Chapter 2

PUMPS, FUEL, FP 3 SERIES

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LIST OF ILLUSTRATIONS

Introduction

1. This chapter gives a general description of the pumps in the FP 3 series; information applicable to a particular mark will be found in the relevant chapter in A.P.4343D, Vol. 1, Book 2, Sect. 7. The pumps are of the sliding blade type, and are coupled to an electric motor through a gearbox with a 4 : 1 ratio.

2. The relief valve is a normal pressure relief valve and is not balanced in respect of inlet pressures. It will be appreciated that where positive inlet pressures are employed, such pressures are additive to the delivery pressure. The pressure figures given under leading particulars in A.P.4343D, Vol. 1, Book 2, Sect. 7 are for information only; details regarding the actual settings must be obtained from the Aircraft Handbook.

DESCRIPTION

Pump unit

3. Of the rotary, positive displacement type, the pump unit (*fig.* 2) consists of an aluminium housing with an eccentric bore containing a hardened mechanite sleeve. A rotor, with four equally spaced sliding vanes, is rotated within the sleeve by a shaft coupled to the driving motor. A centre pin keeps the blades in position when the pump is stationary. The passage of fuel through the pump provides adequate lubrication, and no other lubricant is required.

4. The spring-loaded relief valve, located in the pump end cover, may be adjusted throughout its entire pressure range by a screwdriver-slotted adjusting screw. A locknut enables the screw to be secured in the required position after adjustment has been made.

Gland seal

5. The seal incorporated in this pump is designed for use where a pressure feed to the inlet port is desirable, but is equally effective under suction conditions. The seal functions satisfactorily with inlet pressures from −6 lb. per sq. in. to +20 lb. per sq. in.

6. The design, which embodies a face seal is such that the inlet pressure assists the gland

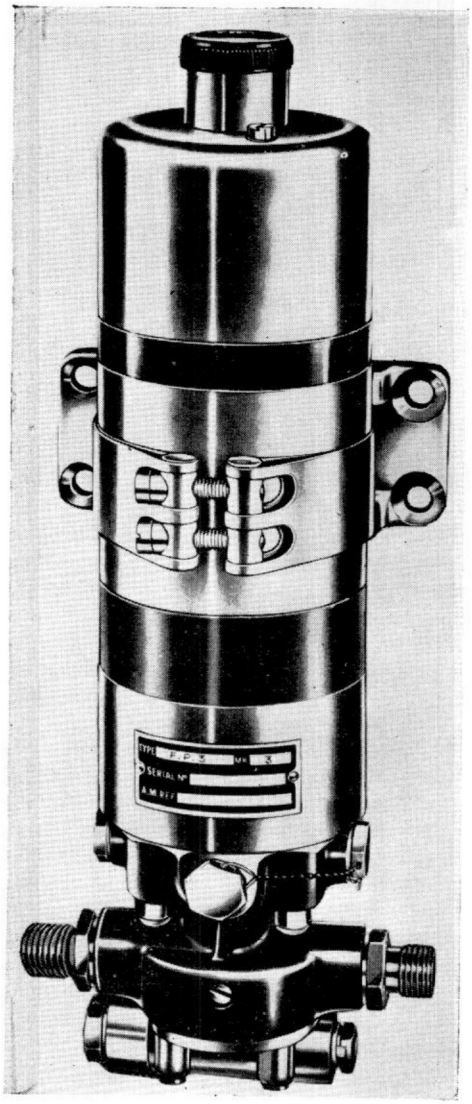

Fig. 1. General view of FP 3 pump

spring by imposing a small hydraulic load on the sealing face. The seal is made between a rotating steel thrust plate and a perfectly flat carbon washer which is stationary.

7. Projections on the gland sleeve attached to the pump drive shaft are used to drive the steel thrust plate. The gland sleeve houses the gland spring and thrust plate, and a rubber washer. The periphery of this washer seals the bore of the sleeve and normally prevents leakage past the back of the thrust washer.

8. A drain port with a $\frac{1}{8}$in. B.S.F. connection is provided to drain away any fluid finding its way past the seal.

