Chapter 52

PUMP, FUEL, SPE 1322, Mk. 3A

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Pump, fuel, SPE 1322, Mk. 3A	**Ref. No. 5UE/7056**
Motor unit	*Four-pole compound wound Flameproof*
Rated output	1300 *g.p.h.*
Fuel delivery pressure	11·5 *lb/in²* at 26*V d.c.*
Current consumption	16·5*A* (*max*) at 26*V d.c.*
Electrical connection	*Sealed single pillar 2-pole connector*
New brush length	0·406 *in.*
Minimum permissible brush length	0·354 *in.*
Brush spring pressure	5 *lb/in²* ± 7·5 *per cent at* 0·719 *in.*
Commutator diameter new	$\frac{1{\cdot}224}{1{\cdot}232}$ *in.*
Permissible commutator diameter for further use	1·181 *in.*
	Width *depth*
Undercut commutator segments	0·028 *in.* 0·5 *mm*
Maximum commutator eccentricity with shaft journals	0·001 *in. T.I.R.*
Motor unit bearings	*SPE. Part No.* 14044

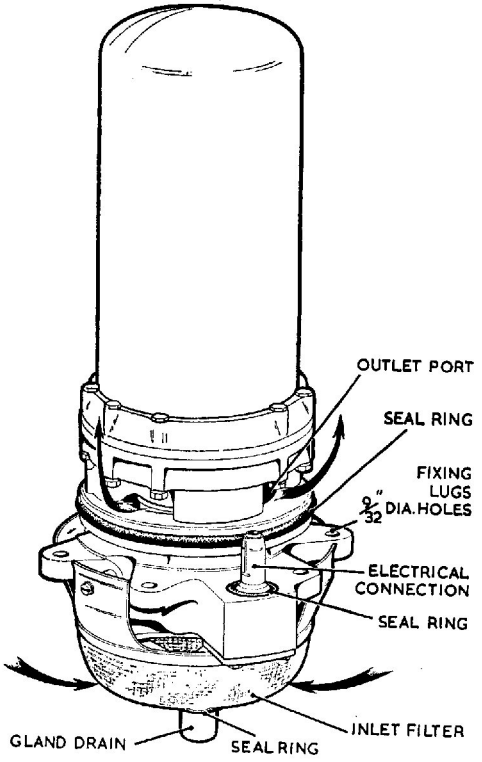

Fig. 1. External view of SPE. 1322 Mk. 3A pump

Introduction

1. The SPE.1322 Mk. 3A pump, an external view of which is shown in fig. 1, is electrically driven and designed to deliver fuel under pressure to the main aircraft supply line, at varying conditions of fuel de-aeration, temperature, and vapour formation at high altitudes. The unit can also be used to transfer fuel from the auxiliary to the main tanks.

2. The design is such that the complete pump assembly can be mounted and removed from the mating sleeved housing, without draining the tank to which it is fitted. The pump includes built in radio interference suppressors.

DESCRIPTION

General

3. Basically the pump, a sectional view of which is shown in fig. 2, consists of a sealed motor unit with an extended armature shaft driving the pump impeller system which is housed in a light alloy casting.

Pump body

4. The lower end of the pump body casting, together with an insert and liner assembly forms a housing for the inpeller system. The upper end is recessed and houses a diffuser sleeve which directs the fuel flow from the impeller chamber upwards into the sleeved housing.

5. A gland drain spider casting fitted to the base of the pump, mates with a machined channel in the pump casting, and its purpose is to lead away any fuel which tends to seep past the motor/pump unit seal. A filter which is secured to the spider casting by three 4BA bolts and shakeproof washers, prevents the ingress of any foreign matter into the pump.

