11.Speed Governor Oil Pump
Breathing Connection Pipeline

Engine Lubrication and Breathing Diagram Figure 1

2. DESCRIPTION

Oil from the tank is fed to the oil pump via an oil line through the oil inlet connection, mesh filter in the rear cover and inner space of the driven shaft to the oil pump delivery section (Ref. Fig. 1).

Oil under pressure from the delivery section of the oil pump is fed to the space of the oil pump drive shaft, then through the hollow vertical shaft, radial holes in its walls to the annular racess of the vertical boss of the crankcase rear cover to lubricate the bushings of the upper and lower supports of the vertical shaft.

Oil from the annular racess of the vertical boss is supplied to the attachment flanges of the tachometer generator drive, compressed air distributor and compressor to lubricate these drives and their accessories.

Further oil flows through drilled passages to two grooves for the magneto drive housing for lubricating these drives and to the twin gear of the blower impeller drive.

Oil is delivered to the bearings of the drives of the tachometer generator, compressed air distributor, compressor and magnetos through the recesses, flats and radial holes in the drive housings.

The bulk of oil fed from the annular racess in the vertical boss of the crankcase rear cover is fed through a passage to the central boss of the crankcase rear cover and is branched in two directions:

Through the drilled passage to the aligning recess for the generator drive housing and further through the passage drilled in the generator drive housing stiffening rib to the inner annular recess to lubricate gear bearings.

Through radial drilled passages in the drive gear to the space of the drive shaft connected with the space in the main journal of the crankshaft rear section. A part of oil from the drive shaft space passes through drilled holes to lubricate support necks of the drive gear, drive shaft and blower impeller shaft.

From the crankshaft rear section main journal space, oil gets through drilled passages in the web to the space of the crankpin and then the oil flow is divided into three directions:

Through two oil intake pipes to the flat of the crankpin to lubricate the crank mechanism.

Through the calibrated orifice in the jet driven into the web of the crankshaft front section to the crankcase for additional lubrication of the cylinders, pistons and connecting rods.

Through the passage in the web of the crankshaft front section to the space of the crankshaft front section end.

Two oil intake pipes installed in the crankpin space and serving as an oil cleaning centrifuge supply clean oil to the crank-mechanism parts.

During rotation of the crankshaft, heavier particles contaminating the oil are rejected by centrifugal force to the base of the pipe protruding part, while clean (lighter) oil gets through the pipes to the master connecting rod bushing.

Oil from the gap between the master connecting rod bushing and the crankpin of the crankshaft flows through radial passages in the bushing and in the lugs of the master connecting rod to the space of the articulated rod pins from which it is fed through two radial passages to lubricate friction surfaces of the articulated rod big end bushings.

The cylinder surface, pistons, pins and bushings in the connecting rod small ends are lubricated by oil squirted from the gaps of the crank mechanism and from the oil jet of the crankshaft.

The crankshaft bearings are also splash-lubricated.

Oil from the crankshaft front section space is fed through the radial hole in the shaft

end, through the spacer to the cam plate bushing.

The gears and bearings of the timing mechanism, the cam plate and speed governor drive are lubricated by oil splashing.

The tappets and parts of valve mechanisms, needle rollers and rocker rollers, valve springs, spherical surfaces of tappet push rods and inlet valve stems of cylinders Hos 1, 2, 8, 9 and the exhaust valve stems of cylinders Nos 1, 2, 3, 8, 9 are pressure lubricated with oil supplied from the gearbox housing.

Other tappets and parts of the valve mechanisms are lubricated with oil gravitating to them through the gap between the tappets and their guide bushings.

Oil from the crankshaft front section end space flows to the airscrew shaft space to lubricate the bushing pressed in the crankshaft end and serving as the airscrew rear support.

Further the oil flows along the airscrew shaft passage.

Oil is fed through a flat and a special passage in the airscrew shaft to the annular space between the spacer and the airscrew shaft, from the annular space the oil is fed via special passages of the airscrew shaft to the annular groove in the airscrew shaft.

From the annular groove the oil is supplied through the passages in the satellite cage to the satellite pivots. From the satellite pivots the oil is fed through the passages for lubricating satellite needle roller bearings.

The front ball bearing is lubricated with oil fed from the gearbox housing jet. Other gears and friction parts of the gearbox are lubricated by splashing.

The oil is fed to the speed governor and airscrew as follows.

Oil from the airscrew shaft apace is supplied through the longitudinal receaa on the airscrew shaft plug surface and radial hole in the airscrew shaft and spacer to the rear annular space formed by the oil transfer bushing. From the annular space the oil flows through the passage in the gearbox housing, mesh filter at the governor inlet to the speed governor.

Oil is delivered from the speed governor to the airscrew and back from the latter to the apeed governor through the same route.

With the engine running, oil from the governor is fed to the airscrew and back through the passage in the gearbox housing, which connects the speed governor with the front annular space of the oil transfer buahing. From this space oil is delivered through radial holes in the spacer and airscrew shaft to the longitudinal hole in the airscrew shaft plug and then to the airscrew cylinder.

Oil flowing out from the gaps between friction surfaces of the gearbox parta as well as from the timing mechanism drains down to the oil sump.

Oil from the spaces of the intermediate crankcase, mixture collector and rear cover also flows to the oil sump.

The oil is sucked through the filter with chip detector located in the lower front part of the oil sump, passages of the oil sump, mixture collector and crankcase rear cover by the scavenging section of the oil pump and is fed further through the oil cooler to the oil tank.

During operation of the engine certain amount of gases penetrates from the combustion chamber through the gaps between the piston rings and cylinder sleeves to the crankcaae, besides, oil contained in the crankcase partially evaporates owing to high temperature.

The blow-by gases and oil vapour increase pressure inside the crankcase which may lead to oil leakage through the crankcase joints.

To equalize the pressure between the engine crankcase cavities they are interconnected by the breathing holes and to equalize the pressure inside the crankcase with the atmospheric pressure the engine is equipped with two breathing holes, one of which is located in the gearbox housing, and the other on the mixture collector. These holes are connected with the breathing system of the airplane.

Provided in the lower front part of the oil sump is a flange with two studs and a hole which serves for providing airplane breathing during inverted flight.

3. LUBRICATION SYSTEM UNITS

3.1. OIL PUMP MN-14A

The oil pump is intended to deliver oil from the tank to the engine oil gallery and to scavenge oil from the oil sump to the tank.

Specifications

Direction of rotation .... Left

Drive transmission ratio 1.125

Pump drive shaft speed of rotation:

Maximum (for up to 10 min) .... 3319 r/min

Minimum .... 580 r/min

Working fluid .... Oil MS-20 GOST 21743-76

Pump delivery at drive shaft speed of 2400 r/min:

Delivery section:

At oil pressure of (5±0.2) kgf/cm in oil gallery and oil temperature of 50 to 60 °G 516 1/h

At cap plugged and outlet backpressure of (6±0.2) kgf/cm^2 .... Not less than 900 1/h

Scavenging section at outlet backpressure of (1±0.2) kgf/cm^2 and oil temperature of 75 to 125 °C……………Not less than 1460 1/h

The oil pump comprises a housing, drive shaft, driven shaft with gear rims, four gears, reducing and check valves, packing gland and other parts.

The pump housing assembly is a magnesium casting comprising scavenging section housing (9) (Ref. Fig. 2), delivery section housing (4), upper cover (14) and lower cover (2).

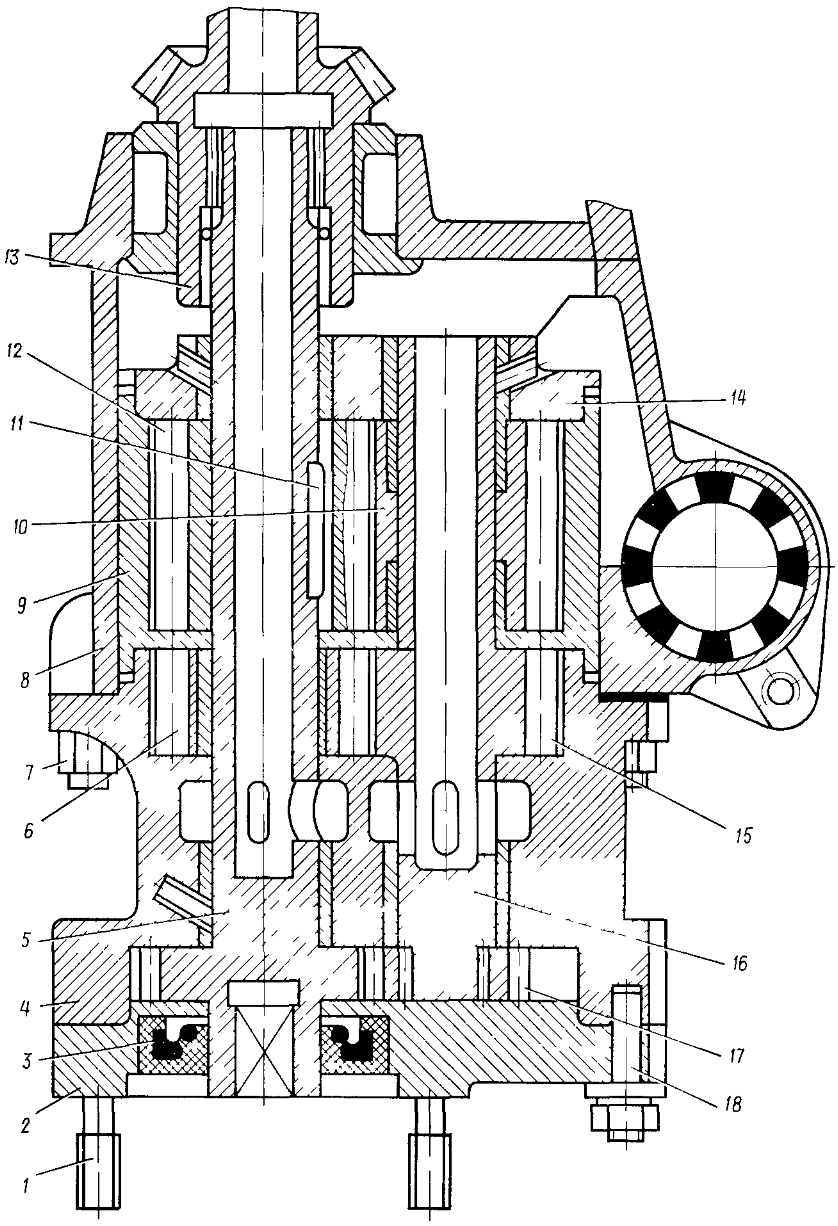
The scavenging section housing has two wells accommodating gears (10) and (12), holes for studs and shafts, holes for inlet and outlet of oil and locating recesses.

The scavenging housing bottom makes the partition between the scavenging and delivery sections.

Delivery section housing (4) has two wells for gears (6) and (15), oil inlet and outlet holes, holes with pressed-in bronze bushings serving aa shaft lower bearings, flange with holes for studs (7) adapted to attach the housing to the rear cover and six studs (18) for attachment of lower cover (2).

The lower flange wells accommodate delivery section gearing, reducing and check valves and oil pressure measuring connection.

Housing upper cover (14) has a locating collar, two holes with pressed-in and locked bronze bushings being the pump shaft bearings and four holes for passing studs (11) (Ref. Fig. 3) which secure the pump housings.



1.Fuel Pump Attachment Stud
2.Lower Cover
3.Rubber Seal with Metal Insert
4.Delivery Section Housing
5.Drive Shaft
6.Delivery Section Gear
7.Rear Cover Attachment Stud
8.Rear Cover
9.Scavenging Section Housing
10.Scavenging Section Gear
11.Key
12.Scavenging Section Gear
13.Rear Cover Vertical Shaft
14.Upper Cover
15.Delivery Section Gear
16.Driven Shaft
17.Driven Gear
18.Stud

Oil Pump MN-14A. Longitudinal Section View
Figure 2

Lower cover (2) (Ref. Pig. 2) has a locating collar and is attached by six studs (18) to the delivery section housing. The cover has a flange with four studs (1) to mount the fuel pump and a seat for rubber seal with metal insert (3) which precludes leakage of oil from the oil pump and fuel pump.

The shafts and gears are of steel and have cemented teeth.

Pump drive shaft (5) has a gear rim, splines for connecting with vertical shaft (13) rotating the pump, slot for key (11) of scavenging section gear (12), radial and central holes for delivery of oil through the pump drive shaft to the engine, a square hole shank whereby the fuel pump is rotated.

Driven shaft (16) is made integral with gear (15), its lower end has a splined ahank on which gear (17) is installed, meshing with the gear rim of drive shaft (5).

Scavenging section gears (10) and (12) have central holes for mounting on shafts (5) and (16).

Gear (12) includes a slot for key (11) whereby it is connected with drive shaft (5) of the pump.

Pressed in gear (10) are two bronze bushings which allow free rotation of the gear on shaft (16).

Delivery section gear (6) has a central hole with a bronze bushing which allows free rotation of the gear on shaft (5).

The reducing valve assembly (Ref. Pig. 3) comprises a seat pressed in the pump housing, valve (1), bushing (3), spring (2), adjustment screw (7), lock nut (5), cap (8) and gaskets (6). The oil in the delivery section (outlet line) is adjusted to the required pressure by the adjustment screw. If the delivery section pressure exceeds the permissible limit, the valve opens and by-passes excessive oil to the delivery section inlet, thus maintaining constant pressure of oil in the oil system during normal operation of the engine.

The check valve comprises a body, a valve, a guide and a spring. The valve is made of bronze and has a spherical collar whereby it is pressed to the seat in the housing by the spring.

The valve is installed on its guide by the cylindrical hollow shank. The valve body is a hollow steel part pressed in the delivery section housing.

The valve body has four cutouts on each of two sides to pass flow of oil during operation of the engine.

With the engine inoperative, the check valve precludes flow of oil from the tank to the engine.

When the engine is running, the valve is opened by the oil pressure to pass oil from the pump delivery section to the engine oil system.

3.2. OIL SUMP

The oil sump (Ref. Pig. 4) cast of magnesium alloy is installed between cylinders Nos 5 and 6 and serves as a container to receive oil from the engine.

The oil sump is attached to the intermediate crankcase by two flanges and studs driven into the intermediate crankcase. The flanges have passages to drain oil from the intermediate crankcase.

Besides, the rear flange of the oil sump has an outlet hole of the passage for scavenging oil from the sump, connected to the passages in the intermediate crankcase, mixture collector, diffuser and rear cover.

The top front portion is provided with a flange for mounting the bellows and a round hole to drain oil from the gearbox housing.

y The lower part of the oil sump has a flange with three studs to install the adapter of

the filter with chip detector and a flange with two studs to connect the pipeline to breath the engine in inverted flight.

3.3. FILTER WITH CHIP DETECTOR

The filter with chip detector is intended to timely warn of troubles linked with failure of parts and to clean oil fed from the engine to the oil pump.

The filter with chip detector comprises a filtering section and a detector section.

The filtering section comprises filter (10) (Ref. Fig. 5) and insulation bushing (3) entering the bore in the oil scavenging passage. The filter is soldered to contact stem (2).

The detector comprises contact stem (2), plate stack (9), rings (8), textolite bushing (6), metal washer (5).

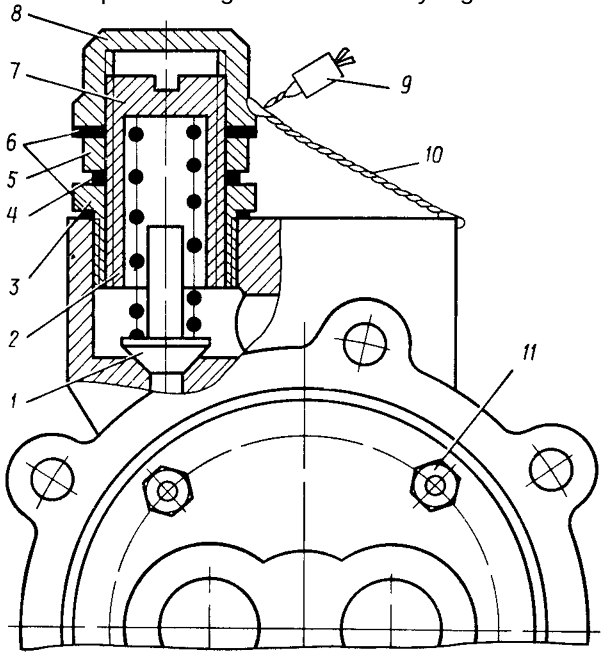
The entire stack is secured on the stem by nut (4). The contact stem carries end piece (1).

Plate stack (9) comprises seventeen brass plates separated from each other by cardboard insulation segments (three segments between two plates).

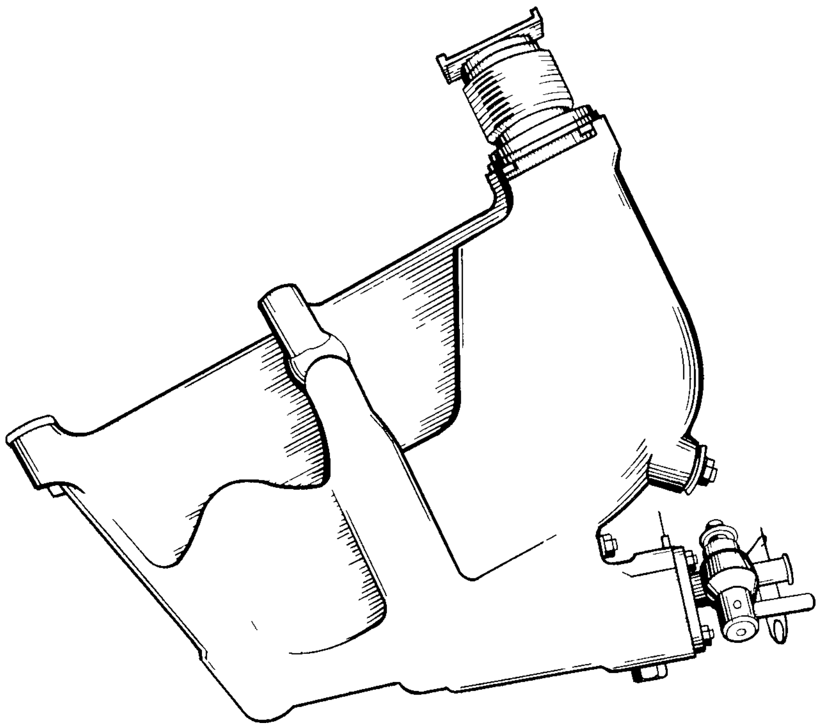
The insulation segments are attached to the plates by epoxy resin.

The filter with chip detector is connected to 27-VDC system. Current from the power source is fed to the terminal of end piece (1), passes through contact stem (2), plate stack (9) and body (7) to the oil sump housing. When the gap between the plates is filled with chips, the electric circuit is made and warning light illuminates in the pilot's cabin.

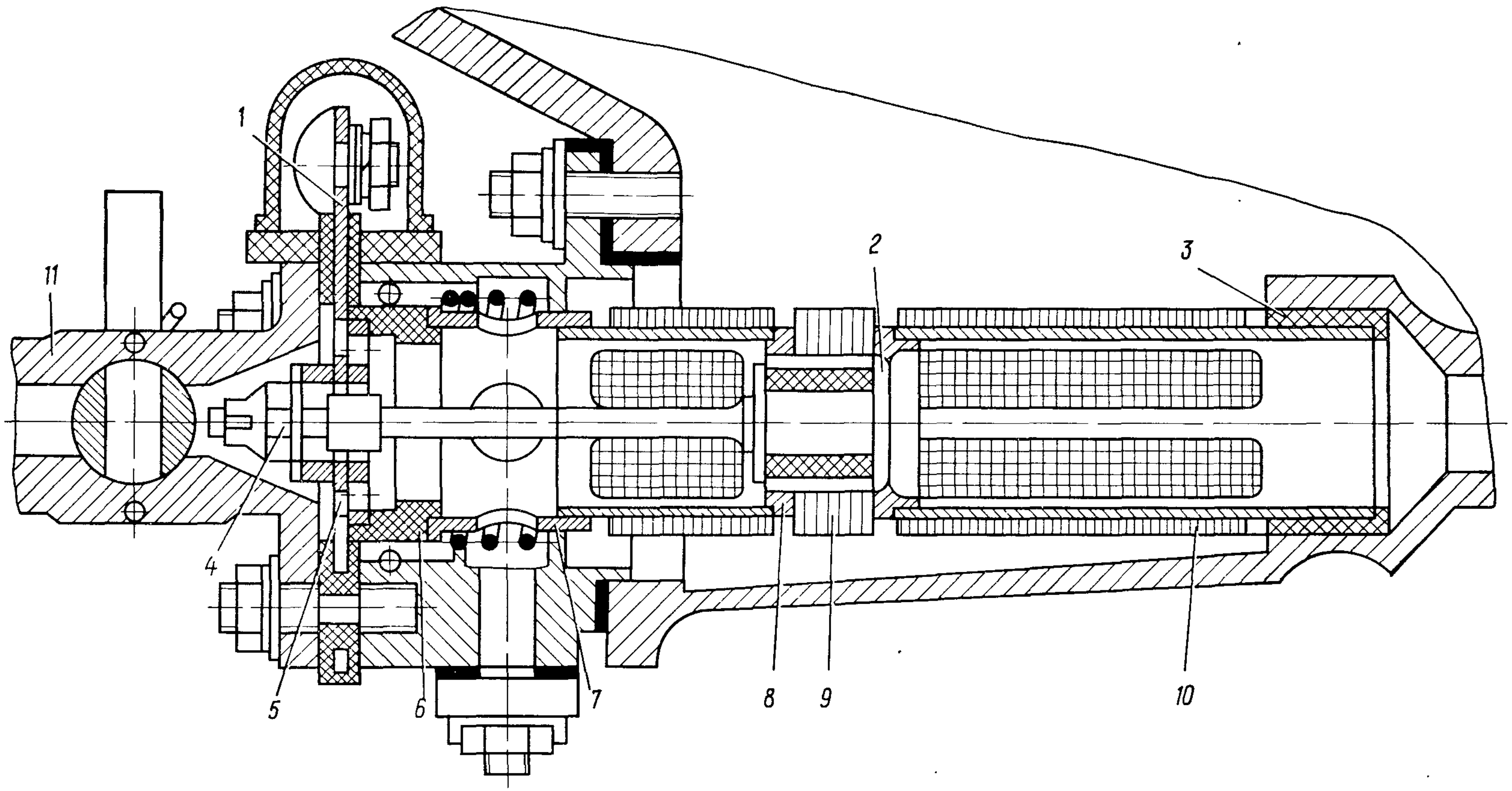
Oil Pump Reducing Valve Assembly Figure 3



1. Reducing Valve
2. Spring
3. Adjustment Screw Bushing
4. Gasket
5. Lock Nut
6. Gasket
7. Adjustment Screw
8. Cap
9. Seal
10. Wire
11. Stud



Oil Sump Figure 4



1. End Piece
2. Contact Stem
3. Insulation Bushing
4. Nut
5. Washer
6. Bushing
7. Body
8. Ring
9. Plate Stack
10. Filter
11. Oil Drain Cock

LUBRICATION - TROUBLE SHOOTING

For mostly often encountered troubles and their remedies, refer to the Table given below.

Trouble	Possible cause	Correction
1.Low oil pressure	(1) Air lock in line for supply of oil to oil pump, thickened oil (in winter), clogged oil tank vent pipe (2) Faulty pressure gauge or its wires (3) Maladjusted reducing valve of oil pump (4) Oil is excessively thinned by gasoline (5) Clogged filters in line from tank to engine (6) Jammed reducing valve, clogged valve (7) Foaming of oil	Eliminate air lock, heat oil line and oil, clean oil tank vent pipe Replace pressure gauge, check wiring Adjust pressure by reducing valve (Ref. Task Card Ho. 204) Change oil and check that dilution cock is not leaky (Ref. 072.00.00, Task Card Mo. 244) Check lines, wash filters (Ref. 072.00.00, Task Card No. 249) Remove and disassemble oil pump reducing valve as follows: Unlock and undo cap of adjustment screw (Ref. Pig. 3). blacken adjustment screw look nut. Drive out adjustment screw with screwdriver. Drive out reducing valve body and remove valve and spring. Wash removed parts in clean gasoline and blow with dry compressed air. Reinstall spring and valve and drive home reducing valve body. Screw on lock nut. Adjust oil pressure (Ref. Task Card Mo. 204) V/ash and check oil system, change oil (Ref. 072.00.00, Task Card Mo. 244)

Trouble	Possible cause	Correction
2. Filter with chip detector warning lamp comes up	(8) Low oil level in oil tank (1) Metal chips in filter (2) Faulty circuit (3) Water in oil	Add oil to oil tank to required level Detect cause of chips in oil and. together with Supplier's representative take decision on withdrawal of engine from service Test circuit for continuity (Ref. 072.00.00, Task Card Ho. 226) Change oil (Ref. 072.00.00, Task Card No. 244)

LUBRICATION - MAINTENANCE PRACTICES

1. LIST OF TASK CARDS

Task Card:

Title	Task Card No.
Removal	201
Depreservation of New Oil Pump	202
Installation	203
Adjustment of Oil Pressure	204

2. OPERATION PROCEDURE

TO M-14P MS	**TASK CARD No. 201**		
MS ITEM	PROCEDURE: Removal		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Unlock and open the oil sump drain cock and drain oil from the engine. 2. Disconnect the fuel and oil system pipelines. 3. Undo six oil pump attachment nuts. 4. Remove the oil pump with the fuel pump from the engine. 5. Remove the sealing gasket. 60 Disconnect the fuel pump from the oil pump using the following procedure: (1) Undo four nuts securing the fuel pump to the oil pump. (2) Disconnect the fuel pump. (3) Remove the sealing gasket. 7. Close and lock the oil sump drain cock. S. Carefully wipe and inspect the bearing surface of the flange on the rear cover body and splines of the vertical shaft, surface of the oil pump mounting flange and splines of the drive shaft. T.R. Nicks or dents are not allowed on flange and shaft spline surfaces		Dress nicks and dents carefully	

OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CH ECKED BY
TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**	
	Tray for draining oil Hose Pliers, flat-noaed 150 V/rench 11x14 14-24-861 Wrench 9x11 700002 Wrench 24x27 700880-8 Wrench 27x30 7811-0041	Cloths	

TO M-14P MS	**TASK CARD No. 202**	
MS ITEM	PROCEDURE: Depreservation of New Oil pump	

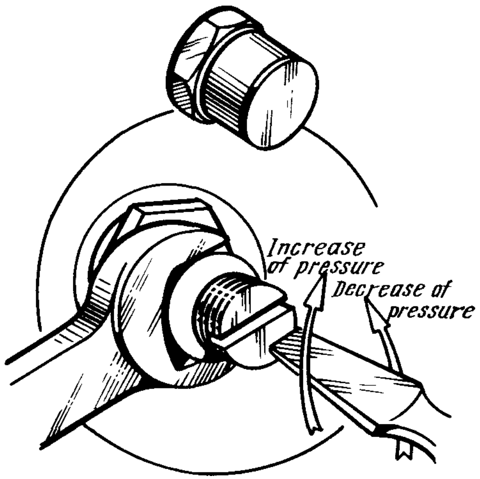
OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Release the oil pump from packaging and remove all blanking covers from it. 2. To remove preservation grease, immerse the oil pump into a bath with clean oil MS-20 heated to a temperature of 75 to 85 °G and while rotating the drive splined shaft leftwards by hand, wash the spaces of the scavenging and delivery stages of the oil pump. 3. Wipe the outer surface with a cloth moistened in gasoline.		

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Bath, depreservation	Oil MS-20 Gasoline Nefras-S 50/170 or BR-1, BR-2 Cloths

TO M-14P MS	TASK CARD No. 203		
MS ITEM	procedure Installation		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Carefully inspect the support surface of the flange, aligning surface of the housing and splined shaft. T.R. Nicks and dents are not allowed. 2. Install a new sealing gasket coated with sealant "50" onto the oil pump housing. 3. Make sure the rubber ring is present and intact on the oil pump shaft. 4. Install the oil pump on the crankcase rear cover so that the pump drive shaft enters the splined joint of the vortical shaft of the drive. Install the oil pump in its seat. T.R. Jamming of splines in installation is not allowed. ***NOTE: 7hen installing the oil pump, protect its shaft rubber sealing ring agai ns t d amage.*** 5. Install new locks on the studs, screw on and uniformly tighten six oil pump attachment nuts. 6. Lock the nuts by locks. 7. Install the fuel pump (Ref. 073.10.01, Task Card No. 203). 8. Connect the oil and fuel system pipelines, ensuring leak-proof joints.		Carefully remove nicks and dents	

OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CHECKED BY
9. Start the engine (Ref. 072.00.00, Task Card No. 201) and adjust oil pressure (Ref. Task Card No. 204). ***NOTE: The oil pump is installed by the Supplier.***			
TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**	
	Pliers, flat-nosed 150 Wrench 11x14 14-24-861 Wrench 9x11 700002 Wrench 24x27 700880-8 Wrench 27x30 7811-0041	Sealant "50" Wire, locking KO-0.8 Locks	

TO M-14P MS	**T A S K C A R D No. 204**		
MS ITEM	PROCEDURE **Adjustment of Oil Pressure**		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CH ECKED BY**
1. Check oil pressure with the engine running at a crankshaft speed, of 64 % (1860 r/min). 3 T.R. Oil pressure should be 4 "to 6 kgf/cm . 2. Unlock and undo adjustment screw cap (Ref. Fig. 201). 3. Loosen the screw with a wrench, holding the screw against turning with the screwdriver inserted into the screw slot. 4. Turn the adjustment screw with a screwdriver to obtain the required pressure. To increase the pressure, turn the screw clockwise holding the lock nut against turning with a wrench; to decrease the pressure, turn the screw counterclockwise. ^ To change oil pressure for 1 kgf/cm , turn the adjustment screw for about1.5 turns. 5. Tighten and lock the adjustment screw with a lock nut, holding the screw against turning with a wrench after adjusting the required pressure. 6. Install and lock the adjustment screw cap. 7. Check proper oil pressure by test running the engine (Ref. 072.00.00, Task Card No. 202). ***NOTE: Check the oil pressure after replacement of oil pump, disassembly and adjustment of the reducing valve.***		Shut down engine (Ref. 072.00.00, Task Card No. 203)	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Pliers, flat-nosed 150 Screwdriver 700346 A200x1 Wrench 27x30 7811-0041 Wrench 24x27 700880-8	Wire, locking KO-0.8

ACCESSORY DRIVES - DESCRIPTION AND OPERATION

1. GENERAL

The present section describes engine accessory drives located in the rear cover.
The engine accessory drives and gear trains are shown in the kinematic diagram (Ref. Fig. 1).
The data on transmission ratios and directions of rotation of the drives are given in the Table .

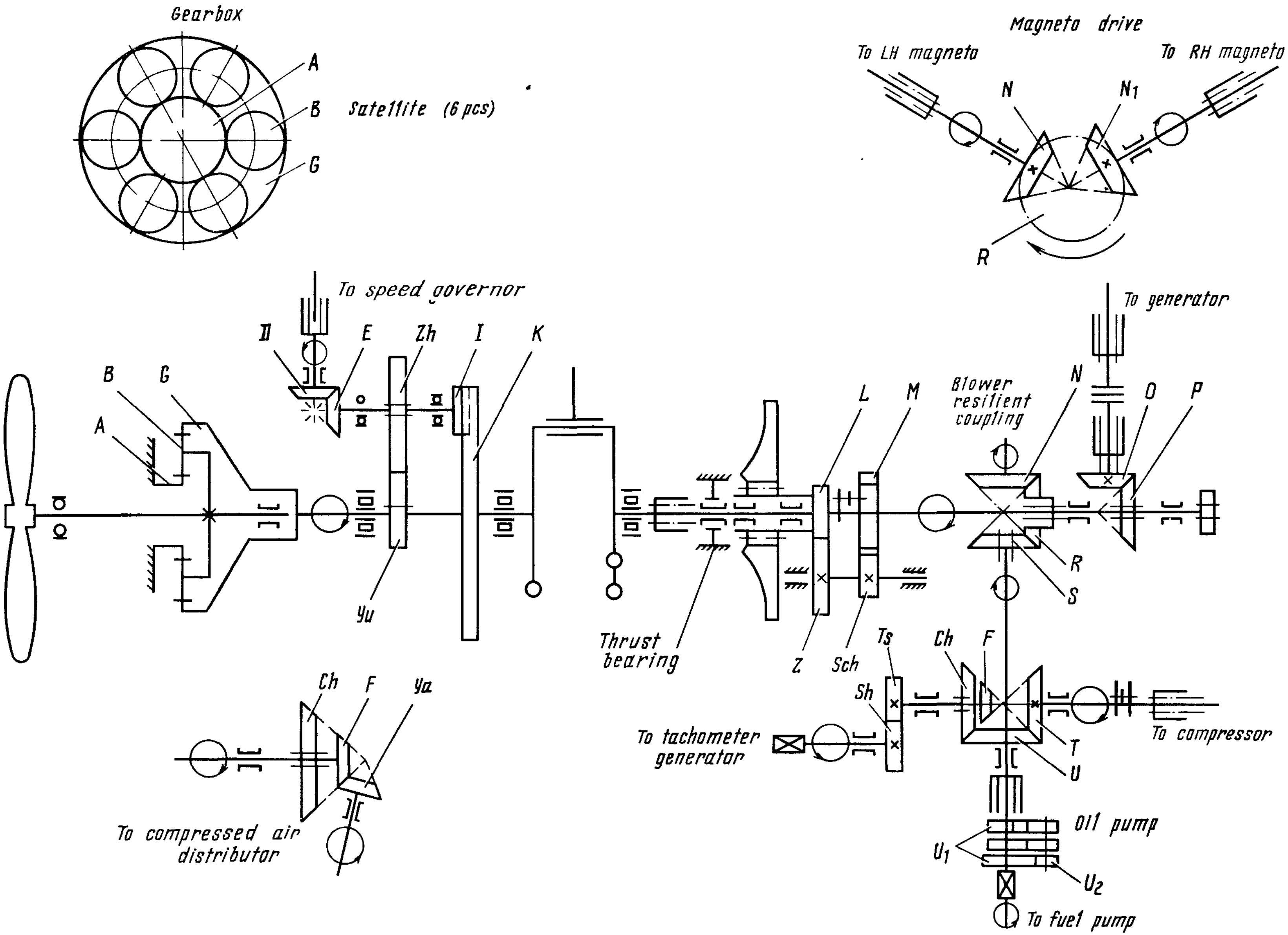
Drive	Designation of gear	Transmission ratio relative to	Direction of rotation
Gearbox	G, B, B, A	0.658	LH
Speed governor drive	Yu, Zh, E, D	1.045	RH
Cam plate drive	Yu, Zh, I, K	0.125	LH
Blower impeller drive	M, Sch, Z, L	8.160	LH
Magneto drive	P, N (N.,)	1.125	LH
Generator drive	P, 0	2.5	LH
Compressor drive	P, S, U, T	0.9	RH
Oil pump drive	P. S	1.125	LH
Fuel pump drive	P, S	1.125	LH
Compressed air distributor drive	P, S, U, Ch, F, Ya	0.5	LH
Tachometer generator drive	P, S, U, Gh, Ts, Sh	0.857	LH

Drives and gear trains of the gearbox, timing mechanism, blower are described in Sections 072.10.00, 072.30.00 and 072.40.00.

