Chapter 18

PUMPS, FUEL, SPE.800 AND 1200 SERIES

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Introduction

1. The SPE.800 and SPE.1200 series, electrically driven fuel booster pumps are designed to maintain the required fuel supply to the aircraft engine driven pump under the varying fuel temperature and altitude conditions experienced in flight. The pumps are for operation on 24 volts d.c. aircraft supply, and all electrical circuits include built-in radio noise suppressors. The nominal delivery rating of the SPE.800 series pumps is 800 gallons per hour, and that of SPE.1200 series pumps 1200 gallons per hour.

2. All the pumps in these series are of the right-angled drive type to suit installation requirements where fuel tank depth is restricted by thin wing sections or other considerations. The method of mounting the pump—side, base flush or base sump—constitutes one of the main differences between basic types of pump in each series (*para.* 3).

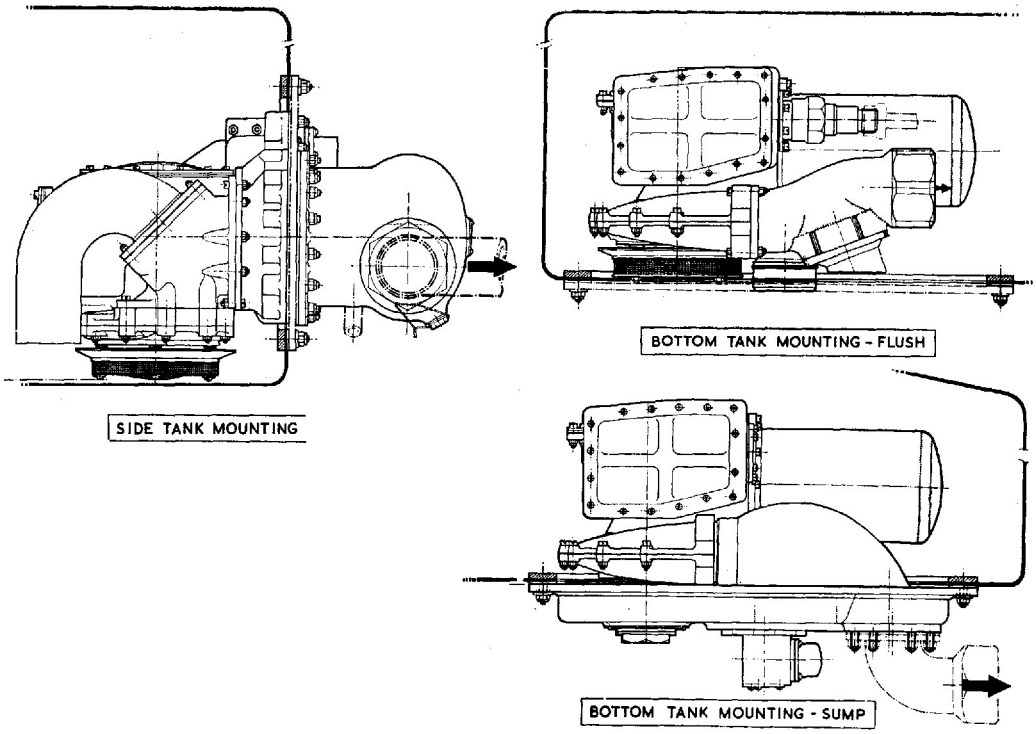

Fig. 1. Typical fuel tank pump mountings

Pump mountings

3. The different types of mounting are illustrated in Fig. 1 and may be defined as follows:

(1) *Side mounting.* Provision is made for including in the assembly a mounting plate for securing the pump to the side of the tank so that the pump unit is within the tank and the motor unit protruding. The electrical connection to the pump motor is made externally.

(2) *Base flush mounting.* With this type of mounting the pump is wholly within the fuel tank and bolted to a cast mounting plate secured to a stud ring in the base of the tank. The electrical supply to the pump motor is through a special fuel tight connection on the pump base.

(3) *Base sump mounting.* The use of a sump or dished mounting plate for the pump enables the fuel tank to which it is fitted to be completely drained, either by the action of the pump or by removal of a drain plug located in the mounting plate. The electrical connection to the pump is made externally.

(4) *Inclined sump mountings.* Similar to the BASE SUMP mounting, but designed for use where the tank bottom is angled to suit the configuration of the aircraft.

