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	Eliminate air lock, heat oil line and oil, clean oil tank vent pipe
	(2) Faulty pressure gauge or its wires	Replace pressure gauge, check wiring
	(3) Maladjusted reducing valve of oil pump	Adjust pressure by reducing valve (Ref. Task Card No. 204)
	(4) Oil is excessively thinned by gasoline	Change oil and check that dilution cock is not leaky (Ref. 072.00.00, Task Card No. 244)
	(5) Clogged filters in line from tank to engine	Check lines, wash filters (Ref. 072.00.00, Task Card No. 249)
	(6) Jammed reducing valve, clogged valve	Remove and disassemble oil pump reducing valve as follows: Unlock and undo cap of adjustment screw (Ref. Fig. 3). Slacken adjustment screw lock 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 No. 204)
	(7) Foaming of oil	Wash and check oil system, change oil (Ref. 072.00.00, Task Card No. 244)

Trouble	Possible cause	Correction
	(8) Low oil level in oil tank	Add oil to oil tank to required level
2. Filter with chip detector warning lamp comes up.	(1) Metal chips in filter	Detect cause of chips in oil and together with Supplier's representative take decision on withdrawal of engine from service
	(2) Faulty circuit	Test circuit for continuity (Ref. 072.00.00, Task Card No. 226)
	(3) Water in oil	Change oil (Ref. 072.00.00, Task Card No. 244)

LUBRICATION - MAINTENANCE PRACTICES

1. LIST OF TASK CARDS

Title	Task Card
Removal	201
Depreservation of New Oil Pump	202
Installation	203
Adjustment of Oil Pressure	204

2. OPERATION PROCEDURE

TO M-14P M.S.	TASK CARD No. 201	PAGE(S) 203, 204
M.S. 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.		
6. 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.		
8. 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	CHECKED BY

TEST EQUIPMENT	TOOLS AND FIXTURES	MATERIALS
	Tray for draining oil Hose Pliers, flat-nosed 150 Wrench 11x14 14-24-861 Wrench 9x11 700002 Wrench 24x27 700880-8 Wrench 27x30 7811-0041	Cloths

TO M-14P M.S.	TASK CARD No. 202	PAGE(S) 205
M.S. 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 °C 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 M.S.	TASK CARD No. 203	PAGE(S) 207, 208
M.S. 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.	Carefully remove nicks and dents	
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 vertical shaft of the drive. Install the oil pump in its seat. T.R. Jamming of splines in installation is not allowed. NOTE: When installing the oil pump, protect its shaft rubber sealing ring against damage.		
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.		

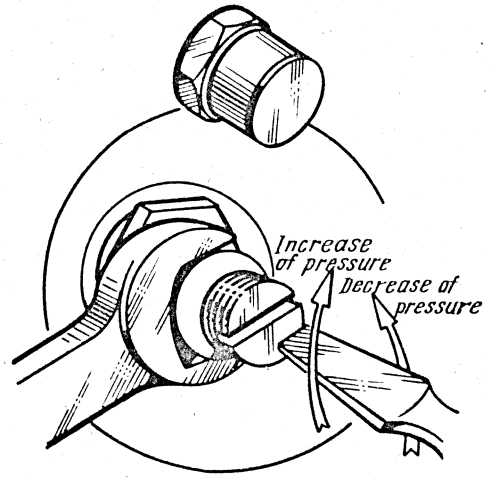
OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
9. Start the engine (Ref. 072.00.00, Task Card No. 201) and adjust oil pressure (Ref. Task Card No. 204). NOTE: The oil pump is installed by the Supplier.		

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 M.S.	TASK CARD No. 204	PAGE(S) 209, 210
M.S. ITEM	PROCEDURE: Adjustment of Oil Pressure	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
1. Check oil pressure with the engine running at a crankshaft speed of 64 % (1860 r/min). T.R. Oil pressure should be 4 to 6 kgf/cm^2.	Shut down engine (Ref. 072.00.00, Task Card No. 203)	
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^2, turn the adjustment screw for about 1.5 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.		

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY



Adjusting Oil Pressure by Oil Pump Reducing Valve

Figure 201

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

072.70.00

ACCESSORY DRIVES

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).