The crankcase rear cover mounts drives of the generator, two magnetos, oil pump, fuel pump, tachometer generator, compressed air distributor and compressor.

The accessory drives are driven by a bevel gear of the crankcase rear cover drives.

Engine M-14P Gear Train Figure 1



3. DESCRIPTION

2.1. CRANKCASE REAR COVER

The crankcase rear cover (Ref. Fig. 2) cast of aluminium alloy is attached to the mixture collector and simultaneously secures the blower diffuser by its flange.

The lower part of the rear cover has a boss with wella to accommodate the oil pump and filter.

The boas has two flanges with two studs each for connecting oil inlet and outlet branch pipes.

Two holes are provided at the cover flange bottom to drain oil from the rear cover space and scavenge oil from the oil pump.

The generator drive housing and adapter flange are secured to the upper horizontal flange.

Two upper inclined flanges with three studs each serve to install the magnetos. The magneto drives are installed in the inclined flange recesses.

The lower part of the recesses has a threaded hole intended to drain oil entrapped in the recess. The hole is closed with a hexagon head plug. The plug is locked with a plate lock.

Secured at the side flanges of the lower part are the air compressor drive (RH side), tachometer generator and compressed air distributor drives (LH side).

Two bosses with bushings are provided at the bottom of the rear cover coaxially with its vertical center line. The lower bushing is removably mounted on two studs, the upper bushing is pressed-in. The bushings are intended to install the vertical shaft. The boss has a hole for installing the oil filter.

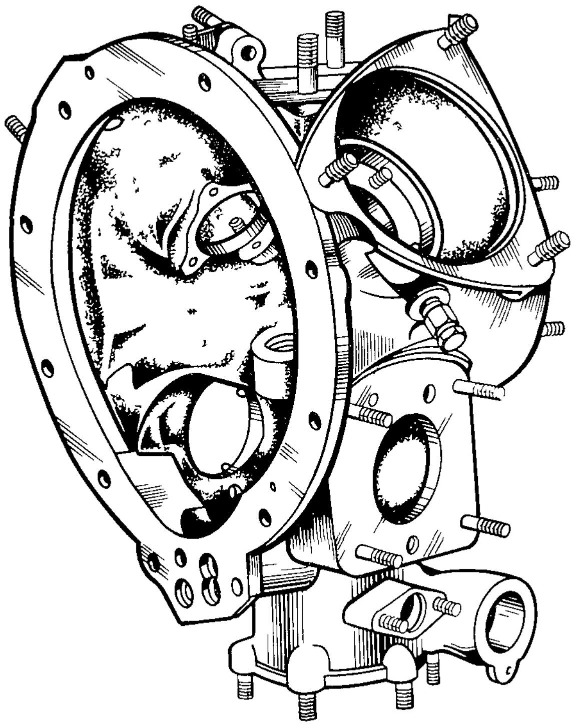
Arranged along the horizontal axis on a conical diaphragm is a boss with pressed-in bronze bushing serving as a front support for the drive gear of the accessory drive.

The rear end face of the cover has a flange with studs whose central hole has pressed-in bronze bushing being the rear support of the drive gear.

Passages for supply of oil under pressure to lubricate the drives are drilled from the front vertical and horizontal bosses of the rear cover to the drive flanges.

The vertical wall of the rear flange has two holes: the upper hole is for breathing the spare drive spaces and the lower one, for draining oil.

The upper part of the front flange has an inclined hole aligned with those in the diffuser and the mixture collector for breathing the rear cover space in normal flights and draining oil from the rear cover in inverted flights.



Grankcase Rear Cover Figure 2

2.2. DRIVE GEAR

Drive gear (16) (Ref. Pig. 3) of the rear cover drives is made of nickel-chrome steel. Its front has a cylindrical shank for sealing the oil gallery and the internal splines for coupling with the drive shaft of the accessory drive. The gear outer bevel rim meshes with bevel gears (28) of the magneto drives and vertical shaft (18).

The external splines of the drive gear shank mount: friction coupling (22) of the generator drive and drive gear rear support tightened with screw (21).

The cylindrical shank serves as the front support of the drive gear.

Its surface has four radial holes to supply oil under pressure to the drive shaft of the accessory drive.

The drive gear is rotated by the drive shaft of the accessory drive.

2.3. REAR COVER VERTICAL SEARING

Vertical gearing transmits torque from the drive bevel gear of the rear cover drives to the drives of the compressor, compressed air distributor, oil and fuel pumps, tachometer generator.

The vertical gearing comprises vertical shaft (18) and bevel gear (17).

Vertical shaft (18) of the rear cover is a hollow nickel-chrome steel part. The shaft upper end has external rectangular splines for mounting the distant ring and bevel gear (17).

Located under the splines is a cylindrical support portion with a groove and four radial holes to supply oil from the vertical shaft space to the bore in the vertical boss of the rear cover. Oil from the bore is fed through drilled passages for lubricating accessory drives and. to the space of the drive gear of the rear cover drives.

The lower part of the vertical shaft has a cylindrical shank and a bevel gear meshing with the compressor drive, tachometer generator and compressed air distributor drive.

The shank rotates in a bronze bushing secured on studs driven into the rear cover in the oil pump space and has internal triangular slots for coupling with the splines of the oil pump drive shaft. The shank is provided with a hole and flat to supply oil to the bushing. The fuel pump is driven from the oil pump drive shaft whose shank is connected with the drive shaft of the fuel pump pumping unit.

To preclude leakage of oil from the oil pump to the fuel pump, rubber seal is installed. The fuel pump is secured to the oil pump by four studs.

2.4. GENERATOR DRIVE

The generator drive comprises housing (14) (Ref. Fig. 3) with seal and plug (29), drive gear (16) with friction coupling (22), driven sh.-J.ft (20), adapter shaft (96) (Ref. 072.00.00, Fig. 7) with buffer rubber insert (95), adapter (97) and fasteners.

Generator drive driven shaft (20) (Ref. Pig. 3) rotates in bronze bushings (15) pressed in the drive housing. The drive housing has a round flange and a square flange.

The drive housing is attached by the square flunge with the aid of four studs to the rear cover of the engine; the same studs mount adapter (97) (Ref. 072.00.00, Fig. 7).

Torque from drive gear (16) (Ref. Fig. 3) is transmitted through friction coupling (22), driven shaft (20), adapter shaft (96) (Ref. 072.00.00, Pig. 7) to the generator ahaft.

The generator shaft, adapter shaft and drive shaft are connected by splined joints.

Buffer rubber insert (95) is intended to preclude axial displ'acement of adapter shaft (96) during operation of the engine.

Oil to lubricate bearings of driven shaft (20) (Ref. Pig. 3) is fed under pressure through passages drilled in the drive housing and in the rear cover.

Plug (29) is intended for periodic drainage of oil seeping into the space between the generator drive and generator flange during inverted flight.

2.5. MAGNETO DRIVE

The magneto drive comprises housing (27) (Ref. Fig. 3) stamped of aluminium alloy, bevel gear (28) and carrier (23) splined to the bevel gear.

To preclude ingress of oil into the magneto, the drive housing is provided with

spring-loaded rubber seal (24). The seal is locked with ring (26). The carrier has rubber sealing ring (25). A cardboard gasket is placed between the drive housing and the crankcase rear cover.

The magneto drives are identical in the construction. Each drive is attached by the round flange with four studs to the respective flanges of the rear cover.

The gears of the drives are made of cemented steel and mesh with the rear cover drive gear and through carriers (23) with two rectangular lugs to transmit rotation to the magneto rotor through rubber couplings.

2.6. TACHOMETER GENERATOR AND COMPRESSED AIR DISTRIBUTOR DRIVE

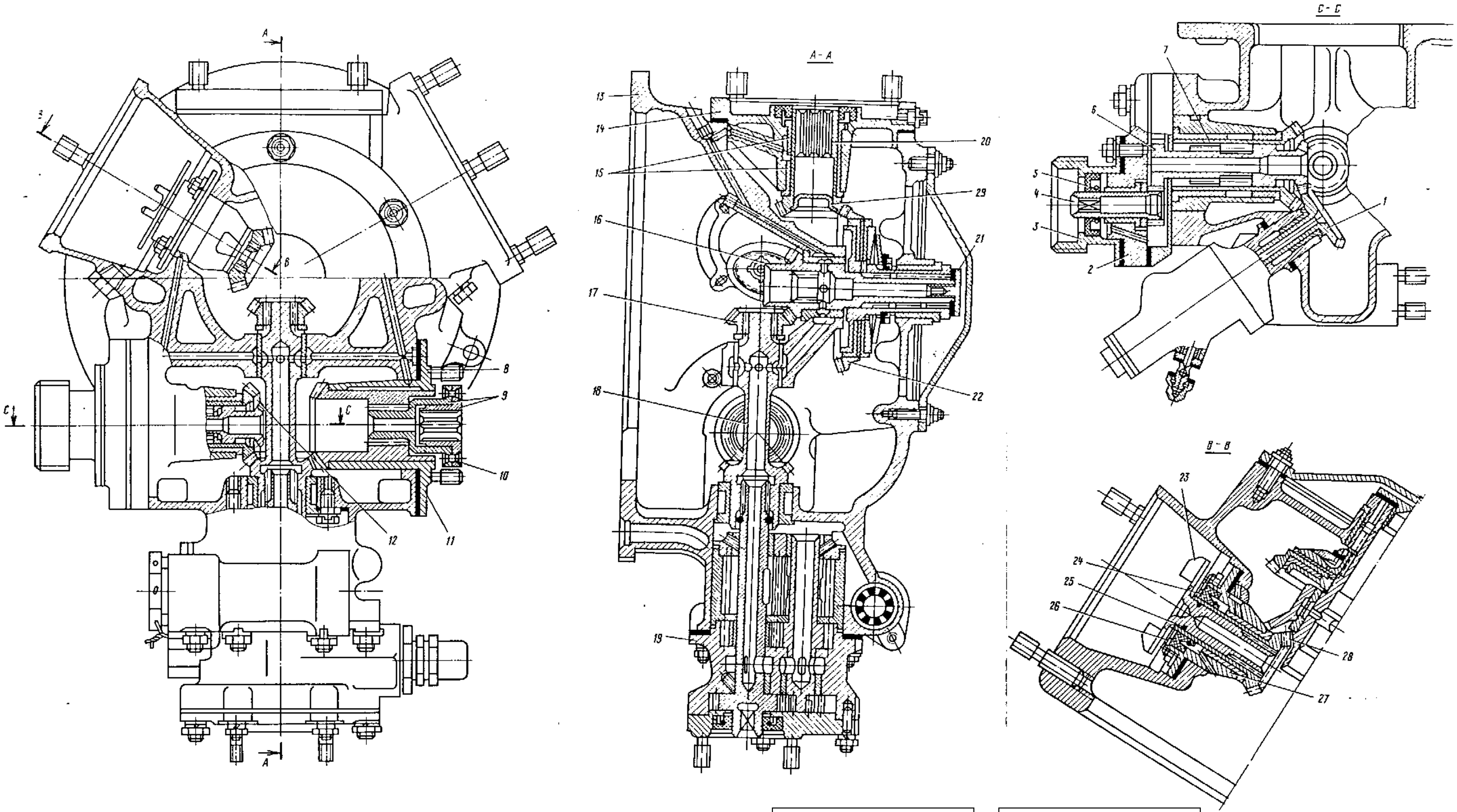
The tachometer generator and compressed air distributor drive comprises housing (2) (Ref. Pig. 3), steel cover with threaded connection for mounting the tachometer generator, drive gear (6) with bevel and spur rims at opposite ends, drive gear (7) with bevel rim, shaft (4) of the tachometer generator drive with a spur gear, bevel gear (1) of the compressed air distributor and other parts.

Hollow drive gear (7) rotates in the drive housing in two bronze bushings; arranged in the gear at the bevel gear side on the splines is gear (6) with bevel rim meshing with bevel gear (1) of the compressed air distributor.

The spur rim of gear (6) meshes with the gear of the tachometer generator drive shaft.

The drive housing has a flange for attachment to the rear cover. Two bronze bushings pressed and locked in it are sliding bearings of the drive shaft of the tachometer generator drive.

Drilled between the bushings in the drive housing is a hole through which the splashed oil gets into the housing interior to lubricate friction surfaces of the drive shaft and bronze bushings.



1. Compressed Air Distributor Bevel Gear
2. Tachometer Generator Drive Housing
3. Tachometer Generator Cover
4. Tachometer Generator Drive Shaft
5. Seal
6. Compressed Air Distributor Drive Gear
7. Tachometer Generator Bevel Drive Gear
8. Compressor Drive Housing
9. Half-Coupling
10. Pin
11. Compressor Drive Gear
12. Tachometer Generator Bevel Drive Gear

13. Crankcaae Rear Cover
14. Generator Drive Housing
15. Bushing
16. Rear Cover Drive Gear
17. Bevel.Gear 1B. Vertical Shaft
19. Pump Delivery Section Housing
20. Generator Driven Shaft
21. Screw
22. Generator Drive Friction Coupling
23. Carrier
24. Seal
25. Sealing Ring
26. Retaining Ring
27. Magneto Drive Housing
28. Bevel Gear

2.7. COMPRESSOR DRIVE

The compressor drive comprises housing (8) (Ref. Fig. 3) and torque-limiting pin coupling.

Housing (8) is made of aluminium alloy and has a round flange with six holes to receive the attachment studs, one hole to supply oil to the compressor, two holes to drain oil from the compressor space and three milled flats to remove the housing from the engine.

The torque-limiting pin coupling protects the rear cover drive parts against breakage in case of compressor wedging.

The pin coupling comprises gear (11), two half-couplings (9) interconnected by steel pins (10).

Bevel gear (11) meshes with the bevel gear of the vertical shaft.

Provided inside gear (11) is a band with internal cylindrical splines to receive external splines of one of half-couplings (9). The second half-coupling has internal splines for coupling with the air compressor shaft.

When torque exceeds the permissible limit (at compressor wedging) pins (10) of the half-couplings are sheared off and the compressor drive is disengaged.

ACCESSORY DRIVES - TROUBLE SHOOTING

For mostly often encountered troubles and their remedies,refer to the Table given below.

Trouble	Possible cause	Correction
Oil leaks through vents or along magneto attachment flange	Oil accumulated in magneto drive	Unlock drain plugs, drain accumulated oil (Ref. 072.00.00, Task Card No. 256)

FUEL SYSTEM - DESCRIPTION AND OPERATION

1. GENERAL

The engine fuel system comprises a fuel pump, a fine fuel filter, a carburetor and interconnecting pipelines.

During operation of the engine the fuel pump supplies fuel from the fuel tanks through the filters to the carburetor from which the fuel-air mixture is fed to the engine blower.

On passing the blower, the mixture collector manifold, intake pipes and inlet valves, the mixture gets to the engine cylinder combustion chambers.

2. DESCRIPTION

The 702ML rotary vane-type pump supplies fuel (gasoline) at excessive pressure for normal
o operation of the carburetor. Fuel pressure at the carburetor inlet is 0.2 to 0.5 kgf/cm
o at operating ratings and not below than 0.15 kgf/cm at a minimum rotational speed.

The fuel pump is attached to the lower flange of the oil pump housing by four studs. The pump rotor is driven through a square shank entering a square hole in the oil pump shaft.

To obtain the combustible mixture the fuel fed to the engine should be atomized and mixed with air.

The process of preparation of the mixture is called carburation, while the unit adapted for it is carburetor.

The AK-14P carburetor prepares the fuel-air mixture at all ratings and attitudes of the
airplane.

As regards the operating principle of the main metering system, the AK-14P carburetor belongs to draft type. It has a membrane-type constant level chamber and is, therefore, called a floatleas carburetor.

Fuel fine filter 8D2.966.064 is intended to filter off mechanical impurities over 36 to 40 µm in size.

The filter is of a sump type.

FUEL PUMP 702ML - DESCRIPTION AND OPERATION

1. GENERAL

The 702ML fuel pump (referred to hereinafter as "pump" is intended, to supply fuel from the airplane fuel tanks through the filters to the engine carburetor.

The pump features a reducing chamber detachable housing accommodating two valves;a reducing valve and a priming valve. Repositioning of the reducing chamber through 180° relative to the pump housing ensures operation of the pump for RH or LH direction of rotation without changing the position of the pumping unit.

To connect to the' engine, the pump has a special flange and a square drive shank.

2. DESCRIPTION

2.1. Specifications

Pump drive	From engine
Pump rotor direction of rotation	LH
Pump speed of rotation:	
Maximum (permissible for 30 s)	3000 r/min
Minimum at which continuous jet is ensured.	200 r/min
Nominal	2200 r/min
Fuel line inlet and outlet diameter	At least 8 mm
Total delivery of pump (with reducing valve engaged) without backpressure at 2200 r/min and fuel suction height of 1 m	At least 400 1/h
Pump delivery at 2200 r/min,backpressure of o P = 0.1 kgf/cm in delivery line and fuel suction height of 1 m	At least 175 1/h
Pump delivery at 200 r/min,backpressure of P = 0.1 kgf/cm in delivery line anf fuel suction height of 1 m	At least 10 1/h
Maximum permissible pressure in delivery line	Up to 1 kgf/cm
Dry pump mass	Up to 580 g
Pump power consumption	Up to 0.5 hp

NOTES: ***1. In the course of operation seepage of oil to return line from the fuel pump drive should not exceed 5 droplets per hour.***

2. It is allowed to run the pump on foreign-made fuels (Ref. 072.00.00, Appendix 1).

2.2. CONSTRUCTION

The 702ML pump (Ref. Pig. 1) comprises a rotary vane-type pumping unit, reducing valve unit with priming valve and sealing parts.

The pumping unit comprises housing (33), rotor (20), four vanea (37), sleeve (19), floating pin (36), bearings (21) and (18).

Pumping unit vanes (37) are lodged in slots of rotor'(20) and rest with one side on floating pin (36) and with the other on the inner surface of sleeve (19). The rotor rests with ita journals on bearings (21) and (18).

The pumping unit is mounted in a cylindrical bore of housing (33). The pumping unit is fixed in position with pin (9).

Pump housing (33) has two flanges: one for attaching the pump to the engine and the other for securing to reducing chamber housing (7). The seal located in the cylindrical bore of housing (33) precludes ingress of fuel from the pumping unit space to the engine drive and oil from the drive space to the pumping unit of the pump.

To check leakage of fuel and oil through the seal, two holes with tapered thread are made in housing (33). The drain connection is screwed into one of the holes.

To connect to the engine, the flange of housing (33) has four bosses with holes and an aligning collar.

The reducing valve unit comprises reducing chamber housing (7), cover (26), reducing valve (6) parts, priming valve (23) with spring (22).

Reducing chamber housing (7) has two flanges: one with the aligning collar for coupling with pumping unit housing (33),the other for mating with reducing chamber cover (26).

To connect to housing (33) and cover (26), four holes, dia. 5.3 mm, and two threaded holes are made on reducing chamber housing (7).

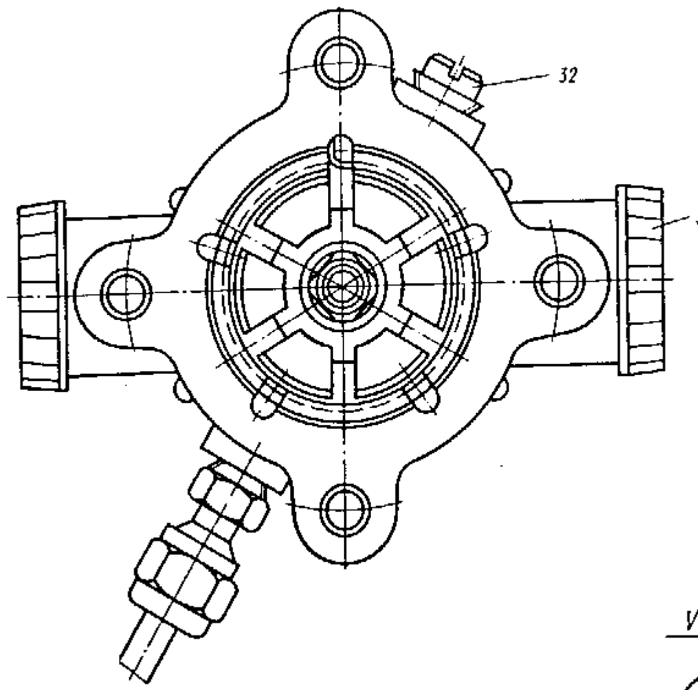
Two cast passages for inlet and outlet of gasoline are made in the inner space of the reducing chamber housing.

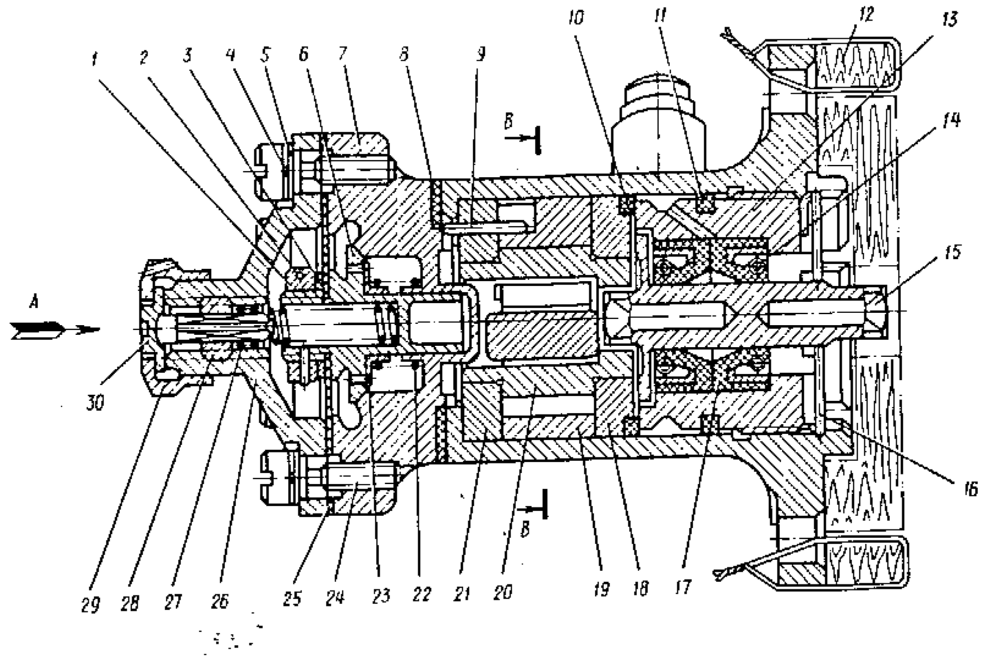
The housing accommodates reducing valve (6) assembly and priming valve (23) with spring (22).

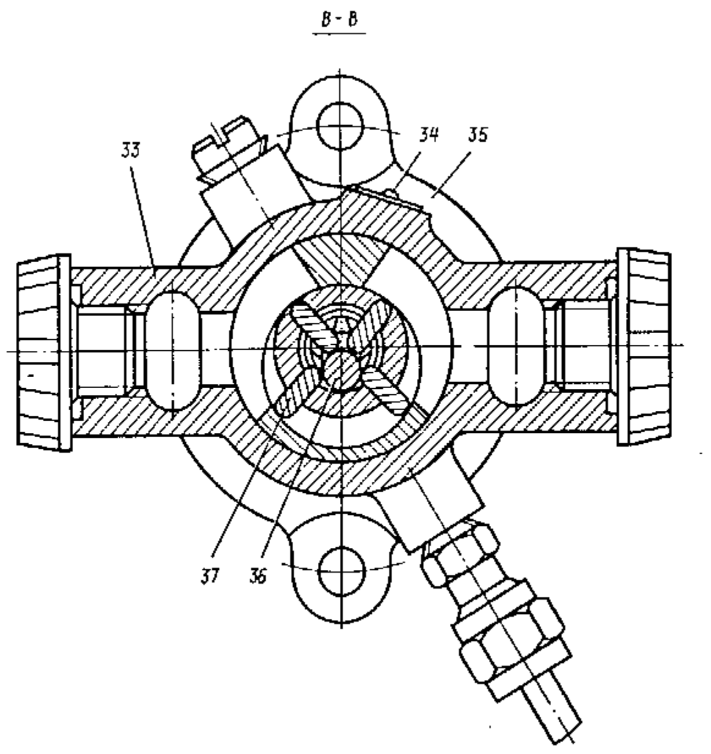
Reducing chamber cover (26) is attached to housing (7) and to housing (33) of the pump by six screws (24), (38) and (40).

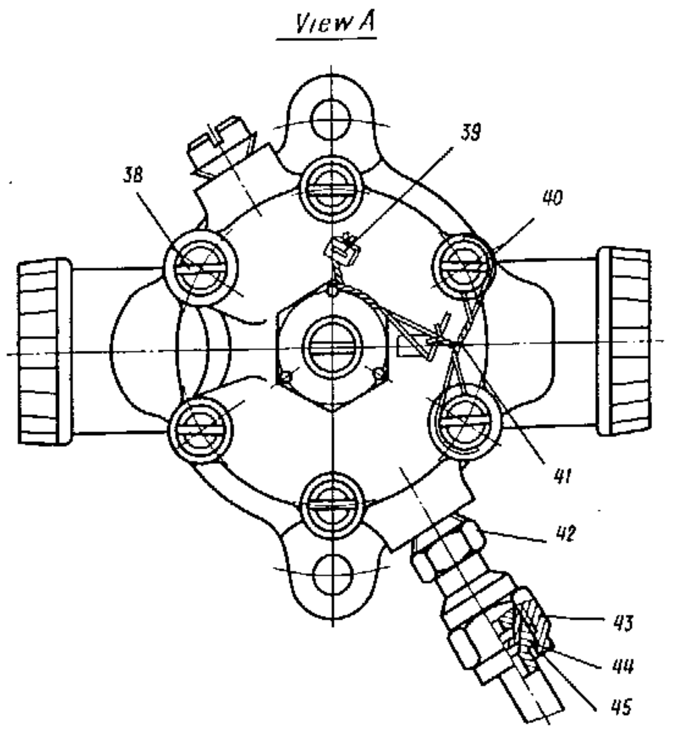
Cover (26) has a boss with external thread for cap (29) and internal thread for adjustment screw (28) and a boss with a hole for communicating with atmosphere.

Reducing valve assembly diaphragm (25) is installed between the mating surfaces of the cover and housing of the reducing chamber.









1.Reducing Valve Nut	16. Retaining Ring	31.Plug
2.Reducing Valve Nut Lock	17. Seal	32.Plug
3.Diaphragm Washer	18. Upper Bearing	33.Pump Housing
4.Spring Washer	19. Sleeve	34.Pin
5.Washer	20. Rotor	35.Nameplate
6.Reducing Valve	21. Lower Bearing	36.Floating Pin
7.Reducing Chamber Housing	22. Priming Valve Spring	37.Vane
8.Reducing Chamber Gasket	23. Priming Valve	38.Screw
9.Pin	24. Screw	39.Locking Seal
10.Sealing Ring	25. Reducing Valve Diaphragm	40.Screw
11.Ring	26. Reducing Chamber Cover	41.Locking Wire
12.Support	27. Reducing Chamber Spring	42.Connection
13.Seal Nut	28. Adjustment Screw	43.Hut
14.Seal Spring	29. Adjustment Screw Cap	44.Nipple
15.Rotor Shank	30. Adjustment Screw Head	45.Plug

The reducing valve assembly comprises valve (6) with diaphragm (25) and spring (27) secured on it by nut (1). Nut (1) is safetied with lock (2). One end of spring (27) thrusts against the valve stem seat and the other end,against the end of adjustment screw (28).

The conical part of reducing valve (6) rests on the seat in reducing chamber housing (7), while its cylindrical guide with two decompression flats enters a recess in the reducing chamber housing.

Gasoline pressure in the delivery space is adjusted by varying tension of spring (27) by adjustment screw and adjustment screw head (30).

When rotating the head clockwise, adjustment screw (28) screws into the boss of cover (26) and compresses spring (27). Fuel pressure rises. When the head is rotated counter-clockwise, the spring weakens and the fuel pressure decreases.

The reducing valve cylindrical guide carries priming valve (23) serving to fill the fuel line before starting the engine.

To prime the fuel line, gasoline is pumped through twelve drilled holes uniformly spaced around the mushroom-type head of reducing valve (6). The priming valve is pressed to the end face of the reducing valve mushroom-type head by spring (22), thus sealing off fuel supply.

The pump sealing arrangement comprises two rubber seals (17) with metal inserts, pressed in seal nut (13).

The seal inner lip embraces shank (15). To additionally press the seals to the shank, spring (14) is installed on the seal cone outer surface.

The outer surface of the pumping unit is sealed with rubber sealing ring (10) which is lodged in the recess of upper bearing (18).

Rubber ring (11) precludes leakage of oil along the thread of seal nut (13).

Seeping fluid is drained from the drain space via special passages in the seal nut which connect the drain space with drain connection (42).

The seal nut is safetied with retaining ring (16).

The joint between the pump housing and the reducing chamber housing is sealed by paronlte gasket (8).

3. OPERATION

The pumping unit operates on the principle of varying the volumes of the sleeve internal space during rotation of eccentric rotor (20) (Ref. Pig* 1) with vanes (37)«

The rotor with four vanes and floating pin (36) form a rotary mechanism which divides the chamber of sleeve (19) into two spaces - suction space A (Ref. Fig. 2) and delivery space B. As the rotor rotates, the volume of the suction and delivery spaces is continuously varying. The volume behind the vanes increases ensuring suction of g&soline from the tanks, while in front of the vanes it decreases and gasoline under pressure is supplied to the carburetor. During one revolution of the rotor the pumping unit takes four volumes of gasoline at fuel pump inlet and forces them out at the fuel pump outlet.

When gasoline flow rate decreases, pressure in the delivery space rises and gasoline pressure force acting upon the reducing valve lifts it compressing the spring. As a result some gasoline flows through the reducing valve to the suction space and its delivery automatically decreases.

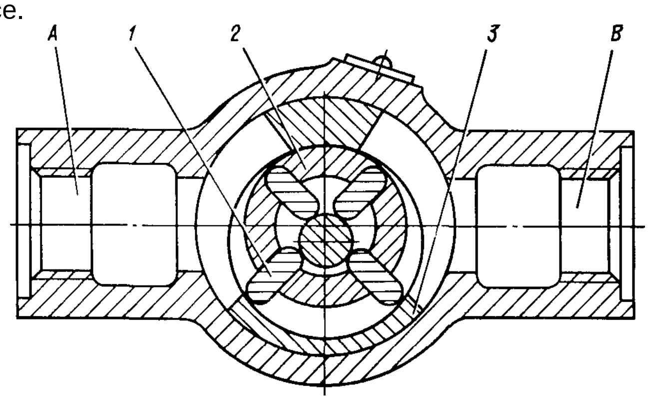
If gasoline is not consumed from the delivery space, all gasoline by-passes to the suction space, i.e. the pump circulates the gasoline In its housing.

The gasoline pressure in the delivery space is adjusted by changing compression of the reducing valve spring by driving in or out the adjustment screw.

Diaphragm (25) (Ref. Pig. 1) is intended for ensuring constant delivery pressure at inlet and atmospheric pressure variations. The space above the diaphragm communicates with atmosphere through a special vent.

When climbing and as fuel reserve decreases in the airplane tank, suction rarefaction rises. However, since pressure drops equally both above the reducing chamber diaphragm and in the pump suction line and in the air space of the carburetor diaphragm mechanism, the delivery pressure is maintained within required limits.

Since the priming system hand pump is installed upstream of the fuel pump, prior to starting the engine, the fuel fed by the priming pump fills the volume above the reducing valve through holes made in the reducing valve mushroom-type head, presses upon the priming valve, compresses its spring to open flow of fuel to the fuel system delivery space.



Pump Operation Diagram Figure 2

1. Vane
2. Rotor
3. Sleeve

FUEL PUMP 702ML - TROUBLE SHOOTING

For mostly often encountered troubles and their remedies, refer to the Table given below.

Trouble	Possible cause	Correction
1. Soon after starting engine, fuel pressure gradually drops to zero and engine stalls	Leaky joints in suction system (air suction)	Check suction line joints for leakage and eliminate suction of air (Ref. 072.00.00, Task Card No. 228)
2. Fuel pressure is normal at idle but drops drastically as rotation speed increases	Clogged fuel filter, clogged fuel line	Clean fine fuel filter (Ref. 072.00.00, Task Card No. 229), carburetor fuel filter (Ref. 072.00.00, Task Card No. 258), blow suction line (Ref. 072.00.00, Task Card No. 228)
3» Fuel pressure is normal but carburetor is short of fuel	Clogged fuel line between pump and carburetor, jammed carburetor needle	Blow delivery line (Ref. 072.00.00, Task Card No. 228), eliminate jamming of carburetor needle (Ref. 073.10.03, Task Card No. 203)
4. Low or zero fuel pressure but engine runs normally	Clogged or disconnected pipe between fuel line and pressure gauge, faulty pressure gauge	Inspect and eliminate pipe defects, replace pressure gauge according to airplane Maintenance Manual
5. Fuel pressure is unstable, pressure gauge pointer hunts	Jamming of reducing valve guide portion	Replace fuel pump (Ref. Task Card No. 201)
6. Low fuel pressure, insufficient pump delivery	Foreign particles in reducing valve, jammed priming valve	Replace fuel pump, inspect filters
7. Fuel flows to drain line. Oil return exceeds 5 droplets per hour	Loosened seal nut (13) (Ref. Fig. 1),worn seals (17), shrinkage of sealing rings (10) and (11)	Tighten seal nut, replace fuel pump

FUEL PUMP 702ML - MAINTENANCE PRACTICES

1. LIST OF TASK CARD

2.OPERATION PROCEDURE

TO M-14P MS.	**TASK CARD No. 201**		PAGE(S) 203
M.S. ITEM	procedure: Removal		

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Disconnect the fuel system pipelines. 2. tJndo four fuel pump attachment nuts and remove the pump from the engine. 3. Remove the sealing gasket. 4" Carefully wipe and inspect the drive flange bearing surface and pump drive shaft shank. Make sure they are free from nicks.	Dress nicks carefully if detected	

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Pliers, flat-noaed 150 Wrench 11x14 14-24-861 Wrench 27x30 7811-0041 Wrench 19x22 700880-7	Cloths Gasoline Wefras-S 50/170 or BR-1, BR-2

TO M-14P MS	**TASK CARD No. 202**	page(s) 205, 206 '
MS ITEM	procedure: Depreservation of New Fuel Pump	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CH ECKED BY**
1. Release the pump from packaging. 2. Wash off grease from the outer surface with clean gasoline, wipe with a cloth and blow with dry compressed air. 3. Remove shipping covers. NOTE; When depreserving in winter, it is necessary that the pump acquires indoors temperature. 4. To depreserve the interior spaces, immerse the pump into a bath with clean oil MS-20, heated to a temperature of 60 to 70 °C, keep it in oil for 20 to 30 min till heated fully. 5. Remove the pump from the bath and turning its rotor manually by the ahank, drain preservation grease from the inlet and outlet pipes and immediately immerse the pump into a bath with clean gasoline. 6. Wash the pump by turning shank 5 to 10 times in each direction. 7. Drain gasoline, rotating the shank. 8. Force clean gasoline through the vent into the sealing arrangement portion of the pump till jet of clean gasoline emerges from the opposite hole. 9. After washing blow the seal arrangement, internal and external surfaces of the pump with dry compressed air.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY

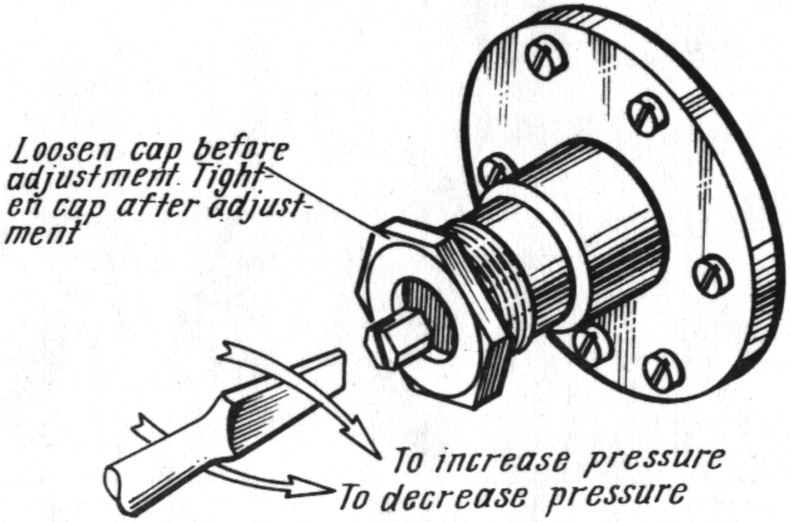
TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Syringe UB-24-05 Wrench 11x14 7811-0041 Bath, depreservation	Gasoline Hefras-S 50/170 or BR-1, BR-2 Mr, compressed Cloths Oil MS-20

TO M-14P MS.	TASK CARD No. 203	PAGE(S) 207
M.S. ITEM	procedure: Installation	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY
1. Install a sealing gasket between the pump flange and its mounting plane. 2. Arrange the fuel pump so that the shank freely enters its seat. 3. Place washers and uniformly tighten four pump attachment nuts. 4. Connect the fuel system pipelines ensuring tight joints. NOTES; 1. When installing, ensure tight and reliable joints. 2. The pump air space should communicate with atmosphere. The drain connection pipe should be brought outside the airplane cowling.		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Pliers, flat-nosed 150 Wrench 9x11 700002 Wrench 11x14 14-24-861 Wrench 27x30 7811-0041 Wrench 19x22 700880-7	Sealant "50" Wire, locking KO-0.8

TO M-14P M.S.	**TASK CARD No. 204**	page(s) 209, 210	
M.S. ITEM	procedure-. Adjustment and Test		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CH ECKED BY**
Start the engine and adjust fuel pressure, if required, using the following procedure: 1. Unlock and undo for four turns the cap of the fuel pump adjustment screw, holding the adjustment screw against turning with a screwdriver inserted into the screw slot (Ref. Fig. 201). o 2. Adjust fuel pressure to he from 0.2 to 0.5 kgf/cm at nominal rating; to increase pressure turn the adjustment screw clockwise, to decrease it, counterclockwise. One revolution of the adjustment screw changes fuel pressure for 0.06 to 0.12 kgf/cm . 3. While holding the adjustment screw, tighten its cap. 4. Check fuel pressure with the engine running. 5. The adjustment over, lock the adjustment screw cap.			