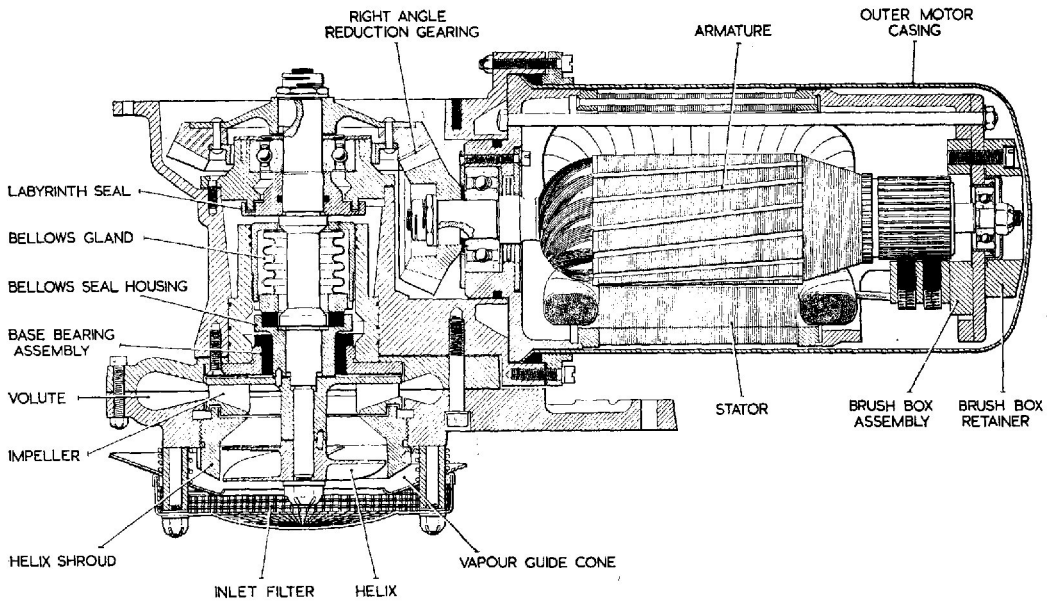

Fig. 2. Typical SPE.800 and SPE.1200 series pump and motor unit assembly

DESCRIPTION

Typical pump and motor unit assembly

4. A typical pump and motor unit assembly is illustrated in Fig. 2. This basic arrangement is common to all 24 v. d.c. SPE.800 and SPE.1200 series pumps except for minor casting profile details to suit the various installation configurations.

Motor unit

5. The motor units fitted to these pumps are suitable for 24 volts d.c. aircraft supply. The basic construction is similar for both types, but the SPE.1200 series motor unit is larger dimensionally than that of SPE.800 series pumps. All the motor units are totally enclosed compound wound machines using a conventional two-pole construction. The armature laminations are skewed.

6. In a typical motor the armature shaft is supported by shielded bearings, that at the commutator end being retained in a steel sleeve. The shaft drive is fitted with a bevel pinion which engages with a bevel gear on the pump shaft, providing a reduction of approximately 2 : 1.

7. The brush gear is of unit construction, comprising four brushes, two either side in tandem producing two brush tracks. The type and position of the electrical connection varies with the mounting arrangement.

8. The motors are generally wired for single speed operation, although certain SPE.1200 series pumps were originally designed for use as two-speed machines with provision for externally switching of the shunt leads. The electrical circuits include radio noise suppressors, but positioning of these varies with the mounting configuration.

Pump unit

9. The two-stage centrifugal pump unit, driven through the right-angled bevel gearing, comprises a first stage helical impeller and second stage centrifugal impeller mounted to a common vertical shaft. This shaft is supported at its upper end by a shielded ball-bearing and at its lower end in a plain carbon bearing lubricated by fuel. Fuel from the impeller system is fed into a spiral volute and thence to the delivery line.

10. The main casting or pump body housing the impeller system also contains the metallic bellows type seal unit preventing fuel ingress into the motor unit and gear chamber. Any slight fuel leakage past this gland will be dissipated by a thrower ring incorporated in the shaft machining and drained to

atmosphere through drain channels in the pump castings.

11. Foreign matter is prevented from entering the pump unit by a wire mesh filter which encloses the inlet. A vapour guide cone surrounding the inlet to the impeller system assists in separating fuel and air bubbles dissipated from the tips of the impeller helix.