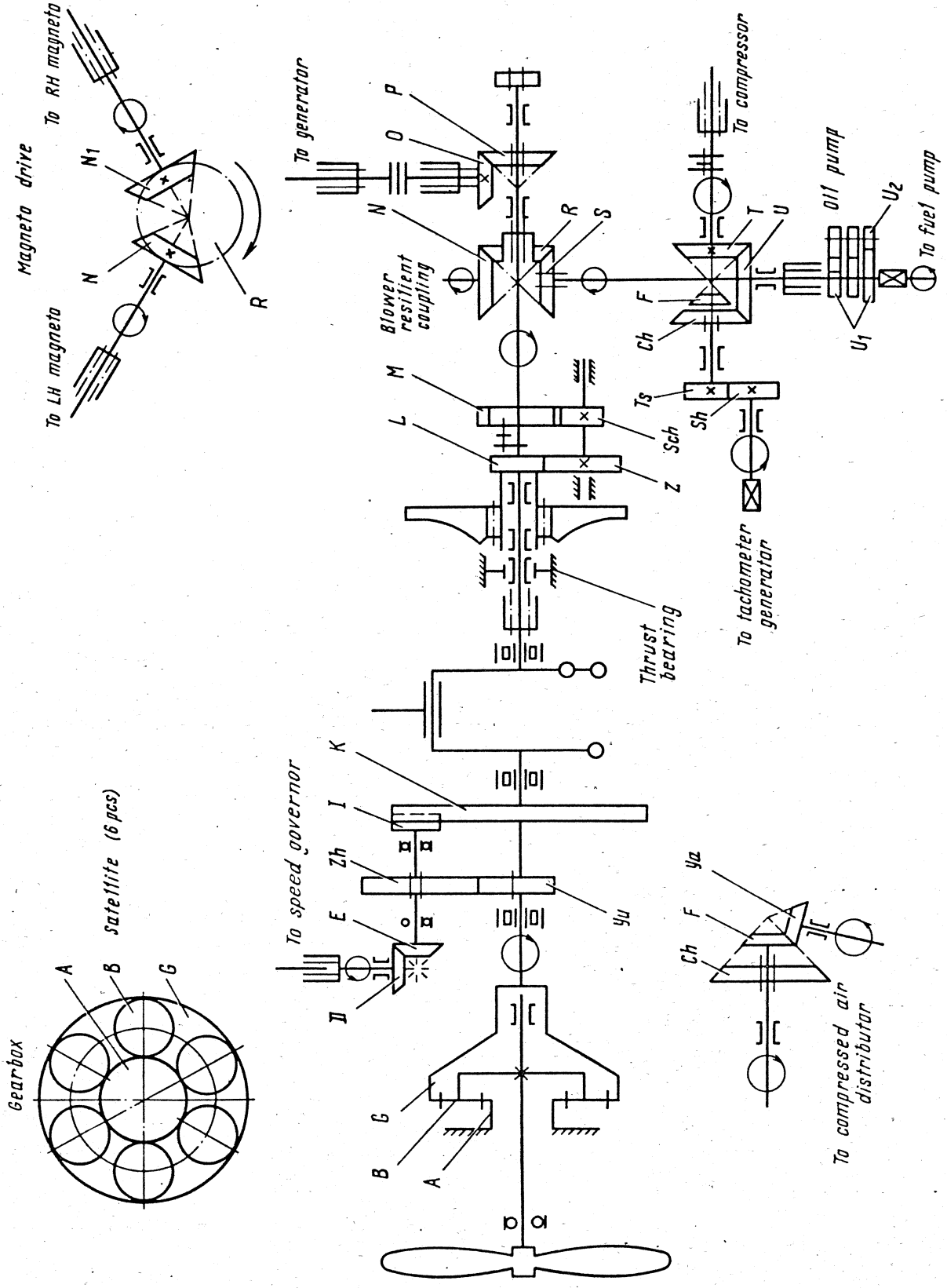
The data on transmission ratios and directions of rotation of the drives are given in the Table .

Drive	Designation of gear	Transmission ratio relative to crankshaft	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)	1.125	LH
Generator drive	P, O	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, Ch, 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

2. 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 wells to accommodate the oil pump and filter.

The boss 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.

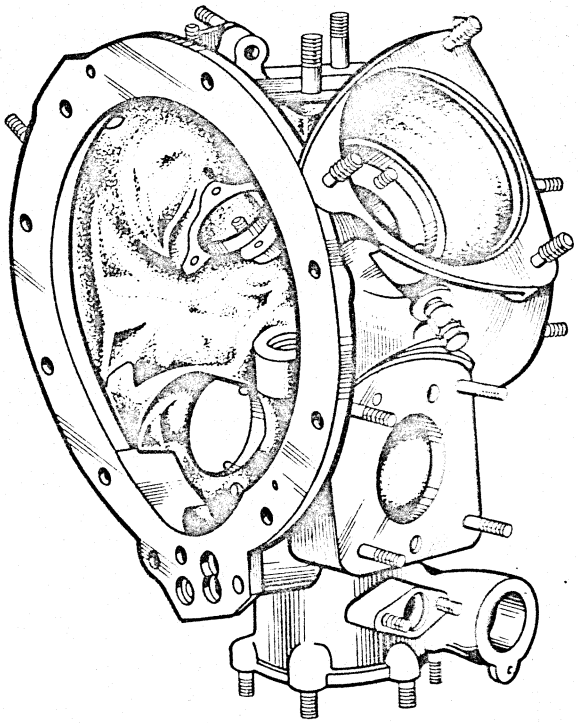
Arranged along the horizontal axis on a conical diaphragm is a boss with pressed-in bronze bushing serving as a front support for the drive gear of the accessory drive.

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.



Crankcase Rear Cover

Figure 2

2.2. DRIVE GEAR

Drive gear (16) (Ref. Fig. 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 GEARING

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 shaft (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. Fig. 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 flange 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, Fig. 7) to the generator shaft.

The generator shaft, adapter shaft and drive shaft are connected by splined joints.

Buffer rubber insert (95) is intended to preclude axial displacement of adapter shaft (96) during operation of the engine.