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
Adjusting Fuel Pressure by Fuel Pump Reducing Valve Figure 201  		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS	
	Wrench 27x30 7811-0041 Wrench 24x27 700880-8 Screwdriver 700346 A200x1 Pliers, flat-nosed 150	Wire, locking KO-0.8	

FILTER 8D2.966.064 - DESCRIPTION AND OPERATION

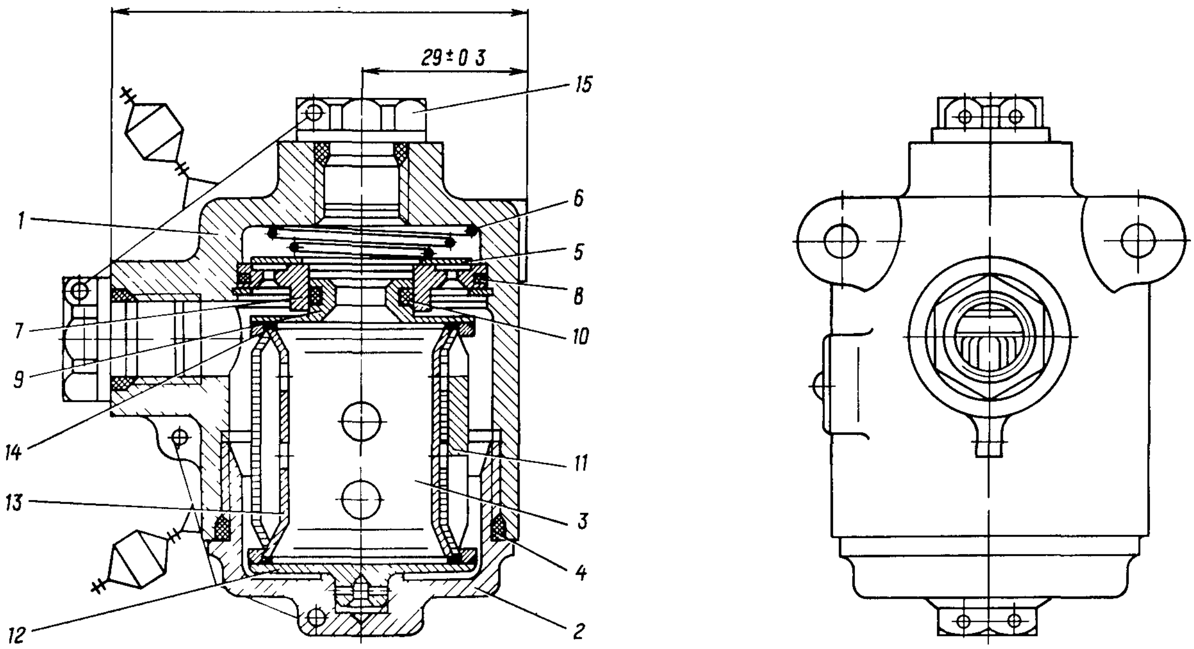
1. GENERAL

Filter 8D2.966.064 is intended to clean fuel of mechanical impurities in the airplane fuel system.
The filter operates on the principle of retaining mechanical particles contained in the fuel flow by means of a mesh partition.
The filter includes a filtering element and a by-pass valve. The filter is installed on the airplane. 2. DESCRIPTION
The filter (Ref. Fig. 1) comprises a housing with valve assembly, cover, filtering element.
The housing has inlet and outlet threaded holes for connecting the pipelines. Valve (5) arranged near the housing outlet hole is pressed by spring (6) to disk (7).
To preclude flow of fuel between the disk and the housing, sealing ring (8) is lodged in the disk groove.
Filtering element (3) installed with its flange in the disk hole comprises flange (9) • whose groove has sealing ring (10), body (11) and bottom (12).
Body (11) is a corrugated cylinder and two holders (14). The cylinder is manufactured of wire mesh housing rigid metal frame (13).
The corrugated cylinder and metal frame are welded at the end faces. Flange is welded to one end of the body and the bottom to the other end.
The cover has a hexagonal head for the wrench and is screwed into the housing.

2.2. SPECIFICATIONS

Filtration fineness:

Nominal	36µm
Absolute	40µm



1. Filter Housing
2. Cover
3. Filtering Element
4. Sealing Ring
5. Valve
6. Spring
7. Disk
8. Sealing Ring
9. Flange
10. Sealing Ring
11. Filtering Element Body
12. Bottom
13. Frame
14. Holder
15. Shipping Plug

Fuel Filter 8D2.966.064
Figure 1

Maximum throughput 5 1/min
Clean filter hydraulic resistance at maximum
throughput and ambient temperature and fuel
temperature of (25±10) °C .... Up to 0.03 kgf/cm^2
Filtering element pressure difference of by-pass
valve opening .... (0.1±0.02) kgf/cm
Operating pressure .... (0.35±0.15) kgf/cm
Mass .... Up to 0.5 kg
Working fluid .... Gasoline of grades SB-78, B-70, B91/115

Temperature range:
Working fluid .... From minus 50 to 60 °C
Ambient .... From minus 60 to 65 °C
Vibration loads within frequency band of up to 300 Hz:
Acceleration 10g
Amplitude .... 1 mm
Impact strength:
Acceleration 12g
Impact duration .... 20 to 50 m/s
Acceleration (linear loads) 4g

3. OPERATION

In the course of operation fuel gets to the inlet space of housing (1) (Ref. Fig. 1). On passing through the mesh of filtering element (3), fuel is cleaned of mechanical impurities, flows to the filtering element inner space and is fed to the engine through the filtering element outlet hole.

If the filtering element gets clogged and fuel pressure difference on it is (0.1±0.02) kgf/cm , the by-pass fuel opens and fuel passes through the holes in disk (7) from the housing space to the filter outlet hole by-passing the filtering element.

FILTER 8D2.966.064 - MAINTENANCE PRACTICES

1. LIST OF TASK CARDS

TO M-14P M.S.	**TASK CARD No. 201**	PAGE(S) 203
M.S ITEM	PROCEDURE: Removal	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CH ECKED BY**
1. Make sure there is no fuel pressure in the fuel system. 2. Drain fuel from the system. 3. Unlock the filter-to-airplane attachment. 4. Disconnect the pipelines from the filter. 5. Undo two nuts which secure the filter to the airplane.		

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Pliers, flat-nosed 150 Wrench 17x19 UB-24-07 Wrench 19x22 700880-8 Wrench 24x27 700880-7	

TO M-14P M.S.	**T A S K C A R D No. 202**	PAQE(S) 205	
M.S. ITEM	PROCEDURE: Depreservation of New Filter		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Remove the filter from the shipping container, make sure locking is intact and Supplier's seals are not missing; check absence of mechanical defects. 2. Remove locking and drive out shipping covers. 3. Perform internal depreservation by multiple filling batches of gasoline Mefras-S 50/170 or BR-1, BR-2 and draining them from the filter interior till preservation grease is fully removed. 4. Pill the depreserved filter fully with working fluid and then drain it. 5. Depreserve spare filtering elements by rinsing them in a bath with gasoline Nefras-3 50/170 or BR-1, BR-2.			

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Pliers, flat-nosed 150 Bath, depreservation	Gasoline Nefras-S 50/170 or BR-1, BR-2

TO M-14P MS	TASK CARD No. 203		PAGE (S) 207
M S ITEM	PROCEDURE Installation		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
1. Install the filter on the airplane vertically with the cover down and tighten the nuts. **CAUTION:** PRECLUDE SOILING OF FILTER AND PIPELINE INTERIOR. 2. Connect the fuel system pipelines to the inlet and outlet holes of the filter so that gasoline enters and goes out according to the arrows applied to the filter housing. 3. Tighten the fasteners. 4. Fill the fuel Jystem with gasoline and build up operating pressure in it. 5. Inspect the filter-to-pipeline joints, make sure there is no leakage of gasoline or sweating of the joints. Check tightness by absence of stains on filtering paper. **T.R.** Fuel leakage is not allowed.	Eliminate leakage and sweating by tightening attachment nuts and pipeline connections	

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Pliers, flat-nosed 150 Wrench 24x27 700800-7 Wrench 27x30 7811-0041	Wire, locking KO-0.8 Cloths Paper, filtering

CARBURETOR AK-14P - DESCRIPTION AND OPERATION

1. GENERAL

The AK-14P carburetor is intended to be mounted on a four-stroke radial nine-cy-linder air-cooled engine, type M-14P.

The carburetor is of a floatleas, single-barrel type. To ensure engine pickup, the carburetor features mechanical and air acceleration pumps; an altitude control is provided to adjust mixture quality in climbing.

The carburetor has no heating devices.

Air delivered to the cylinders is heated in a special heater arranged upstream of the carburetor.

The carburetor functional diagram is given in Pig. 1.

2. DESCRIPTION

2.1. SPECIFICATIONS

Type	Diaphragm, floatless
Operating position	Arbitrary
Mixing barrel diameter	70 mm
Venturi diameter	64 mm
Throttle idle setting angle (from completely open position)	11°
Carburetor inlet fuel pressure:	
At main ratings	(0.35±0.15) kgf/cm2
At idle	Not less than 0.15 kgf/cm2
Suction jet diameter	1.3 to 2.0 mm
Idle air jet diameter	2.2 mm
Inlet air jet diameter	2.5 mm
Acceleration pump fuel jet diameter	0.9 to 1.4 mm
Fuel jet diameter	3.2 to 3.3 mm
Mass (less fuel, oil and shipping fixtures)	Up to 5 kg
Operating temperatures:	
Carburetor inlet air	From 10 to 45 °C
Ambient	From minus 50 to+45 °C
Carburetor inlet fuel	From minus 50 to+45 °C
Working fluid	Gasoline B91/115

2.2. CONSTRUCTION

The AK-14P carburetor comprises the following main units:
Carburetor body.
Pressure regulator.
Link mechanism.
Throttle mechanism.
Metering system.
Mechanical acceleration pump.
Idle needle.
Fuel line.
Altitude control.
Air manifold.
Air acceleration pump.

2.2.1. Carburetor Body

The carburetor body is a magnesium alloy casting with a system of fuel and air passages (Ref, Fig. 2).

Located at the left side of the body (on the emblem side) is a pressure regulator fuel chamber; the link mechanism chamber, idle needle space and fuel valve apace are at the right side.

The link chamber and the air filter space are located at the front. Arranged in the rear part of the body are the space of the mechanical acceleration pump, fuel filter space and fuel inlet boss.

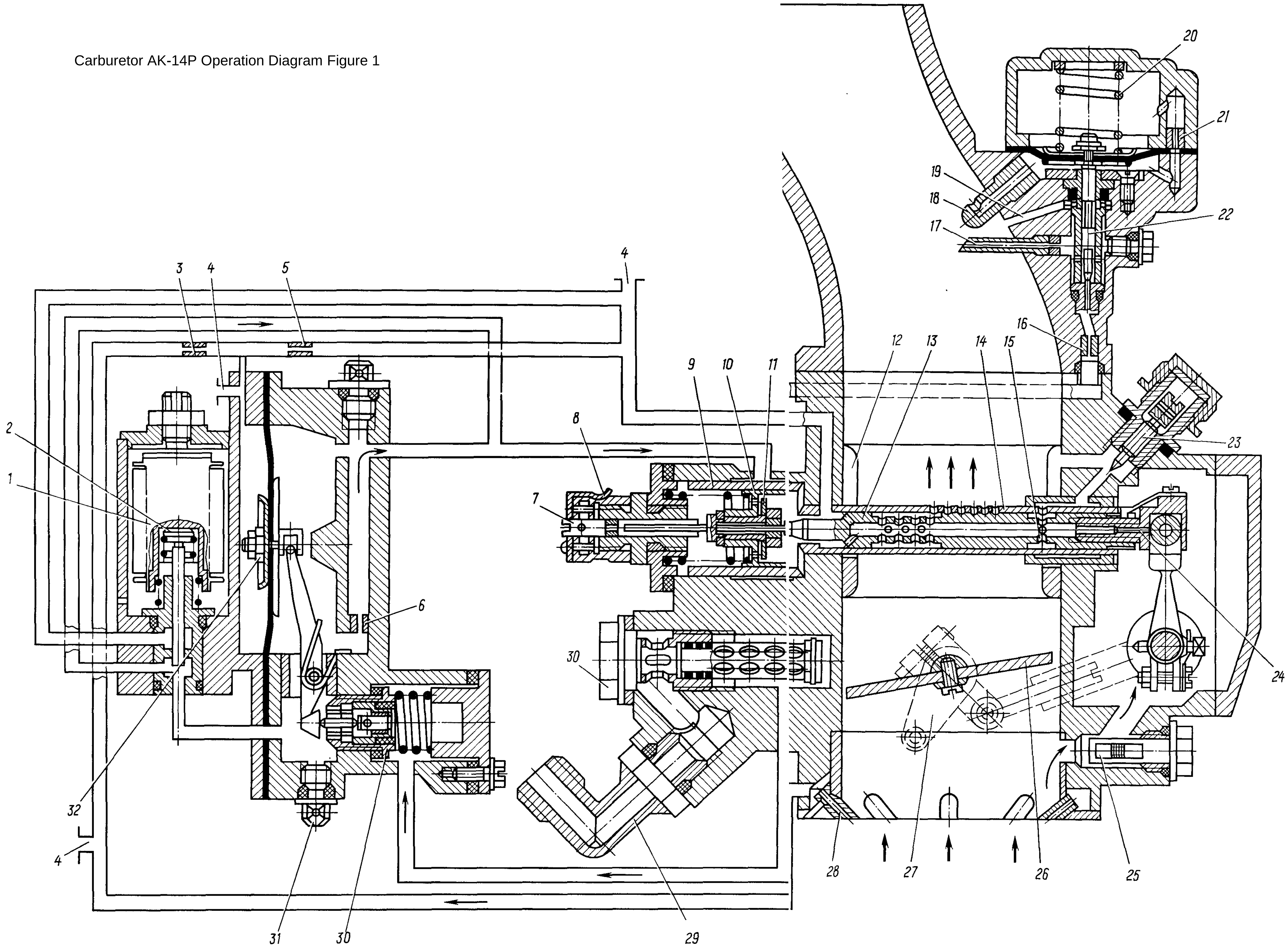
The spaces and chambers are externally defined by flanges with holes for attachment screws of the appropriate covers.

The carburetor barrel is bored at the middle part of the body throughout its height. The barrel is made as a hollow cylinder.

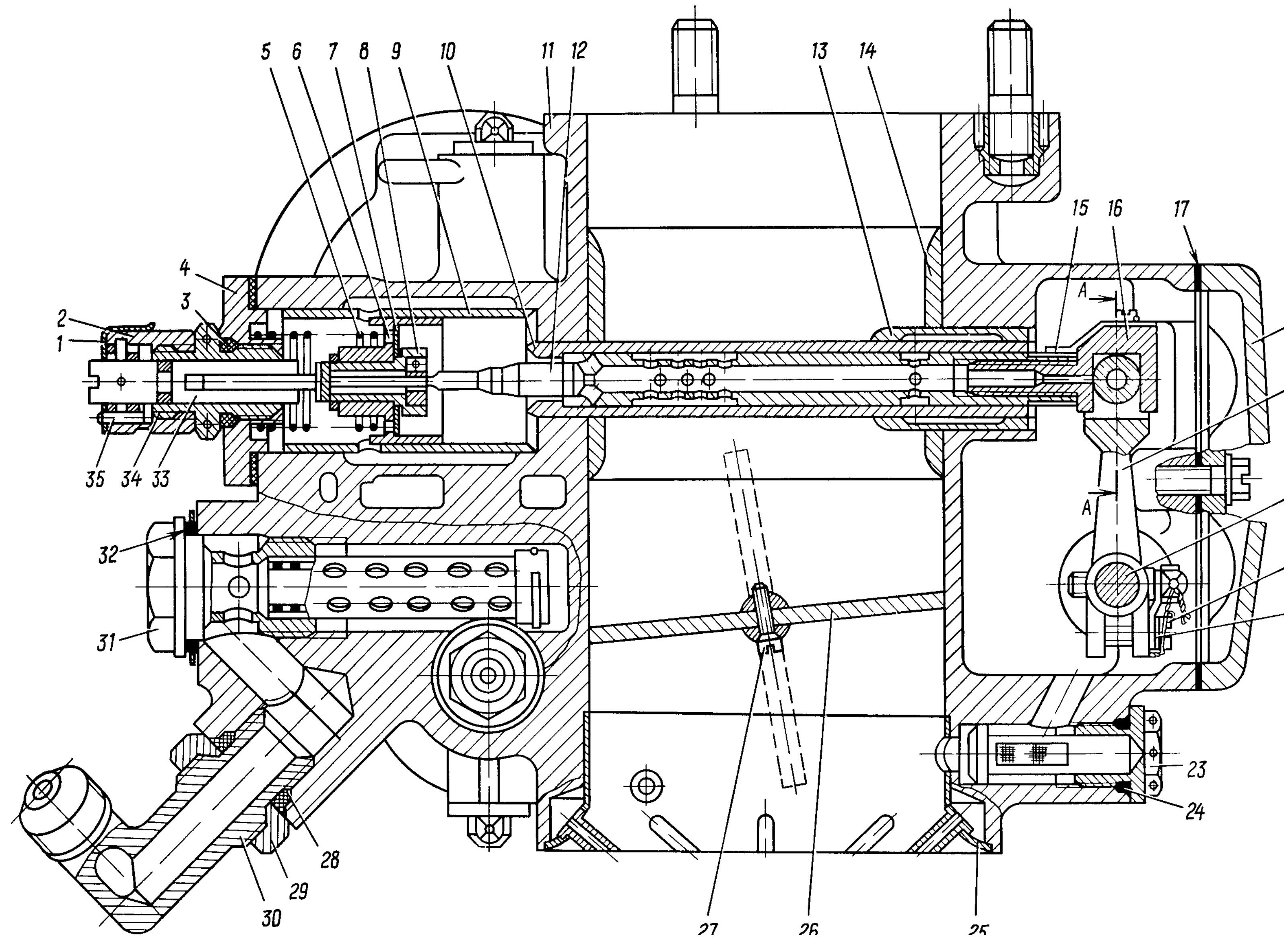
The body top and bottom is defined by flanges. Attached to the upper flange by four studs is the carburetor adapter; a protective strainer is secured to the lower flange.

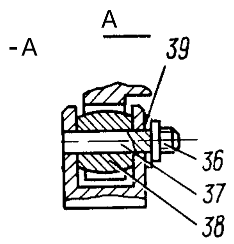
Brass bushings are screwed into the threaded holes of four bosses on both flanges. To preclude turning, each bushing is locked by two brass cylindrical pins.

Carburetor AK-14P Operation Diagram Figure 1



1. Altitude Control Aneroid Capsule
2. Altitude Control Needle
3. Inlet Air Jet
4. Air Pressure Measuring Point
5. Suction Jet
6. Fuel Jet
7. Metering Needle Adjustment Screw
8. Adjustment Screw Limiter
9. Spring
10. Piston
11. Valve
12. Venturi
13. Metering Needle
14. Nozzle
15. Orifice in Idle Passage
16. Fuel Jet
17. Acceleration Pump Pipe
18. Air Intake Pipe
19. Drain Passage
20. Spring
21. Air Jet
22. Acceleration Pump Needle Valve with Diaphragm
23. Idle Adjustment Screw
24. Idle Air Jet
25. Air Filter
26. Throttle
27. Throttle Actuation Lever
28. Ram Pressure Pipe
29. Fuel Inlet Connection
30. Fuel Valve
31. Drain Plug
32. Diaphragm Assembly





1. Thrust Pin Holder
2. Nut
3. Sealing Ring
4. Pump Cover
5. Spring
6. Piston
7. Valve
8. Coupling
9. Valve
10. Nozzle
11. Carburetor Body
12. Metering Needle
13. Sleeve
14. Venturi
15. Spring
16. Trunnion
17. Gasket
18. Lever Chamber Cover
19. Metering Needle Lever
20. Metering Needle Link Shaft
21. Setting Pin
22. Lock
23. Air Filter
24. Sealing Ring
25. Air Manifold
26. Throttle
27. Throttle Attachment Screw
28. Sealing Ring
29. Nut
30. Fuel Inlet Connection
31. Fuel Filter
32. Sealing Ring
33. Adjustment Shaft
34. Connection
35. Thrust Pin
36. Cotter Pin

Carburetor
AK-14.P Figure 2

Driven with pitch diameter interference into the bushing threaded holes of the upper flange are attachment studs.

The lower flange has two threaded holes for the air manifold attachment screws.

Other features of the body are outlined when describing the base units and parts of the carburetor.

2.2.2. Pressure Regulator

The pressure regulator comprises diaphragm assembly (1) (Ref. Fig. 3)» fuel valve (11) assembly and fuel valve lever (10) with lever support (8).

When assembling the carburetor, the fuel diaphragm assembly is clamped between the carburetor body and pressure regulator cover.

Fuel valve lever (10) adapted to couple the diaphragm with the fuel valve rotates freely on pivot (9) inserted into the hole of support (8).

The valve lever ball head enters a slot in the membrane trunnion, while the lever other end presses the fuel valve rod.

Pitted to pivot (9) of the lever is spring (7) acting upon the lever to close the fuel valve.

The left end of the rod of fuel valve (11) presses the ball to the edges of the hole in the valve seat pressed in the guide mounted in the valve body together with a rubber sealing ring and a washer and safetied with a lock.

Fuel valve (11) is screwed into a threaded hole located at the right lower side of the carburetor body and is closed with cover (17).

To seal and adjust the position of valve lever (10), fiber shims (12) of various thickness are placed under the support end face of valve (11) body.

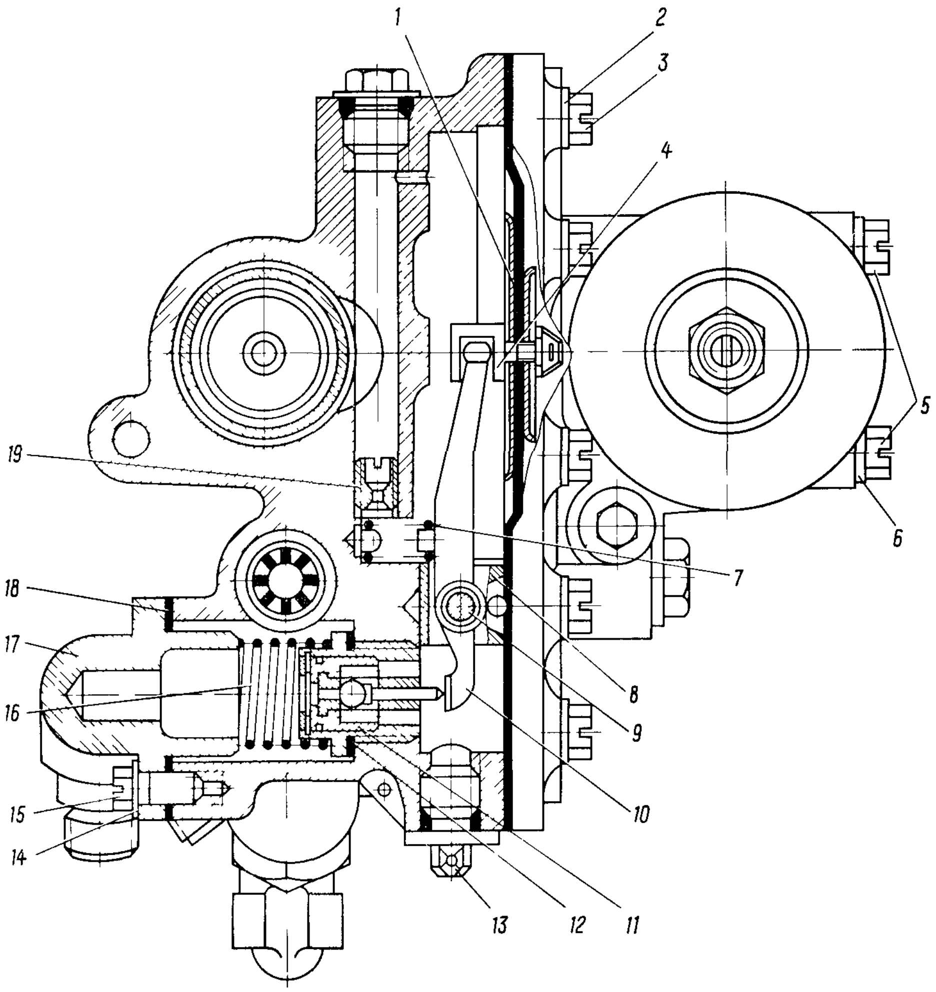
The valve rod freely moves in the central hole of the valve body.

Six longitudinal holes are drilled in the valve body and in the guide to pass fuel to the carburetor when the valve is open.

Fuel valve space cover (17) is cast of magnesium alloy. The cover guide end compresses locking spring (16) which in its turn presses the fuel valve body to preclude its unscrewing in operation.

Cover (17) is attached to the carburetor body by three screws (15)» steel washers (14) are placed under the screw heads,

To seal the cover joint with the'carburetor body, use is made of paronite gasket (18).



1.Diaphragm Assembly
2.Washer
3.Cover Attachment Screw
4.Diaphragm Trunnion
5.Elongated Cover Attachment Screws
6.Copper Sealing Ring
7.Lever Spring
8.Lever Support
9.Lever Pivot
10.Lever
11.Fuel Valve
12. Adjustment Shim
13.Lower Drain Plug
14.Washer
15.Fuel Valve Cover Attachment Screw
16.Spring
17.Fuel Valve Cover
18.Gasket
19.Fuel Jet

Diaphragm Assembly and Fuel Valve Figure 3

Connec-tion (7) (Ref. Fig. 5) is screwed, into the threaded hole of the loss on the outside of the fuel valve cover.

'Support (8) (Ref. Fig. 3) of the fuel valve lever is inserted into a special seat in the carburetor body and is so fitted to it that the support plane is aligned with the body flange or is depressed from it for up to 0.2 mm. Projection of the support over the flange plane precludes adjoining of the diaphragm to the body and makes a leaky joint.

The fuel valve lever support is drilled after fitting in the joint with the body and a locking ball is pressed into the hole.

2.2.3. Link Mechanism

The link mechanism is used to couple metering needle (12) (Ref. Fig. 2) with throttle shaft (14) (Ref. Pig. 4) and comprises a link, a link lever and a metering needle lever.

Pressed into a milled groove in the end of link shaft (11) is Woodruff key (26) which enters the link hole slot at assembly. Such a connection precludes turning of the link on the shaft. The link is finally secured on the shaft by tightening the link clamp with screw (27). Steel washer (28) is placed under the coupling screw head.

To preclude unscrewing of the screw and loosening of the link-to-shaft joint in operation, the screw is safetied to the shaft with wire.

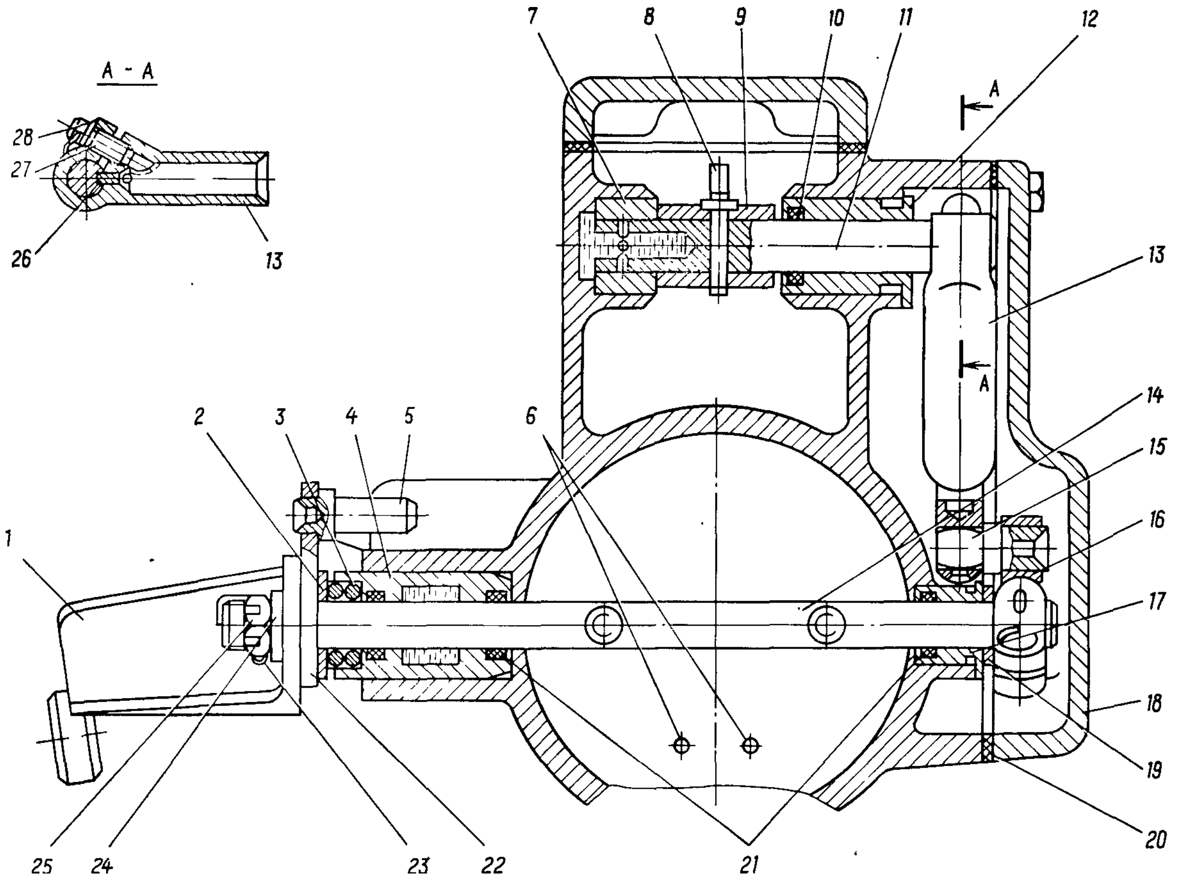
Then the link assembly is inserted with the shaft free end from the link chamber si'de into the boas holes and simultaneously into the hole of the lever of metering needle (12) (Ref. Pig. 2).

Link shaft (11) (Ref, Fig. 4) freely rotates in two bronze bushings (7) and (12) pressed into the carburetor body bosses. Rubber sealing ring (10) is installed in the recess of bushing (12).

The link lever assembly comprising lever (16) and pin (15) pressed into it is secured on the end of throttle shaft (14) extending into the link chamber by coupling screw (6) (Ref. Fig, 5). The lever pin enters the hole of slide (3) inserted into link (13) (Ref. Fig. 4).