Impeller system and vapour guide cone

6. A formed vapour cone is fitted around the pump inlet and in conjunction with the rotation of the helical impeller assists in separating out air bubbles and fuel vapour evolved, before they reach the centrifugal impeller. Both impellers are fitted to the end of the motor shaft, and are secured by a 2BA washer and a self locking nut

Motor unit seal

7. A Flexibox type seal which comprises a rotating lapped metal sealing element with an integral O ring rotating against a stationary carbon seal is positioned immediately above the impeller system and its purpose is to prevent the ingress of fuel to the motor unit.

Motor

8. The motor unit is a totally enclosed compound machine which operates on a nominal 24V d.c. supply. It is spigot mounted to the pump body and is secured by five 2BA bolts and locknuts.

9. The brush gear is of unit construction, the four brush boxes being secured to a bakelite carrier and the complete assembly attached to the commutator end casting. The opposite brushes are linked by flexible leads, which are positioned by a channelled plate and cover. The brushes are of rectangular section with integral coil compression springs.

10. The armature is supported at each end by pre-packed double shielded bearings. The lower bearing is housed in the drive end casting and is retained in position by a

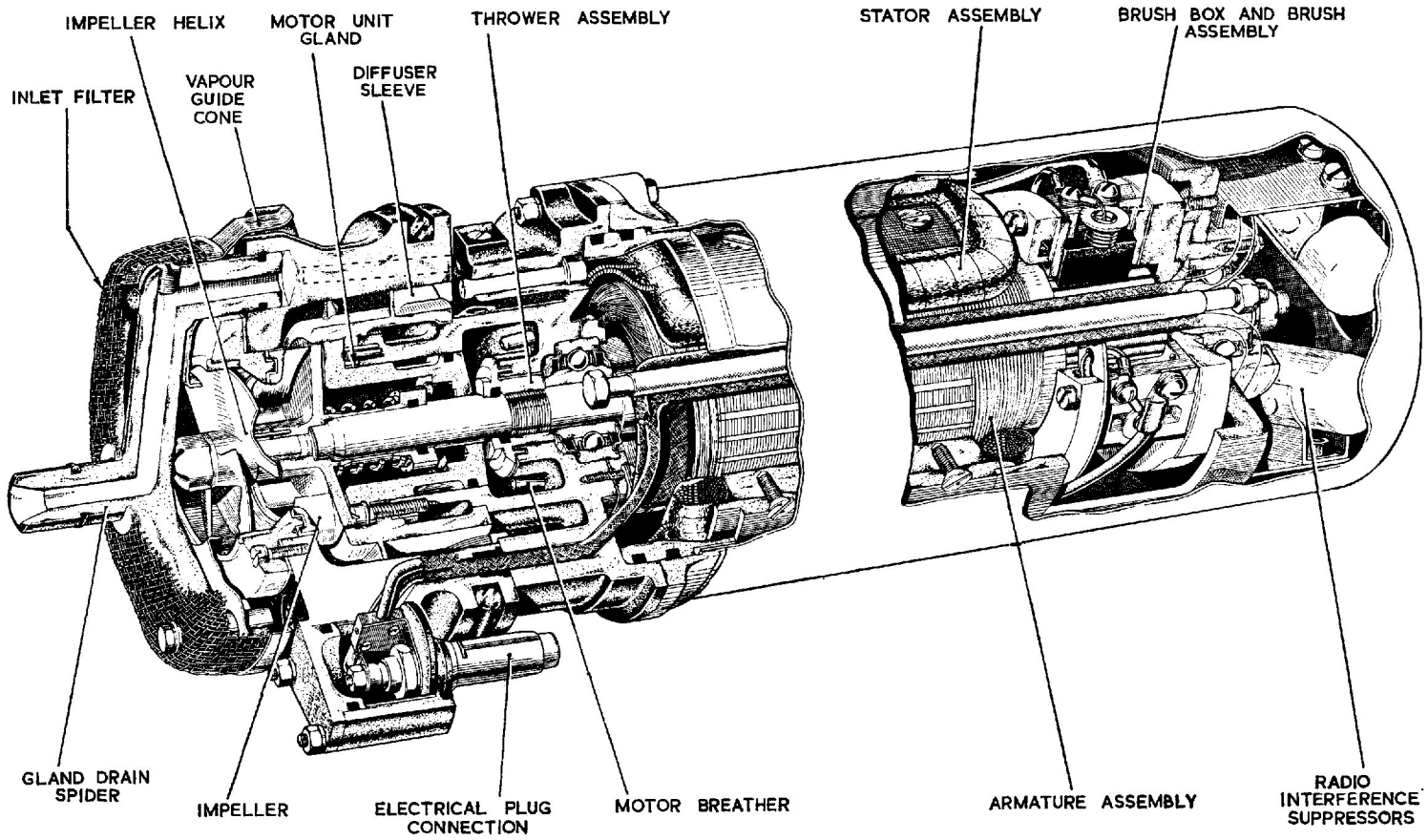

Fig. 2. Sectional view of SPE. 1322 Mk. 3A pump

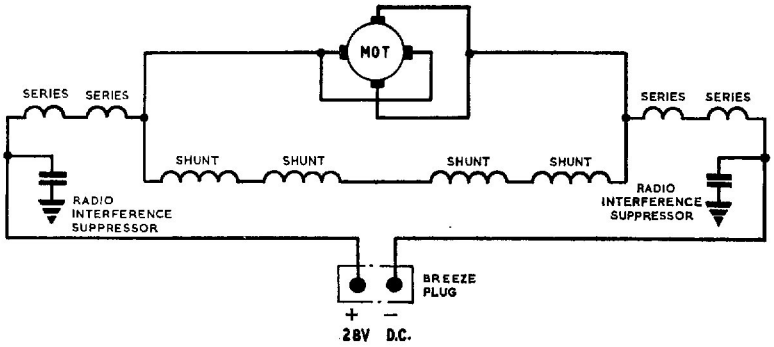

Fig. 3. Circuit diagram

retainer plate on the motor side and a thrower ring on the pump side. The thrower ring which incorporates a seal is screwed on to the shaft and serves to throw off any fuel which tends to seep past the motor unit seal. The upper bearing is housed in the commutator end housing and is retained in position by a retainer plate and a pre-loaded spring. A self-locking nut and washer screwed on to the end of the shaft secures the centre race of the bearing.