Oil to lubricate bearings of driven shaft (20) (Ref. Fig. 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

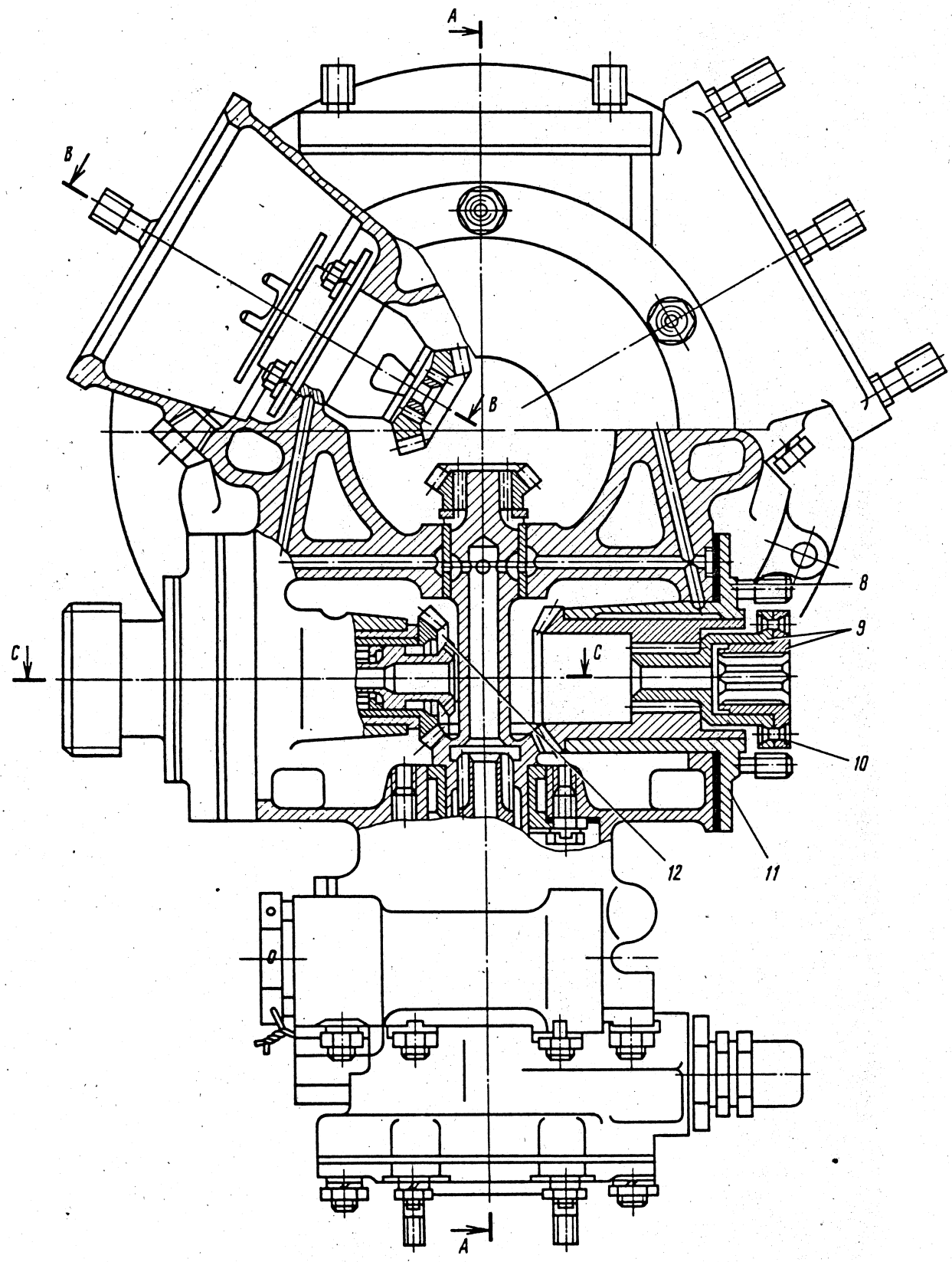
The tachometer generator and compressed air distributor drive comprises housing (2) (Ref. Fig. 3), steel cover with threaded connection for mounting the tachometer generator, drive gear (6) with bevel and spur rims at opposite ends, drive gear (7) with bevel rim, shaft (4) of the tachometer generator 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.

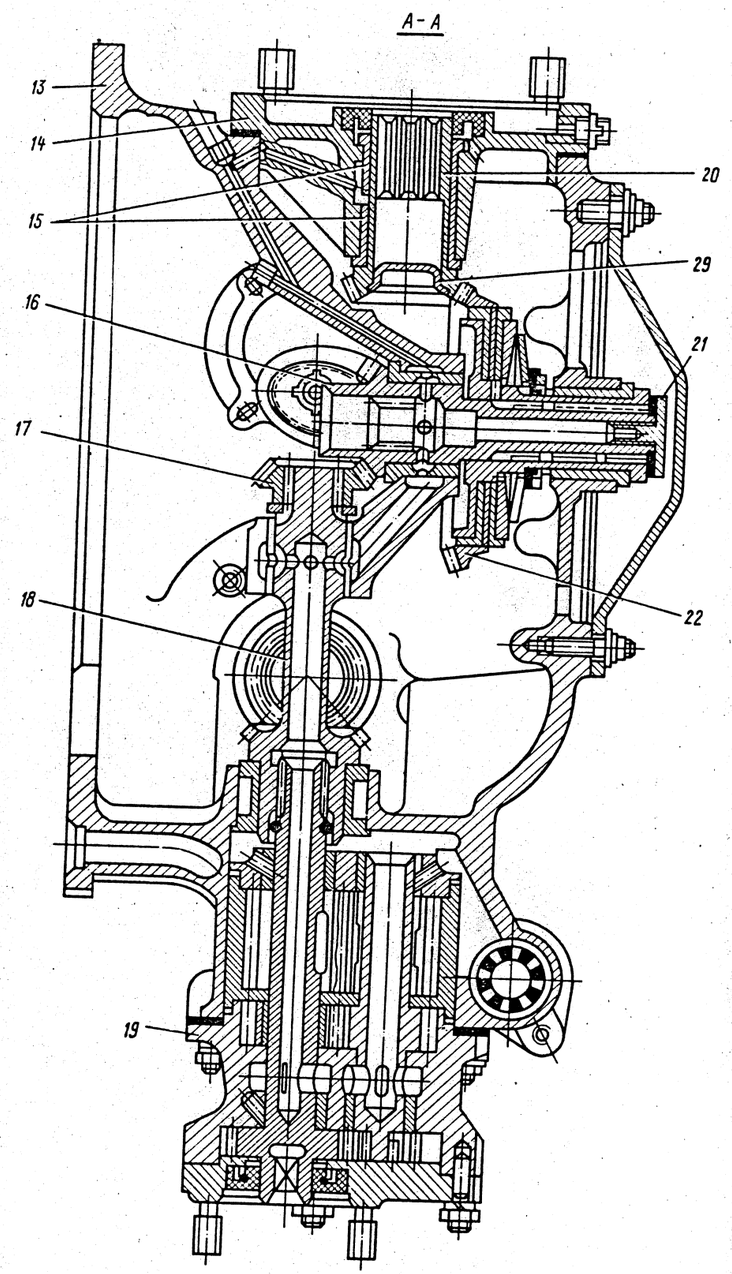
The drive housing has a flange for attachment to the rear cover. Two bronze bushings pressed and locked in it are sliding bearings of the drive shaft of the tachometer generator drive.