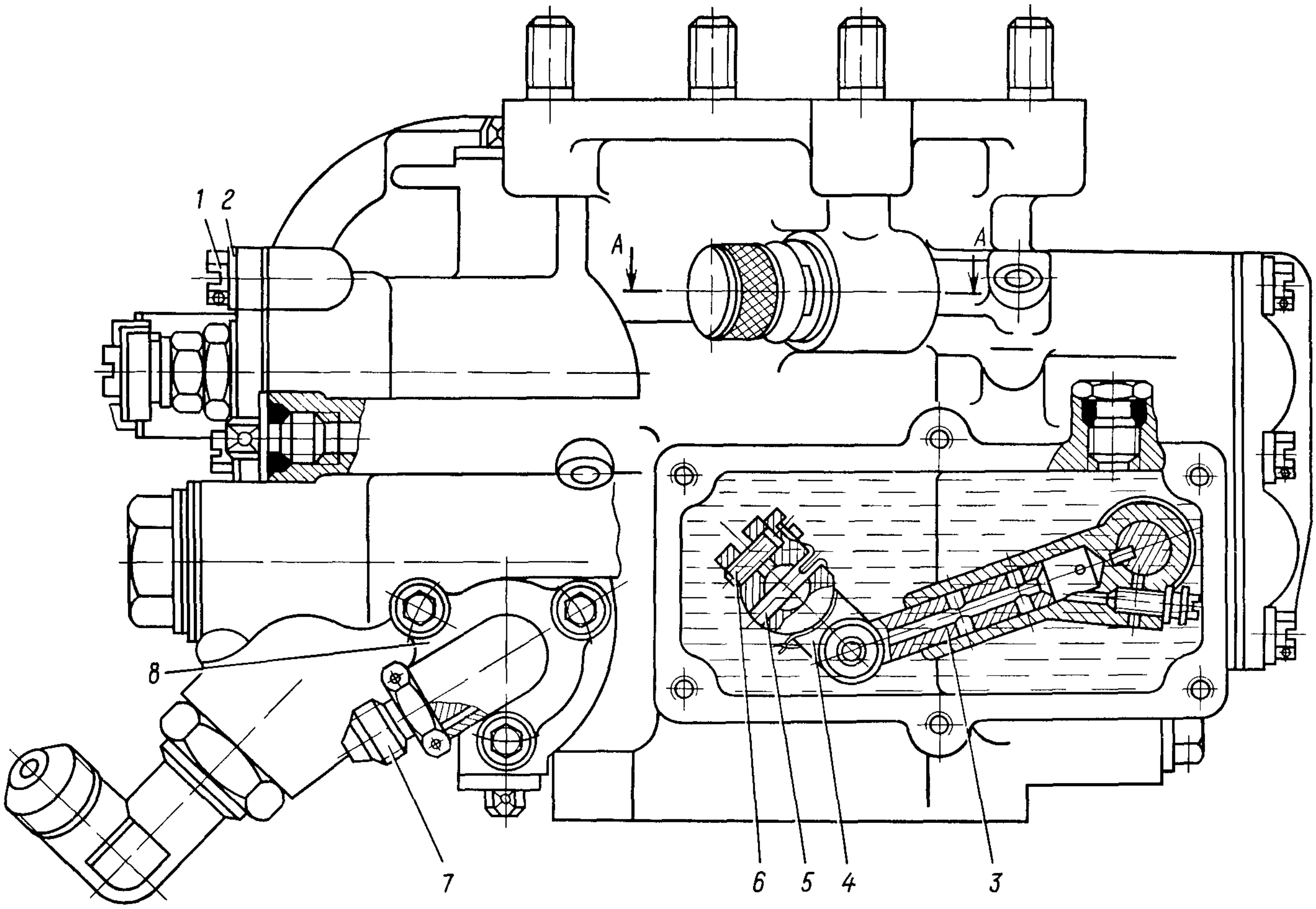
The link chamber is filled with oil MK-8 through a hole in the body. A plug with a rubber sealing ring is screwed into the hole. The oil getting through the holes in the link and slide lubricates friction surfaces.

After installing metering needle (12) (Ref. Pig. 2) to the initial position and checking its travel versus angle of turn of the throttle, link lever (16) (Ref. Pig. 4) is finally tightened by screw (6) (Ref. Pig. 5) and is secured on the throttle shaft by tapered cotter pin (5). At the same time the metering needle lever and the shaft are drilled to receive setting pin (8) (Ref. Fig. 4).



1. Carrier
2. Adjustment Washer
3. Clearance Take-Up Spring
4. Bushing
5. Pin
6. Holes, Dia. 2 mm
7. Bushing
8. Setting Pin
9. Metering Needle Lever
10. Sealing Ring
11. Link Shaft
12. Bushing
13. Link
14. Throttle Shaft
15. Link Lever Pin
16. Link Lever
17. Bushing
18. Link Chamber Cover
19. Washer
20. Gasket
21. Sealing Ring
22. Thrust Lever
23. Cotter Pin
24. Washer
25. Nut
26. Woodruff Key
27. Screw
28. Washer

Throttle Assembly Figure 4



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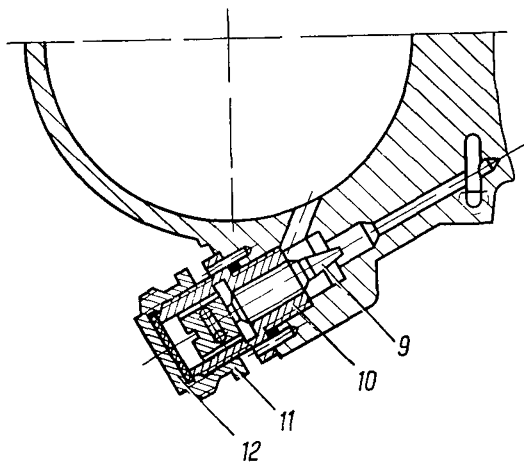


1. Screw
2. Washer
3. Slide
4. Link Lever
5. Tapered Cotter Pin
6. Screw
7. Fuel Pressure Measuring Connection
8. Fuel Valve Cover
9. Idle Needle
10. Coupling
11. Cap
12. Gasket

Link Mechanism and Idle Needle Figure 5

Setting pin (8) is inserted into the hole and. safetied against dropping out with lock (22) (Ref. Pig. 2) which is secured to the metering needle lever by two screws. The same screws are used to rigidly secure metering needle (12) lever to link shaft (20).

The upper part of the lever of metering needle (12) is a rectangular slot whose walls have one through hole each. Barrel-like roller (38) freely rotating on axle (37) is inserted inside the slot between the walls. Washer (39) safetied with cotter pin (36) is fitted to the axle end protruding from the lever.

Thus longitudinal play of the axle in the lever is limited on one side with the axle collar and on the other,with the washer. When installing the lever in the carburetor, roller (38) enters the slot in metering needle trunnion (16) thus coupling the needle kinematically with the carburetor link mechanism.

The carburetor link chamber is closed with cover (18) (Ref. Fig. 4) which is secured to the body by six screws. Steel washers are placed under screw heads.

The joint of the link chamber cover is sealed with paronite gasket (20). 2.2.4. Throttle Mechanism

The carburetor throttle chamber accommodates throttle (26) (Ref. Pig. 2) having two holes, dia. 2 mm, drilled near the edge and intended to improve atomization of fuel at idle rating.

Throttle (26) is tightly fitted to the carburetor barrel diameter and fully closes or opens the chamber at turning.

In assembly the throttle is inserted into the slot of shaft (14) (Ref. Fig. 4) and is secured to it by two screws (27) (Ref. Fig. 2).

Two longitudinal grooves are milled on the throttle plane to pass brass locking wire for safetying the throttle-to-shaft attachment screws.

Throttle shaft (14) (Ref. Fig. 4) rotates in two bronze bushings (17) and (4) pressed

in the body.

One rubber sealing ring is installed in bushing (17) and two rubber sealing rings

(21) are installed in bushing (4). The recess between the rings is packed with grease TsIATIM-201.

Pitted to the shaft at the link chamber side are washer (19) and link lever (16);

clearance take-up spring (3), adjustment washer (2), throttle thrust lever assembly are installed at the other side. The throttle thrust lever assembly comprises lever

(22) and pin (5) pressed and then flared in it. Arranged at the throttle thrust lever assembly side of the shaft are also throttle carrier (1) and a thrust washer assembly comprising washer (24) and a setting pin riveted in it.

The thrust lever is precluded, against turning "by flats provided on throttle shaft (14).

Thrust lever (22) and carrier (1) have holes of equal diameter uniformly spaced around the periphery; the carrier is provided with eight holes, and the thrust lever, nine holes.

When mounting thrust washer (24) on the throttle shaft, the setting pin enters the aligned holes of carrier (1) and thrust lever integrating them into one assembly.

Such a construction of the throttle control unit allows repositioning of the carrier to an angle of 5°.

After installation the throttle control unit is secured on the shaft by crown nut (25) locked with a cotter pin after tightening.

When installing the thrust lever on the idle stop, the lever bears with its pin (5) against the end of a thrust screw driven into the carburetor body boss and locked with a lock nut.

When the throttle is fully open, pin (5) of the lever bears against the boss on the body.

2.2.5. Metering System

The metering system comprises a nozzle assembly, a metering needle assembly and a venturi. The nozzle assembly is pressed into the carburetor body at the lever chamber side and includes nozzle (10) (Ref. Fig. 2) and sleeve (13) pressed onto its one end. The other end of the nozzle has a calibrated orifice which receives the shaped end of the metering needle assembly. The middle portion of the nozzle has holes serving to release fuel-air mixture. These holes are so arranged as to smoothly increase the area when being open by the shut-off edge of the metering needle. Provided inside sleeve (13) is a recess communicating six radial holes of the nozzle with one large hole in the sleeve. The fuel-air mixture passes through these holes and recess into the mixing chamber when the carburetor is idling. The second hole in the sleeve is provided to allow the use of the sleeve on other units.

To align the hole in the sleeve with the corresponding hole in the carburetor body, as well as to ensure required position of the holes in the mixing chamber relative to the air stream, the sleeve is pressed onto the nozzle and the nozzle assembly is pressed into the body in a strictly definite position.

To achieve this, milled splines offset from the part center are provided on the end faces of the nozzle and sleeve. Alignment of the nozzle spline with the sleeve spline indicates correct assembly of this unit.

When pressing the nozzle assembly into the carburetor body the splines should be directed along the lever chamber and be displaced towards the link chamber.

The nozzle interior serves as guide for metering needle (12).

The metering needle haa a shaped portion intended to meter fuel. At the end of the needle the shaped portion transforms into a flat shank whereby the needle is turned to adjust fuel consumption. Twelve longitudinal splines are milled on the outer cylindrical surface of the needle other end,

Drilled at the shaped portion base are four inclined holes to supply metered fuel to the inner space of the needle. The outer diameter surface of the metering needle has a wide recess with fourteen holes to supply fuel and air to the nozzle holes. Closer to the splined end on the outside of the needle there is a groove with four drilled holes to supply fuel and air to idle holes in the nozzle. The splined end face of the needle has a threaded hole for attachment of trunnion (16). The trunnion has a calibrated hole, dia. 2.2 mm, serving as an air jet and connecting the inner space of the metering needle with the lever chamber. Plate U-shaped locking spring (15) is secured on top of the trunnion by two screws. The middle of the bridge of this spring has a locating lug entering a recess of the spline on the metering needle and being pressed to it by the spring force.

Such a construction positively fixes the metering needle against inadvertent turning

that might offset fuel consumption during operation of the engine.

When turning the needle, the locating lug of the spring moves to the adjacent recess of the needle splined portion and a distinct click is heard. The number of clicks may be counted to estimate the longitudinal displacement of the metering needle.

One click corresponds to a needle movement of 0.08 mm.

Such a construction allows displacement of the needle on the assembled carburetor irrespective of the throttle position. This is needed to change the initial position of the metering needle when adjusting carburetor fuel consumption.

The metering needle is connected by the link mechanism with throttle shaft (14) (Ref. Pig. 4). Therefore, when the throttle shaft is turned, the link mechanism turns lever (19) (Ref. Pig. 2) of metering needle (12) which moves the latter. Thus, the needle is moved in the nozzle at change of engine ratings.

After installing the metering needle assembly in the carburetor, cover (18) is at'-tached to the lever chamber flange by six bolts. Steel washers are placed under the bolt heads. The joint between the cover and the body of the carburetor is sealed with

paronite gasket (17).

Air is fed to the air jet from the lever chamber where it gets from the throttle chamber via air filter (23) driven into the threaded hole of the boss provided at the lower part of the carburetor body under the lever chamber.

The air filter is constructed as follows: a mesh is inserted into a frame made from a sheet brass and rolled into a tube; the frame tube is brazed at the joint and is inserted with one end into the plug hole and is brazed to its threaded end. A ring is brazed to the other end of the frame. The filter assembly is sealed in the housing with a rubber sealing ring.

Venturi (14) is inserted into the carburetor barrel from the lower flange side. The nozzle with sleeve are accommodated in the venturi slot.

2.2.6. Mechanical Acceleration Pump

Piston (6) of the mechanical acceleration pump reciprocates Inside a steel cylinder of valve (9) (Ref. Pig. 2) pressed in the carburetor body. A wide cylindrical bore in the body near the cylinder communicates with the fuel chamber of the pressure regulator by a passage drilled in a special boss. Thus, fuel fed from the fuel chamber of the pressure regulator fills the annular space between the cylinder and the bore wall in the body and gets inside the cylinder through radial holes drilled in it.

Piston (6) of the mechanical acceleration pump, turned as a hollow thin-walled cylinder, has an internal partition with four fuel holes iniformly spaced around the circumference. A boss with internal through hole is provided at the center at one side of the partition. The other side of the partition has a lapped surface.

Two shallow dirt traps are turned on the outer surface of the piston.

Valve (7) being a flat duralumin washer is fitted, with its hole on the cylindrical band at the middle part of coupling (8). This cylindrical band serves as a valve guide.

Coupling (8) is installed with a small radial clearance in the central through hole of piston (6) to thrust against the middle bend end.

The coupling is locked against longitudinal play with a lock crimped in the groove on the coupling end protruding from the piston. Mechanical acceleration pump flat valve (7) moves longitudinally within the guide band length. In the leftmost position it is tightly pressed by fuel pressure to the lapped surface of the piston partition to shut off fuel holes; on the other hand when being moved rightward to thrust against the end of the head on the right end of the coupling, it opens the holes and forms a gap for free passage of fuel.

The coupling flat shank is intended for mating with the slot of adjustment shaft (33). Pressed in the internal cylindrical bore in the coupling head is a bushing with a central through rectangular hole for passing the flat shank of the metering needle. The bushing is fixed in the coupling by a round pin pressed in the holes of the coupling and bushing. Spring (5) constantly presses the mechanical acceleration pump piston assembly to the end face of the metering needle flat shank. Thus, any longitudinal displacement of the needle causes the same displacement of the pump piston. The same spring takes up clearance between metering needle trunnion (16) and lever barrel-like roller (38). The left end of the spring bears against cover (4) of the mechanical acceleration pump. The cover is attached to the carburetor body by three screws; steel washers are placed under "the screw heads. The joint between the cover and the body is sealed with a paronite gasket.

A through threaded hole made at the center of cover (4) receives connection (34). The joint between the connection and the cover is sealed with a rubber sealing ring.

Adjustment shaft (33) is inserted in connection (34) through the internal through hole. The shaft has a slot to receive the flat shank of coupling (8), protruding from the piston assembly of the mechanical acceleration pump. Union nut (2) connected with shaft (33) by a thrust pin is screwed onto the second threaded end of the connection to bear against the hexagon. The thrust pin is pressed to stop in the hole made in the side surface of the adjustment shaft. Pressing is carried out through one of four radial holes drilled on the cylindrical band of union nut (2).

The thrust pin end protruding from the shaft is accommodated in a groove inside the nut so that the shaft is free to rotate in the nut and connection. Longitudinal travel of the shaft is limited by the width of the nut internal bore.

The gap between 'the shaft and connection is sealed by a rubber ring lodged in the shaft groove.

A slot for a screwdriver is milled on the adjustment shaft end protruding from the union nut hole. In adjustment, the metering needle is turned and moved by a screwdriver inserted into the adjustment shaft slot owing to interconnection of shaft (33)» coupling (8) and the metering needle.

To limit the shaft turn during adjustment of the carburetor, a special device, stop with holder,is mounted on the outer face of the union nut. This assembly comprises two parts: thrust pin (35) and pin holder (1) made of spring steel in the form of flat round washer with two tabs arranged in diametrically opposite directions. The hole of the holder short tab receives thrust pin (35) whose end is riveted on the tab. The holder longer tab is hooked and has a locking hole at the end. The free end of the thrust pin is inserted into one of six holes uniformly spaced around the outer face of union nut (2), while the holder is fitted with its central hole onto the splined end of the adjustment shaft. Its bent end tightly embraces (owing to springi-ness of the material) the side surface of the union nut thus retaining the assembly on the carburetor.

The adjustment shaft turn is limited by pin (35) bearing against the thrust pin. Thus, the range of adjustment shaft turn is less than one revolution for the pin diameter.

To ensure similar adjustment range of the metering needle in both directions, i.e. towards increasing and decreasing fuel consumption, the stop with holder is set by the Supplier in such a position which allows the shaft to turn through about the same angle in both sides.

For more reliable attachment and to preclude exceeding of the permissible adjustment range of the metering needle in service, the stop with holder is locked with wire passed through the hole at the holder end and in the attachment bolts of the mechanical acceleration pump cover. The wire is sealed with the Supplier's seal.

2.2.7. Idle Needle

A threaded hole in a special boss above the link chamber receives idle adjustment needle coupling sealed at the end with a lead gasket. The coupling is fixed in the boss against turning with two brass round pins. Made inside the coupling at the side of its portion screwed into the body is a threaded hole to receive the idle needle assembly; twelve longitudinal slots spaced uniformly around the circumference are made closer to the outer end. Idle needle assembly comprising needle (9) (Ref. Pig. 5) with a tapered end, two retaining balls with a spring in-between is screwed into the coupling so that the tapered end of the needle enters the passage drilled in the carburetor body.

The retaining balls forced outside by the spring enter diametrically opposite slots of the coupling to fix the needle in the required position.

When the needle is rotated by a screwdriver inserted in the slot on the needle head, clicks are heard; the number of clicks allows to estimate the needle longitudinal travel.

Screwed on to the outer end of the coupling is cap (11). Flexible textolite sealing gasket (12) is arranged inside the cap to seal the coupling end face. To connect the idle passage with the nozzle hole, a hole is drilled in the boss cast on the lever chamber wall and closed with a production plug on the outside.

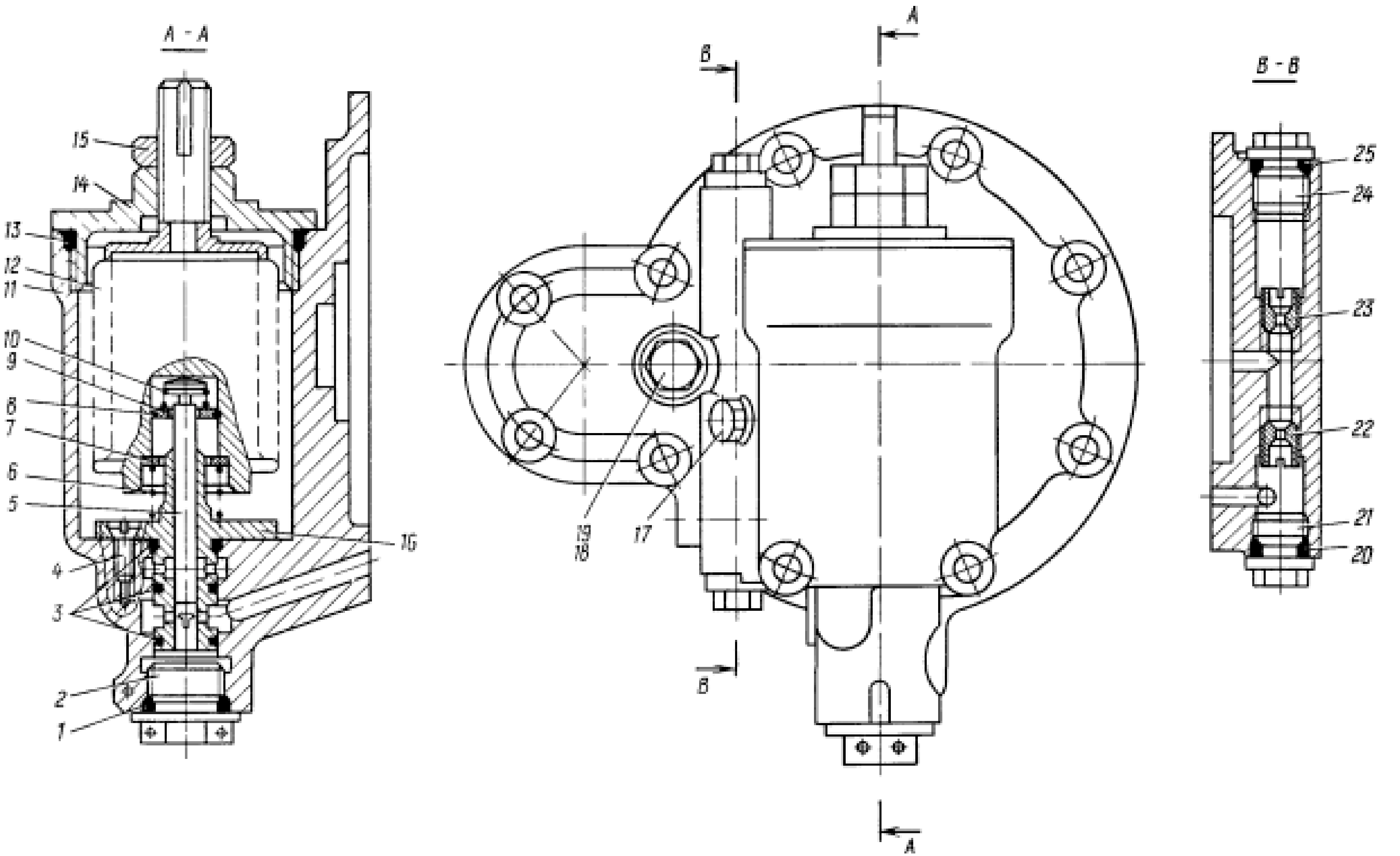
2.2.8. Supply of Fuel to Carburetor

Fuel is fed to the carburetor through fuel inlet connection (30) (Ref. Pig. 2). The connection is locked with nut (29). The connect]on-to-body joint is sealed with rubber ring (28). On passing the connection, fuel gets to fuel filter (31). The fuel filter assembly driven into the boss threaded hole is located under the fuel inlet boss. The filter connection face is sealed with ring (32). Plugs with rubber sealing rings driven into the holes at the top and bottom of the fuel chamber of the pressure regulator serve to drain fuel from the carburetor.

2.2.9. Altitude Control

Cover (11) (Ref. Fig. 6) closing the aneroid space doubles as a body for the altitude control.

The body aneroid space accommodates bushing (16) inserted in the aneroid space hole and sealed in it by three rubber sealing rings (3). The bushing is secured to the space bottom by two screws (4) locked by punching. Plug (2) with rubber sealing ring (1) is screwed into the threaded hole from the outside. Needle (5) is connected with aneroid capsule (12) by spring (10), thrust ring (9) and retaining ring (8).



1. Sealing Ring
2. Plug
3. Sealing Ring
4. Screw
5. Needle
6. Spring
7. Thrust Washer
8. Retaining Ring
9. Thrust Ring
10. Spring
11. Cover
12. Aneroid Capsule
13. Sealing Ring
14. Cover
15. Lock Nut
16. Bushing
17. Plug
18. Plug
19. Sealing Ring
20. Sealing Ring
21. Plug
22. Suction Jet
23. Inlet Air Jet
24. Plug
25. Sealing Ring

In climbing, aneroid, capsule (12) moves needle (5) in the bushing to shut off shaped ports. The needle is returned back by spring (6).

The threaded shank of aneroid capsule (12) is screwed into cover (14) and is safetied with lock nut (15); the cover is screwed into the body and is sealed with rubber ring (13).

A passage with two jets is made in a special boss under the aneroid space. Inlet air jet (23) and suction jet (22) are driven into the passage. The passage is closed on both sides with plugs (21) and (24) fitted with rubber sealing rings.

The aneroid space communicates with atmosphere through special plug (17).

A hole for measuring air pressure in the pressure regulator chamber is provided in the aneroid space cover. Plug (18) with rubber sealing ring (19) is screwed into the hole.

The altitude control assembly is attached to the flange of the pressure regulator fuel chamber by eight screws (3) (Ref. Pig. 3) and two elongated screws (5). Eight steel washers (2) and two sealing copper rings (6) are placed under the screw heads.

2.2.10. Air Manifold

Air manifold (25) (Ref. Fig. 2) made as a thin-walled steel ring with collar is mounted in a special recess in the carburetor body at the lower flange side. Kight ram pressure copper pipes are uniformly spaced around the ring. The manifold has a hole to supply air to the air filter. The manifold is attached by the collar with the aid of two screws.

2.2.11. Air Acceleration Pump

The air acceleration pump is mounted in the carburetor adapter boss.

Air pipe (18) (Ref. Fig. 1) and fuel pipe (17) of the pump entering the mixing chamber are pressed in the holes of the adapter wall. Two studs for attachment of the carburetor to the engine are screwed into the upper flange of the adapter; four studs for attachment of the pump cover to the adapter are driven into the boss flange.

A needle valve seat with two rubber sealing rings is inserted into the boss hole at the flange side.

Needle valve (22) is inserted into the valve seat. The needle valve carries an

aluminium washer, a diaphragm disk, a rubberized fabric diaphragm, a second diaphragm disk, aluminium sealing ring, crown nut safetied with cotter pin, internal spring, stop, lock, outer spring and adjustment washer.

The acceleration pump cover with air jet (21) screwed into it is fitted onto the boss flange studs.

The cover is attached to the adapter by four nuts with spring washers. The cover-to-body joint is sealed by the diaphragm. The carburetor adapter is secured on the body upper flange studs by four nuts safetied with plate locks. The adapter-to-carburetor joint is sealed with a paronite gasket.

CARBURETOR AK-14P -TROUBLE SHOOTING

For mostly often encountered troubles and their remedies, refer to the Table given below.

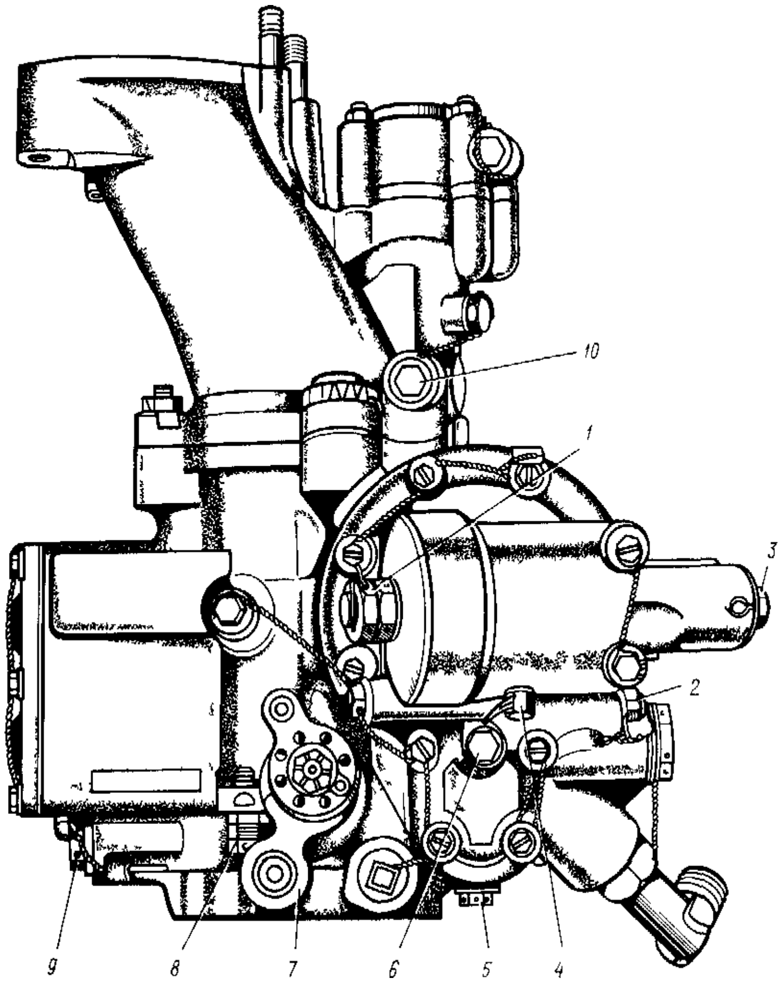
Trouble	Possible cause	Correction
1. Exhaust to carburetor at idle rating 2. Fuel leaks from carburetor nozzle	(1) Excessive opening of throttle at starting (especially in cold weather) (2) lean mixture (3) Air leakage in suction pipe (4) Incorrect setting of magneto (5) Mixed leads in magneto blocks (6) Clogged jets (7) Clogged fine fuel filter (8) Low fuel pressure Dirt gets under carburetor fuel valve	Close throttle Enrich mixture by idle adjustment screw (Ref. Task Card No. 204) Eliminate leakage in suction pipe Check magneto setting (Ref. 074.10.01, Task Card No. 202) Check high-tension wiring and eliminate defects (Ref. 072.00.00, Task Card No. 237) Check and clean jets (Ref. Task Card No. 202) Replace filtering element (Ref. 072.00.00, Task Card No. 257) Adjust fuel pressure to be at n least 0.15 kgf/cm at idle rating (Ref. 073.10.01, Task Card No. 204) Wash fuel passage by passing gasoline through lower drain plug with main fuel jet plug open (Ref. Task Card No. 202)

CARBURETOR AK-14P - MAINTENANCE PRACTICES

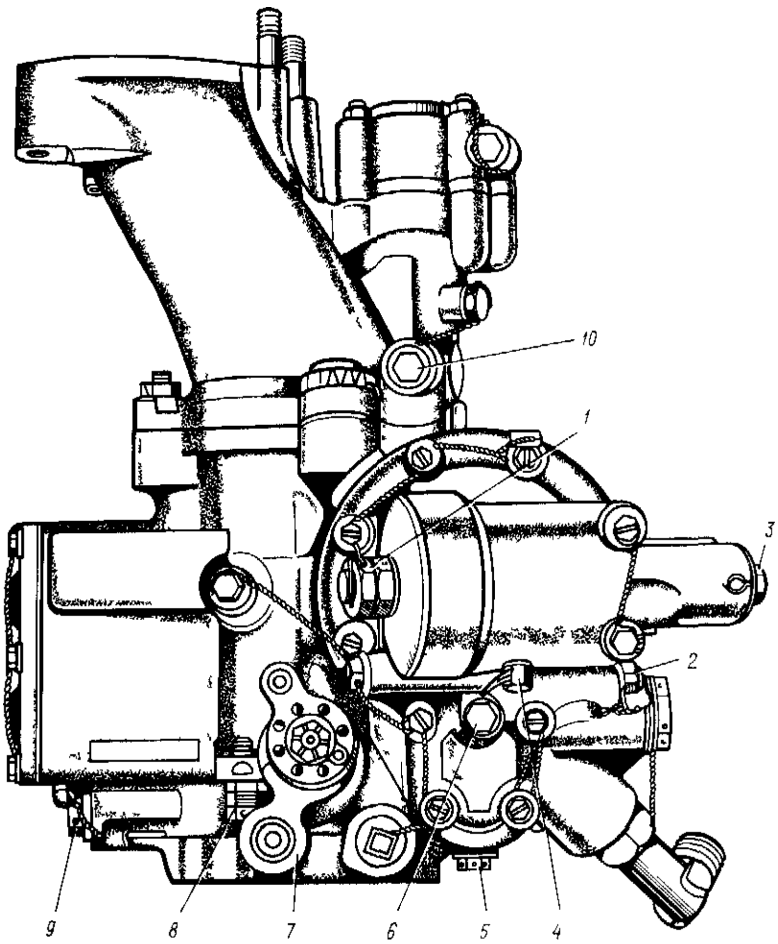
1. LIST OF TASK CARDS

2.OPERATION PROCEDURE

TO M-14P MS.	**TASK CARD No. 201**		
MS ITEM	**PROCEDURE: Removal**		
OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CH ECKED BY
1.Disconnect the fuel line from fuel inlet connection (6) (Ref. Fig, 201). 2.Disconnect the throttle control rod. 3.Disconnect the fuel pressure measuring pipe from connection 4.Unlock and. und-o four carburetor attachment nuts. 5.Remove the carburetor. 6.Remove the gaaket.			
TEST EQUIPMENT	TOOLS AMD FIXTURES	MATERIALS	
	Pliers, flat-nosed 150 Screwdriver 70345 A150x0.5 Wrench 24x27 700880-8 Wrench 11x14 14-24-861 Wrench 27x30 7811-0041 Wrench 14x17 14-232-03		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY
 Carburetor AK-14P (Right Side View) Figure 201		

TO M-14P MS	**T A S K C A R D No. 202**		
MS ITEM PROCEDURE'. DC preservation of Hew Carburetor			
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CH ECKED BY**
1, Unpack the new carburetor. 2, Remove preserving grease from the external surfaces with a brush moistened in clean gasoline. 3. Blow the external surfaces with dry compressed air. 4. Drive out upper drain plug (2) (Ref. Fig. 201). 5. Drive out plug (3) (Ref. Fig. 202) for measuring the initial position of the altitude control needle. 6. Remove shipping cap from fuel inlet connection (6) (Ref. Pig. 201). 7. Connect the hand pump line to connection (6). 8. Set the throttle lever to the full open stop. 9. Drive out plug (6) (Ref, Fig, 202) for measuring air pressure in the regulator air space. p 10, Supply air at a pressure of up to 0.5 kgf/cm in-to the hole for plug (6). p 11. Flush clean gasoline at a pressure of (0.5^0-2) kgf/cm through fuel inlet connection (6) (Ref. Fig. 201) till gasoline appears from the hole for upper drain plug (2). 12. After gasoline appears from the hole, reinstall plug (2).			



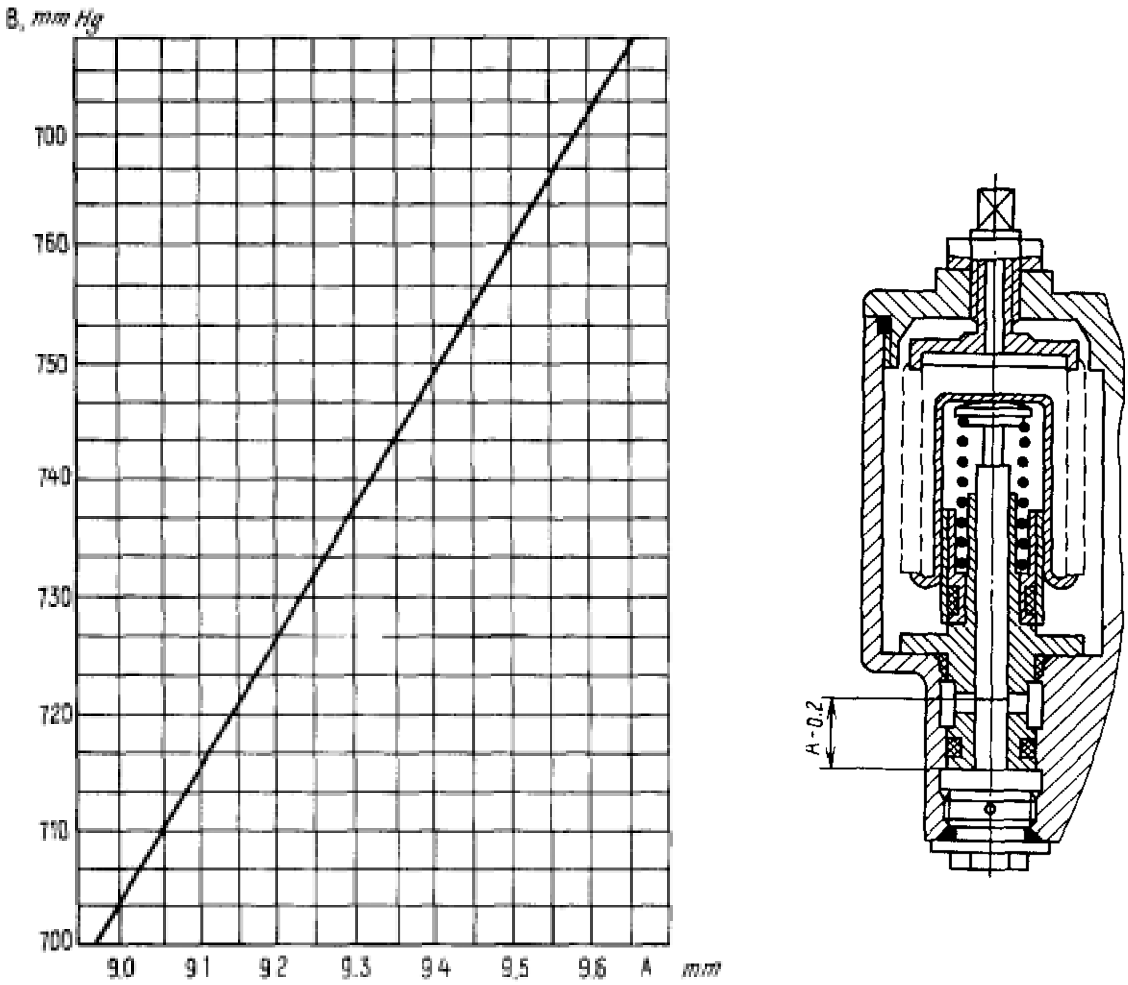
1. Altitude Control Needle Adjustment Screw
2. Suction Jet Plug
3. Plug for Measuring Initial Position of Altitude Control Needle
4. Breathing Plug
5. Lower Drain Plug
6. Plug for Measuring Air Pressure in Regulator Air Space
7. Throttle Control Lever
8. Throttle Idle Stop Screw
9. Air Filter 10, Acceleration -Pump Jet Plug

Carburetor AK-14P (Left Side View)
Figure 202

OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CH ECKED BV
27. Disconnect the hand pump line from connection (6) (Ref. Fig. 201). 28. Install the shipping cap on the connection, 29. Wipe the carburetor externally with a clean cloth.			
TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**	
	Bath, depreservation Wrench 11x14 14-24-861 Wrench 17x19 UB-24-07 Wrench 27x30 7811-0041 Wrench 19x22 700880-7	Gasoline Mefras-S 50/170 or BR-1, BR-2 Brush, hair Air, compreased. Cloths	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY
13. Keep on flushing till- clean gasoline emerges from the hole for plug (3) (Ref. Fig. 202) of the altitude control. 14. Reinstall altitude control plug (3). 15. Keep on flushing till clean gasoline emerges from the nozzle. 16. Turn the throttle lever from the idle stop to the throttle fully open position three or four times. IJOTE: Do not drain gasoline remainder. 17. Tighten and lock the plugs. 18. Set the throttle lever to the full open stop. 19. Flush clean gasoline through the hole of lower drain plug (5) at a pres-p sure of 0,1 kgf/cm , 20. Drain fuel remainder through the hole of diaphragm chamber plug (5). p 21. Blow the hole for plug (5) with dry air at a pressure of 0.5 kgf/cm . 22. Reinstall and lock plug (5)-23. Remove plug (4). 24. Check cleanliness of the hole for breathing plug (4). 25. Wash the hole for plug (4) with clean gasoline if grease is found in the hole. 26. Reinstall and lock plug (4).		