12. The delivery outlets from the volute chamber differ in each mounting arrangement. All pumps in the series are fitted with a simple hinged-plate by-pass valve at some point in or adjacent to the delivery outlet which enables the engine-driven pump to draw fuel from the tank in the event of booster pump failure. The valve is normally held closed by booster pump pressure.

outside the tank to either of two horizontally opposed $1\frac{1}{2}$ in. B.S.P. outlet connections on the fuel jacket surrounding the motor unit. This fuel jacket also includes a $\frac{1}{4}$ in. B.S.P. gland drain tapping, the channel of which is incorporated in the casting and mates with a similar duct in the main pump body. A by-pass valve is mounted over the delivery duct and is backed by a fabricated duct formed so that the end is immersed in fuel until the tank is almost empty.

15. Radio interference suppressors are contained in a housing on the end of the main pump body casting and the electrical connection is made to a Plessey plug fitted to an external mounting surface on the pump casting.

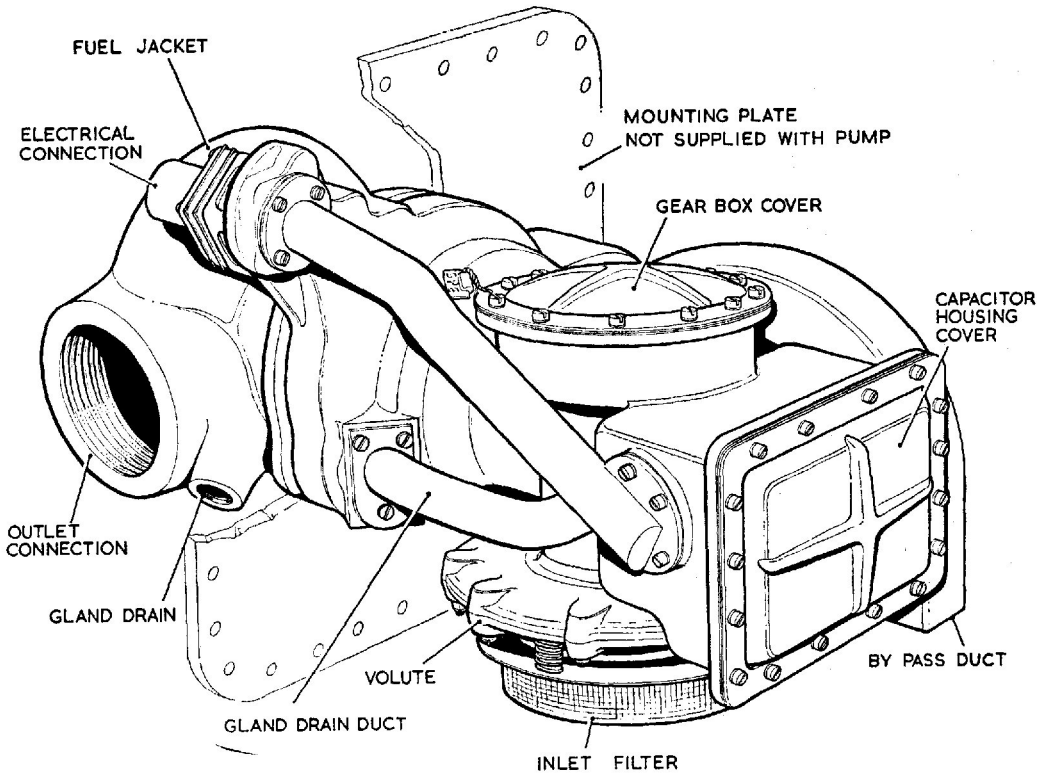

Fig. 3. Typical side mounting fuel booster pump

Type descriptions

Side mounting fuel booster pumps

13. In a typical side mounting SPE.800 or SPE.1200 series fuel booster pump, the pump and motor unit are basically as described in para. 4-12, but the pump shaft is slightly longer to suit installation requirements.

14. The fuel delivery line is connected

16. The side mounting fuel pumps are normally supplied without mounting plate or associated gaskets. The fuel jacket is attached in a few positions only with additional nuts supplied in separate package.

