Chapter 14
PUMP, FUEL, SPE 418 Mk.2

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LEADING PARTICULARS

Pump, Fuel, SPE 418 Mk. 2	**Ref. No. 5UE/**
Rated performance	
Voltage	26*V d.c.*
Rated flow	800 *gal/hr.*
Minimum delivery pressure at rated flow	9·5 *lb/ in*^{2}
Maximum current consumption at rated flow	12*A*
Minimum no-flow delivery pressure	24 *lb/in*^{2}
Delivery connection	1 *in. B.S.P.*
Gland drain connection	$\frac{1}{4}$ *in. B.S.P.*

Introduction

1. The SPE 418 series fuel booster pumps are electrically driven, self-contained units designed to supply fuel under pressure to the aircraft engine driven pumps, or alternatively to transfer fuel from auxiliary to main tanks. The pumps are of the immersed type normally installed in the base of the aircraft fuel tank.

2. This chapter covers the SPE 418 Mk. 2 pump. Appendix 1 to this chapter covers the SPE 418 Mk. 3 pump and additional appendices will be added, as required, to cover other pumps in the series.

DESCRIPTION

General

3. The pump comprises, basically, an upper and a lower base assembly and a 26V d.c. motor. The motor, mounted on the upper base inside a sealed outer casing, drives a helix and an impeller mounted on the extended motor armature shaft. The upper and lower bases are bolted together to form the pump chamber and house a non-return (by-pass) valve. A gauze filter surrounds the pump inlet and a bellows gland in the upper base protects the motor against fuel ingress.

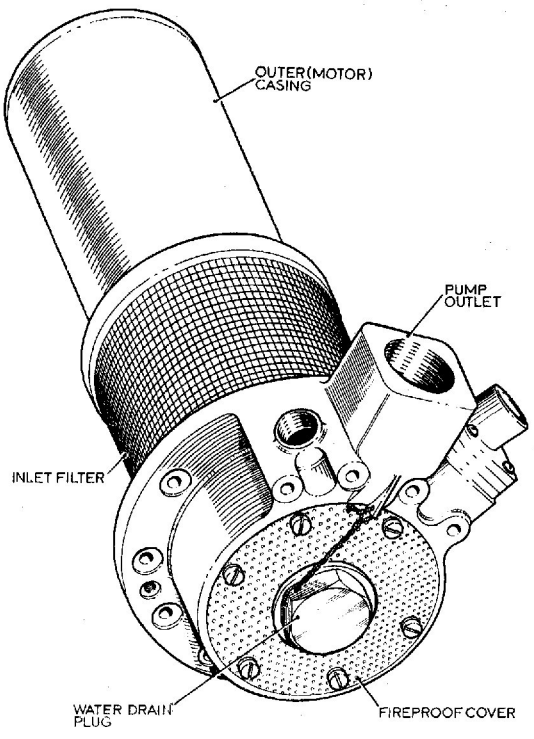

Fig. 1. General view of fuel pump SPE.418 Mk. 2

Motor unit

4. The motor is a compound wound, unidirectional, two pole machine suitable for use on a nominal 26V d.c. suply. The brush gear, mounted in the top motor casing, is of unit construction to facilitate assembly and carries four brushes mounted in pairs 180° apart.

5. The armature shaft is supported in pre-lubricated, double shielded ball bearings housed in the top and bottom casings. A thrower assembly, threaded on the armature shaft, retains the inner race of the lower ball bearing and prevents fuel which may have collected in the gland chamber from entering the motor windings.

Upper base assembly

6. Three equispaced hollow pillars form the centre portion of the upper base casting. The casting houses the bellows gland and is machined to accept the motor mounting spigot and attachment flange.

7. A sleeve in the upper base locates with the bottom motor casing to form two annular spaces, each of which connects, via a hollow pillar with the lower base. One passage forms the motor breather, the other facilitates gland drainage. The third pillar carries the motor leads.

8. The motor armature shaft extends through the bellows gland and carries a vapour assister and the pump helix and impeller. A vapour guide cone, mounted at the helix inlet, diverts any fuel and air vapour formed during operation out of the main fuel stream through the pump.

Lower base assembly

9. The lower base casting incorporates the the pump mounting flange and is machined to accept the fuel delivery adapter, the gland fuel drain connection and the electrical connection. A port in the base, protected by a wire gauze (flame trap), forms the motor breather and a drain plug in the centre of the base connects with the impeller chamber. The by-pass valve at the delivery end of the integral cast volute chamber enables fuel to flow from the tank when the pump is inoperative. The valve is normally held closed by the pump pressure.