11. The main body of the motor is in two parts and consists of an upper assembly which carries the field system, and a lower assembly which incorporates two external synthetic seal rings. These seal rings are recessed in grooves provided in the body and seal the motor when assembled.

12. Four tie-bolts secure the motor assembly together and a light alloy casting totally encloses it. The cover is secured to a flange provided on the motor drive-end casting, and is secured by eight 4BA bolts, nuts and spring washers. Ventilation of the motor is by way of two tubes provided in the motor drive-end casting, and connection to atmosphere is through channels in the pump body and the gland drain outlet.

Electrical connection

13. Electrical connection to the pump is by way of a single pillar, two-pole connector located at the side of the pump body. This connection engages with a permanent pin and sleeve connection located in the sleeved housing assembly, and a rubber ring fitted to the base of the pillar seals the connection when the pump is fitted into the sleeved housing.

Sleeved housing

14. The sleeved housing assembly is designed for use with the pump and in principle form an envelope over the fuel pump. It is fitted with a sleeve valve which, when required, can be closed to allow the pump to be withdrawn from the tank without the necessity of previously emptying the tank of fuel. Fig. 4 shows a sectional view of the sleeved housing illustrating the sleeve of the housing in both the open and closed position. When the sleeve of the housing is in the closed position for pump removal, the fuel left in the pump housing can be drained off by means of a spring loaded drain valve and plug, positioned in the bottom of the housing cover plate. The sleeved housing is not supplied as part of the pump.