Base flush mounting fuel booster pumps

17. Both SPE.800 and SPE.1200 base flush mounting fuel booster pumps are fitted with

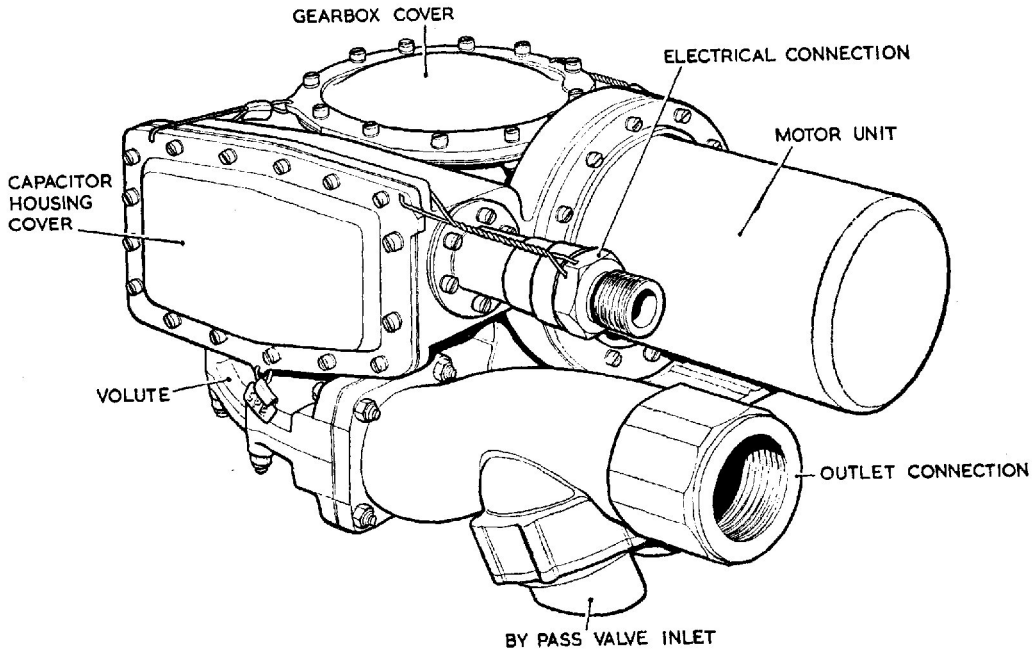

Fig. 4. Typical base flush mounting pump

a pump and motor unit basically as described in para. 4-12.

18. The fuel delivery line is connected within the tank to a $1\frac{1}{2}$ in. B.S.P. outlet casting, which includes the by-pass valve enabling fuel to be drawn from the tank with the booster pump idle. A mounting flange and boss is provided for bolting the pump to a tank mounting plate (not normally supplied with pump). Both the gland drain and motor breather channels are brought to the outside of the tank through this mounting boss.

19. The electrical connection to the pump is made within the fuel tank and is of special flameproof and fuel tight design. Radio noise suppressors are contained in a housing on the side of the main pump body casting.

Base sump mounting fuel booster pumps

20. In a typical base sump mounting SPE.800 or SPE.1200 series fuel booster pump, both the pump and motor unit are basically as described in para. 4-12.

21. The pump is bolted to a dished sump type mounting plate through an extension of the lower volute casting. The fuel delivery line connection is made outside the tank to a stud ring in the base of the sump and the by-pass valve enabling fuel to be drawn from the tank when the pump is idle, is included in the connector casting assembly linking the pump volute to the sump outlet.

22. The electrical connection to the pump is made externally through a 'Breeze' plug fitted to a special carrier assembly secured to the undersurface of the sump mounting plate. This carrier casting also incorporates the motor breather. Radio noise suppressors are contained in a housing in the side of the main pump body casting.

Inclined sump mounting fuel booster pumps

23. The inclined sump mounting type SPE.800 and SPE.1200 series fuel booster pumps are fitted with a pump and motor unit basically as described in para. 4-12.

24. The pump is bolted to an inclined dished sump type mounting plate through an extension of the lower volute casting. The fuel delivery line is connected within the tank to a $1\frac{1}{2}$ in. B.S.P. outlet casting which includes the by-pass valve enabling fuel to be drawn from the tank with the booster pump idle.