TO M-14P MS	**T A S K C A R D No. 203**		
MS ITEM	PROCEDURE: Installation		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Measure the initial position of the altitude control needle (Ref. Fig. 202). 2. Adjust the altitude control needle position, if required, according to the graph (Ref. Fig. 203 and Task Card No. 206). 3. Make sure the carburetor and mixture collector flanges are free from nicka T.^R. Nicks are not allowed. 4. Install a new sealing gasket on the carburetor flange. 5. Install the carburetor on the mixture collector. 6. Install four locks and screw on four carburetor attachment nuts. 7* Uniformly tighten and lock the carburetor attachment nuts. 8. Connect the throttle control rod to -the carburetor. 9. Connect the fuel supply line to connection (6) (Ref. Pig. 201) and lock it 10. Connect the pipe for measuring fuel pressure at carburetor inlet to connection (7). 11. Operate the hand priming pump to build up a pressure in the fuel system,		Dress nicka	

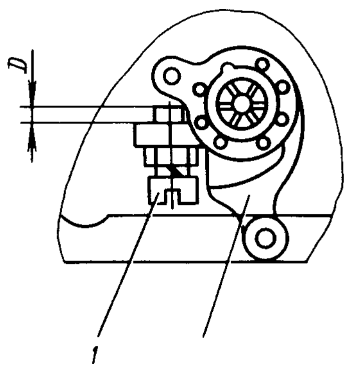


Carburetor Altitude Control Needle Position Versus Barometric Pressure (Barometric Graph)Figure 203

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Template 60660-3863 Pliers, flat-nosed 150 i/rencl-i 19x22 700880-7 drench 11x14 14-24-861 Wrench 7x9 700880-2 Screwdriver 530-280-1 Pump, priming UB-24--05 './rench 17x19 UB-24-07	Sealant "50" iVire, locking KO-0.8 Grease TsIATIM-201

TO M-14P MS	**T A S K C A R D No. 204**		
M S ITEM	PROCEDURE: Idle Adjustment		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**C HECKED BY**
1. Start and warm up the engine (Ref. 072.00.00. Task Card Mo, 201), 2. Adjust carburetor inlet fuel pressure to be 0.2 to 0.5 kgf/cm at main ratings and at least 0.15 kgf/cm at the idle rating (Ref. 073.10.01, Task Card Mo. 204). 3. Unlock and undo the cap of idle needle (3) (Ref. Fig. 201). 4. Remove the cap and sealing gasket, 5. Turn the idle needle to either side to set idle speed of up to 26 %. It ia allowed to adjust idle speed by screw (8) (Ref. Fig, 202) of the throttle stop at the idle rating set by the Supplier to size D (Ref. Pig. 204) (the size ia entered in the carburetor Certificate) within +1.5 turns; size D ia changed within +1.5 mm, 6. Reinstall the sealing gasket and idle needle cap. 7. Screw on and lock the cap. **CAUTION:** ADJUST IDLE SPEED FINALLY AFTER ALUUATING MAIIT RATINGS.			

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
 1. Throttle Idle Stop Screw 2. Carburetor Throttle Control Lever Determining size D Figure 204		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Pliers, flat-nosed 150 Screwdriver 700345 A150x0.5	**Wire, locking KO-0.8**

TO M-14P MS	**TASK CARD No. 205**	
MS ITEM	PROCEDURE Adjustment at Main Ratings	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Check engine operation at all ratings on the initial adjustment starting from the take-off rating (Ref. 072.00.00, Task Card No. 202), NOTE: If engine operates poorly at separate ratings, adjust the carburetor. 2. Adjust fuel consumption at take-off and nominal ratings using the following procedure: (1) Unlock and undo suction jet plug (2) (Ref. Fig, 202). (2) Select and replace the auction jet. UO'JE: It ia allowed to install jet, dia. 1.3 to 2.0 mm. Increasing the jet diameter leans out the mixture, decreasing it, enriches the mixture. The jet diameter change of 0,05 mm changes specific fuel consumption at take-off rating for 2 to 5 g/hp-h. (3) Install and, lock suction Jet plug (2). 3. Adjust the engine in cruise rating II using the following procedure: (1) Unlock metering needle adjustment screw (4) (Ref. Fig. 201). (2) Turn adjustment screw (4) to the required, aide to obtain the desired fuel consumption* NOTES: 1. Adjust -the carburetor on the shutdown engine. Rotating the shaft clockwise enriches the mixture and vice versa, 2, Turn the metering needle screw up to the limit stops in either direction from the initial adjustment setting. 3. The adjustment range to stop is eight clicks. One click of the metering needle adjustment shaft changes fuel consumption from 4 to 8 g/hp'h.		

TO M-14P M.S	**T A S K C A R D No. 206**	
MS ITEM	PROCEDURE: Adjustment of Altitude Control	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Measure the altitude control needle position, using the following procedure. (1) Unlock and drive out plug (3) (Ref. Fig. 202) from the carburetor. (2) Using a special template or depth gauge, measure the actual initial position of the needle (Ref, Fig. 203). (3) Determine the required initial position of the altitude control needle against the barometric graph, size A, 2, Adjust the altitude control if measured size A is other than size A required by the barometric graph using the following procedure: (1) Unlock and undo the lock nut of screw (1) (Ref. Pig. 202). (2) Turn screw (1) to the required side, KOTBi To decrease aneroid capsule size A, drive in the screw, to increase it, drive the screw out. One revolution of the screw corresponds to 1 nun. (3) Tighten the lock nut of screw (1). (4) Lock the lock nut with wire. » 3. Screw on plug (3) and lock it. 4. Make an entry on the operations performed in the carburetor Certificate. MOTES; 1. Check the altitude control needle position for correspondence to the barometric graph when installing a new carburetor and after every 100 h of engine operation, 2. Carry out the check on the shutdown engine. 3. It is allowed to adjust the altitude control only if the needle		

OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CHECKED BY

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Template 60680-3863 Wrench 11x14 14-24-861 Wrench, flat 7x9 700880-2 Pliers, flat-nosed 150	Wire, locking KO-0.8

TO M-14P M S	**T A S K C A R D No. 207**	
M S ITEM	procedure: Adjustment of Acceleration Pump	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
1.Unlock and drive out plug (10) (Ref. Fig. 202). 2. Drive out the acceleration pump fuel jet. 3. Select a fuel jet. **<u>NOTES:</u>** 1. It is allowed to install jets, dia. 0.9 to 1.4 mm. 2. The jets required for adjustments are included in the individual SPTA set of each carburetor. J. When increasing the fuel jet diameter, the acceleration pump delivery increases and vice versa. 4. Screw in the selected jet. 5. Drive in and lock plug (10). ***NOTE: It is allowed to replace the fuel jet when installing a new carburetor.***		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	V/rench 7x9 700880-2 Wrench 11x14 14-24-861 Pliers, flat-nosed 150 Wrench 14x17 14-232-03	Wire, locking KO-0.8

IGNITION SYSTEM - DESCRIPTION AND OPERATION

1. GENERAL

The ignition system ensures well-timed igniting of the working mixture in the cylinders,

The M-14P engine ignition system includes two M-9F magnetos, SD-49SMM spark plugs, shielded ignition harness (magneto selector switch and high-tension starting coil KP-4716).

2. DESCRIPTION

The mixture is ignited in the cylinders by a high-tension apark generated, in two magnetos mounted on the rear cover of the engine crankcase,

High-tension current from the magneto is transmitted to the spark plugs via high-tension cables enclosed in a shielded ignition harness* Both magnetos are of the LH rotation type. The RH magneto serves the rear spark plugs and the LH one, the front spark plugs.

To ignite the working mixture in the cylinders at starting, starting coil KT-4716 is included in the system.

Current from the airplane eloctrica] system passing through the primary winding of coil KF-4716 magnetizes its core and the starting coil breaker points, previously open, close the primary winding to ground. Magnetic field disappearing with current, induces high voltage in the coil secondary winding, which is needed to generate spark between the spark plug electrodes.

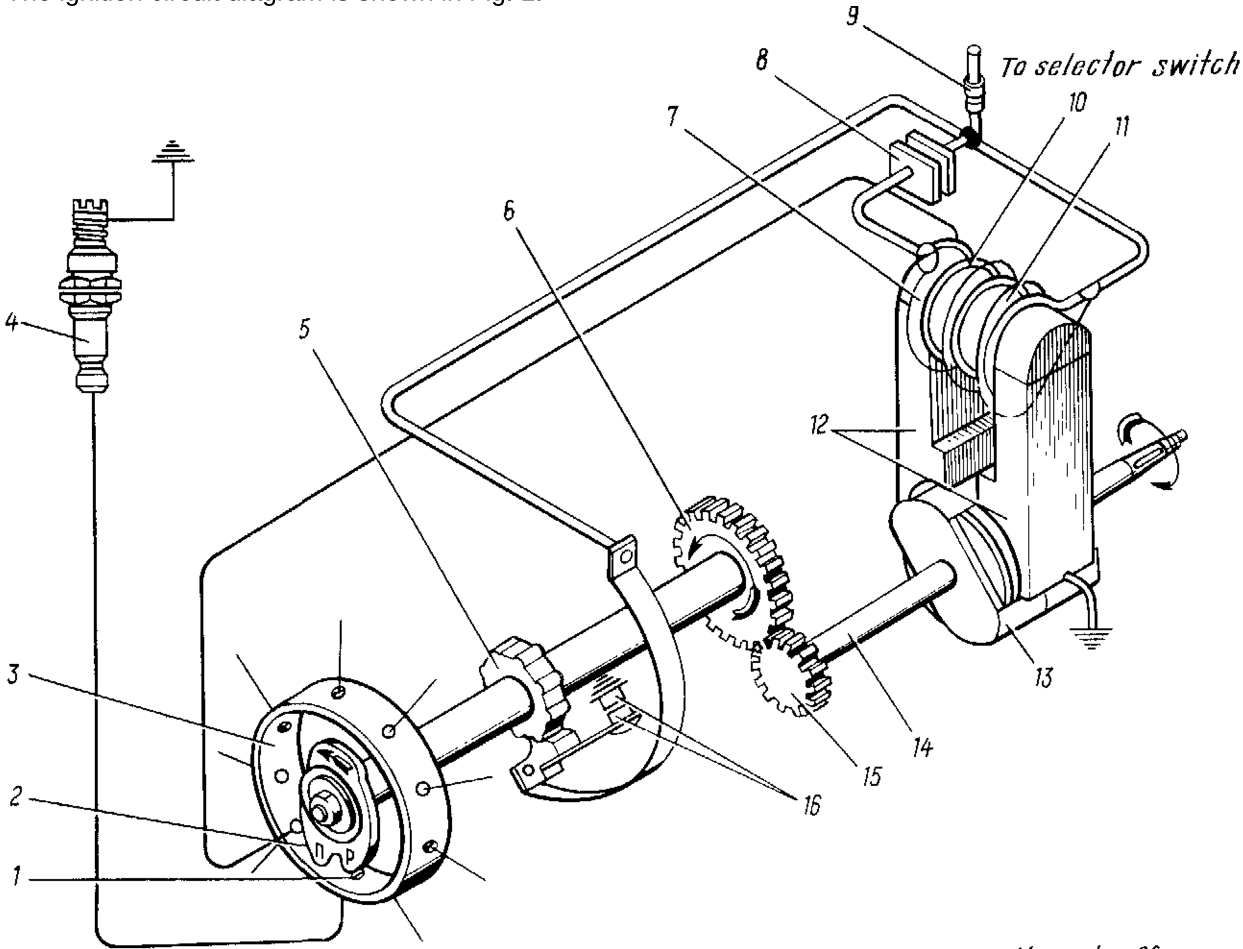
High voltage is fed to the starting electrode of the magneto rotor and through the dis-stributor electrodes to the cylinder spark plugs.

When the engine accelerates to a speed of 1? to 14 % (300 to 400 r/min), the magneto is switched on and starting coil KP-4716 is cut out. In this case high voltage from the secondary winding of the magneto transformer is fed to the working electrode of the rotor and then through the distributor electrodes to the cylinder spark plugs.

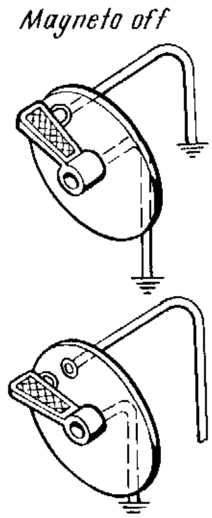
The magnetos are cut in and out by means of a selector switch the knob of which can be set to either of the following four positions:

"0" - both magnetos are off.
"1" - the LH magneto ia on and the'RH magneto is off.
"2" - the RH magneto is on and the LH magneto is off.
"1+2" - both magnetos are on.

High-tenaion starting coil KP-4716 is connected, to the starting electrode of the LH magneto. The ignition circuit diagram is shown in Fig. 1.



1. Working Electrode
2. Rotor
3. Distributor
4. Spark Plug
5. Cam
6. Gear
7. Transformer Secondary Winding
8. Condenser
9. Selector Switch Lead
10. Transformer Primary Winding
11. Transformer Core
12. Pole Shoes
13. Magnet
14. Rotor Shaft
15. Pinion
16. Breaker Points



Magneior on
Ignition Diagram Figure 1

MAGNETO M-9F - DESCRIPTION AND OPERATION

1. GENERAL

The M-9F magneto (Ref, Fig. 1) is intended, to generate high-tension current and, distribute it among the spark plugs of piston engines for igniting the working mixture.

The M-9F magneto is of a rotor construction (permanent magnet is rotating, the transformer is stationary).

The M-9F magneto has fixed spark, i.e. it does not include a spark advance mechanism.

The magneto operates jointly with coupling MR-09 serving to set the spark when mounting the magneto on the engine and to ensure smooth transmission of drive torque to the rotor

The M-9F magneto is designed for starting the engine with the use of starting coil KP-4716.

2. DESCRIPTION

2.1. SPECIFICATIONS

Vibration load frequency at amplitude:
0.8 mm ....Up to 50 Hz
3 mm ....At least 1.5 Hs
Ambient temperature (atmospheric air with gasoline vapors) ....±60 °C
Rotor speed at which magneto offers troublefree operation ....600 to 3420 r/min
Breaker point gap ....0.25 to 0.35 mm
Breaker point pressure ....(650±100) gf
Dwell (angle of rotor turn from neutral position to beginning of breaker point operating) ....
....13 to 16"
Rotor direction of rotation (if viewed from magneto drive side) ....
....LH
Mass ....Up to 5.4 kg

MAGNETO M-9F - TROUBLE SHOOTING

For mostly often encountered troubles and their remedies, refer to the Table given below.

Trouble	Possible cause	Correction
1. Magneto does not produce sparks 2. Magneto keeps on operating with selector switch cut off 3. Magneto misses some spark plugs	(1) Heavy carbon deposit or oxidation on points (4) (Ref. Fig. 1) of breaker (10) (2) Poor ground contact of t rans to rmer (16) (3) Oiling of points (4) of breaker (18) because of ingress of oil into breaker space (4) Breakdown of transformer (16) (5) incorrect connection of high-tension lead (19), broken carbon knob (23) of distributor (22) (6) Cracks in distributor (22) (1) Broken contact springs on transformer (16) (2) Poor connection of wire to cut-ou t t erminal (15) (3) Soiling of terminal (15) of transformer (1b) (4) Rotor (2[1];) broken down or burnt through (1) Maladjusted magneto (2) Poor connection of wires to distributor (22) (3) Breakdown of spark plug high-tension cable	Burnish breaker (18) points Tighten screws (11) securing transformer (16) to shoes (10) of housing (29) Clean points (4) and apace of breaker (18) and wipe with chamois or clean dense cloth (calico) slightly moistened in gasoline. Eliminate cause of oil ingress into apace of breaker (18) Replace transformer (16) Check connection of high-tension lead (19) and condition of carbon knob (23), replace carbon knob Replace distributor (?2) Replace transformer (16) Check connection of wire V;ipe terminal (15) Replace rotor (25) Adjust gap of points (4) Check connection of wires to distributor (22), tighten contact screws (27) Replace cable

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MAGNETO M-9F - MAINTENANCE PRACTICES

1. LIST OF TASK CARDS

2.OPERATION PROCEDURE

TO M-14P M S	**TASK CARD No. 201**		
MS ITEM	PROCEDURE: Depreservation of New Magneto		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
		If oil gets on points (4), wipe them with clean chamois or calico cloth moistened in alcohol	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
7. Pill two droplets of turbine oil T22 on the end of wick (2) protruding from the oil fitting cup to lubricate cam (24) using a medical pipet. **CAUTION:** FILL THE OIL PITTING WHEN DEPRESERVING THE MAGNETO AFTER PROLONGED STORAGE (AT LEAST TWO YEARS) OR WHEN STORING ON THE ENGINE. IP THE STORAGE PERIOD WAS LESS THAN TWO YEARS, DO NOT FILL OIL. NEVER WASH BREAKER (18) AND CAM (24) WITH GASOLINE OR OTHER SOLVENTS. 8. Carefully wipe points (4) of breaker (18) with clean chamois or calico cloth moistened in clean alcohol. T.R. Corrosion on parts is not allowed. Never dress corrosion on spring (5) of breaker (18) and working profile of cam (24).	Dress corroded areas, wipe them and lubricate Replace corroded parts	

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Wrench 14 UB-24-16 Screwdriver 700345 A150x0.5 Brush Pipet, medical Tweezers	Cloths, calico Alcohol Oil, turbine T22

TO M-14P MS	**TASK CARD No. 202**		
M S ITEM	PROCEDURE'. Installation		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CH ECKED BY**
1. Inspect the magneto and make sure the arrow on front cover (31) (Ref. Fig, 1) of the magneto shows LH rotation and. the gaps of points (4) of breaker (18) are properly adjusted. 2. Drive out the front spark plug from cylinder No. 4 (Ref. 074.20.02, Task Card No. 202) and drive in the piston T.OC indicator in its hole. 3. Set the piston of cylinder No. 4 to the TBC position in the compression stroke using the TUC indicator. To fix the airscrew shaft position, secure a pointer to one of the studs for attachment of the airscrew shaft thrust bearing cover and bring it to the zero scale division applied to the airscrew shaft flange. 4. To eliminate the effect of gear backlash upon accuracy of magneto setting, when "bringing the piston to the required position, first turn the airscrew shaft through 40 to 50° in the opposite direction (more than the setting angle). Then slowly turn the airscrew shaft in its normal direction to set the piston in cylinder 1'io. 4 to position 14°30' to 16° before the TDC in the compression stroke, 5. loosen the coupling bolt, remove the adjustment screw of the UR-09 coupling install the magneto on the engine so that: its attachment studs are at the center of the slots made in the magneto flange, screw nuts on the studs without tightening them fully. 6. Turn the magneto distributor rotor in the direction of its rotation till its electrode is aligned with "the mark applied to the end face of the magneto housing rear cover. The "breaker cam with the mark should start			

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY
opening the breaker points which corresponds -to supply of spark to cylinder No. 4 in operation. 7. Carefully remove the magneto from the engine, insert the adjustment screw, tighten and lock the nuts of the coupling bolt and adjustment screw of the coupling, precluding turning of the latter* 8. Place a gasket under the magneto flange, install the magneto on -the engine according to Item 5. 9. Insert a feeler gauge, 0.03 mm thick, between the breaker points and turn the airscrew shaft through 10 to 15° opposite to the direction of rotation. Then rotate the airscrew shaft in its normal direction to check the moment of breaker point opening initial moment by the scale applied to the airscrew shaft flange. She breaker points should start opening at an airscrew shaft turning angle of 14°30' to 16° before TDC. The breaker point gap should be 0.25 to 0.35 nun, 10. If normal adjustment is not achieved, adjust sparking moment by turning the magneto on the studs extending through the slots in the magneto flange, 11. Finally secure the adjusted magneto on the engine. 12. Install the second magneto similarly to the first one by performing operations under Items 5, 6, 7, 8, 11. 13. Insert a feeler gauge, 0*03 mm thick, between the breaker points and turn the airscrew shaft opposite to its normal direction through 10 to 15°. Then rotate the airscrew shaft in its normal direction, check synchronous beginning of point opening in both magnetos. If there is no synchronism, turn the second magneto on its studs extending through its flange slots to ensure synchronous opening of the points. Finally secure the adjusted magneto on the engine.		

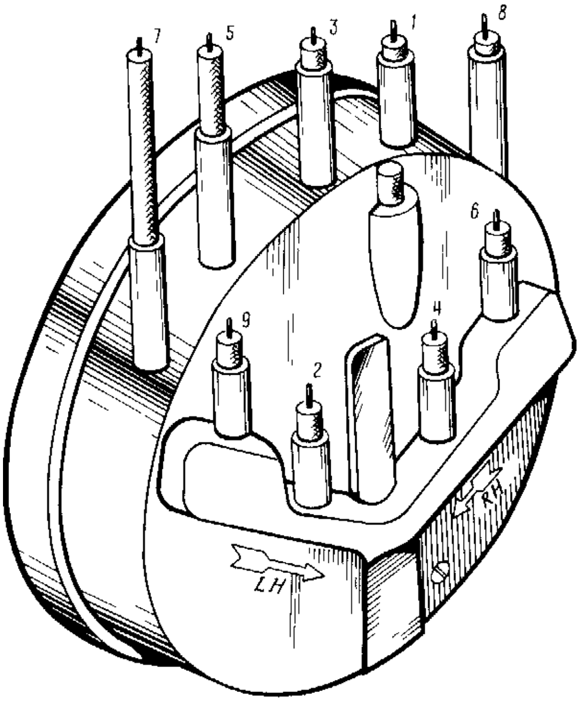
OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
14. Secure high-tension lead of starting coil KF-4YKS to term-nal P of the LH or .SH magneto distributor. 15. Check proper setting of the distriou-tor and. its shield and close both magne bos. LIake sure that: The high-tension lead gets into its aeat in the distributor. The carbon knob is not missing in the distributor. The distributor is properly set relative to the retainer. The tubular shield of -the ignition harness is properly safetied. 16. Install the shield, and pipe of the ignition harness, secure the pipe by four screws and safety with locking wire. 17. Connect the magneto selector switch wire using the follov/ing procedure: Install the tenninal into the upper cover connection. 3crew on the shaped nut and safety it with lock.		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	T.DC indicator V/rench 19x22 700880-7 Wrench, spark plug 22 15-32-173 7/rench 11x14 14-24-861 Screwdriver 700346 A200x1 Feeler gauge Pliers, flat-nosed 150	Uire, locking KO-0,8 Sealant "50"

TO M-14P MS	T A S K C A R D No. 203		
M S ITEM	PROCEDURE'. Adjustment of Breaker Point Gap		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CH ECKED BY**
1. Drive out four screws (26) (Ref. Fig, 1) which secure the magneto pipe. 2, Drive out shield (21) three attachment screws. 3. Remove shield (21). 4. .Remove distributor (22) from magneto rear cover (28) and nove it aside. **CAUTION:** REMOV3 DISTRIBUTOR (22) CARSFU1LY NOT TO UAMAGE HIGH-TENSION LEAD (19). 5. Install rubbing block (6) of breaker (18) in the first valley of cam (24) (marked with a notch) by turning the airscrew shaft. Then turn the airscrew shaft so that rubbing block (6) is on the cam lobe, 6. Check gap of points (4) of breaker (18) using a feeler gauge. **T.R.** The gap of points (4) should be within 0.25 to 0.35 mm. 7. Adjust the gap as follows: (1) Unlock and loosen the attachment screws of point plate (7) to the dwell plate of breaker (18) so that the point plate is turnable around the axis of rubbing block (6), (2) Turn eccentric (8) and set the required gap. ***NOTE: When turning eccentric (8) clockwise, the gap decreases, when turning it counterclockwise, increases.*** (3) Tighten the attachment screws of point plate (7) of breaker (18) and. wipe points (4) with clean chamois or calico cloth slightly moistened in clean alcohol.		Adjust gap under Item 7.	

TO M-14P MS	**TASK CARD No. 204**	
MS ITEM	PROCEDURE:Replacement of Magneto Distributor and Ignition Harness Cables	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1, Carry out operations under Items 1 through 4 (Ref. Task Card No. 203), 2, Loosen screws (27) (Ref. Fig. 1) for attachment of ignition cables to the contacts of distributor (22). 3. Remove leads from the socketa of distributor (22), 4. Install the wire leading to the spark plug of cylinder Ho* 9 into the socket of the distributor LH projection (Ref, Fig. 201). 5. Install wires along the direction of arrow LH ROTATION on the distributor to spark plugs of cylinders 2, 4, 6, 8, 1, 3, 5, 7 which corresponds to the following mixture firing order in cylinders 1, 3, 5, 7, 9, 2, 4, 6, 8. 6. Stop spare socket P with a length of wire. 7. Tighten screws (27) (Ref, Pig. 1) for attachment of ignition cables to contacts of distributor (22). **NOTES:** 1. The RH magneto leads run to the rear spark plugs, those of the LH magneto, to the front ones. 2. Connect the leads to the magneto selector switch as follows: c/ith the selector switch knob in position "O", both magnetos should be cut out. With the selector switch knob in position "1" or "LH",the LH magneto should be cut in and the RH one should be cut out		



NOTE: Figures indicate numbers of cylinders to which distributor cables are to be connected. Cables from LH magneto run to front spark plugs, from RH one, to rear spark plugs.

Magneto Distributor Figure 201

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY
(the front, spark plugs operate). In position "2" or "RH" - the RH magneto is on and the LH one is off (the rear spark plugs operate). In position “1+2” or "LH+RH" - both magnetos are cut in. 8. Carry out operations under Items 8 through 10 (Ref. Task Card, No. 203). 9. If the lead is defective, proceed as follows: (1) Disconnect the defective lead elbow from the spark plug. (2) Remove magneto distributor (22) carrying out operations under Items 1 through 4 (Ref. Task Card Ho. 203). (3) Loosen screw (27) for attachment of the defective lead to the contact of distributor (22). (4) Loosen the ignition harness attachment nuts. (5) Release the lead from the elbow, proceeding as follows: Undo the elbow nut. Remove the spring and the end-piece. Release the lead, (6) Rub a new lead with paraffine. (7) Connect the ends of the new and faulty leads at the distributor side. (8) Install a new lead into the ignition harness by pulling the defective lead backwards from the elbow side. (9) Disconnect the new lead from the defective one. (10) Strip the ends of the new lead.. (11) Solder around the new lead end, connect it to the elbow and assemble the latter. (12) Install the lead end into the respective socket of the distributor and tighten the lead-to-distributor contact attachment screw. (13) Screw the lead elbow onto the spark plug. (14) Carry out operations under Items 8 through 10 (Ref, Task Card No. 203).		

OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CHECKED BY
TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**	
	Screwdriver 70346 A200x1 Wrench 7x9 700880-2 Wrench 36x41 14-32-11 Screwdriver 700345 A150x0.5	Solder Paraffine	

<table>
<tr><td>TO M-14P MS</td><td colspan="3">TASK CARD No. 205</td><td colspan="2"></td></tr>
<tr><td>MS ITEM</td><td colspan="5">PROCEDURE: Removal</td></tr>
<tr><td colspan="4">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="4">1. Disconnect the magneto selector switch wire using the following procedure:
(1) Move away lock (14) (Ref. Fig. 1) and undo shaped nut (13) from connection (12) of upper cover (17).
(2) Remove terminal (15). 2. Drive out magneto pipe four attachment screws (26).
3. Drive out three attachment screws (20) of shield (21) and remove the shield.
<u>CAUTION</u>: REMOVE THE DISTRIBUTOR CAREFULLY NOT TO DAKAGE HIGH-TENSION LF.AD.
4. Remove distributor (22) from rear cover (28) of the magneto and move it aside,
5. Drive out three magneto attachment nuta. 6. Remove three split and three flat washers. 7. Remove the magneto and the gasket.</td><td></td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td colspan="2">TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td colspan="2">Screwdriver 700345 A150x0.5 Wrench, socket 11x14 UB-24-16 Pliers, flat-nosed 150</td><td colspan="2"></td></tr>
</table>

MAGNETO M-9F - STORAGE INSTRUCTIONS

When receiving the magneto, check intactness of the container. The magneto delivered, in winter and, not intended for placement in storage should be unpackaged in 2 to 3 h. after being kept indoors. In summer the magneto may be unpackaged immediately after bringing them indoors.

The Supplier's hermetic packaging protects the magneto against soiling, corrosion and mechanical damage at prolonged storage and. shipment,

Place the magnetos intended for prolonged storage in the containers which ensure intactness of the hermetic packaging. The containers with magnetos should be protected against moisture and chemicals in storage.

NOTE: ***The prolonged storage period for the magnetos in the Supplier's packaging is given in the magneto Certificate.***

Store and. ship the magneto installed on the engine according to the engine Maintenance Manual.

Store the magneto unpackaged or removed from the engine in •lhe hermetic packaging and individual container for up to one year in tlie absence of corrosive medium, shakes and vibrations.

MAGNETO M-9F - SHIPMENT

The packaged magnetos may be shipped, by any transport and. over any distances.

In shipment protect the containers with the packaged magnetos against dust, snow, water and liquids.

CAUTION: NEVER DROP OR TURN OVER THE CONTAINERS WITH THE PACKAGED MAGNETOS IK SHIBIENT.

The shipping containers should bear warning inscriptions.

SPARK DISTRIBUTION - DESCRIPTION AND OPERATION

1. GENERAL

High-tension current from the magneto is transmitted, to the spark plugs via high-tension cables enclosed, in metal shield. - shielded ignition harness.

IGNITION HARNESS - DESCRIPTION AND OPERATION

The shielded, ignition harness (Ref. Fig. 1) serves to eliminate interference of electromagnetic waves generated by high-tension cables into operation of radio equipment.

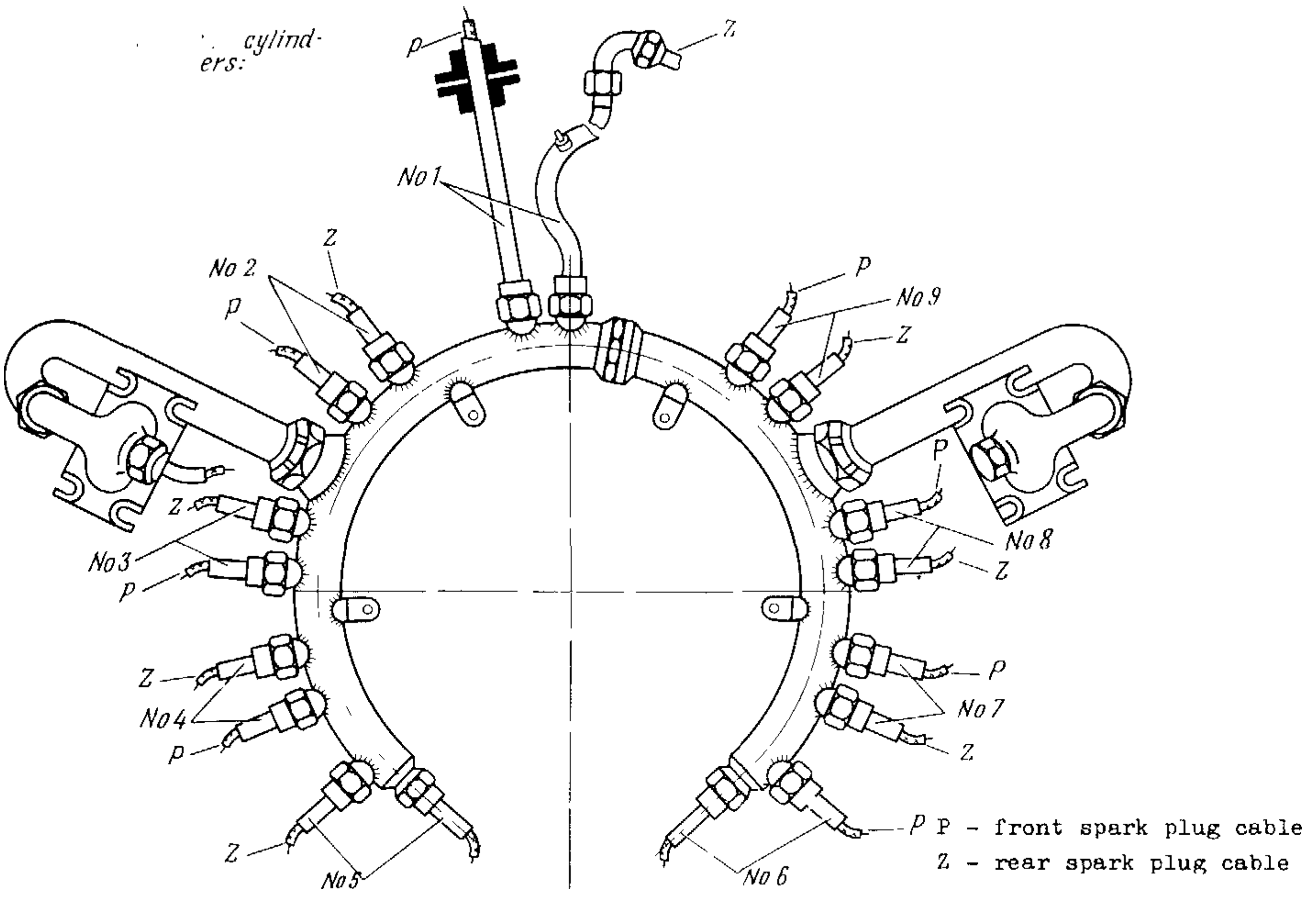
The high-tension cables between the magneto and the ring are enclosed in a flexible shield hose being a common shield for all the cables.