OPERATION

15. Fuel from the tank enters the pump through the wire mesh filter into the underside of the impeller helix, and is drawn into the eye of the centrifugal impeller. The fuel is forced through the spiral channels of the diffuser sleeve and portways of the upper pump base to the delivery annulus formed by the surrounding sleeved housing, and thence upward through the outlet connection at the top of the sleeved housing into the fuel line. Under conditions in which the flow from the pump is low due to low engine requirements, the impeller continues to rotate at approximately normal speed without causing any increase in fuel pressure.

REMOVAL AND INSTALLATION

Removal

16. The following notes on the removal and

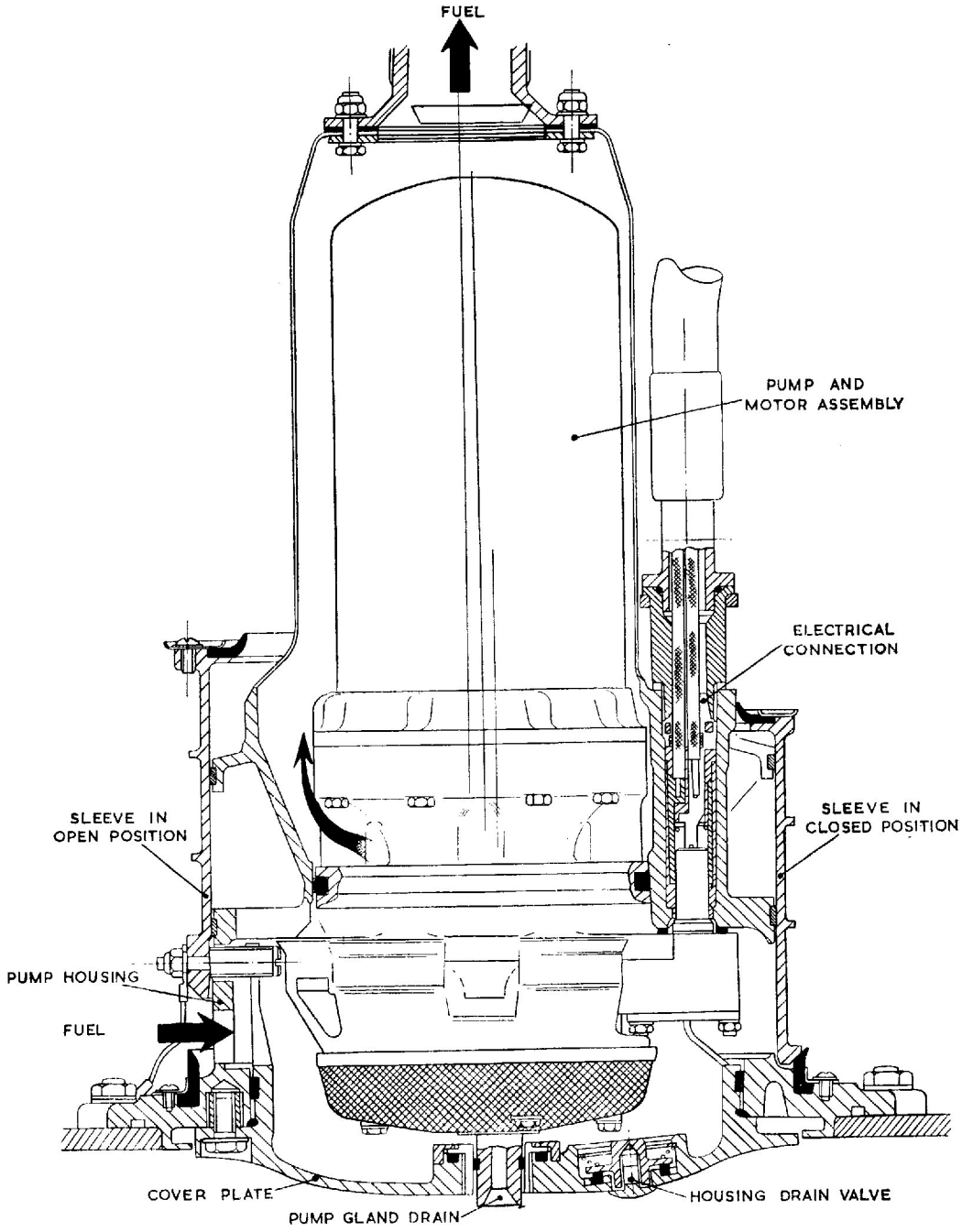

Fig. 4. Sectional view of pump and sleeved housing

installation of a pump from the tank are of a general nature. For precise information on a particular pump installation reference should be made to the appropriate Aircraft Handbook.

(1) Isolate the relevant fuel pump circuit.

Note . . .

(a) *It is not necessary to drain the fuel tank prior to removing a pump from its housing.*

(b) *The electrical plug connection is disengaged when the pump is withdrawn. To prevent any arcing that might occur if the circuit is not isolated, the two contacts disengage before the two contact mating parts leave their insulated housing.*

(2) Remove the ten bolts securing the cover plate to the pump housing.

(3) Attach a special tool similar to the SPE. Part No. 6-Y407A to the cover plate and turn the cover in an anti-clockwise direction to the limit of travel. This action unlocks the bayonet connection between the housing sleeve and the cover plate and rotates the sleeve, which is guided on helical slots, into the closed position. The air vent aperture at the upper end of the sleeve is also closed by this action.

(4) Unscrew the drain valve in the cover plate, push up the valve and drain off the fuel trapped in the housing (approximately half-gallon) into a suitable container.

(5) Align the integral lugs of the cover plate with the slots in the housing. Remove the cover plate by pulling downwards.

Note . . .

Care should be taken when removing the cover plate as a small amount of fuel may still remain in the housing.