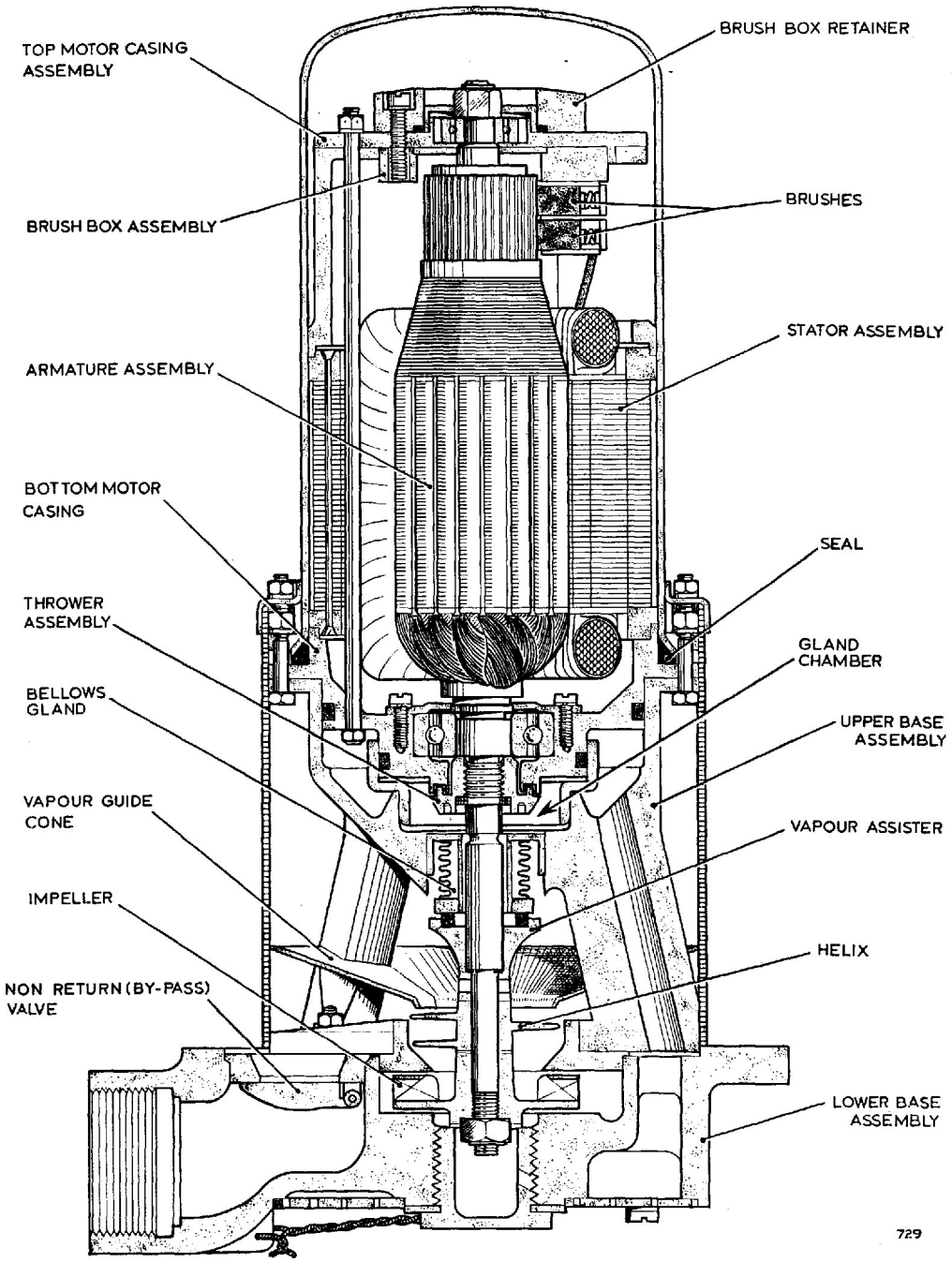

Fig. 2. Sectional view of fuel pump

OPERATION

10. When the pump motor is energized, filtered fuel from the tank is passed, via the vapour guide cone and the helix, to the eye of the impeller. The fuel is pressurized under the centrifugal action of the impeller and passes from the volute chamber to the pump outlet.

11. Under operating conditions in which the maximum pump flow is not required, the pump maintains the fuel outlet pressure at a pre-determined figure. When the pump is inoperative and the fuel outlet pressure falls, the by-pass valve opens allowing fuel to pass from the tank direct to the outlet.

REMOVAL AND INSTALLATION

Removal

12. Reference should be made to the appropriate Aircraft Handbook for the precise method of removal of the pump.

13. Before attempting to remove the pump, ensure that the aircraft tank has been drained, that all necessary fuel cocks are correctly positioned, and that the electrical supply to the pump is switched off. Residual fuel may be drained from the tank by unscrewing the water drain plug in the pump lower base.

14. Removal of the pump consists of disconnecting the fuel outlet and gland drain pipes and the electrical connection socket. The twelve nuts or bolts securing the pump flange to the tank mounting ring can then be removed and the pump lowered from the tank. Take care to support the pump during this operation. Two $\frac{1}{4}$ in. B.S.F. screws can be used, if necessary, in the pump mounting flange tapped holes to break the joint with the tank mounting ring.