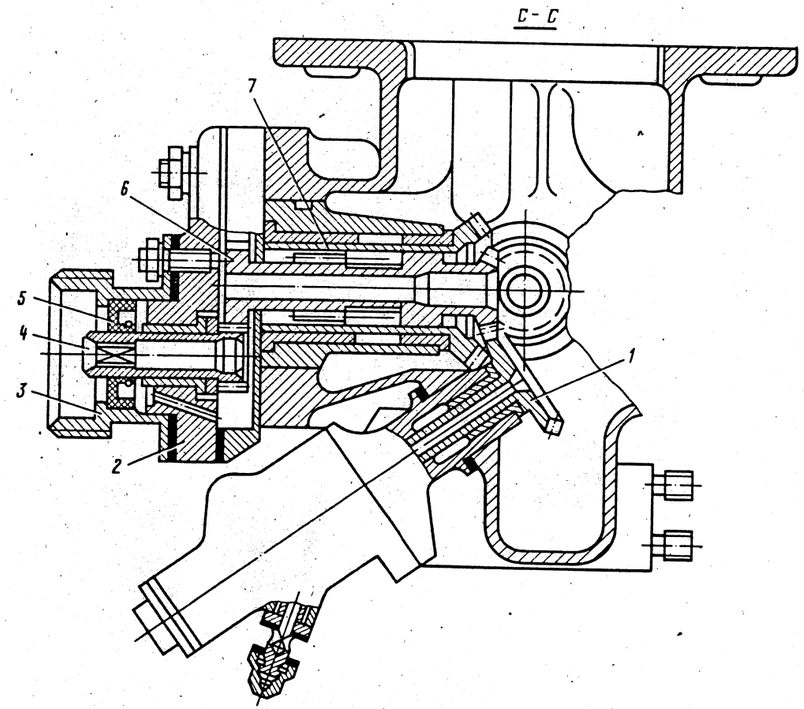
Drilled between the bushings in the drive housing is a hole through which the splashed oil gets into the housing interior to lubricate friction surfaces of the drive shaft and bronze bushings.

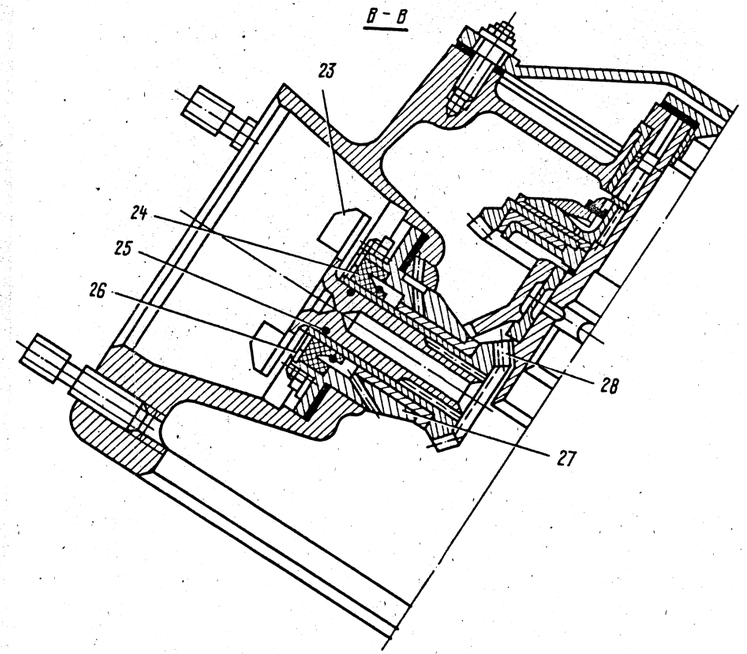


Rear Cover with Accessory Drives

Figure 3







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. Crankcase Rear Cover
14. Generator Drive Housing
15. Bushing
16. Rear Cover Drive Gear
17. Bevel Gear
18. 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
29. Plug

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)

073.00.00

FUEL SYSTEM

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 operation of the carburetor. Fuel pressure at the carburetor inlet is 0.2 to 0.5 kgf/cm^2 at operating ratings and not below than 0.15 kgf/cm^2 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 floatless 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.