(6) Support the pump and remove the six securing bolts, then withdraw the pump.

Pre-installation checks

17. (1) If a new or reconditioned pump is to be installed, ensure that all transit blanks and plugs are removed and that the pump is clean externally.

(2) Check that new seal rings are fitted to the pump electrical plug and to the external groove in the pump body and to the gland drain connection.

(3) Ensure that the inside of the pump housing in the vicinity of the electrical connection is free from fuel.

(4) Examine the seals of the cover plate for condition and ensure that they are not twisted. Renew if necessary.

Installation

18. (1) Support the pump in the housing and align it so that the electrical plug enters the plug insulated housing. Assemble the six retaining bolts and shakeproof washers; the odd length bolt must be fitted in the third lug from the electrical connection (counting anti-clockwise). Finally tighten the bolts.

(2) Check that the cover plate drain valve is securely tightened. Align the cover plate lugs with the slots in the housing, press upwards to engage the bayonet connection between the cover plate and housing sleeve and turn in a clockwise direction to rotate the housing sleeve to the open position.

(3) Secure the cover plate with ten bolts and shakeproof washers.

(4) Remove the special tool and restore the aircraft electrical supply after ensuring that the tank contains fuel.

SERVICING

Functional test

19. After installation, and at periods stated in the appropriate Servicing Schedule the pump should be checked for pressure of fuel delivery. The minimum no-flow pressure at varying input voltages is given in fig. 5. The procedure for the test is as follows:—

(1) Close the low pressure fuel cocks.

Note . . .

These cocks are interconnected with the mechanically operated hydraulic valves and therefore must not be operated when the hydraulic valves are in use. The cocks can be disconnected if required.

(2) Obtain a 20 p.s.i. pressure gauge and adapter incorporating an $\frac{1}{8}$ in. B.S.P. male thread.

(3) Open the hinged access panel beneath the centre-section front spar, and remove the drain plug from the large pipe union at the extreme right-hand end (looking forward) of the cross-feed fuel pipe.

(4) Connect the pressure gauge and a sealing washer to the drain plug aperture.