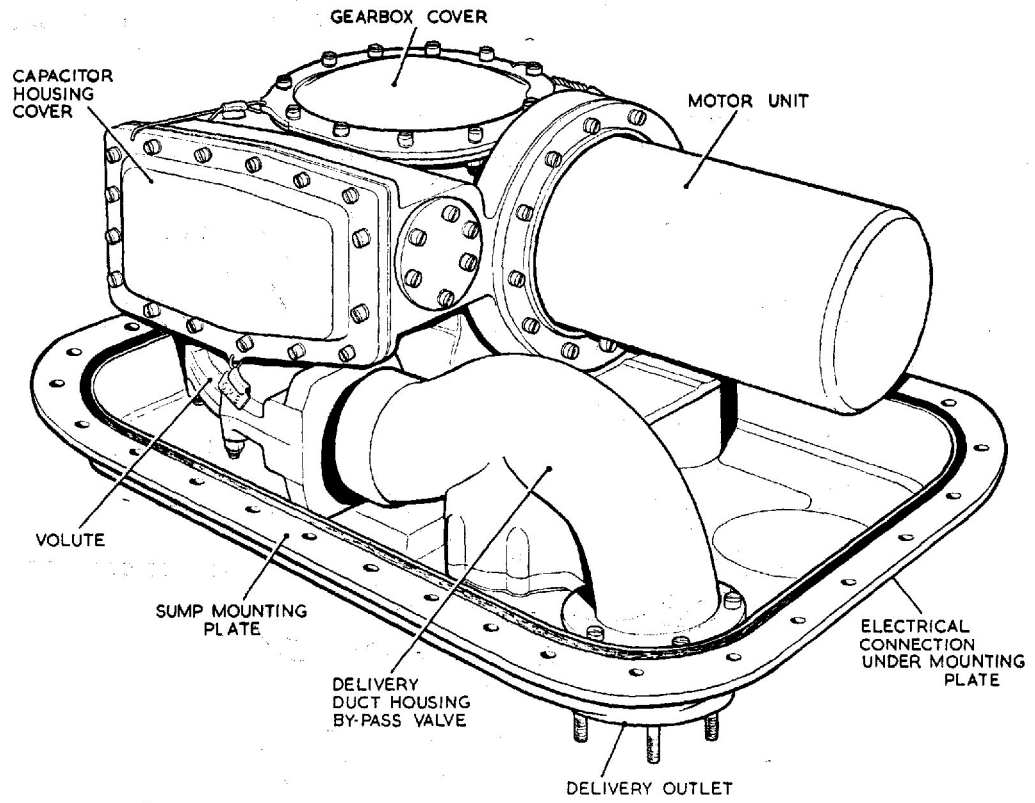

Fig. 5. Typical base sump mounting fuel booster pump

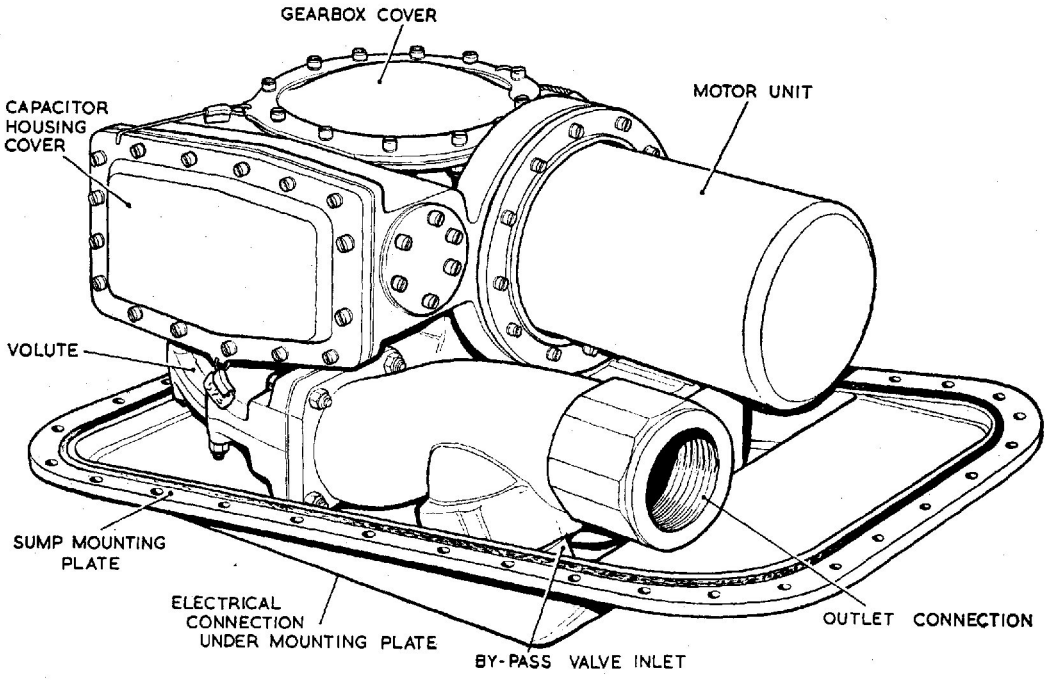

Fig. 6. Typical inclined sump mounting fuel booster pump

25. The electrical connection is made externally through a Breeze plug secured to a housing on the sump mounting plate. This mounting plate is fitted with a special water drain valve and a gauze protected outlet for the motor breather channel. Radio noise suppressors are contained in a housing in the side of the main pump body casting.