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DISTRIBUTION SYSTEM

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 l/h
Pump delivery at 2200 r/min, backpressure of P = 0.1 kgf/cm^2 in delivery line and fuel suction height of 1 m	At least 175 l/h
Pump delivery at 200 r/min, backpressure of P = 0.1 kgf/cm^2 in delivery line anf fuel suction height of 1 m	At least 10 l/h
Maximum permissible pressure in delivery line	Up to 1 kgf/cm^2
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. Fig. 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 vanes (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 its 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).

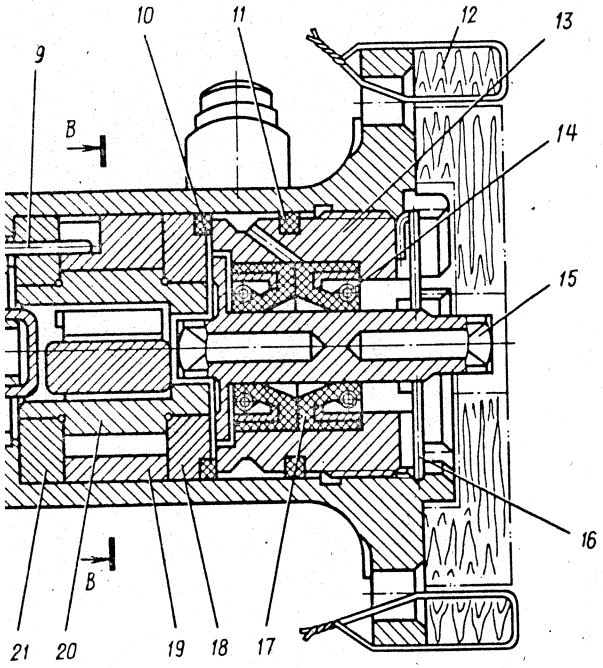
Two cast passages for inlet and outlet of gasoline are made in the inner space of the reducing chamber housing.

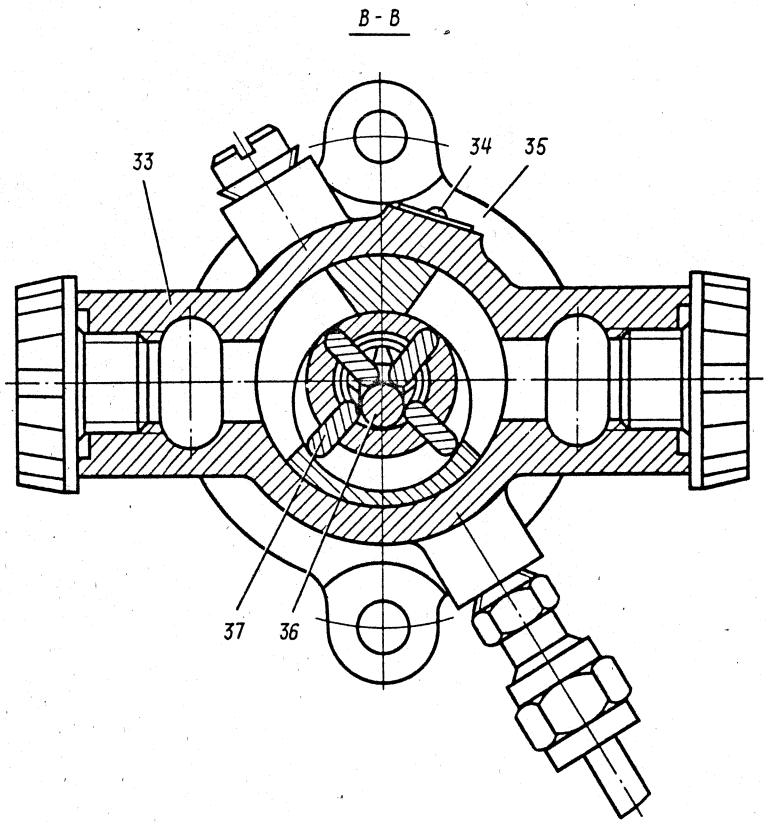
The housing accommodates reducing valve (6) assembly and priming valve (23) with spring (22).

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.





educing Valve Nut
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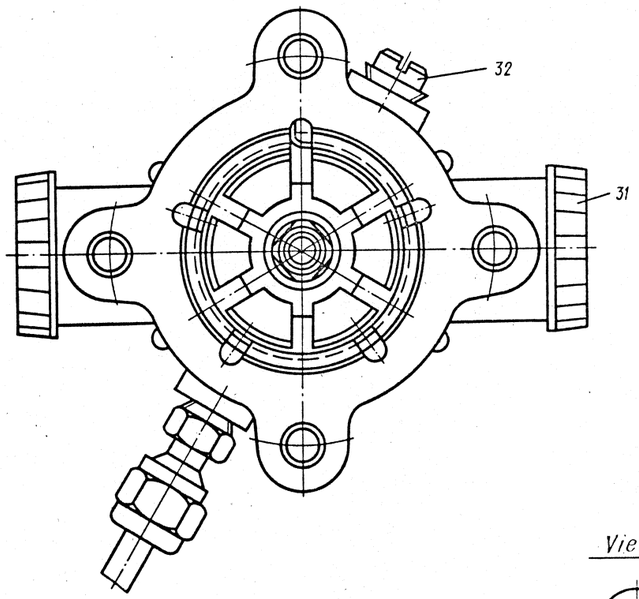
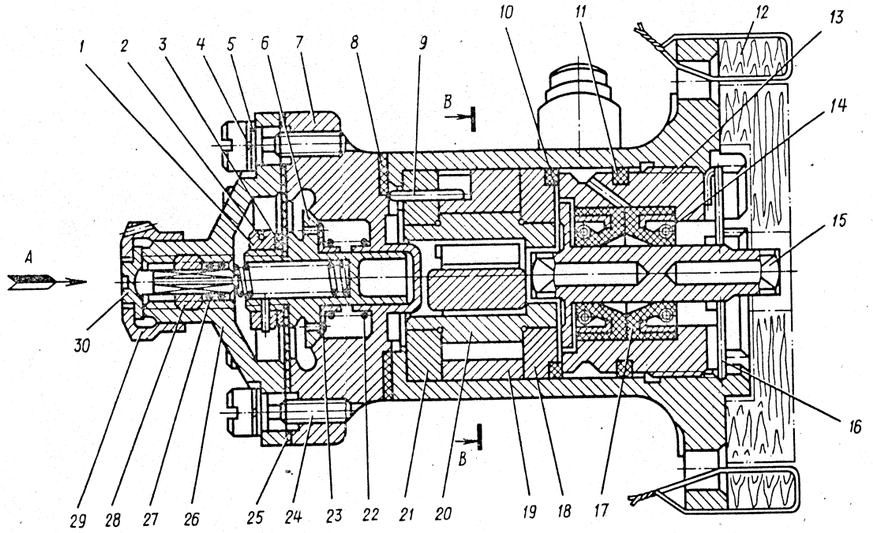
eal Spring
otor Shank