(5) Depending on the location of the pump to be tested, select the isolation common feed and cross-feed cocks to the

positions as indicated in the appropriate Aircraft Handbook.

(6) Restore the electrical supply, switch on the pump under test and check that the pressure is in accordance with the figures quoted in fig. 5.

(7) Switch off the pump, remove the gauge and adapter and quickly replace the drain plug and sealing washer.

20. Low delivery pressure could be caused by a faulty motor, and a pressure surge by a tight or pre-loaded bearing. Where a fault is evident, the pump should be removed and a new or reconditioned pump fitted.

Electrical test

21. This test should be made under load conditions, it is essential therefore that the pump is immersed in fuel. Ascertain the position of the pump circuit breaker with reference to the appropriate Aircraft Handbook. Connect the aircraft to a ground supply and proceed as follows:—

(1) Trip the relevant circuit breaker of the pump to be tested, and connect a suitable ammeter across the circuit breaker terminals.

(2) Operate the pump switch and note the reading of the ammeter for a period of not less than half a minute.

22. The interpretation of the reading on the ammeter is similar to the interpretation given for other pumps described in this section. Current consumption figures together with the associated voltage inputs are given in fig. 5. When the test is completed, switch the pump off, disconnect the ammeter, replace the circuit breaker terminal cover and reset the circuit breaker.

Routine inspection

23. In additon to the preceding tests, the following checks should be made at the times specified during routine inspections:

(1) Examine the pump cover plate for signs of leakage, renew seals if the plate attachments bolts are tight.

(2) Examine the pump gland drain for leakage. The maximum leakage permissible is 2 drops per minute with the pump running. Where leakage is in excess of this figure the pump should be removed and a new or reconditioned pump fitted.

(3) Remove the cover plate and pump inlet filter.

Note . . .
Before removing the cover plate and inlet filter reference should be made to the relevant Aircraft Handbook.

(4) Examine the pump impeller for damage. Before refitting the filter remove any foreign particles by reverse flushing and ensure that the filter is undamaged.

(5) When refitting the cover plate, the two seals should be renewed.

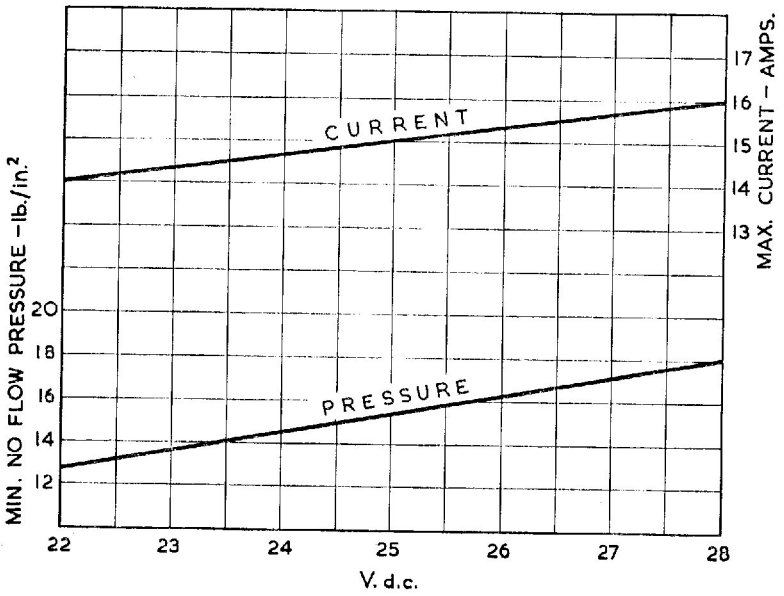

Fig. 5. Estimated current consumption and delivery pressure under no-flow conditions

Note . . .

The above graphs are provided as a guide to the pump performance under no-flow conditions and should not be interpreted as forming part of the approved acceptance test.