OPERATION

26. Fuel from the tank enters the pump through a wire mesh filter and is picked up by a helical impeller which serves the dual purpose of de-aerating and pressurising the fuel at the eye of the centrifugal impeller. This latter feeds the fuel through the spiral volute chamber and thence into the outlet duct.

27. Under conditions in which the flow from the booster pump is low due to reduced engine requirements, the impeller continues to rotate at approximately normal speed without causing any excessive increase in fuel pressure.

28. When the pump is idle the pressure on the by-pass valve is relieved. As a result the valve opens and allows the engine driven pump to draw fuel direct from the tank without passage through the pump impeller system.

REMOVAL AND INSTALLATION

29. Before attempting to remove a pump ensure that the tank has been drained of fuel and that the electrical supply to the pump motor unit has been switched off. The former can be checked by easing the tank drain plug which may be fitted either in the tank itself or on the pump mounting plate. The precise method of removing each type of pump will be detailed in the appropriate Aircraft Handbook. Generally it will comprise the disconnection of the fuel delivery pipe, the electrical connection and the gland drain connection. The pump can then be removed by disconnecting the pump mounting plate from the tank bolt ring. Care should be taken to support the weight of the pump during the latter operation.

30. The installation of a new pump should be preceded by the following checks:

(1) Ensure that the pump has not been stored for longer than the specified maximum period (i.e. 12 months in the original packing and carton as supplied by the manufacturer, or 3 years where special packing has been provided).

(2) Inspect the exterior of the pump for evidence of damage and security of pump locking wires. Check for any signs of corrosion. Blend out slight areas of corrosion and apply a protective finish (e.g., chromic acid solution) to the unprotected area.

(3) Ensure that the pump is scrupulously clean externally.

(4) Remove the transit plugs, caps and other protective material from the delivery outlet, the electrical connection, the gland drain and motor breather.

(5) It is advisable to make a starting check on the pump before installation. To do this the carbon shaft bearing should be lubricated by pouring a small quantity of fuel through the small holes in the pump casting at seal level, care being taken to ensure that fuel does not contaminate the electrical connection or flow into the gland drain or motor breather ducts. Apply a 24 volts d.c. supply through the electrical connection using an approved mating socket for the pump plug. The pump should start immediately. Switch off the current and repeat the test several times. If the pump fails to start immediately it should be returned to an overhaul base for further serviceability testing using approved equipment.

The above pre-installation instructions apply to all aircraft installations of these pumps. For detailed procedure covering installation in a particular aircraft reference should be made to the appropriate Aircraft Handbook.

31. As a general example installation in the aircraft will comprise the following operations:

(1) Ensure that new seal rings and gaskets are fitted where necessary to all pump/mounting plate or mounting plate/tank bolt ring joints. Note that the seal ring in the periphery groove of the base and sump mounting plates is fixed in position with rubber cement.

(2) Connect the fuel delivery line, the electrical supply and the gland drain connections. These connections should be

made either before or after offering the pump assembly to the tank bolt ring, being dependent on whether these connections are inside or outside the fuel tank.

Note that the pipe from the gland drain should always face to rear of aircraft to prevent possible pressurisation in flight.

(3) Secure the pump mounting plate to the fuel tank bolt ring with requisite number of nuts and lock-washers. Tighten the nuts in turn to ensure even compression of the joint washers and seal rings.

(4) Wire lock all the internal and external connections to the pump assembly.

SERVICING

Routine inspection

32. At routine inspections care should be taken to conform to the following procedure:

(1) Inspect all pipe connections and wire locking to the pump. Correct as necessary.

(2) Test the pump as detailed in para. 34-40. If the pump is found to be defective in any way, a new or reconditioned one must be fitted. No in-situ maintenance is possible.