The ring comprises steel pipe segments with welded connections. Separate cables running from the ring to the spark plugs are shielded with individual metal braid.

The hose ends have internal and external threaded bushings and the "braid is clamped between their collars and welded to them, Huts fitted to the hoses -are used to attach the hose to the ring connection and to the spark plug. The cable is freely run in the hose between the magneto distributor shield and the spark plug elbow,

The ring is attached to the engine mixture collector on studs with the aid of four clamps. Shielded cables running from the ring to the spark plugs are attached to the push. rod casings by special clamps,

Ignition Harness Figure I



SPARK PLUG SD-49SMM - DESCRIPTION AND OPERATION

1. GENERAL

The spark plug together with the magneto and high-tension cables is intended to Ignite fuel-air mixture in the engine cylinder.

2. DESCRIPTION

2.1. CONSTRUCTION

The spark plug (Ref. Fig. 1) is a non-detachable, shielded ceramic insulator device.

The working part of the spark plug has central electrode (l) and side electrode (2). Electric discharge jumps spark gap A of the spark plug through the air gap between the central and side electrodes. Damping resistor (3) connected in series to the central electrode and arranged inside the spark plug is intended to decrease electrode erosion and diminish ignition system radio interference,

Contact head (4) is insulated from shell (5) of the spark plug with ceramic tube (6).

The spark plug ahell has a hexagon for wrench S = 22 mm and two threads. Thread B, dia. M14x1.25» is intended to screw the spark plug into the engine cylinder hole with the use of copper-asbestos sealing ring (7).

Thread C, dia. M18x1, is intended to connect a high-tension cable.

2.2. SPECIFICATIONS

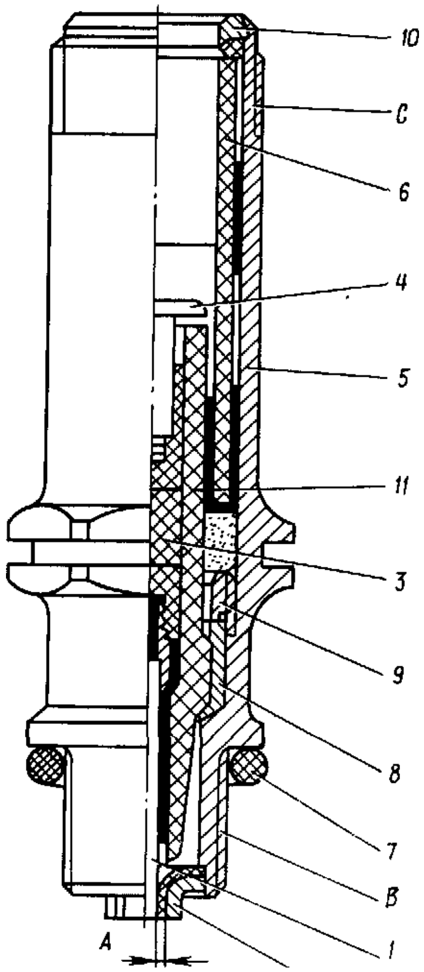
Damping resistance at a temperature of (25±10) °C,
pressure of 1,0 kgf/cm and relative humidity of (65±15) % ...... From 10,000 up to
1000 ohms

The spark plugs should be tight.

Seepage at a pressure difference of 40 kgf/cm is allowed………. Not more than 1 cm3
during 30 s

Spark generation should be at a pressure of surrounding air
equal to 10 kgf/cm………………………………………………………Continuous

Spark plug mass .... …………………... Up to 0.095 kg.



1. Central Electrode
2. Side Electrode
3. Damping Resistor
4. Contact Head
5. Spark Plug Shell
6. Ceramic Tube
7. Copper-Asbeatos Sealing Ring

8. Heat Transfer Bushing
9. Nipple
10. Shaped Ring
11. Heat-Resistant Cement

A, Spark Gap
B. Thread M1 43:1. 25
C. Thread M18z1

Spark Plug SD-49SMM Figure 1

SPARK PLUG SD-49SMM - TROUBLE SHOOTING

The spark plug la not subject to repair and ensures the specified service life of the engine if operated properly.

The main parameter determining operability of the spark plug in service is absence of missing. Possible causes of missing are given in the Table "below.

Trouble	Possible cause	Correction
1. Missing or absence of sparks 2. Increased gap between electrodes 3. Carbon deposit, soot, oil fouling	(1) Damage to apark plug (nicks on seats and locating areas, deformed, shell) (2) Cracks on ceramic tube (3) Shorting of electrodes, wetting of shield space, Increased lead deposit in spark plug nose space Wear of electrodes after prolonged operation Recessive oil consumption, rich mixture, prolonged idle running	Replace spark plug Replace spark plug Eliminate aborting. Dry wet spark plug. Check grade of fuel used.. Clean and test apark plug according to Maintenance Manual Regap spark plug to 0.4 to 0.46 mm and check spark genera-p tion at pressure of 10 kgf/cm Uash spark plug in clean gasoline, dry and clean apark plug nose space on sandblaating unit. Blow with compressed air, check sparking. Adjust fuel mixture and eliminate excessive oil consumption

SPARK PLUG SD-49SMM - MAINTENANCE PRACTICES

1. LIST OF TASK CARDS

Title	Task Card Uo.
Removal	201
Installation	202

2.OPERATION PROCEDURE

TO M-14P MS	**TASK CARD No. 201**	PAGEIS) 203
M.S ITEM	PROCEDURE •. Rem oval	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
1. Disconnect ignition cable elbows from the spark plug shields. 2. Remove the spark plugs with a special wrench. T.R. Wrench handle bar torque should not exceed 4 to 5 kgf'm. **CAUTION:** REMOVE AND INSTALL THE SPARK PLUGS AFTER COOLING DOWN THE ENGINE. 3. Place all the spark plugs removed from the engine into an individual container and send for check or repair. ***NOTE: NEVER drop the spark plugs, store or ship them in piles*, T.R.** Ensure against damage to the spark plugs in shipment or storage.	Check spark plugs un-screwed with torque above 9 kgf-m for sparking and leakage	

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Wrench 19x22 700880-7 Wrench, spark plug 22 15-32-173	

TO M-14P MS	**T A S K C A R D No- 202**	PAGE(S) 205, 206	
MS ITEM	PROCEDURE: Installation		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKE D BY**
1. Inspect the spark plug* HOTS: The spark plugs delivered in -the Supplier's packaging are installed on the engine without pre-testing on the instrument, **CAUTION:** 1. DO HOT HE-USE SHE SPARK PLUG SEALING RING. 2. INSTALL ONLY Olffi SEALING RING UHDER THE SPARK PLUG. 3. WHLN INSTALLING THE THERMOCOUPLE SENSOR UNDER THE SPARK PLUG, DO NOT INSTALL THE SEALING RING. 2, Install the copper-asbestos sealing ring on the spark plug. **T.R.** The ring should "be clean, smooth,without nicks or burrs* 3. Coat the threaded portion of the spark plug with grease ST (NK-50) to protect against burning. **CAUTION**: WHEN COATING THE SPARK PLUG WITH GREASE ST (1JK-50). ENSURE AGAINST INGRESS OF GREASE INTO THE NOSE SPACE A:fl) ELECTRODES OF THE SPARK PLUG. 4. Drive the spark plug finger-tight into the engine cylinder bushing. **CAUTION:** 1. AVOID STRIKING THE '.VRENCH OR SLIPPING OF THE V/RENCH FROM THE SPARK PLUG. 2. NEVER ECTEM) THE WRENCH HANDLE BAR OR USE '.TRENCHES IVITH DAMAGED FACES WHEN INSTALLING THE SPARK PLUGS. 3. TORQUE APPLIED TO INSTALL THE SPARK PLUG SHOULD NOT EXCEED 3 TO 4 kgf-m. 5. Tighten the spark plug with a special wrench,		Replace damaged ring	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
6. Check the elbow and contact system for condition. **T.R.** The contact spring end should be bent inward and the insulation bushing should be free from damage. **CAUTION:** MISALIGNMENT OF THE CONTACT DEVICE IS NOT ALLOWED. 7. Insert the elbow contact device into the shield space. 8. Screw the elbow union nut on the spark plug finger-tight. 9. Tighten the elbow union nuts. ***NOTE: Tighten the elbow nuts with a wrench at a leverage of up to 100 mm.***	Replace defective contact spring and insulation bushing	

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	wrench 19x22 700880-7 V/rench, spark plug 22 15-32-173	Grease ST (NK-50)

STARTING SYSTEM - DESCRIPTION AND OPERATION

1. GENERAL

The M-14P engine is equipped with a compressed air starting system (Ref. Fig. 1) comprising an air compressor, compressed air distributor, starting valves, pipelines, compressed air bottle and a fuel priming system.

To start the engine, it is necessary to fill the cylinders with fuel mixture, prepare i-fc for ignition and then to ignite the mixture. Before starting the engine, gasoline is sucked by the starting pump from the fuel tank and. is fed to the mixing chamber of the blower through the nozzle screwed into the mixture collector.

At starting the air system valve opens and the solenoid valve button is depressed. The compressed air from the airplane bottle rushes to the slide valve of the compressed air distributor and then via a pipeline to the starting valve of the cylinder at the beginning of the power stroke.

Under the action of compressed air the starting valve opens and air gets to the cylinder combustion chamber.

Compressed air fed to the cylinder moves the piston thus rotating the crankshaft and distributor slide valve so that compressed air is supplied to other cylinders according to the firing order.

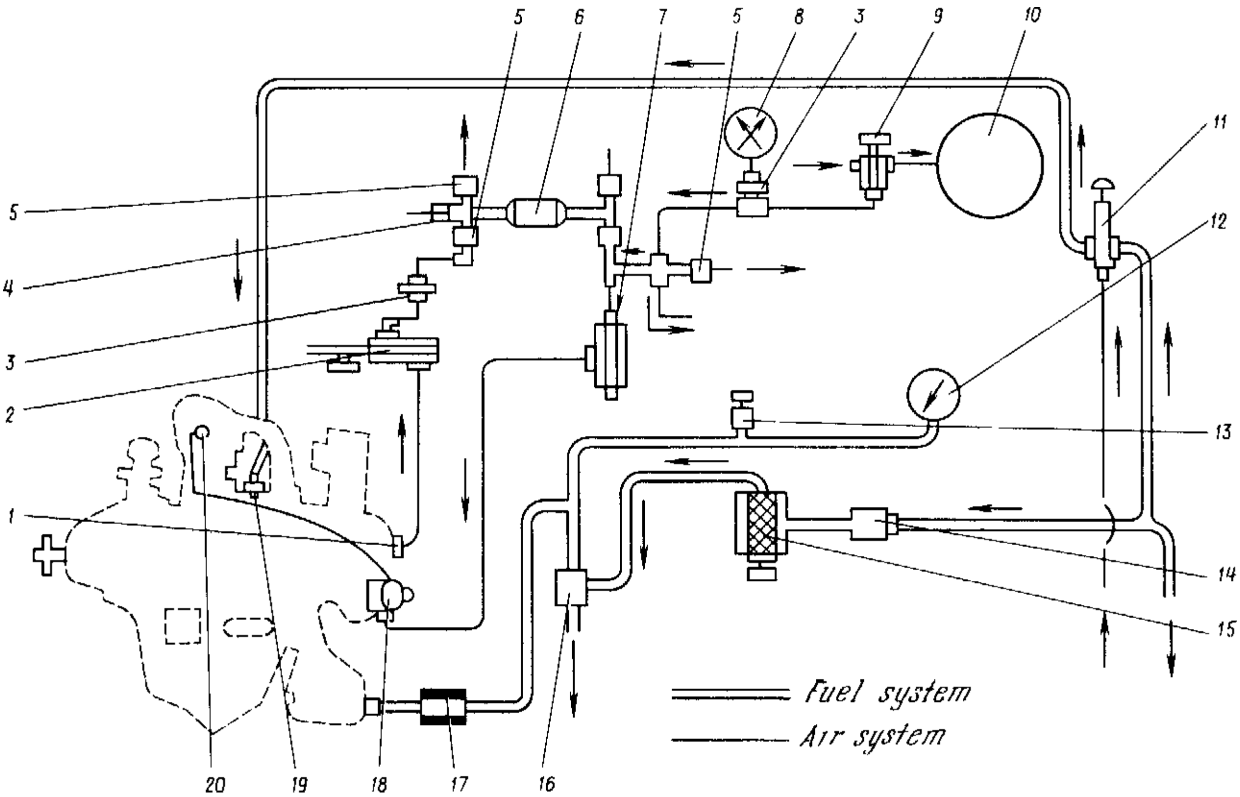
During rotation of the crankshaft, fuel mixture is sucked into the cylinders. The mixture consists of gasoline injected by the priming pump into the mixture collector and air fed through the carburetor to the engine blower. The mixture is ignited from the starting coil.

2. AIRBORNE AIR COMPRESSOR AK-50A

2.1. GENERAL

A two-stage air-cooled piston compressor ensures charging of the airplane bottle with 2 compressed air at a pressure of up to 50 kgf/cm •

Compressed air is used to start the engine, control the brakes, retract and extend the landing gear and air brakes.



1. Compressor AK-50A
2. Sump
3. Adapter
4. Safety Valve
5. Check Valve
6. Filter
7. Solenoid Valve
8. Two-Pointer Pressure Gauge
9. System Charging Valve
10. Air Bottle
11. Hand. Priming Pump
12. Pressure Gauge
13. Oil Dilution Cock
14. Fuel Shut-Off Valve
15. Fuel Filter
16. Fuel Pump
17. Fine Fuel Filter
18. Compressed Air Distributor
19. Nozzle
20. Starting Valve

M-14F Engine Starting System Diagram Figure 1

2.2. DESCRIPTION

2.2.1. Specifications

First stage cylinder diameter	46 mm
Second stage cylinder diameter	40 mm
Piston stroke	20 mm
3 Operating pressure	Up to 50 kgf/cm
Drive direction of rotation	Arbitrary
Compressor speed of rotation:	
Maximum at continuous operation during 1 min	Up to 2655 r/min
Maximum at continuous operation during 10 min	Up to 2610 r/min
At "bottle charging:	
Maximum	2300 r/min
Minimum	1450 r/min
Rate of compressor cylinder air cooling through area of 25x100 mm	At least 20 m/s
Cylinder temperature:	
Maximum	110 °C
Recommended	70 to 80 °C
Oil grade	MS-20 GOHT 21743-76
p Oil pressure	2 to 5 kgf/cm^2
Oil temperature	Up to 95 "C
Oil leakage at oil temperature of 40 to 80 °C and	
I rotational speed of 1450 r/min	Up to 30 cnr/h
Time of filling "bottle, 8 lit in capacity to operating	
pressure (compressor delivery at eccentric speed, of	
UbO r/min)	Up to 30 min
Mass	Up to 3 kg

2.2.2. Construction

The compressor includes crankcase (4) (Hef. Pig. 2), eccentric (2), connecting rod. (22), piston (15), cylinders (6) and (7), valves (29), (30) and (24), bearings (1) and other parts,

The compressor crankcase is made of magnesium alloy and comprises two halves interconnected by studs. Silk thread. (20) is used to seal the joint between the crankcase halves. One of the crankcase halves has a flange to secure the compressor to the drive flange on the rear cover ana. passages (32) to supply and (33) to return oil.

Eccentric (2) with web (3) are installed inside the crankcase on two ball bearings. One end of the eccentric is splined. to mate with the drive, Connecting rod. (22) has a needle bearing at the big end. connected, to eccentric (2). The connecting rod. small end. ia connected to piston (15) by pin (5).

Two-atep piston (15) made of aluminium alloy has five sealing rings on each step.

The piston head has a by-pass valve serving to by-pass air from the first-stage cylinder to the second-stage one.

The two-step cylinder of the compressor is of a detachable type, comprises two parts with different internal diameters: first stage cylinder (7) and second-stage cylinder (6).

Cylinder (7) is made of aluminium alloy. Steel sleeve is pressed inside the aluminium shell.

Cylinder (6) is made of steel. It is installed with a square flange on four studs driven into the crankcase.

Cylinder (7) is attached to the round flange of cylinder (6) by eight studs (16) screwed into the shell of cylinder (7).

The cylinder inner surface is nitrided. The air filter and. inlet valve (29) are installed in the upper part of cylinder (7).

The air filter is used to clean air fed to the compressor and comprises housing (8), two aluminium meshes (12) between which filtering element (11) is disposed.

The filter housing is cast of aluminium alloy and is attached to cylinder (7) by four screws (28).

The filter is secured by spring lock (10) which ia installed with the convex middle portion towards the mesh.

To discharge the compressed air from -the compressor to the airplane bottle, delivery valve (24) is driven into the boss in the lower part of first stage cylinder (7). The valve has awivel nipple (25) for connection to the air line.

2.3. OPERATION

Rotation of the eccentric causes reciprocation of piston (4) (Ref. Fig. 3).

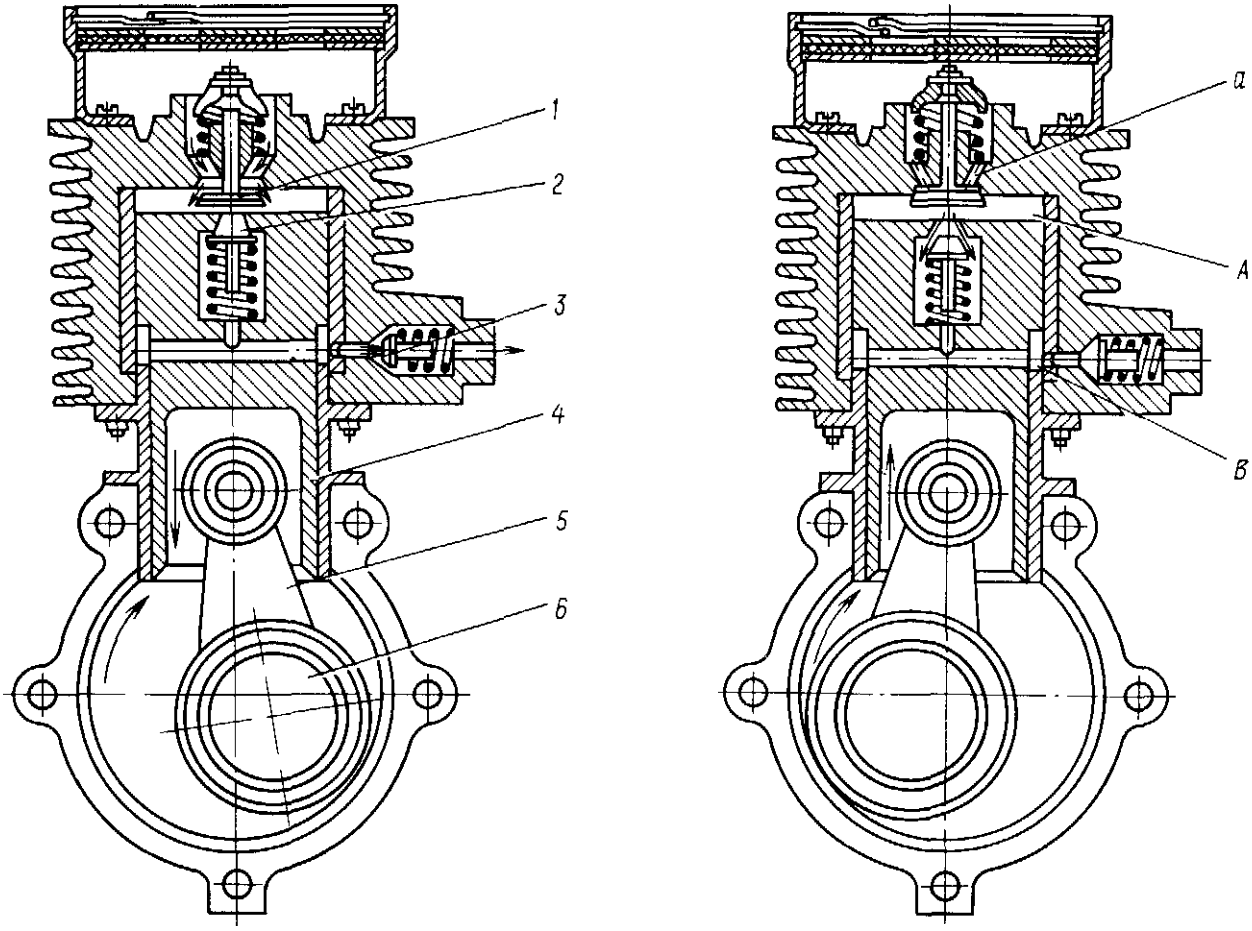
When the piston moves down,the volume of space A of the first stage cylinder increases and rarefaction is formed in it. Inlet valve (1) opens and air is sucked from atmosphere through hole "a" into the cylinder. At this time, the volume of space B of the second stage cylinder decreases and. the pre-compreaaed air contained in it ia additionally compressed. Air compressed in space B opens delivery valve (3) and flows to the airplane bottle.

When the pis-ton moves upward, the volume of space A decreases and air fed to it is p compressed to 5 to 6 kgf/cm , the volume of space B increases and rarefaction is created in it. The pressure difference in spaces A and B opens by-pass valve (2) and air compressed, in space A is fed, via the passages in the piston to space B of the second-stage cylinder.

When the piston moves down, by-pass valve (2) gets closed, air is compressed in space B of the second-stage cylinder and is supplied via the air line to the airplane bottle.

The volume of the second-stage cylinder space is considerably smaller than that of the first-stage cylinder space so that the air delivered to the airplane bottle is com-
2 pressed to 50 kgf/cm .

Air



6. Eccentric
   A. Stage I Space
   B. Stage II Space
   a. Hole for Suction of Atmospheric Air

1. Inlet Valve
2. By-Pass Valve
3. Delivery Valve
4. Piston
5. Connecting Rod

Compressor Operation Diagram Figure 3

STARTING SYSTEM - TROUBLE SHOOTING

For mostly often encountered troubles and their remedies, refer to the Table given below.

Trouble	Possible cause	Correction
1. Compressor does not ensure normal pressure in airplane bottle	(1) Leaky joints of air system pipelines	Ensure tightness by tightening nuts of air system joints and replacing defective sealing gaskets
	(2) Defective gaskets of body and connection of delivery valve	Replace gaskets: Disconnect the airplane bottle air line. Unlock and undo the swivel nipple attachment nut. Remove the nipple and old gaskets. Drive out the delivery valve, Remove the old gasket, Install a new gasket. Screw in the delivery valve. Install new gaskets and fit the swivel nipple. Screw on and lock the swivel nipple attachment nut. Connect the airplane bottle air line, and ensure leak-proof joints
	(3) Inlet, delivery and by-pass valves are leaky	Replace the compressor (Ref. Task Cards Nos 201 through 203)-NOTE; Compressor is replaced by the Supplier's representatives
	(4) Clogged air filter of the compressor	Remove and replace the filtering element (Ref. 072.00.00, Task Card No. 263)
	(5) freezing of condensate in the compressor and in the airplane air line	Warm the compressor and air line (Ref. 072.00.00, Taak Card No. 204). Blow the airplane air system with dry compressed air

Trouble	Possible cause	Correction
	(6) Ovartorque coupling pins are sheared, off	Install new coupling from the individual SPTA set, having checked free rotation of the compressor by the shaft ahank using wrench UB-24-07

STARTING SYSTEM - MAINTENANCE PRACTICES

1. LIST OF TASK CARDS

Title	Task Card No.
Removal	201
Depreservation of New Compressor	202
Installation	203

<table>
<tr><td>TO M-14P MS</td><td colspan="2">TASK CARD No. 201</td><td colspan="2"></td></tr>
<tr><td>M S ITEM</td><td colspan="4">PROCEDURE: Removal</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="3">1. Disconnect the compressed air outlet pipe.
2. Undo six nuts for attachment of the compressor to the engine crankcase rear cover, remove the washers.
3.Remove the compressor from the engine. 4. Remove the gasket,</td><td></td><td></td></tr>
<tr><td>TEST EQUIPMENT</td><td colspan="2">TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td></td><td colspan="2">Pliers, flat-nosed 150 Wrench 11x14 14-24-861 Wrench 19x22 700880-7</td><td colspan="2"></td></tr>
</table>

TO M-14P MS	**TASK CARD No. 202**		
M S ITEM	PROCEDURE Depreservation of Kew Compressor		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1.move the new compressor from its packaging. 2. Remove the blanking cover from the delivery valve. 3. Remove the spring lock, mesh, filtering element and the aecond mean. 4. '.Vine the outer surfaces and flange of the compressor with a clean cloth moistened, in clean unleaded gasoline. 5. Press the stem of the inlet valve with hand. and turn the compressor eccentric 15 to 17 full revolutions to remove preservation grease from the cylinder Interior. 6. Wash the filtering element with gasoline and dry with compressed air. 7. Install the mesh, filtering element, second mean and lock with the spring lock. ***NTES: 1. Install the filtering element inside the filter housing with the same surface inward as it was before washing.*** 2, Install the filter lock with the convex middle portion -toward-s the mesh.			

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Screwdriver 700345 A150x0.5	Gasoline Nefraa-S 50/170 or BR-1, BR-2 Air, compressed Brush, hair Glotha

TO M-14P MS	**TASK CARD No. 203**		
M S ITEM	PROCEDURE' Installation		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Carefully wipe and, inspect the flange and. shank of the new compressor. T.R. Soiling and. nicks on the flange and shank are not allowed. 2, Clean the oil supply passage and blow it with compressed air. T.R. Soil in the passage is not allowed. **CAUTIOH**: WHEN INSTALLING THE GASKET. SEE TO IT THAT ITS HOLES ARE ALIGNED WITH OIL PASSAGES. 3. Install a sealing gasket between the flanges of the drive and compressor. 4. Install the compressor on the drive ao that the holes of the oil passages are aligned and ensure free mating of the drive shaft with the shank of the compressor shaft. 5. Install six flat and six spring washers, onto the studs attaching the compressor, 6. Screw on and tighten six compressor attachment nuts. 7. Connect the compressed air outlet pipe to the compressor.		If soil is detected, wash it with clean gasoline and blow with compressed air. Dress nicka on flange and shank Wash the passage with clean gasoline and blow with compressed air	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
8. Run the engine to teat operation of the compressor and tightness of the No. 202). system (Ref. 072,00.00, Task Card **T.R.** Leakage of .toints is not allowed.	If leakage ia detected, check and tighten the compressor connection nut	

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Pliers, flat-nosed 150 Wrench 11x14 14-24-861 Wrench 19x22 700880-7	Sealant "50" Wire, locking KO-0.8 Gasoline Air, compreaeed

SPINNING SYSTEM - DESCRIPTION AND OPERATION

1. GENERAL

To perform the engine spinning at starting, use is made of the compressed air distributor, starting valves and fuel priming system.

The compressed air distributor automatically distributes compressed air among the cylinders at power stroke thus rotating the crankshaft.

The fittings for supply of compressed air to the cylinders comprise nine connecting pipes and nine starting valves screwed into the head of each cylinder.

The fuel priming system serves to enrich the working mixture to facilitate starting. 2. CONSTRUCTION

2.1. COMPRESSED AIR DISTRIBUTOR

The compressed air distributor comprises a housing, cover, drive shaft, slide valve, elbow, pad, thrust bearing, adjustment coupling, nine connections, ball valve and other parts.

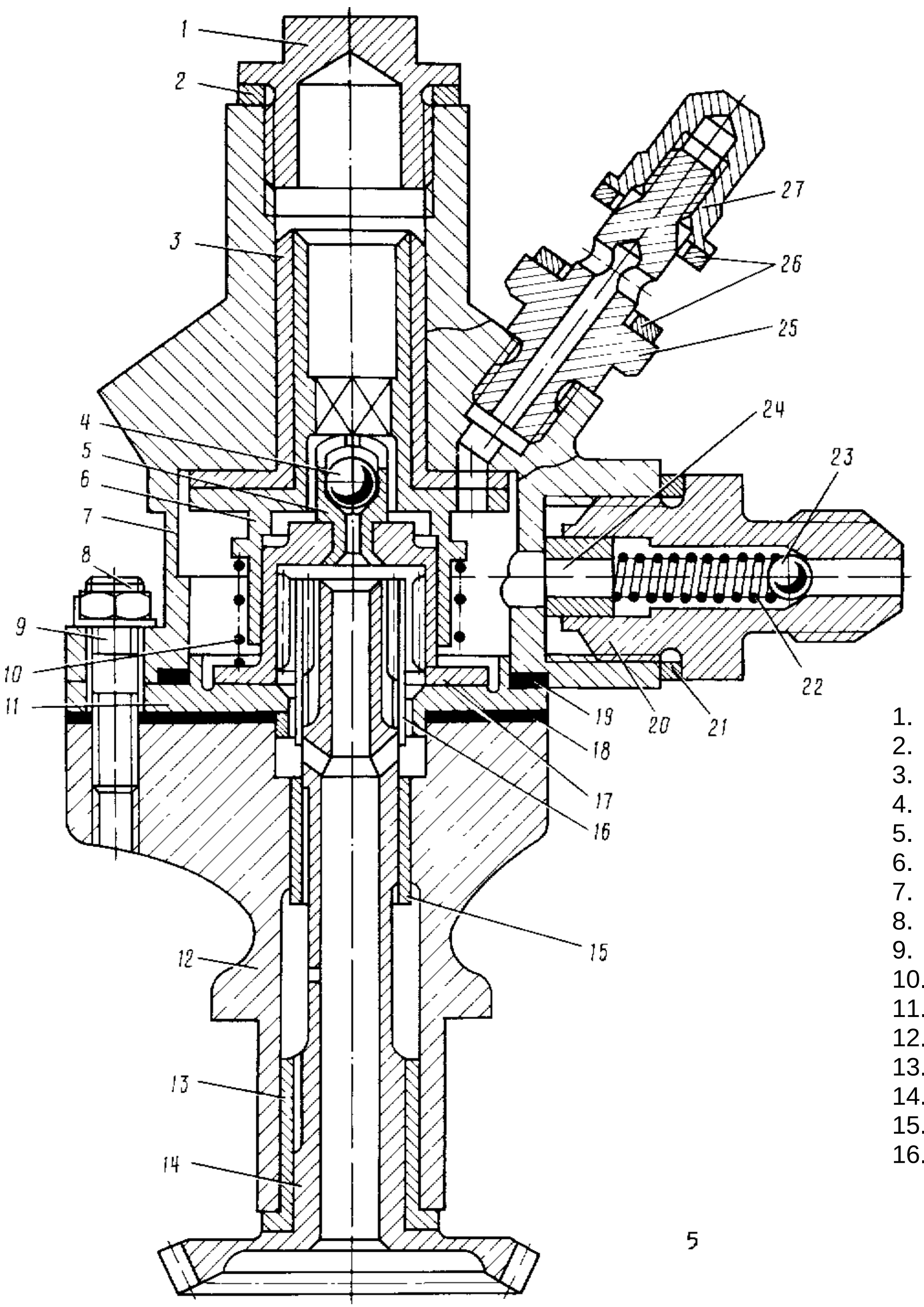
Housing (12) (Ref. Fig. 1) and cover (7) are made of aluminium alloy and are interconnected by three studs (9). Bronze pad (11) supporting steel thrust bearing (17) is installed between the housing and the cover. The joints between the housing, pad and cover are sealed with paronite gaskets (18) and (19).

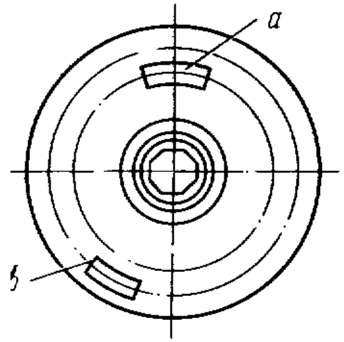
Bronze bushings (3) and (15) are pressed inside the housing and. cover. The cover has plug (1) sealed with gasket (2).

The compressed air distributor is rotated by a driven gear of the drive, made integral with shaft (14). The splined end of shaft (14) imparts rotation through adjustment coupling (16) having external and internal splines to thrust bearing (17) with end projection rotating slide valve (6).

The disk of slide valve (6) is constantly pressed by compression spring (10) to bushing (3) of cover (7) and by-passes compressed air through two ports positioned at different distances from the center for starting the engine or scavenging lower cylinders,

Compressed air is fed to the cylinders for starting the engine through the port adjacent to the slide valve center and through all the holes in the distributor cover.





5

1. Plug
2. Gasket
3. Bushing
4. Ball
5. Valve Seat
6. Slide Valve
7. Housing Cover
8. Nut
9. Stud
10. Compression Spring
11. Pad
12. Housing
13. Bushing
14. Driven Shaft
15. Bushing
16. Adjustment Spline Coupling
17. Thrust Bearing
18. Gasket
19. Gasket
20. Check Valve Connection
21. Sealing Ring
22. Check Valve Spring
23. Ball
24. Valve Spring Thrust Bushing
25. Inlet Connection
26. Sealing Ring
27. Air Release Pipe Nipple Attachment Nut

a. Port to Supply Compressed Air for Starting Engine

b. Port to Supply Compressed Air for Low Cylinders Scavenging

Air is fed through the port located, away from the slide valve center and through the oval holes in the distributor cover to the lower cylinders Nos 4» 5, 6 and 7 for scavenging them during exhaust stroke,

The check valve comprises connection (20), ball (23), spring (22) and bushing (24). It is intended to preclude oil from the distributor to the compressed air supply pipeline during operation of the engine,

Installed in thrust bearing (17) is a ball valve including ball (4) and seat (5) to pass oil during operation of the engine to the shank of the slide valve to lubricate the latter. In the course of starting, ball (4) shuts off compressed air from the distributor to the engine rear cover.

2.2. STARTING VALVE

The starting valve ensures supply of compressed, air to the engine cylinder.

Constructionally, the starting valve includes housing (^{c};) (Ref. Fig, ?), valve (6) with spring (2) and thrust nut (1), clamping cap (8) and three aluminium sealing gaskets (3) and (4). Starting valve housing (5) is a steel hollow part. Its outer surface has a hexagon for the wrench and thread on both sides, as well as a hole to pass compressed air to the inner space.

The housing has a conical seat for the valve face and a thrust bridge to support the spring with a hole for the valve stem.

Valve (6) is made of alloyed steel. It has a head with a face and a slot for seating tool. The valve stem is threaded to receive the support spring and haa a hole to lock the nut compreaaing the spring. The valve atera near the neck is provided with a cylindrical aligning surface with three slots to pass air.