Driving motor

9. The motor is of the totally enclosed flameproof type, and has a long-shunt compound winding. It develops $\frac{1}{6}$h.p. on 22 volts d.c. at 13,000 r.p.m. and will operate the pump satisfactorily at any voltage between 16 and 29 volts with a maximum current consumption of not more than 8 amp. The motor should not be run continuously under load for more than 15 minutes.

10. The field system comprises the yoke, the laminated pole pieces mounted in the bore of the yoke, and the field windings carried on the pole pieces. The armature shaft rotates in ball races, packed with antifreeze H.M.P. grease, which are housed in diecast end plates. Two bolts passing through the yoke hold the end plates in position and at the commutator end form fixing pillars for the end cover.

11. The brush gear, designed as a complete unit, is secured by the two screws holding the Bakelite insulator to the lugs on the end plate.

12. A four-pin Breeze plug projecting through the centre of the end cover affords connection for the incoming cables. Accuracy of alignment is ensured by a spigot formed on the end plate of the motor to which the pump is fitted. Four studs, engaging tapped holes in the motor end plate, hold the pump in position.

Gearbox

13. The pump is driven through a small self-contained gearbox with a 4 : 1 reduction ratio. Both the gears and the bearings are lubricated during manufacture and require no further lubrication.

INSTALLATION

Before fixing

14. Remove the dust covers from the inlet and outlet ports, the drain connection, and the electrical connection. Check the pump for freedom of operation by temporarily connecting the motor to a 24-volt supply. The current consumption should not exceed 8 amp. A small quanitity of engine oil should be poured into each port before testing. If the unit does not operate freely under these conditions, it should be rejected as unsatisfacory.