(3) Ensure that the by-pass valve is functioning correctly. To do this turn on tank selector cock and appropriate engine master cock. Switch on the pump and observe the fuel pressure, indicated by aircraft fuel pressure gauge or warning light. Very low pressure on the gauge or failure to extinguish the warning light indicates that the by-pass valve is not functioning correctly. In certain installations the fuel pressure warning light may be set to operate at a higher pressure than that at which the pump is rated. The warning light setting for the particular installation should therefore be checked before rejecting a suspect pump.

33. At the periods laid down in the appropriate servicing schedules, all pumps are to be replaced by new or reconditioned pumps drawn from Stores. Faulty pumps must be returned to a Maintenance Unit, or to the manufacturer, for repair.

Electrical test

34. A periodic electrical check in accordance with the appropriate Servicing Schedule should be made to ascertain that the motor is functioning satisfactorily. The pump must be replaced by a new or reconditioned pump if there is any indication of erratic performance such as excessive current consumption. These tests should only be made with the motor on load, i.e. immersed in and pumping fuel.

'No fuel flow' electrical test

35. Before applying the electrical test at 'no fuel flow' ascertain the position of the aircraft pump test socket and switches, by reference to the relevant Aircraft Handbook. When this has been done proceed as follows:

(1) Close all fuel cocks between pumps and engines to ensure that no fuel can flow.

(2) Connect a suitable portable ammeter to the test socket on the test panel.

(3) Switch on the pump by depressing the test push-switch on the test panel, and note the reading of the ammeter for a period of not less than half-a-minute.

36. Interpret readings obtained as follows:

(1) A steady reading not exceeding the given figure quoted for a particular pump in the appropriate appendix to this Chapter indicates that the pump operation is satisfactory.

(2) A reading in excess of those quoted in the appropriate appendix indicates either a faulty motor unit, a rise in torque loading due to the obstruction of moving parts or a restriction of the fuel flow.

(3) A fluctuating reading indicates faulty brushes or commutator or that the bearings or other rotating parts are binding.

(4) A zero reading indicates an open circuit and is consistent with a blown fuse, defective switch, faulty wiring or, in extreme cases, a complete motor failure.

37. When the above checks have been completed, release the test push switch on the test panel and disconnect the ammeter from the test socket.

Operational test

38. Subject to the electrical tests being satisfactory, the pump should be tested for proof of performance, and checked against the figures given in the appropriate appendix to this Chapter.

Failure to obtain the quoted pressures and rate of fuel delivery could be caused by a faulty motor unit, damaged impeller, or an incorrect loading of the pump unit bellows type gland unit. The pump should be removed to ascertain cause of failure.

Gland leakage

39. During the above tests an examination

should be made of the gland drain exit for fuel leakage. The leakage must not exceed two drops per minute while the pump is running or one drop per minute while stationary. Any leakage in excess of these figures will necessitate removal of the pump.

Insulation resistance test

40. Using a 250 volt constant pressure insulation resistance tester measure the insulation resistance between live parts and the frame. The insulation resistance tester used for this check should be fitted with electrical socket to suit the pump electrical connections. When a new pump is installed, the insulation resistance should not be less than 2 megohms. After installation for operational service, due to the humidity prevalent in aircraft at dispersal points, the minimum insulation resistance permissible is 50,000 ohms.

Appendix 1

PUMPS, FUEL, SPE.802 Mk. 2 and 3, AND SPE.802B Mk. 3

LIST OF CONTENTS

Note . . .

Dismantling these pumps to inspect or replace brushes or bearings will necessitate full re-testing of the units in accordance with the approved Schedule of acceptance Tests.

Introduction

1. Type SPE.802 fuel pumps are of the base flush mounting right-angled drive type described in para. 17-19 of basic chapter. Illustrations showing the main features of this type of pump will be found at the end of this appendix.

Type differentiation

2. The basic differences between the various marks of SPE.802 pumps are as follows

SPE.802 Mk. 2.—Basic design in production.

SPE.802 Mk. 3.—Generally as SPE.802 Mk. 2, but is fitted with re-designed capacitor panel assembly, an improved thrower arrangement incorporating labyrinth type seal and a secondary gland drain position to operate when wings of aircraft are in folded position. Re-designed gear box cover with integral gasket fitted.

SPE.802B Mk. 3.—General as SPE.802 Mk. 3, but brushes fitted with nimonic alloy springs.