16. Retaining Ring
17. Seal
18. Upper Bearing
19. Sleeve
20. Rotor
21. Lower Bearing
22. Priming Valve Spring
23. Priming Valve
24. Screw
25. Reducing Valve Diaphragm
26. Reducing Chamber Cover
27. Reducing Chamber Spring
28. Adjustment Screw
29. Adjustment Screw Cap
30. Adjustment Screw Head

31. Plug
32. Plug
33. Pump Housing
34. Pin
35. Nameplate
36. Floating Pin
37. Vane
38. Screw
39. Locking Seal
40. Screw
41. Locking Wire
42. Connection
43. Nut
44. Nipple
45. Plug





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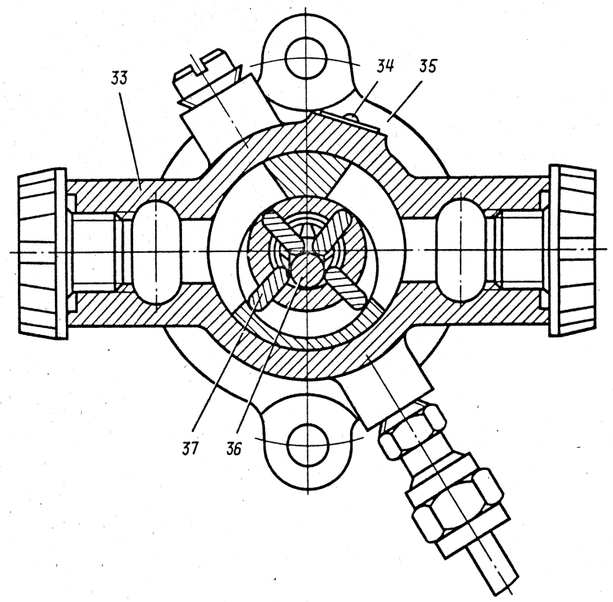
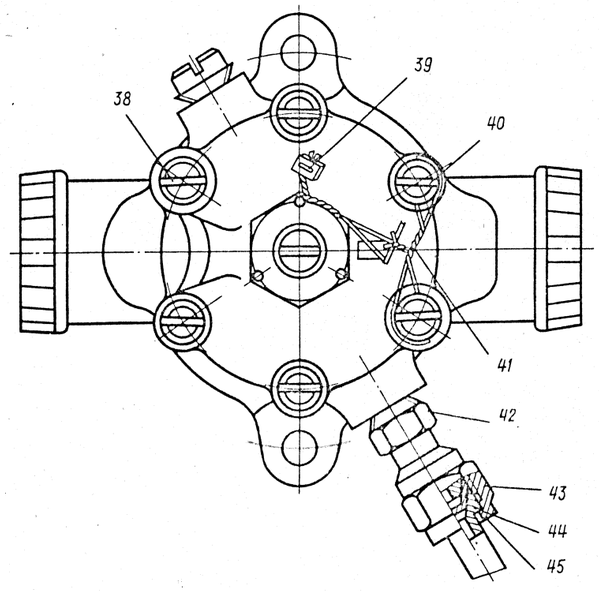


View A



1. Reducing Valve Nut
2. Reducing Valve Nut Lock
3. Diaphragm Washer
4. Spring Washer
5. Washer
6. Reducing Valve
7. Reducing Chamber Housing
8. Reducing Chamber Gasket
9. Pin
10. Sealing Ring
11. Ring
12. Support
13. Seal Nut
14. Seal Spring
15. Rotor Shank
16. Retaining Ring
17. Seal
18. Upper Bearing
19. Sleeve
20. Rotor
21. Lower Bearing
22. Priming Valve Spring
23. Priming Valve
24. Screw
25. Reducing Valve Diaphragm
26. Reducing Chamber Cover
27. Reducing Chamber Spring
28. Adjustment Screw
29. Adjustment Screw Cap
30. Adjustment Screw Head
31. Plug
32. Plug
33. Pump Housing
34. Pin
35. Nameplate
36. Floating Pin
37. Vane
38. Screw
39. Locking Seal
40. Screw
41. Locking Wire
42. Connection
43. Nut
44. Nipple
45. Plug

702ML Pump General View

Figure 1

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 paronite 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. Fig. 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 gasoline 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.