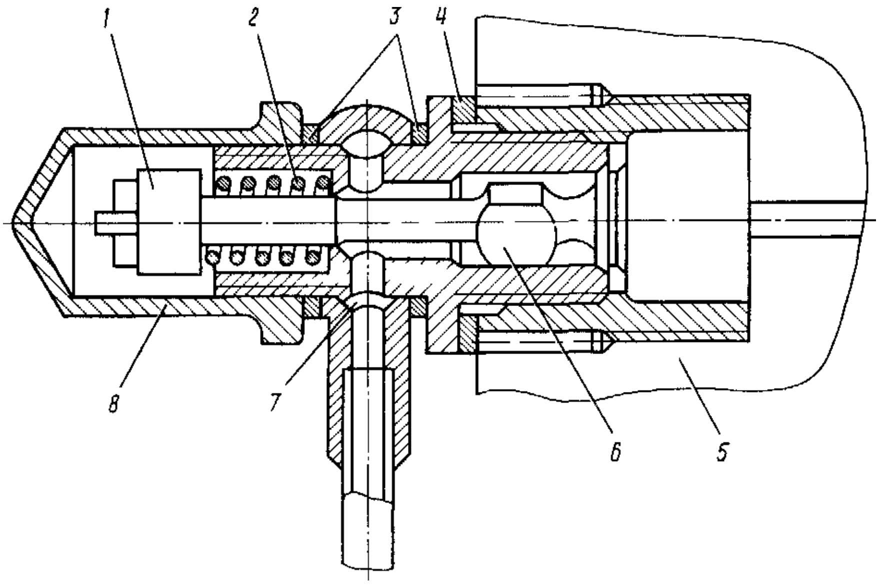
During operation of the engine the valve is closed by the spring and cylinder gas pressure.

To start the engine, compressed air is fed via the pipeline to two radial holes and fills the inner space of the housing, opens the valve and rushes to the cylinder where it pushes the piston to turn the crankshaft.

2.3. FUEL PRIMING SYSTEM

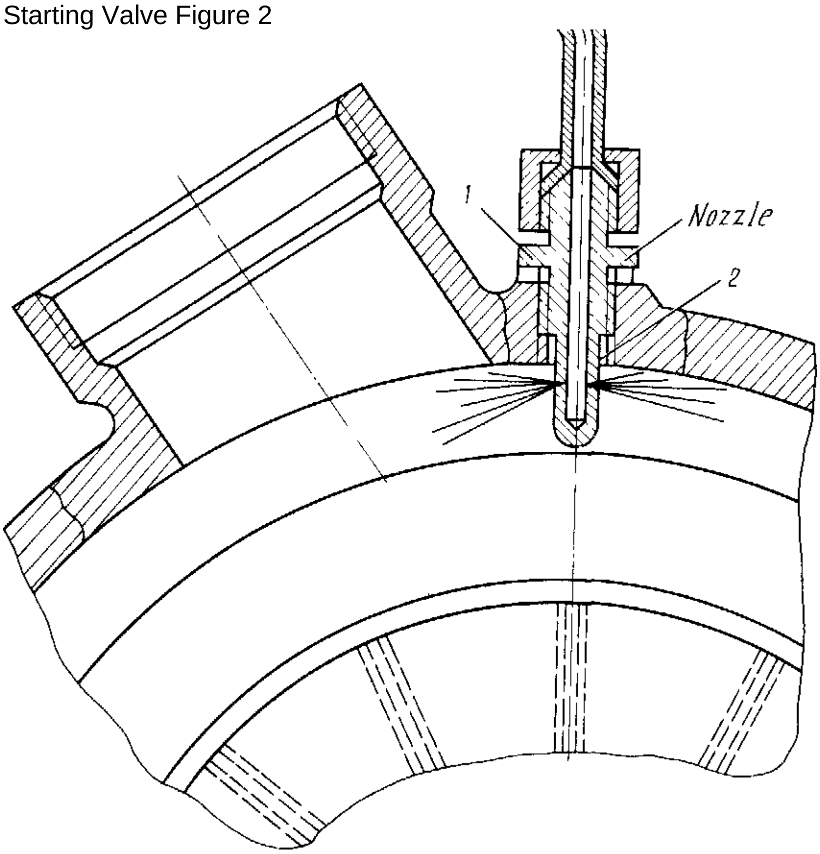
The M-14Pengine fuel priming system includes: the "Atmos" type priming pump or a hand priming pump with a pipeline, a nozzle and a pipe with connection.

The nozzle ensures fine pulverization of gasoline to increase evaporation surface and improve mixing of fuel particles with air for obtaining a homogeneous mixture throughout the mixture collector volume and ail cylinders of the engine,



1. Nut
2. Spring
3. Gasket
4. Gasket
5. Housing
6. Valve
7. Swivel Elbow Body
8. Cap

Starting Valve Figure 2



1. Body
3. Atomizer

Nozzle .Figure 3

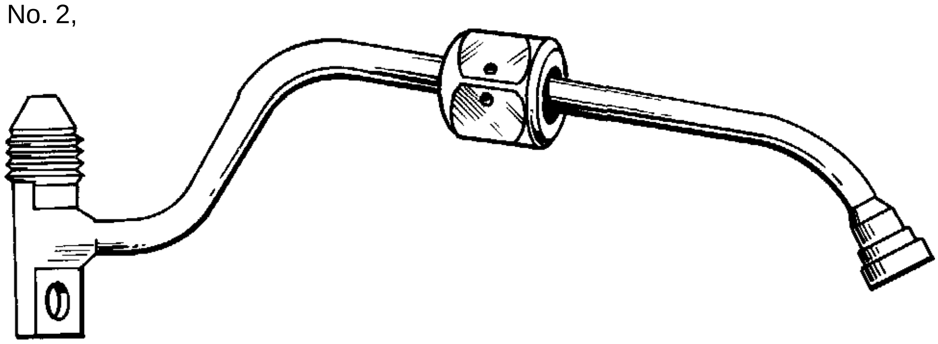
The nozzle includes steel body (1) (Ref. Fig. 3) and atomizer (2).

The body has a hexagon for the wrench and thread on both ends for screwing into the mixture collector and connecting the pipe with gasoline supply connection.

Pressed and flared in the nozzle body ia the atomizer having four inclined holes to ensure fine pulverization of gasoline in the mixture collector with a short jet.

The pipe with connection(Ref. Fig, 4) has a sealing cone with a thread for connecting the pipeline running from the hand priming pump.

The pipe ia attached by a union nut to the nozzle and is attached by a clamp to the inlet pipe of cylinder No. 2,



Pipe with Connection Figure 4

SPINNING SYSTEM - TROUBLE SHOOTING

For mostly often encountered troubles and. their remedies, refer to the Table given, below.

Trouble	Possible cause	Correction
When starting the engine with compressed air, airscrew does not rotate	(1) Low air pressure in bottle (2) Air pressure loss because' of leakage in starting system. (3) Incorrect setting of compressed air distributor slide valve (4) Mixed pipes of starting system (5) Scores on compressed air distributor working surfaces resulting in air getting through gaps to several cylinders simultaneously ***NOTE: The operations under this Item are carried out by the Supplier's representatives***	Fill bottle to pressure of 50 kgf/cm^2 Check starting system for leakage. Eliminate defects Properly set compressed air distributor slide valve (Ref. Task Card No. 204) Replace pipes for individual fit to each cylinder Disassemble compressed air distributor and lap ita working surfaces.

SPINNING SYSTEM - MAINTENANCE PRACTICES

1. LIST OF TASK CARDS

TO M-14P MS	**TASK CARD No. 201**	PAGE(S) 203, 204	
M.S ITEM	PROCEDURE: Removal		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Undo nine caps. 2. Remove nine pipes for supply of air to the cylinders and aluminium sealing washers. 3. Disconnect the pipe for supply of air to the distributor, 4. Unlock and undo three attachment nuts of the compressed air distributor cover. 5. Remove the cover of the compressed air distributor. 6. Unlock two locks of the compressed air distributor housing attachment nuts. 7. Undo two housing attachment nuts. 8. Remove the locks, 9. Remove the distributor housing. 10. Remove the gasket.			

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Pliers, flat-nosed 150 Wrench 7x9 700880-2 Wrench 17x19 UB-24-07 Screwdriver 700345 A150x0.5 Hammer 700016	

TO M-14P MS	**T A S K C A R D No. 202**	PAGE IS) 205	
MS ITEM	PROCEDURE: De preservation of New Compressed Air Distributor		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Remove packaging covers and withdraw the distributor from packaging. 2. Remove the distributor housing cover supporting the pad. 3. Remove the pad, adjustment coupling, thrust bearing and slide valve with spring from the cover. 4. Wash all the removed parts in clean gasoline. 5. Dry them with dry compressed air and coat with a thin layer of oil MS-20.			

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Fliers, flat-nosed 150 Wrench 7x9 700880-2	Gasoline Nefraa-S 50/170 or BR-1, BR-2 Air, compressed - Oil MS-20

<table>
<tr><td>TO M-14P MS</td><td colspan="2">TASK CARD No. 203</td><td colspan="2">PAGE<S) 207</td></tr>
<tr><td>MS ITEM</td><td colspan="4">PROCEDURE' Installation of Compressed Air .Distributor Housing</td></tr>
<tr><td colspan="3">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="3">1. Inspect the distributor housing flange and the locating seat on the rear cover and make sure they are free from nicks.
<u>T.R.</u> Nicka are not allowed.
2. Install the distributor housing on the engine, having placed paronite gasket coated with sealant "50" under the flange.
3.Install two locks and tighten two housing attachment nuts.
4. Lock the nuts.</td><td>Dress nicks</td><td></td></tr>
<tr><td colspan="2">TEST EQUIPMENT</td><td>TOOLS AND FIXTURES</td><td colspan="2">MATERIALS</td></tr>
<tr><td colspan="2"></td><td>Pliers, flat-nosed 150 Wrench 7x9 700880-2</td><td colspan="2">Sealant "50" Wire, locking KO-0.8</td></tr>
</table>

TO M-14P MS	**T A S K C A R D No. 204**	pAGEfsi 209, 210	
MS ITEM	PROCEDURE: Adjustment of Compressed Air Distributor		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Secure the arrow under the airscrew shaft thrust bearing cover attachment nut and bring it to the scale applied to the flange of the airscrew shaft. 2. Drive out one spark plug from each cylinder (Ref. 074.20.02, Task Card No. 201). 3. Drive in the TDC indicator into the plug hole of cylinder Mo. 4. 4. Set the piston of cylinder No. 4 to TDC in compression stroke againat the TDC indicator. 5. Set the piston of cylinder No. 4 to a position of 12° after the TDC in expansion stroke and then. turn the airscrew shaft in its normal direction through 8° after the TDC. ***NOTE: Allan the arrow with the scale zero division beforehand.*** 6. 3et the slide valve in the distributor cover so that the slide valve port closer to the center opens the hole for supply of compressed air to cylinder No. 4 for up to 1 mm (down the direction of slide valve rotation). 7. Assemble the cover. 8. Align the splines of the adjustment coupling with those of "the drive shaft repositioning the adjustment coupling in the thrust bearing splines, **CAUTION:** WHEN ALIGHIK& THE SPLINES OF THE ADJUSTMENT COUPLING AND DRIVE SHAFT, DO NOT OFFSET THE SLIDE VALVE.			

TO M-14P MS	**T A S K C A R D No. 205**	PAGEISI 211, 212	
MS ITEM	PROCEDURE: Installation of Cover of Compressed Air Distributor Housing		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Coat the paronite and rubber gaskets with sealant "50" and install them on the distributor housing, 2, Install the housing cover on. the distributor housing. 3. Pit the locks, install and tighten three nuts for attachment of the distributor housing cover. 4. Lock the attachment nuts. 5- Install aluminium gaskets and nine pipes for supply of air to the cylinders on the compressed air distributor. 6. Screw on and tighten the caps for attachment of the cylinder air supply pipes. 7. Connect the air supply pipe to the distributor. 8. Check proper installation and adjustment of the compressed air distributor by turning the engine crankshaft (Ref. 072.00.00, Task Card No. 201).			

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY

TEST EQUIPMENT	TOOLS ANO FIXTURES	MATERIALS
	Pliers, flat-nosed 150 Wrench 19x22 700880-7 Wrench, spark plug 22 15-32-173 Wrench 7x9 700880-2	Sealant "50" Wire. locking KO-0.8

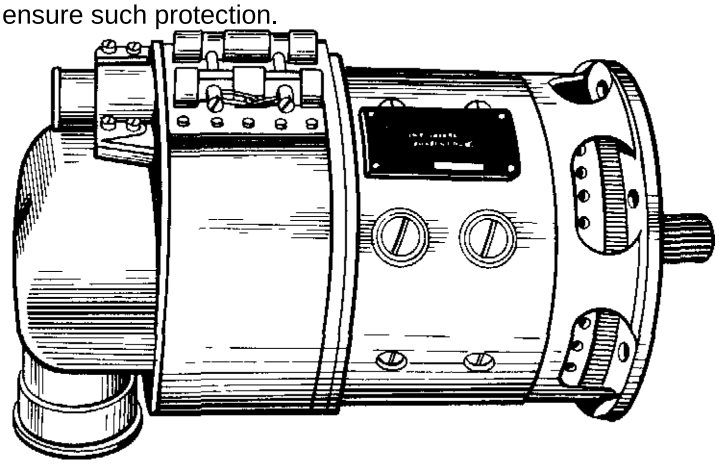
GENERATOR GSR-3000M, SERIES 4 - DESCRIPTION AND OPERATION

1. GENERAL

The G3R-3000M, aeries 4 generator (Ref. Fig. 1) is intended, to feed the airplane electrical system with DC power.

The generator is a shunt-wound four-pole DC machine with four interpoles. The generator is designed for LH rotation (counterclockwise) if viewed from its drive side.

Constructionally the generator is a semi-enclosed electric machine with flange-type mounting and flexible shaft drive. The generator is not protected against ingress of liquid into its interior* The construction of the airplane should ensure such protection.



Generator G3R-3000M. Series 4 Figure 1

2. DESCRIPTION

2.1. CONSTRUCTION

The generator (Ref. Pig. 2) comprises a frame with windings, armature, end shield, and a pipe.

Generator frame (14) serves as a magnetic circuit and carries main poles (13) with field windings (16) and interpoles (2) with windings (1). Bearing (17) is installed in the frame,

Armature (15) has a wave-type winding lodged in slots of lamination stack and interconnected through commutator (11). Flexible shaft (19) is secured by tapered joint inside hollow shaft (18).

End shield (12) ia secured to the frame by bolts (20), The inner surface of the end shield carries four brush holders (6). Each brush holder receives two brushes (7) which are pressed to the commutator by helical springs (8) and levers.

Terminal panel (10) ia mounted on the end shield. The end shield ports and the panel are closed with protective band (21). Bearing (9) is installed in the end shield.

Cooling pipe (3) is secured to the end shield by a atud and nut (4). The cooling air supply hose is fitted to the pipe.

2.2. SPECIFICATIONS

Voltage ....28.5 V
Power (at 30 V) ....3 kW
Load current ……………………………………… ....100 A
Speed of rotation ....4000 to 9000 r/min
Duty ....Continuous
Permissible overloads:
Permissible current at 5000 to 8000 r/min during 1 min ....150 A
Permissible current at 5600 to 8000 r/min during 5 a ....200 A
Permissible load current without air blowing for 15 min 30A
Nominal speed of rotation at load of 100 A and voltage
of 28.5 V with short shunt (without regulator)
when warmed up ....Up to 3600 r/min
Forced cooling is carried out by blowing with on-coming non-heated clean air.
Total air pressure at cooling inlet duct with dynamic
pressure at least 50 mm HnO ....At least 150 mm HpO
Air flow rate at barometric pressure of 760 mm Hg .... At least 35 dm /s
Mass ....Up to 11.6 kg
Winding resistance at 20 °C:
Armature winding ....0.024 ohm_M 0 %
Fie Id winding ....2.20 ohms^6 %
Interpole winding ....0.0122 ohm
Brushes:
Make MGS-7I
Number ....8 pea
Overall dimensions ....7.2x12x25 mm

Generator offers trouble-free operation when exposed to the following environmental and mechanical effects:

Relative humidity . ...Up to 98 %
Temperature variations ....From minus 60 to 50 °C

Mount vibration corresponds to that of the operating engine which carries the generator

3. OPERATION

As regards its operating principle, the GSR-3000M, series 4 generator does not differ from conventional DC machines,

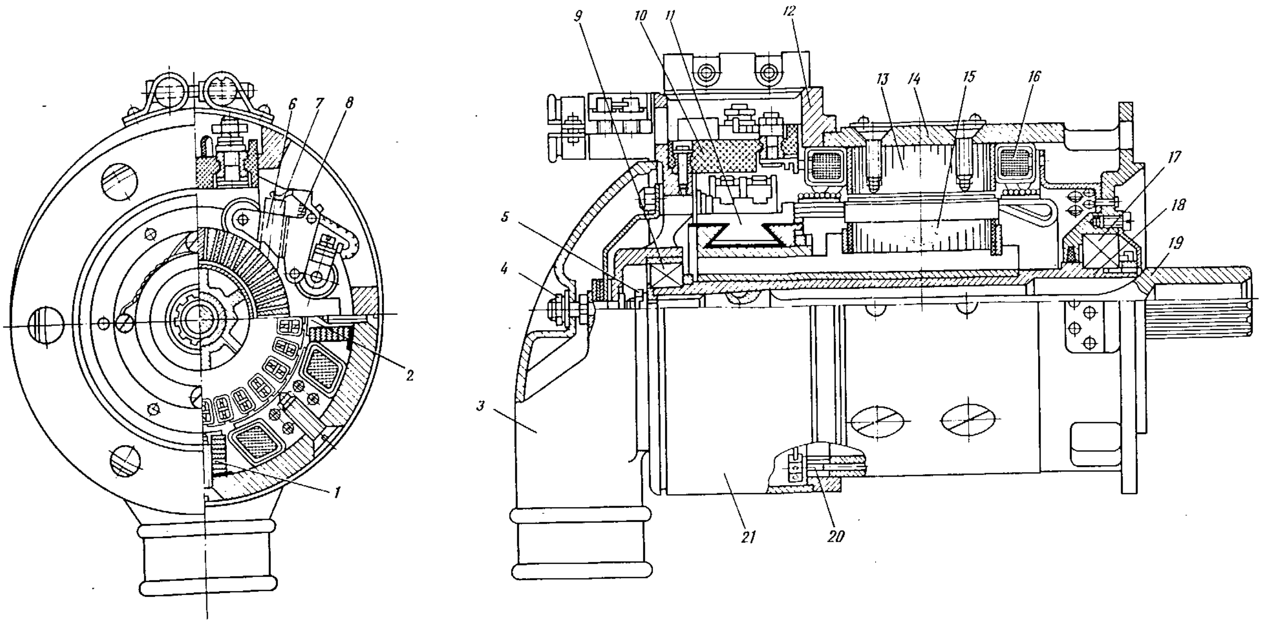
The generator electric connection diagram is shown in fig. 3.

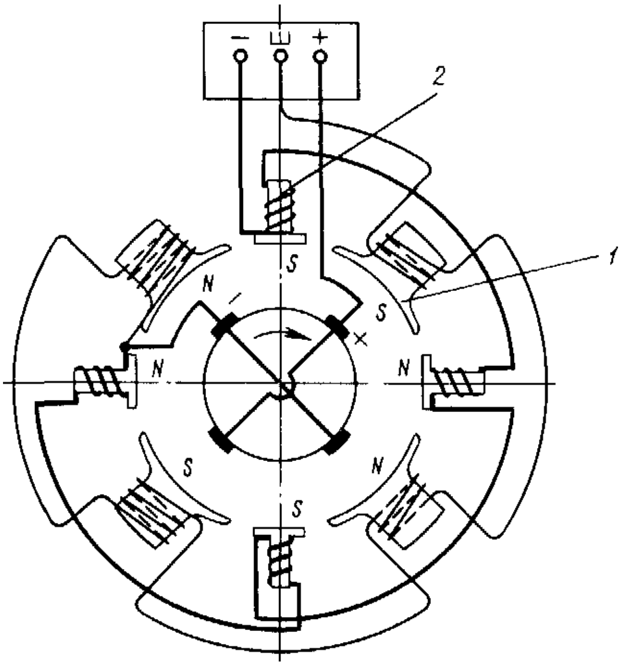
When the armature rotates in the magnetic field created by the main poles with field windings, electromotive force is induced in the armature winding. Voltage across the generator terminals is lower than its electromotive force for the value of voltage drop in the armature winding, caused by load current passing through, the winding and delivered

to the external mains,

Load current passing through the armature winding when the generator operates for the external mains forms armature magnetic field which is stationary in space. This fields acts upon the main pole magnetic field to distort and decrease it (armature reaction phenomenon). To eliminate armature reaction effect, the generator is provided with interpoles whose windings are connected in series with the armature winding. Alternation of polarity of the main poles and interpoles is shown in Fig. 3.

1.Interpole Winding
2.Interpole
3.Pipe
4.Nut
5.Nut
6.Brush Holder
7.Brush
8.Spring
9.Bearing
10.Terminal Panel
11.Commutator
12. End Shield
13. Pole
14. Frame
15. Armature
16. Field Winding
17. Bearing
18. Hollow Shaft
19. Flexible Shaft
20. Bolt
21. Protective Band





1. Main Pole
2. Interpole

Generator Electrical Connection Diagram (Commutator Side View)
Figure 3

GENERATOR GSR-3000M, SERIES 4 - TROUBLE SHOOTING

For mostly often encountered troubles and their remedies, refer to the Table given below.

Trouble	Possible cause	Correction
1, Generator produces no voltage 2, Generator does not produce total voltage or voltage drops under load	(1) Unserviceable brushes: (a) Brushes swell and can hardly be removed from seats, brushes seize in brush holders (b) Brushes hang on pig tail (brushes worn out to length shorter than 17 mm) (2) Damage to field winding. Check field winding resistance: (a) If infinite, field winding circuit is open (b) If zero, field winding is shorted (3) Polarity reversal of generator, Close terminals "Sh" and "+", connect voltmeter to terminals "+" and "-". If with generator rotating, voltmeter displays reverse readings, generator is re magnetized (1) Breakdown in field winding* Check resistance of field winding. If it is legs than 2.2 ohmst& %, field winding ia partially snorted	Replace brushes Replace brushes Replace generator Replace generator Connect storage battery to ter-minals "Sh" and "-" for 1 to 2 s observing polarity: battery "+" to terminal "Sh". battery "-" to terminal "-" Replace generator

Trouble	Possible cause	Correction
3. Heavy sparking under brushes causing burning of commutator bars	(2) Breakdown in armature winding. Check generator in operation and inspect commutator after work* If heavy brush sparking is observed during operation of generator and burning of separate bars on. commutator with melting out of solder from bar risers are detected, armature is ahorted (if solder melts out) or its winding is open (1) Unseated brushes, Check working surface of brushes. If brushes have non-ground (non-shiny) spots on over 30 % of area, brushes are poorly seated to commutator (2) Damaged brushes, Check brushes. Brushes can hardly be removed from brush holders and have bright friction spots on side surfaces (3) Soiled commutator. Inspect commutator. Black deposit or burning on commutator surface (4) Increased runout or loosened bars of commutator. Random burning of commutator bars is observed during commutator inspection. Check commutator for runout (5) Short circuit in armature winding, Burning of separate bars with melting out of solder from risers of these bars	Replace generator Seat and grind brushes Replace brushes Wipe commutator with clean cloth slightly moistened in gasoline. If soiling persists, use emery cloth (of glass, grain size up to 8) rotating armature by hand. While doing this, raise brushes Replace generator Replace generator

Trouble	Possible cause	Correction
	(6) Excessive runout of commutator Commutator is grooved by brushes (7) Traces of oil on commutator. Check gearbox oil slinger	Replace generator Eliminate trouble in gearbox oil slinger. Replace generator

GENERATOR GSR-3000M, SERIES 4 - MAINTENANCE PRACTICES

1. LIST OF TASK

TO M-14P MS	**T A S K C A R D No. 201**	
MS ITEM	PROCEDURE Servicing	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. GENERAL The following conditions shall be ensured for normal operation of the generator: Cooling and loading according to Specifications,' Item 2.2. Protection againat ingress of water, oil, snow, dust,corrosive liquids and foreign objects inside the generator. Accomplishment of scheduled maintenance operations. 2. PREPARATORY OPERATIONS (1) Remove soiling from the generator outer surface. (2) Remove the generator from the engine. (3) Blow the generator interior with compressed air at a pressure of 1 to 2 kgf/cm^2. (4) Check the brush-commutator assembly for condition; make sure the brush springs and pig tails are intact, the brushes move smoothly in the holders. Check to see that the commutator is free from carbon deposit. The commutator surface should be clean, without soiling or traces of burning. Remove soiling by wiping the commutator with a cloth moistened in clean gasoline. If carbon deposit cannot be removed by gasoline, dress the commutator with glass paper.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
Inspect working surfaces of the brushes; make sure they are free from chipping. Measure the brush length. The bruahea shorter than 17 nun and having chipping should, be replaced. Check rotation of the armature with bruahea lifted. The armature should rotate freely, CLEANING COMMUTATOR (1) Arrange the generator on the support. (2) Remove the protective band. (3) Blow the generator interior with compressed air a-t a pressure of 1 to 2 kgf/cra^2. (4) Carefully remove all the bruahea from brush holders. (5) Glean the brush holders from dust and soiling with a tex-tolite wedge. Blow the generator to remove brush dust. (6) While turning the armature by the shaft splined end, make sure it rotates freely and without jamming. (7) Clean the commutator bar grooves of dust with a textolite wedge. (8) If carbon deposit or soiling is found on the commutator, wipe it with a clean cloth slightly moistened in clean gasoline and dry in air. Remove soiling that cannot be removed with a cloth, using glass paper. **CAUTION:** NEVER USE EMERY CLOTH.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CH ECKED BY
7/hen dressing, rotate the generator armature and. press a strip of glass paper fitted, over a pointed wooden stick to the commutator surface. Move th-e glass paper with the stick to and fro throughout the commutator length;after cleaning the commutator, carefully blow its interior with clean compressed, air at a pressure of 1 to 2 kgf/cm^2. 4. REPLACLHC; BRUSHES (1) Carefully seat the new brushes to the commutator with glass paper. **CAUTION:** KEVER USE EMERY CLOTH FOR SEATING SIKCE F1KE EMERY PARTICLES GETTING OM THE SEATED BRUSH SURFACE CAUSE RAPID WEAR OF THE BRUSHES AMD COMMUTATOR, DISRUPT BRUSH CONTACT AKD MAY LEAD TO PREMATURE FAILURE OF THE GENERATOR. Seat the brushes using the following procedure: Wrap a strip of glass paper, equal in width to that of the commutator, up the latter with abrasive layer outwards so that the strip envelopes the entire outer surface of the commutator. Install the brushes in their holders and carefully lower springs onto them. Rotate the armature with glass paper on the commutator counter-clockwise, if viewed from the drive end, till the brushes are fully seated to the commutator around its radius, While seating the brushes, never decrease the brush length for more than 0.5 mm from the original value. (2) Remove the brushes from the brush holders and blow the generator interior through the end shield ports with compressed air at a pressure of 1 to 2 kgf/cm . Direct air jet so that the brush dust is ejected from the generator, rather than is forced inside it.		

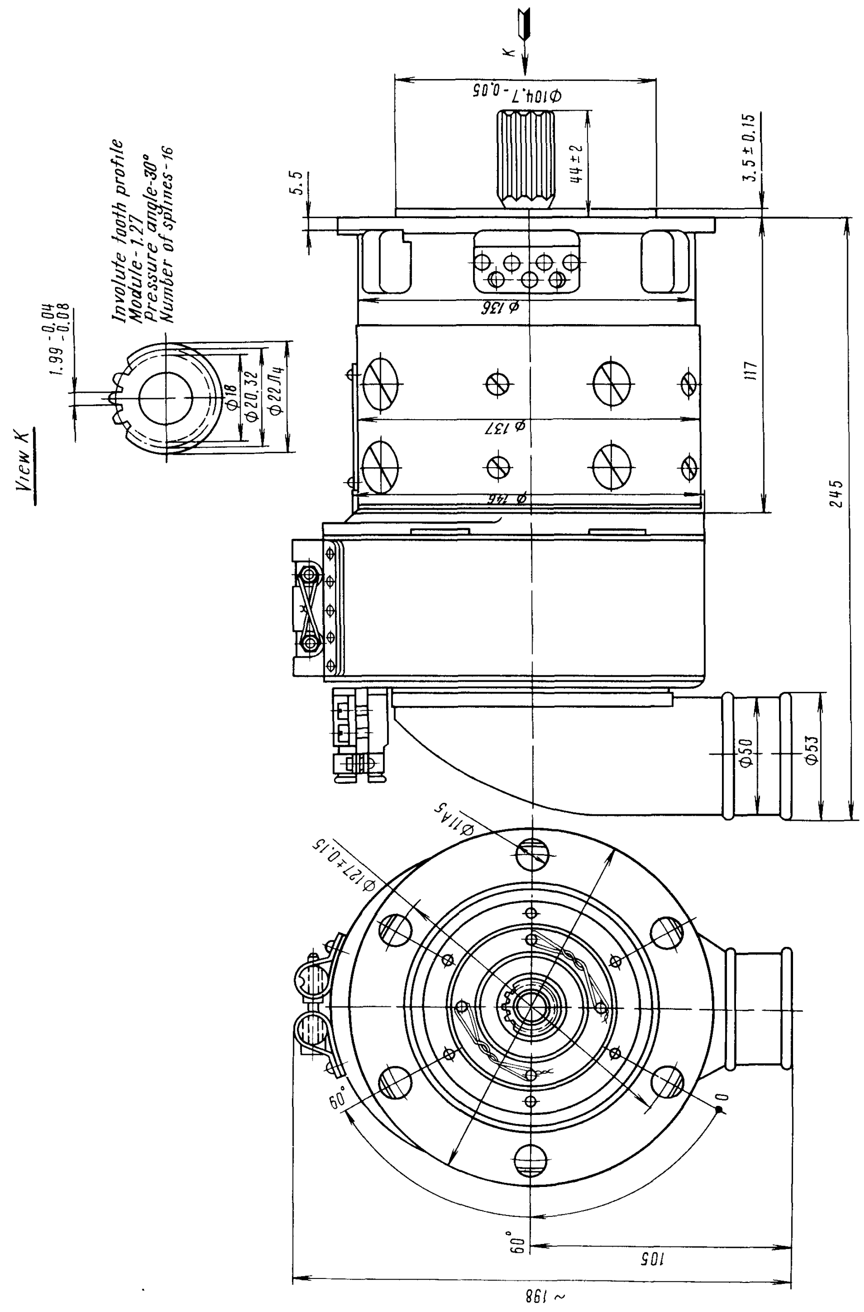
OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
(3) Fit the brushes after seating. The brushes are fitted with the generator run idle in the motor mode at a voltage of up to 15 V. The brushes are considered to be fitted properly if their working surfaces are bright (mirror-like) for at least 85 % of the areas. (4) Blow the generator interior with compressed air at a pressure of 1 to 2 kgf/cm to remove brush dust. ITOTE: Operations under Items 3, 4 are carried out according to terms specified in engine Maintenance Schedule. (5) Install the protective band on the generator and tighten it with screws. Lock the band screws with wire. (6) Make an entry on brush replacement in the generator Certificate.		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Screwdriver 700346 A2OQx1 Wrenches 14x17 14-232-03 and 7x9 700880-2 Hook, spring lifting (for removing brushe s)	Gasoline Nefras-S 50/170 or BR-1, BR-2 Paper, glass,grain size up to 8 Wire DKRM 0.80 L63 Air, compressed

TO M-14P MS	**T A S K C A R D No. 202**	
MS ITEM	PROCEDURE: Removal/Installation	

OPERATIONS AND TECHNICAL REQUIREMENTS	**CORRECTIVE ACTIONS**	**CHECKED BY**
1. INSTALLATION (1) Depreserve the generator by wiping its preserved, surfaces with a clean cloth moistened in. gasoline and then with a dry cloth. Avoid ingress of gasoline inside the generator. **CAUTION**: HOT DEPRESERVATION IS HOT ALLOWED. (2) Inspect the generator to make sure it is free from mechanical defects. **CAUTION:** NICKS ON LOCATING SURFACES CANNOT W ALLOWED. (3) Install the generator on the drive body having passed six attachment studs through the holes in the body flange and see to it that the generator flexible shaft ahank meshes with the intermediate shaft splines. (4) Install six nuts on the studs and cotter-pin them. (5) Remove the protective band and two clamps, (6) Connect wires to the generator terminals. Tighten the terminal nuts to ensure reliable contacts. (7) Install the protective band and clamps on the generator. Lock the screws with wire.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
(8) Connect the cooling air hose to the generator pipe. Check reliable attachment of the pipe to the end shield. **CAUTION:** INSTALL THE HOSE ON THE AIRPLANE SO THAT THE GENERATOR IS PROTECTED AGAINST DIRECT INGRESS OF DUST, SNOW, WATER, ETC. (9) Start the engine and check operation of the generator. (10) Overall dimensions of the generator are given in Pig. 201, 2. REMOVAL (1) Remove the protective band and clamps. (2) Disconnect wires from the generator. (3) Install the protective band and clamps on the generator. (4) Disconnect the cooling air hose. (5) Unlock and undo six generator attachment nuts. (6) Remove the generator from the engine,		



Generator Overall Dimensions

Figure 201

<table>
<tr><td>TO M-14P M.S.</td><td>TASK CARD No. 203</td><td colspan="2"></td></tr>
<tr><td>M.S. ITEM</td><td colspan="3">PROCEDURE: Inspection/Check</td></tr>
<tr><td colspan="2">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="2">CAUTION: PERFORM OPERATIONS OTHERWISE SPECIFIED WITHOUT REMOVING THE GENERATOR FROM THE ENGINE.
(1) Check attachment of the generator, make sure the generator-to-engine attachment nuts are reliably tightened.
(2) Clean the outer surfaces of soiling, check to see that the generator surface is free from mechanical defects, the air intake hose and pipe are reliably secured,
(3) Remove the protective band from the generator and check reliable contacts of all current-carrying wires.
(4) Check easy movement of the brushes in the holders, condition of the commutator, good repair of brush springs. Measure the maximum brush length. Replace the brushes shorter than 17 mm or having chipping with new brushes of the same make taken from the SPTA set.
NOTE: To preclude hanging of brushes and damaee to the commutator, take into account intensity of brush wear during preceding operation period and leave in the generator the brushes of such a length that will suffice to last up to the next scheduled maintenance.
<u>CAUTION:</u> REPLACE BRUSHES ONLY WITH THE GENERATOR REMOVED FROM THE ENGINE. SEAT AND FIT THE NEW BRUSH SET TO THE COMMUTATOR.</td><td></td><td></td></tr>
</table>

OPERATIONS AND TECHNICAL REQUIREMENTS		CORRECTIVE ACTIONS	CHECKED BY
TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**	
	Screwdriver 700346 A200x1 Pliers, flat-nosed 150 Wrench 14x17 14-232-03 Wrench 17x19 UB-24-07 Wrench, socket 14 UB-24-16 Caliper, vernier	Wire, locking KO-0.8 Cloths Brush, hair Paper, glass,grain size up to 8	

CONSTANT SPEED GOVERNOR R-2, SERIES 04- DESCRIPTION AND OPERATION

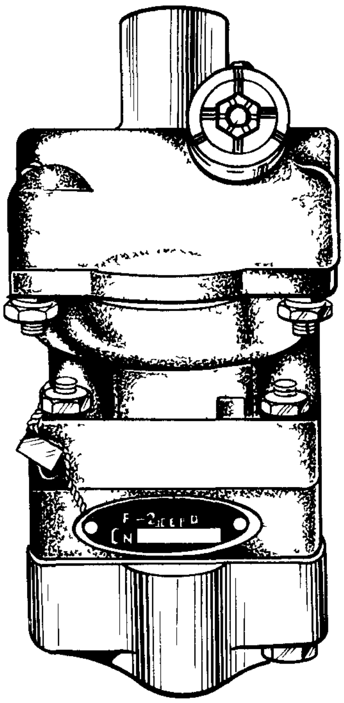
1. GENERAL

The R-2, aeries 04 airscrew constant speed governor (Ref. Fig* 1) is a unit intended to automatically control the hydraulic airscrew,

The R-2, series 04 governor is designed for operation on the M-14F engine with airscrew V530TA-D35 and ensures acconiplishntent of the following functions:

Automatic maintenance of the preset airscrew speed of rotation by varying its pitch.