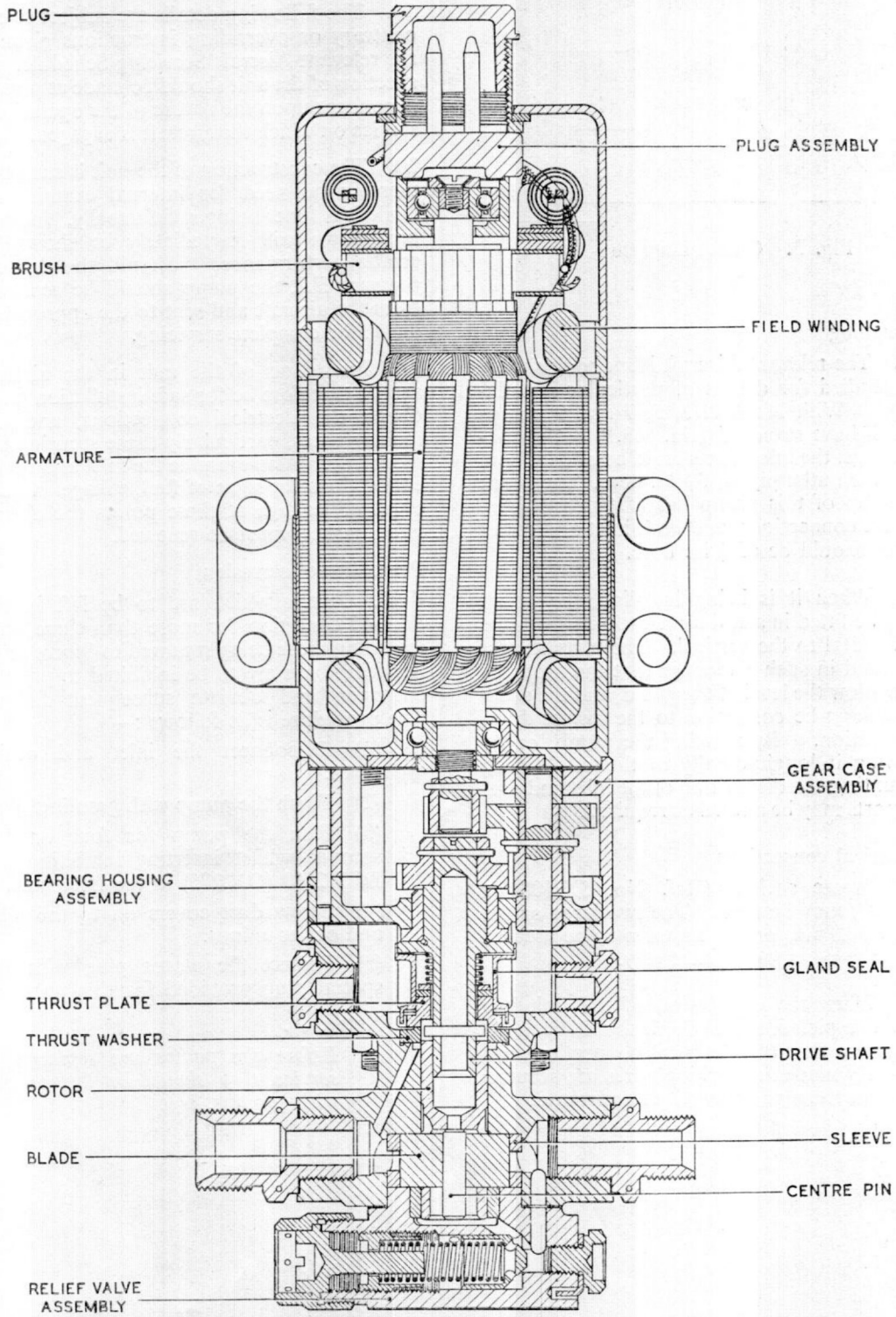

Fig. 2. Sectional view of FP 3 pump

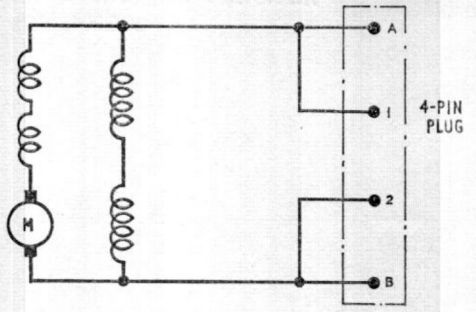

Fig. 3. Circuit diagram

Mounting

15. The relevant Aircraft Handbook should be studied for details of particular installations. With Mark 2, 3, 5, 7 and 9 pumps which have standard $\frac{3}{8}$ in. B.S.P. outlet connections, the inlet pipe should be of $\frac{3}{8}$ in. bore and the outlet pipes of $\frac{1}{4}$ in. bore. The Mark 4 pump of this group has a standard $\frac{1}{4}$ in. B.S.P. connections, and both inlet and outlet pipes should be of $\frac{1}{4}$ in. bore.

16. When it is being installed, the pump may be fitted in any desired attitude from the horizontal to the vertical. The units should be fitted in such a manner that the motor is not below the level of the gland, and the drain pipe must be connected to the lowest drain connection. By rotating the pump, or by moving it longitudinally in the saddle strap mounting, the disposition of the inlet and outlet ports may be altered as required.

Electrical connections

17. Breeze sockets (Ref. No. 5X/108 or 5X/167) may be used. The two large or the two small pins on the motor may be used as they are commoned internally.

18. When the installation of the unit has been completed, a final check should be made to ensure that the electrical connections are properly made, all locking wires are secured and that the pipe connections are sound.

SERVICING

General

19. The following details are subject to any contrary or overriding instructions given in the relevant Aircraft Servicing Schedule. Inspection of the unit should be made at periods dependent upon the nature of the operational service on which the aircraft is engaged.

20. The construction of the unit is such that there is no need for internal examination while it is functioning satisfactorily. Internal breakdown will immediately be shown by erratic performance. Should the delivery pressure fail, the pump should be removed from the aircraft and sent to the appropriate depot for complete servicing.

21. Inspection of the unit in the aircraft should therefore be for safe installation only. Check the electrical connections, and the locking wires, particularly those securing the mounting. Also examine the inlet and outlet connections for signs of fuel leakage. In the event of leakage at these points the aluminium gaskets must be renewed.

Prevention of corrosion

22. Pumps which are to be left in the drained condition for more than three days including those being returned to Stores or to Servicing bays are to be inhibited to prevent corrosion and obviate subsequent failure. The procedure is as follows :—

(1) Disconnect the inlet and outlet pipes.

(2) Flush the pump with gasoline.

(3) Run the pump for four or five seconds whilst inserting inhibiting oil, DEF.2181 (OX.275) in the inlet port.

(4) Screw dust covers on to the inlet and outlet unions.

(5) Protect the motor plug with the special plug provided for this purpose.

Note . . .

Before the pumps are replaced in service they should be flushed out with gasoline.

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