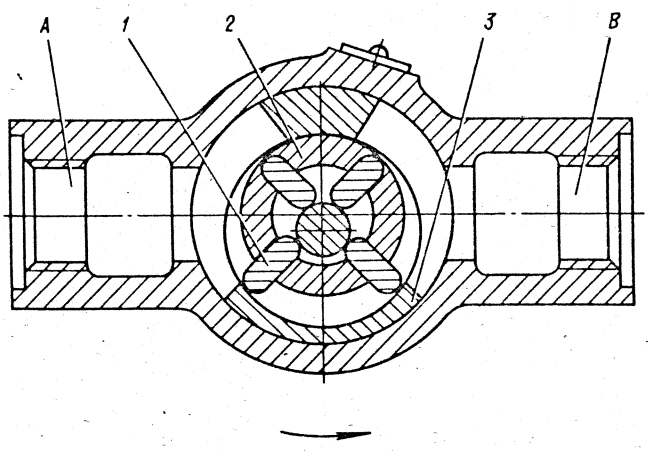
If gasoline is not consumed from the delivery space, all gasoline by-passes to the suction space, i.e. the pump circulates the gasoline in its housing.

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. Fig. 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.



1. Vane
2. Rotor
3. Sleeve

Pump Operation Diagram

Figure 2

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 CARDS

Title	Task Cards No.
Removal	201
Depreservation of New Fuel Pump	202
Installation	203
Adjustment and Test	204

2. OPERATION PROCEDURE

TO M-14P M.S.	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. Undo 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-nosed 150 Wrench 11x14 14-24-861 Wrench 27x30 7811-0041 Wrench 19x22 700880-7	Cloths Gasoline Nefras-S 50/170 or BR-1, BR-2

TO M-14P M.S.	TASK CARD No. 202	PAGE(S) 205, 206
M.S. ITEM	PROCEDURE: Depreservation of New Fuel Pump	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED 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 shank, 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 Nefras-S 50/170 or BR-1, BR-2 Air, compressed Cloths Oil MS-20

TO M-14P M.S.	TASK CARD No. 203	PAGE(S) 207
M.S. ITEM	PROCEDURE: Installation	

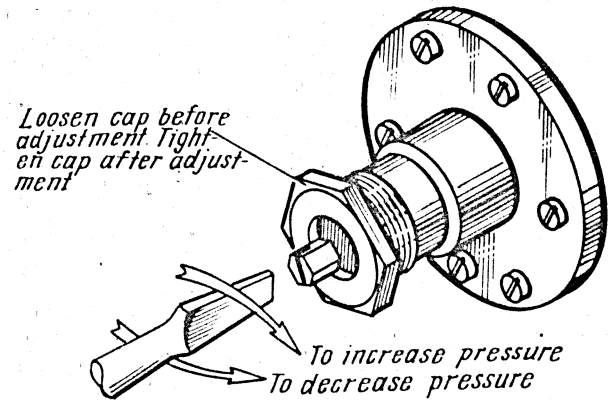
OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED BY
1. Install a sealing gasket between the pump flange and its mounting plane. 2. Arrange the fuel pump so that the shank freely enters its seat. 3. Place washers and uniformly tighten four pump attachment nuts. 4. Connect the fuel system 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	CHECKED 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). 2. Adjust fuel pressure to be from 0.2 to 0.5 kgf/cm^2 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^2. 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

2.1. CONSTRUCTION

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.

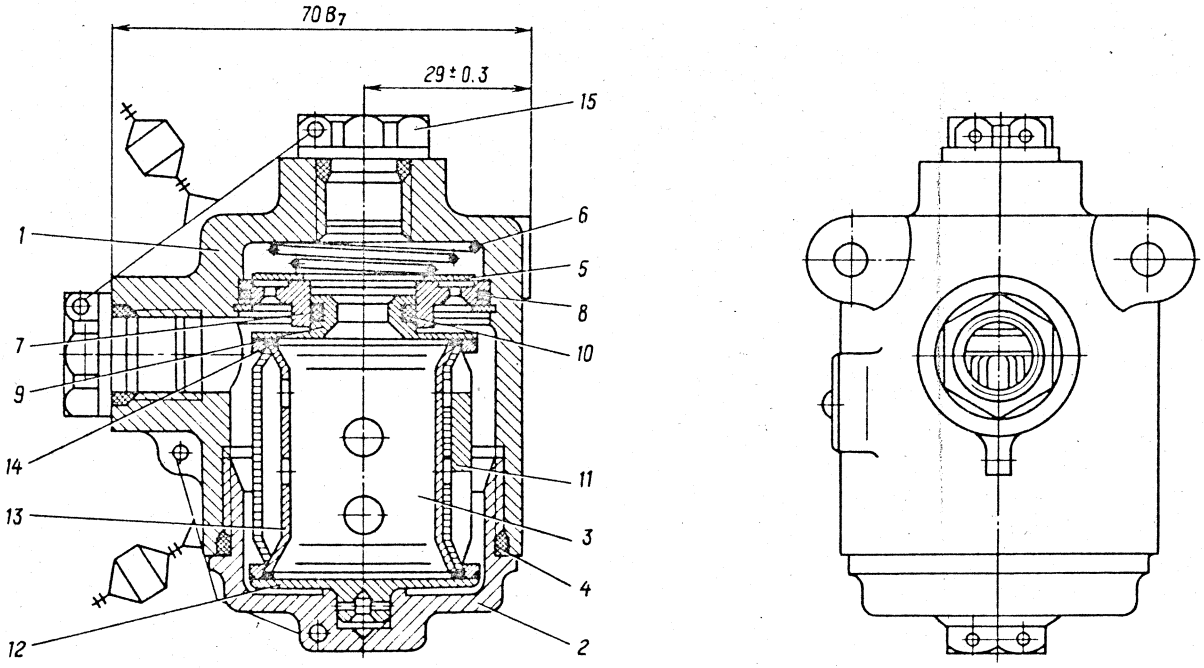
The cover has a hexagonal head for the wrench and is screwed into the housing.