Pre-installation checks

15. The installation of all new or serviced pumps should be preceded by the following checks.

(1) Ensure that the pump storage life has not expired.
Pumps whose storage life has expired should be returned for reconditioning.

(2) Inspect the exterior of the pump for signs of damage, security of locking, cleanliness and corrosion.

(3) Check that the blanks have been removed from the delivery outlet, gland drain and electrical connection and remove any tape or other protectve materials from the inlet filter and motor breather gauzes.

(4) Apply a 24V d.c. supply to the pump electrical connection and check that the pump starts immediately. Repeat the test several times. Failure to start immediately in any one instance will entail rejection and the pump should be returned for overhaul.

Installation

16. The pre-installation checks apply to all aircraft installations of these pumps. For detailed procedure covering installation in a particular aircraft, reference should be made to the relevant Aircraft Handbook.

17. Installation of the pump in the aircraft will comprise the following operations:—

(1) Fitting a new gasket between the pump flange and the tank mounting ring, using an approved jointing compound.

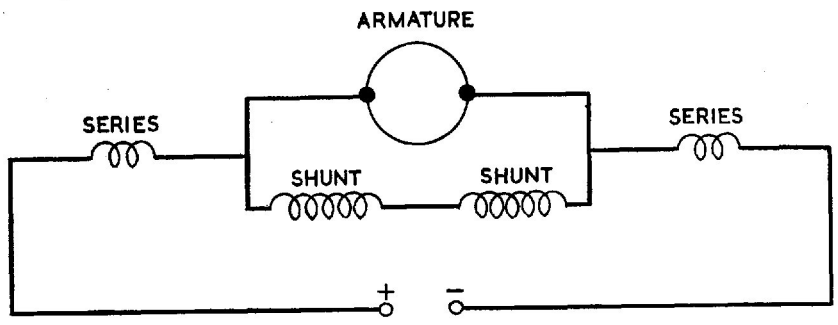

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Fig. 3. Circuit diagram

(2) Securing the pump with the twelve attachment nuts or bolts and washers.

(3) Reconnecting the fuel delivery and gland drain pipes and the electrical supply socket.

(4) Wire locking all pipe connections.

SERVICING

Routine inspection

18. At routine inspections the following procedure applies:—

(1) Inspect all pipe connections and wire-locking to the pump for security and damage. Check the joint between the pump and the fuel tank for leakage, and the motor breather gauze for cleanliness. Rectify as necessary.

(2) Check the gland drain leakage rate which should not exceed 1 drop/min. with the pump stationary or 2 drop/min. with the pump operating.

(3) Test the pump as detailed in para. 19-22. If the pump performance is unsatisfactory in any way, the pump must be removed for reconditioning. No in-situ maintenance is possible.

Operational test

19. The pump should be tested, where aircraft instrumentation permits, for proof of performance and the figures obtained checked against the rated performance figures given in the Leading Particulars at the front of this chapter. Refer to the relevant Aircraft Handbook for procedure details. Possible causes of failure to meet the required performance are given in Table 1.

Gland leakage test

20. During the above tests, an examination should be made of the gland drain outlet for fuel leakage. Leakage must not exceed 2 drops per minute while the pump is running, or one drop per minute while the pump is stationary. Leakage in excess of these figures indicates an unserviceable pump.

Insulation resistance test

21. Using a 250V insulation resistance tester, check that the insulation resistance between the socket pins of the pump connection and earth is not less than 50,000 ohm.

TABLE 1

Faults, possible causes and rectification

Fault	Possible cause	Rectification
Excessive gland leakage	Defective gland seal faces or damaged gland bellows.	No in-situ rectification is permissible. All defective pumps must be removed from the aircraft and returned for reconditioning.
Low insulation resistance	Damp motor windings.	
Pump performance	Faulty motor unit or	
	Low input voltage	Check aircraft supply voltage.

Appendix 1

PUMP, FUEL, SPE 418 Mk.3

LEADING PARTICULARS

Pump, Fuel, SPE 418 Mk. 3 ... ... **Ref. No. 5UE/7689**

Rated performance	
Voltage	25*V d.c.*
Rated flow	800 *gal/hour*
Minimum delivery pressure at rated flow	6·4 *lb/in*^{2}
Maximum current consumption at rated flow	9·5 *A*
Maximum no flow delivery pressure at 26·5*V d.c.*	20·8 *lb/in*^{2}
Electrical connection (Plessey)	*CZ* 28095 (2*CZ* 111402)
Delivery connection	1 *in. B.S.P.*
Gland drain connection	$\frac{1}{4}$ *in. B.S.P.*

General

1. The SPE 418 Mk.3 fuel pump incorporates a smaller impeller than the SPE 418 Mk. 2 (covered in the basic chapter) and a blanking plate is fitted in place of the by-pass valve. The Mk. 3 pump motor has a different speed setting.

2. Pump operation differs in that no by-pass facility exists when the pump is inoperative.

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