Positive change of the airscrew speed of rotation within the operating range from 900 to 1940 r/min.



2. DESCRIPTION

2.1. SPECIFICATIONS

Type .... R-2, series 04

Drive .... From engine

Direction of rotation .... RH if viewed from governor drive end

Engine crankshaft-to-govemor drive transmission ratio 1.045

Governor drive shaft rotational speed. ensuring stable operation of engine	1400 to 3085 r/min (engine speed in this case is 1340 to 2950 r/min5
Operating principle	Centrifugal-hydraulic
Operation pattern	One-way, positive
Working fluid	Oil MS-20 COST 21743-76 from engine delivery line
Oil pressure at governor pump inlet:	
Operating conditions	3 to 4.5 kgf/cm^2
Idling	At least 1 kgf/cm^2
Maximum pressure at governor outlet at n = 2500 r/min,zero flow and oil temperature of 85 to 90 °C	(15±1) kgf/cm^2
Oil temperature at governor inlet:	
Minimum permissible	40 °C
Recommended	50 to 6.5 °C
Maximum permissible	90 °C
Maximum temperature at governor outlet	100 °C
Oil leakage through gaps at n = 2500 r/min, zero flow and temperature of 85 to 90 °C:	
At acceptance tests	Up to 1.5 1/min
By end of service life	Up to 2 1/min
Governor oil pump output at n = 2500 r/min, o outlet pressure P = 8 kgf/cm and temperature 85 to 90 °C	Not less than 7.5 1/min
Governor dry mass	($1.7^{+0.3}$) kg

2.2. CONSTRUCTION

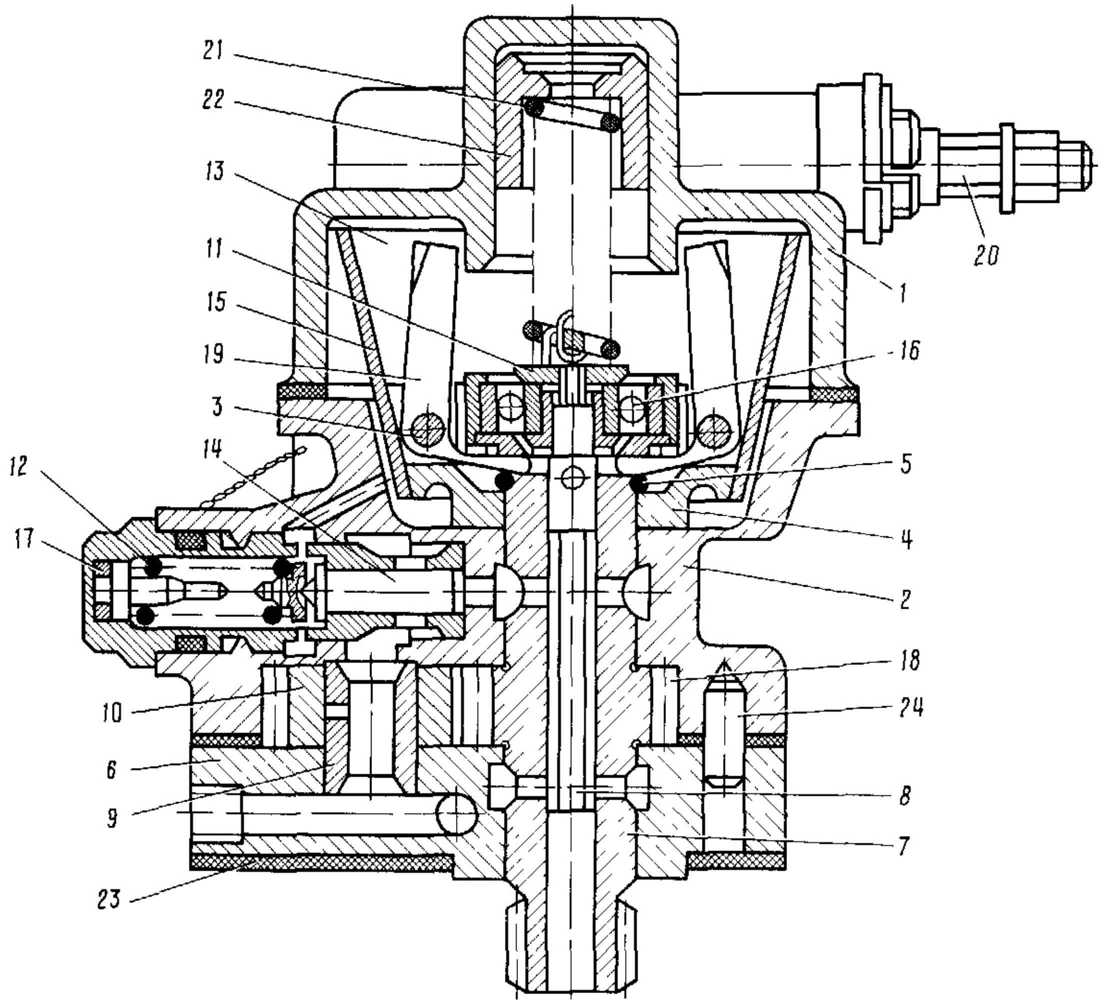
The mechanism of the R-2, series 04, governor (Ref, Fig. 2) comprises the following assemblies:
Governor body (l). Oil pump body (2). Transmission body (6)
All the governor parts are housed in these three assemblies.

2.2.1 Governor Body

Governor body (1) accommodates a slide valve assembly and control shaft (20),

The slide valve assembly controls distribution of oil flow and comprises slide valve (8) movable inside drive shaft (7).

The slide valve has two shoulders.



1. Governor Body
2. Oil Pump Body
3. Weight Pivot
4. Bracket
5. Retaining Ring
6. Transmission Body
7. Drive Shaft
8. Slide Valve
9. Driven Gear Axle
10. Driven Gear
11. Nut
12. Reducing Valve Spring
13. Centrifugal Governor Assembly
14. Reducing Valve
15. Cup
16. Ball Bearing
17. Adjustment Washer
18. Drive Shaft Gear
19. Weight
20. Control Shaft
21. Slide Valve Spring
22. Gear Rack
23. Drive Gasket
24. Pin

Speed Governor R-2, Series 04, Sectional View Figure 2

The lower shoulder controls supply of oil to the airscrew cylinder, the upper shoulder serves as a seal to preclude ingress of high-pressure oil to the centrifugal governor chamber.

Installed on the upper shoulder of the elide valve ia ball bearj-ng (16) whose inner race is pressed to the shoulder by nut (11). The outer race contacts the short arms of weights (19).

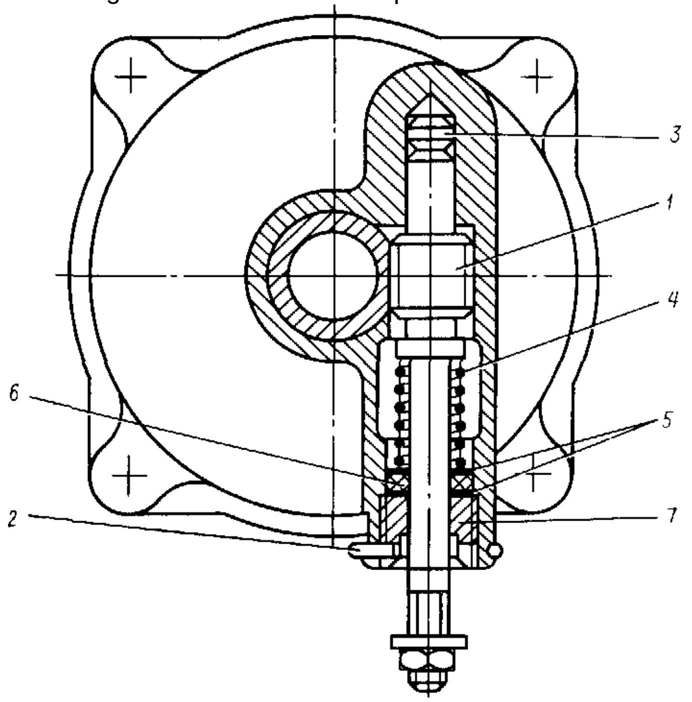
Rotation of drive shaft (7) seta to rotation the centrifugal assembly which thrusts by the enda of the weight short arms against the face of the ball bearing outer race and rotates the latter, whereas the inner race of the bearing and the slide valve are kept against rotation by the centrifugal mechanism spring disposed between the slide valve and the rack,

Rack (22) meshes with the gear of control drive shaft (20).

Control shaft (1) (Ref, Fig. 3) is made integral with a gear meshing the rack teeth,

Number of teeth Z = 12, module m = 1,

The control shaft is arranged in a side bore of the governor body. The shaft rests on end bearing (3) with one end and on sliding bearing (7) with the other end. The sliding bearing is screwed into the body and is locked in it by retaining ring (2), entering the slots in the body and bearing. The shaft is sealed in the body by sealing ring (6) pressed to the bearing face by spring (4) through slip washer (5). The other end of the spring thrusts against the shaft collar to press the shaft to end bearing (3) installed in the body.



1. Control Shaft
2. Retaining Ring
3. End Bearing
4. Spring
5. Slip Waaher
6. Sealing Ring
7. Sliding Bearing

Governor Body Unit Figure 3

The hex end. of the shaft protruding from the body receives a roller or remote control lever,

The governor body is connected with the oil pump body by four studs driven into the governor body bosses. The joint of the bodies is sealed by a paronite gasket.

2.2.2. Oil Pump Body

The oil pump body accommodates the oil pump and reducing valve. The gear-type oil pump comprises two gears - a drive gear and a driven gear.

Drive gear (18) CRef. Fig. 2) is made integral with drive shaft (7) installed in the oil pump body and in the gearing body.

Driven gear (10) is mounted on axle (9) press-fitted in the "transmission body,

The drive gear axle has a center hole for by-passing oil from the reducing valve to the governor pump inlet.

A lateral hole ia made in the axle for lubrication of working surfaces of the driven gear, and its axle,

Drive shaft (7) has a central axial hole where slide valve (8) moves with a small radial clearance. Two upper holes in the drive shaft connect the axial hole with the delivery space of the governor pump; six lower holes connect the axial hole of the drive shaft with the airscrew cylinder when the slide valve is lowered,

The drive shaft lower end is splined for coupling with. the engine gearbox drive coupling whereby the drive shaft is rotated. The upper end of the shaft has a flat for mounting centrifugal governor assembly (13) and a groove for retaining ring (5) preventing the centrifugal governor assembly from longitudinal displacement. Bracket (4) of the centrifugal governor assembly has a hole for its installation on the drive shaft upper end which drives the centrifugal governor assembly.

Two weights (19) are installed on steel pivots (3) in the slots of bracket lugs. The weights are free to turn on the pivots compressing or releasing spring (21).

Pitted to the tapered outer surface of the bracket is thin-walled steel cup (15) beaded into the groove of bracket (4) and spot welded to the latter.

The cup limits weight travel when speed of rotation reaches the preset value and, additionally, while carrying the oil contained in it, eliminates friction of the weights against stationary oil,

A plunger-type reducing valve is installed in a lateral bore of the oil pump body. The reducing valve comprises a guide bushing pressed in the oil pump body, valve (14) with spring (12), a cover and washer (17).

Spring tension is adjusted by selecting washer (17) for maximum oil pressure.

2.2.3. Transmission Body

Transmisaion body (6) is the lower cover of the oil pump and. -the flange for mounting the governor on the engine gearbox case.

Oil is fed from the engine to the governor and from the governor to the airscrew via internal routes for which purpose the transmission body flange has three holes (1), (2), (4) (Ref. Fig. 4).

The transmission body and oil pump body are interconnected by two coupling screws (3), (5). The joint between the oil pump and transmission bodies is sealed by a silk thread placed on sealant between the bodies.

3. OPERATION

The R-2, aeries 04, governor operates only with direct-action airscrew at one-way regulation scheme.

The airscrew blades are shifted to a smaller pitch by the pressure of oil fed by the governor to the airscrew cylinder.

Shifting to a higher pitch is performed by counterweights installed on the airscrew blades; in this case the governor returns oil from the airscrew cylinder to the engine gearbox case.

3.1. ENSURING CONSTANT PRESET SPEED OF ROTATION OF AIRSCREW AND POWERPLANT

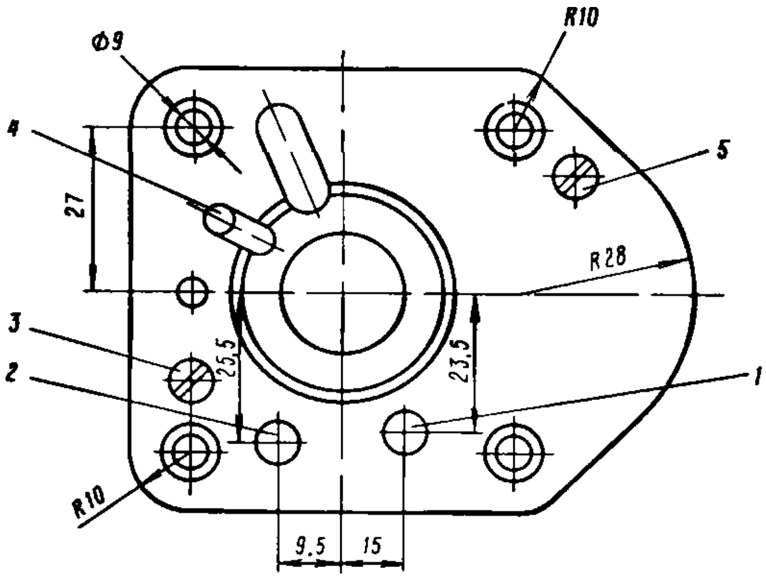
With the governor operating, the oil from the engine line is fed to the locating flange of the governor and then via passage (8) (Ref. Pig. 5) to the inlet of oil pump (7).

The pump increases the of. pressure to a value required for normal operation of the airscrew and feeds oil to the space between two shoulders of slide valve (6) from which it is fed to the airscrew for changing its pitch.

Fig. 5 shows schematic diagram of governor operation under steady-state conditions when the engine power and progressive speed of the airplane remain constant and the governor maintains the required constant speed of the engine.

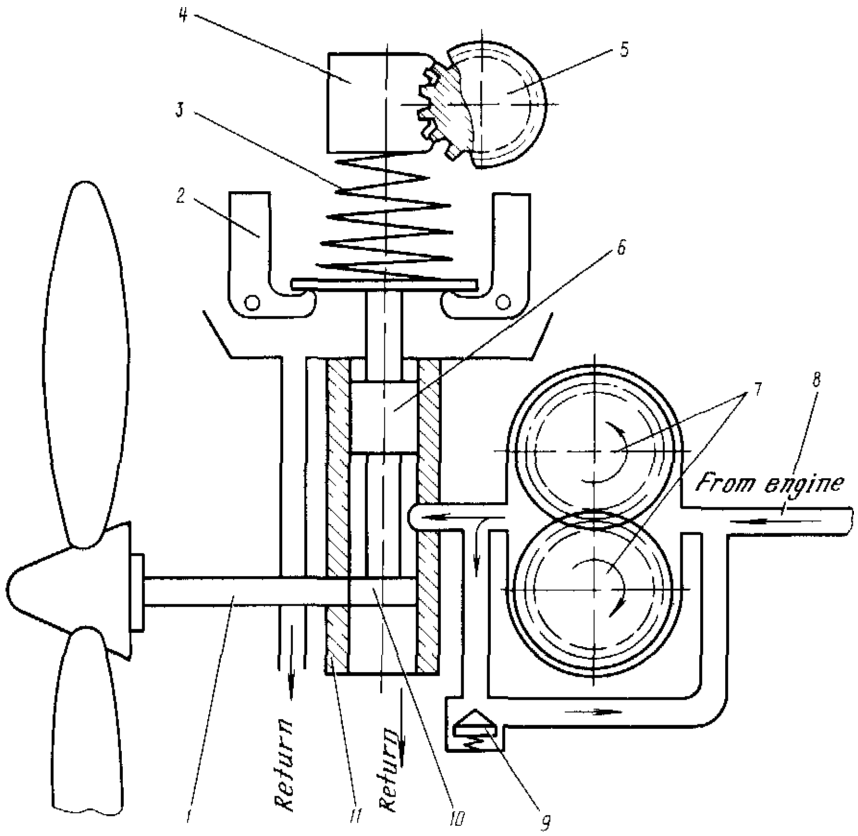
Under steady-state conditions rotating weights (2) are forced by centrifugal effect to turn on their axles and lift slide valve (6) upward, while spring (3) of the governor forces the slide valve down. Thus. position of slide valve (6) is determined by relation between centrifugal forces of weights (2) and force of spring (3).

In the case being discussed the spring tension force is equal to the weight centrifugal force.



1.Hole to Supply Oil from Engine to Governor
2.Hole to Supply Oil from Governor to Airscrew
3.Coupling Screw
4.Hole for Returning Oil from Governor to Engine Crankcase
5.Coupling Screw

Governor Locating Flange Figure 4



1.Passage between Governor
and Airscrew
2.Weight
3.Spring
4.Toothed Rack
5.Control Shaft
6.Slide Valve
7.Oil Pump
8.Passage to Supply Oil
from Engine to Governor
9.Reducing Valve
10.Slide Valve Shoulder
11.Drive Shaft

Governor Operation Diagram for Equilibrium Speed of Rotation.
(Steady-State Conditions)
Figure 5

Thus, shoulder (10) of slide valve (6) seals off passage (1) connecting the governor with the airscrew. The oil contained in the airscrew space is confined within the latter.

Acted upon by the centrifugal force moments of the counterweights installed on the blade sleeves, the blades tend to turn "towards higher pitch, but the oil retained in the airscrew cylinder precludes them from turning so that the pitch remains constant.

Since airscrew pitch change oil flow is zero, the oil from the governor pump is pumped through reducing valve (9) back to the inlet to the governor pump.

If with changing of flight conditions or engine rating the airscrew speed drops, the speed of rotation of the centrifugal governor and centrifugal force of its weights drop accordingly.

Thus, slide valve (6) is made by excessive force of spring (3) lower down (Ref. Fig. 6).

As slide valve (6) moves down, passage (1) gets connected with the governor oil pump high-pressure space* The oil ia fed via passage (1) to the airscrew to decrease its pitch.

As the airscrew pitch decreases, the engine speed starts rising, centrifugal force of weights (2) increases and the weights overcome the force of spring (3)tmove slide valve (6) upward to the initial equilibrium position (Ref- Fig. 5).

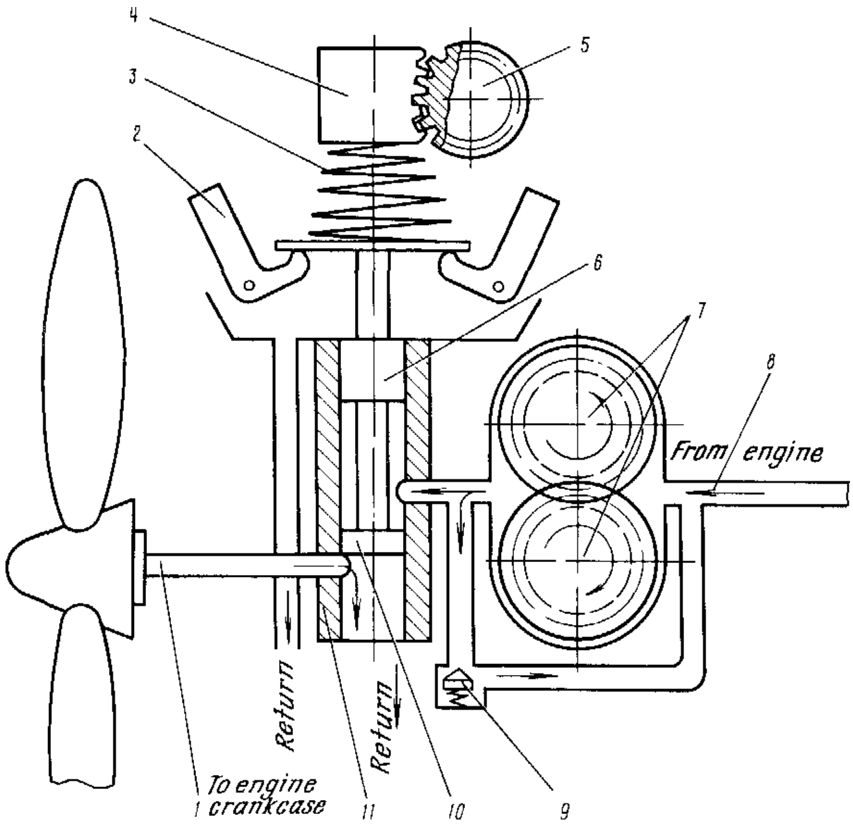
Depending on the rate of deviation of the airscrew speed of rotation from the equilibrium speed, when the mismatch is eliminated the slide valve may overshoot the equilibrium position, upward and then downward but the entire system will be balanced in one or two such overshoots.

If the engine speed increases for some reasons, the speed of rotation of drive shaft (11) (Ref. Fig. 7) of the governor increases as well, hence the speed of centrifugal governor weights (2) secured on the shaft.

As the weight speed increases, weight centrifugal force rises to exceed the force of spring (3). Excessive force will move the weights aside from each other and their short arms will compress the spring while lifting slide valve (6). As slide valve (6) moves upward, passage (1) gets connected with the return line leading to the engine gearbox case. Oil will flow to the return line from the airscrew cylinder.

The counterweight centrifugal forces will move the airscrew blades towards higher pitch.

As the airscrew pitch increases, the engine speed drops down, centrifugal force of weights (2) reduces and spring (3) lowers slide valve (6) to the initial position whereat oil return from the airscrew cylinder ceases and the airscrew again runs at preset equilibrium speed of rotation (fief. Fig. 5).



1. Passage between Governor and. Airscrew
2. Weight
3. Spring
4. Toothed Rack
5. Control Shaft
6. Slide Valve
7. Oil Pump
8. Passage to Supply Oil from Engine to Governor
9. Reducing Valve
10. Slide Valve Shoulder
11. Drive Shaft

Governor Operation Diagram for Increasing Engine Speed Figure 7

As speed of rotation restores to the preset one, overadjustment can also take place, i.e. the slide valve may overshoot the equilibrium position one or two times.

3.2. FORCED CHANGE OF PRESET SPEED OF ROTATION OF AIRSCREW AND ENGINE

3.2.1. Change of Engine Speed of Rotation

The airscrews are adapted for changing the engine speed of rotation upon the pilot's will both in flight and on the ground without touching the throttle quadrant. The engine speed is changed by varying spring tension* To achieve this, the governor is provided with toothed rack (4) (Ref. Fig. 5) meshing with control shaft (55 carrying a roller or lever.

In its turn the roller or lever is connected by a rod or cable with a control knob.

When the governor control knob is pulled, shaft (5) turns clockwise. Rack (4) lifts to decrease spring tension so that the engine equilibrium speed of rotation decreases since spring tension force will become equal to weight centrifugal force at lower speed of rotation of the governor drive shaft.

When the control knob is pushed, shaft (5) turns counterclockwise. Rack (4) lowers to increase tension of the spring so that the equilibrium speed of rotation rises, since spring tension force and weight centrifugal force will become equal to each other at a higher speed, of rotation of the governor drive shaft.

3.2.2. Shifting Airscrew Blades to Lower Pitch

To shift the airscrew blades fully to low pitch, push the governor control knob all the way forward. Now shaft (5) (Ref. Fig. 6) turns counterclockwise up to the low pitch stop. The spring makes governor slide valve (6) move to the lowermost position whereat high pressure oil from the governor pump is fed. to the airscrew through passage (1) for shifting the bladea fully to low pitch, which corresponds to maximum speed of rotation of the engine.

3.2.3. Shifting-Airscrew Blades to Higher Pitch

To shift the airscrew blades fully to high pitch (decrease engine speed of rotation) without touching the throttle quadrant, pull the governor control knob all the way backward.

Now the control ahaft gear turns clockwise up to the high pitch stop. Rack (4) (Ref. Fig. 7) moves upward and the weights shift governor slide valve (6) to the uppermost position whereat the airscrew cylinder space is connected, via passage (1) with the return line and the counterweight centrifugal forces move the airscrew blades fully to high pitch which corresponds to minimum speed of rotation.

CONSTANT SPEED GOVERNOR R-2, SERIES 04 - MAINTENANCE PRACTICES

1. LIST OF TASK CARDS

2. OPERATION PROCEDURE

TO M-14P MS	**TASK CARD No. 201**		
M S ITEM	PROCEDURE'. Removal		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1, Unlock and undo the attachment nut of the governor control roller and remove the roller. 2. Undo four governor attachment nuts. 3. Remove four flat and four split washers. 4. Remove the governor from the engine. 5. Remove the gaake t. 6. Install the governor on the support and secure it to the latter by shipping bolts.			

TEST EQUIPMENT	**TOOLS AND FIXTURES**	**MATERIALS**
	Pliers, flat-nosed 150 Screwdriver 700345 A150x0.5 Wrench 11x14 14-24-861 Wrench 9x11 700002	

<table>
<tr><td>TO M-14P MS</td><td>TASK CARD No. 202</td><td colspan="2"></td></tr>
<tr><td>MS ITEM</td><td colspan="3">PROCEDURE: Depreservation of New Governor</td></tr>
<tr><td colspan="2">OPERATIONS AND TECHNICAL REQUIREMENTS</td><td>CORRECTIVE ACTIONS</td><td>CHECKED BY</td></tr>
<tr><td colspan="2">1. Unpackage the new governor. 2. Make sure governor seals and locks are not missing.
3. Undo four nuts, remove shipping covers and support from the governor.
4. Refer to the governor Certificate to make sure the latter is assembled for RH rotation.
5. Depreserve the governor by removing preservation compound from its outer surfaces by a brush or cloth moistened in gasoline.
<u>CAUTION:</u> ENSURE AGAINST INGRESS OF GASOLINE ON THE SEALING RUBBER COLLAR OF THE CONTROL SHAFT.
6. Wipe the outer surfaces with a clean dry cloth.</td><td></td><td></td></tr>
</table>

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Wrench 11x14 14-24-861 Pliers, flat-nosed 150	Gasoline Nefras-S 50/170 o BR-1, BR-2 Brush, hair Cloths

TO M-14P MS	TASK CARD No. 203		
MS ITEM	PROCEDURE: Installat ion		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1, Inspect the mating planes of the governor and engine, drive coupling splines and governor shank. T.R. Nicks are not allowed. 2, Check ease of rotation of the governor drive shaft by rotating it by the drive coupling at an ambient temperature of not below 8 °C T,.R, The governor drive shaft should rotate smoothly without jamming. 3. Install the governor on the drive studs without a gasket and make sure the lower flange tightly and without gaps adjoins to the drive plane. 4. Remove the governor from the drive, 5. Place the governor gasket coated with sealing on the drive with aligning oil passage holes. 6, Install the governor on the engine so that the shank splines freely enter the drive coupling by slightly turning the engine crankshaft by the airscrew. 7. Place four flat and four split washers and tighten four nuts which secure the governor to the engine.		Dreas nicks Replace governor in case of jamming	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Wrench 11x14 14-24-861 Pliers, flat-nosed 150 Screwdriver 700345 A150x0.5 tVrenoh 9x11 700002	Sealant "50"

TO M-14P MS	**TASK CARD No. 204**		
MS ITEM	PROCEDURE-. Adjustment of Governor on Engine		
OPERATIONS AND TECHNICAL REQUIREMENTS		**CORRECTIVE ACTIONS**	**CHECKED BY**
1. Set the governor control lever in the pilot's cabin to the extreme position corresponding to the airscrew maximum pitch. 2. Turn the governor control shaft all the way clockwise (the spring is fully released). 3. Pit the roller on the control shaft hex so that the hole intended to attach the cable is at the point of cable contact on the roller. 4. Secure the roller in this position on the shaft. 5. Adjust the cable length and secure it on the governor roller. 6, Check operation of the governor control system and make sure the governor control shaft turns through a complete angle of about 160° without playa, jamming or dead sectors. **TR**. Plays, jamming or dead sectors are not allowed. 7. Start and warm up the engine (Ref. 072.00.00, Task Cards Nos 201. 202). 8. Check operation of the governor and its control linkage by changing over the airscrew from. low to high pitch and check operation of the airscrew and governor at equilibrium speed of rotation (Ref. 072,00.00, Task Card No. 202).		Eliminate playa and jamming by adjusting rods, cables	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
NOTE: The adjustment is regarded to be completed, if with throttle fully open and the governor control lever aet to the low pitch stop, the engine gains a speed of 99 % (2900 r/min) and when the lever is shifted to the high pitch from nominal rating II 70 % (2050 r/min), the speed of rotation drops drastically to 53 %. 9. Set the low pitch limit stop of the governor control system, adapted to preclude engine overspeeding above the specified take-off RPM of 99 %, to which end: (1) Accomplish a flight maintaining the crankshaft speed of up to 99 %. (2) Note the position of the speed governor control lever at a fully open throttle corresponding to n = 99 %. (3) After landing and shutting down the engine, set the governor control lever to the position marked in flight with the throttle being fully open (99 %}. (4) Leave the low pitch limit stop in this position. **NOTES:** 1. When setting the speed governor control lever in the pilot's cabin to the maximum speed of rotation, the governor roller should be short of the extreme position for about 5°- 2. When setting the engine speed, limit stop, clicking of rack and shaft teeth cannot be allowed., 3. If the airscrew cylinder is damaged in flight, immediately set the governor control lever to the high pitch position to preclude leakage of oil. 4. If oil leaks through the flange, tighten the governor attachment nuts. If trouble persists, replace gasket (part K8936) taken from the individual SPTA set.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
5. If oil leaks through the control shaft, remove retaining ring (2) (Ref. Fig. 3) and tighten up bearing (7). If trouble persists, replace sealing ring (6) (part PN1-1513) with the ring taken from the SPTA set. Lock the bearing with retaining ring (2).		

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Wrench 9x11 700002 Wrench 11x14 14-24-861 Pliers, flat-nosed 150	

CONSTANT SPEED GOVERNOR R-2, SERIES 04 - STORAGE INSTRUCTIONS

1. STORAGE

The governor which is not meant for immediate installation on the engine should be stored preserved in closed racks in a clean, dry, heated room at an air temperature of 10 to 30 °0 and relative humidity of 45 to 70 %.

CAUTION: IT IS PROHIBITED TO STORE ACIDS, ALKALIS. CHARGED STORAGE BATTERIES AMD OTHER CORROSIVE SUBSTANCES IN THE ROOM WHERE GOVERNORS ARE KEPT.

The governor prolonged storage term (in the original packaging) is given in its Certificate. The governor mounted on the engine shall be stored and shipped according to the Maintenance Manual for the respective engine,

The governor unpackaged or removed from the engine shall be stored for a period of up to 1 year in sealed packaging and individual container protected against corrosive substances, jolting and vibration.

2. PRESERVATION

The governor and its spares delivered for pre-stora^e pronervatlon eihail be prcsoTvsd not later than in 24 h after the moment of acceptance. The preaervat i-on room temperature should be 10 to 3'? °c! relative humidity up bo 70 /-. 'it an ambient temperature below 10 °C, the governor, spares and tools carried to the preservation room shfil1 acquire the room temperature o1' 10 to 35 "C, whereafter thp preservation procpdure may be titartPd.

All the materials used for preservation and riopT'psG'rvation shall oe npr-iod LcaUy .^ub^ect to laboratory tests to confirm their suitability,

Preservation steps should follow one another without intervals.

Corrosion traces, fat stains, aoil and moisture are not allowed on surfaces of the item and parts to be preserved.

Wipe the outer surfaces of the item and Hpares twice with clean cloths generously uoaked in gasoline Nefras-S 50/170 or BR-i , BR-2, then with clean dry cloths. Dry i-n the air for 15 to 20 min and preserve them immediately.

CAUTION: NEVER DRY THE ITEMS 1M ELECTRIC OVENS. NCTER TOUCH THE WASHED AMD WIPED ITEMS

WITH UNGLOVED HANDS. USE KNITTED, CLOTH GLOVBS. PARAmNED PAPER OR APPROPRIATE APPLIANCES.

Use preservation oil K-17 for preservation. Preservation may be also performed with gun grease PVK.

When preserving with oil K-17, immerse the non-painted parts and assemblies into a bath with oil for 1 to 2 min. Repeat immersion several times. Keep the coated, parts and assemblies over the bath to let the oil drain down. Apply oil K-17 without preheating,

When preserving with gun. grease, apply it in a thin uniform layer to all the outer surfaces, with the aid of a hair brush. Preheat gun grease to 105 to 115 °C till foaming ceases before application; maintain this temperature throughout the preservation process.

The individual set of spares and mounting parta are subject to double preservation by immersion into heated grease:

First immersion is at a temperature of 105 to 115 °C for 2 to 10 min, followed by cooling to a temperature of 25 to 35 °G.

Second immersion is at a temperature of 60 to 80 °C without exposure.

Internal preservation of the governor is performed by the Manufacturer by filling its spaces with oil during acceptance tests on the stand. When forwarding for storage or repair, fill the governor passages before packaging with the engine oil. On both occasions install a paronite gasket on the govemor flange and bolt a shipping support to it.

After preservation, wrap the governor and spares with two layers of paraffined paper and, tie with twine,

Such a preservation is performed for a storage period of one year.

Preservation for a storage period of more than one year and for high-temperature regions is carried out the same way as for the one-year storage,

The difference is that the preserved items and spares are placed in polyethylene film covers with silica-gel dehydrator and dehydrator cartridges (indicators).

Pack the governor and spares in a special wooden box and apply marking.

Wrap the accompanying documents in paper, insert in a polyethylene film parcel and place in the same box.

Materials used for preservation are listed in the Table.

Material	Standard, Specifications
Gasoline Nefras-S 50/170	COST 8505-80
or BR-1, BR-2	GOST 443-76
Grease gun PVK	GOST 19537-74
Oil, preservation K-17	GOST 10877-76
Paper, paraffined	GOST 9569-79
Twine	GOST 17308-71
Film, polyethylene 5S or 30, 150, grade 1	GOST 10354-82
Dehydrator silica-gel, grade KSM or ShSM	GOST 3956-76
Cartridges,dehydrator (indicators)	TY MChP M310-53
Indicator silica-gel	GOST 8984-75

CONSTANT SPEED GOVERNOR R-2, SERIES 04 - SHIPMENT

1. GENERAL

The governor may be shipped by any transport. Shipment may be carried, out at atmospheric pressure decreased to 0,2 kgf/cm and temperature of down to minus 60 °C,