2.2. SPECIFICATIONS

Filtration fineness:

Nominal ..... 36 μm

Absolute ..... 40 μm



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 l/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^2
Operating pressure	(0.35±0.15) kgf/cm^2
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^2, 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

Title	Task Card No.
Removal	201
Depreservation of New Filter	202
Installation	203

2. OPERATION PROCEDURE

TO M-14P M.S	TASK CARD No. 201	PAGE (S) 203
M.S ITEM	PROCEDURE: Removal	

OPERATIONS AND TECHNICAL REQUIREMENTS	CORRECTIVE ACTIONS	CHECKED 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.	TASK CARD No. 202	PAGE(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 Nefras-S 50/170 or BR-1, BR-2 and draining them from the filter interior till preservation grease is fully removed. 4. Fill 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-S 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 M.S.	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 system 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 K0-0.8 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-cylinder air-cooled engine, type M-14P.

The carburetor is of a floatless, 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 Fig. 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/cm^2
At idle	Not less than 0.15 kgf/cm^2
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 space are at the right side.

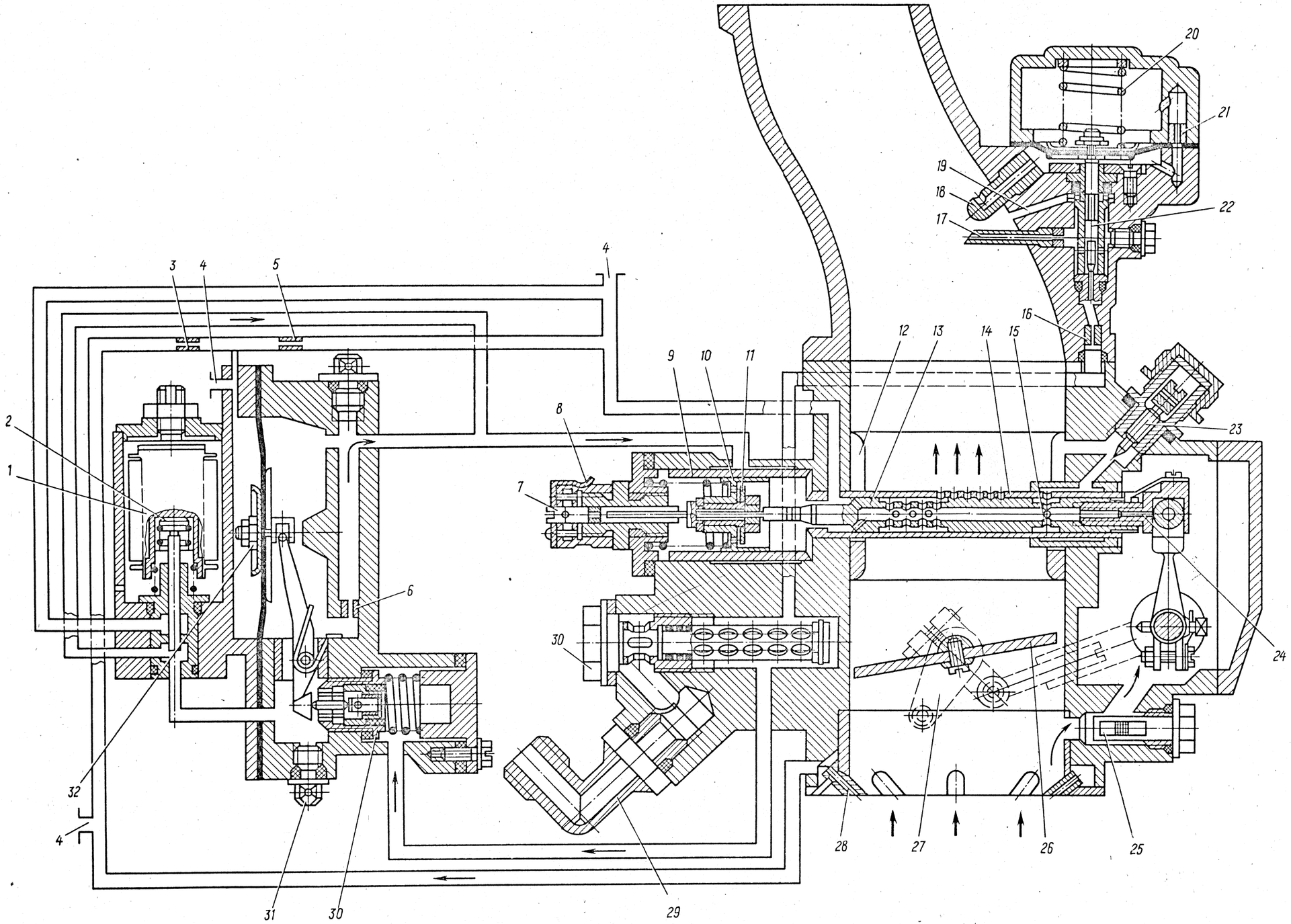
The link chamber and the air filter space are located at the front. Arranged in the rear part of the body are the space of the mechanical acceleration pump, fuel filter space and fuel inlet boss.

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.



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

Carburetor AK-14P Operation Diagram

Figure 1