LEADING PARTICULARS

Type	*SPE.802 Mk. 2 and 3*	*SPE.802B Mk. 3*
Ref. No.	5UE/6283 (*Mk.* 2) 5UE/6344 (*Mk.* 3)	5UE/
Motor unit	24 *V. d.c. flameproof: radio interference suppressed: single speed.*	24 *V. d.c. flameproof: radio interference suppressed: single speed.*
Rated output	800 *g.p.h.*	800 *g.p.h.*
Fuel delivery pressure (24 *v.*)	11·0 *lb/in*^{2} (*min.*)	10·5 *lb/in*^{2} (*min.*)
Rated voltage	24 *V. d.c.*	24 *V. d.c.*
Maximum current consumption	12·0 *A.*	11·5 *A.*
Voltage limits	22·0—28·8 *V. d.c.*	22·0—28·8 *V. d.c.*
Electrical connection	*Special plug and socket assy.*	*Special plug and socket assy.*
No flow delivery pressure (maximum).	*Fig.* 4.	*Fig.* 4.
New brush length to centre of radius.	11·8 *mm* (0·465 *in.*).	11·8 *mm.* (0·465 *in.*).
Minimum permissible brush length for refitting.	10·6 *mm.* (0·417 *in.*).	10·6 *mm.* (0·417 *in.*).
Brush spring pressure.	4·5 *oz.* at 7 *to* 9·5 *mm.* (0·2756 *to* 0·374 *in.*).	4·5 *oz. at* 7 *to* 9·5 *mm.* (0·2756 *to* 0·374 *in.*).
Minimum permissible commutator diameter for re-use.	24·0 *mm.* (0·945 *in.*).	24·0 *mm.* (0·945 in.).
Undercut commutator segments	0·036 *in. wide* x 0·020 *in. deep*	0·036 *in. wide* x 0·020 *in. deep.*
Maximum commutator eccentricity with shaft journals.	0·001 *in. total reading.*	0·001 *in. total reading.*
Motor unit bearings.	*Hoffmann* 106 *PP.* *Hoffmann* 112 *PP.* (*pre-packed with XG/295 grease*).	*Hoffmann* 106 *PP.* *Hoffmann* 112 *PP.* (*pre-packed with XG/295 grease*).
Pump unit bearings.	*Hoffmann* 112 *PP.* (*pre-packed with XG/295 grease*). *Plain carbon—fuel lubricated.*	*Hoffmann* 112 *PP.* (*pre-packed with XG/295 grease*). *Plain carbon—fuel lubricated.*
Delivery outlet.	1½ *in. B.S.P.*	1½ *in. B.S.P.*
Gland drain.	¼ *in. B.S.P.*	¼ *in. B.S.P.*
Weight of unit.	12·5 *lb.* (*Mk.* 2). 12·3 *lb.* (*Mk.* 3).	12·3 *lb.*

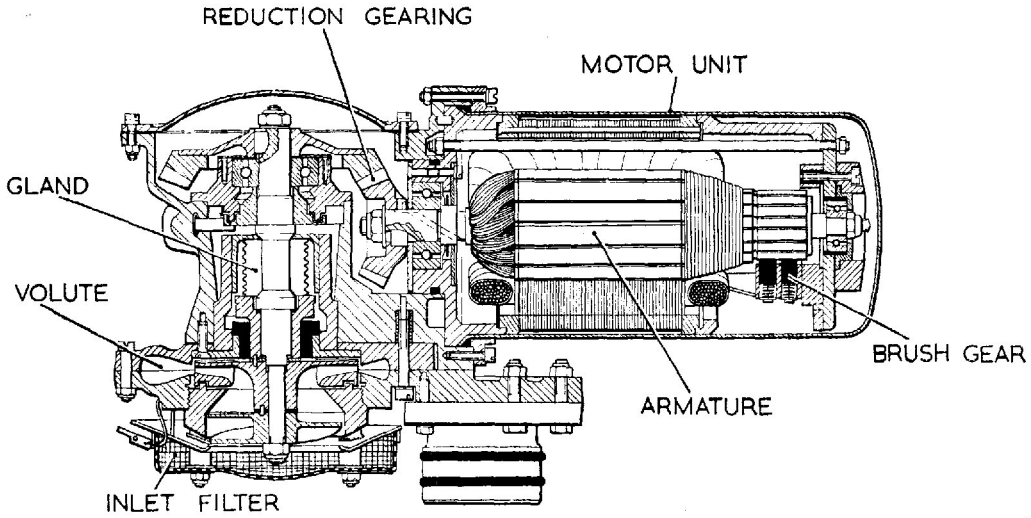

Fig. 1. Sectional view of SPE.802B Mk. 3

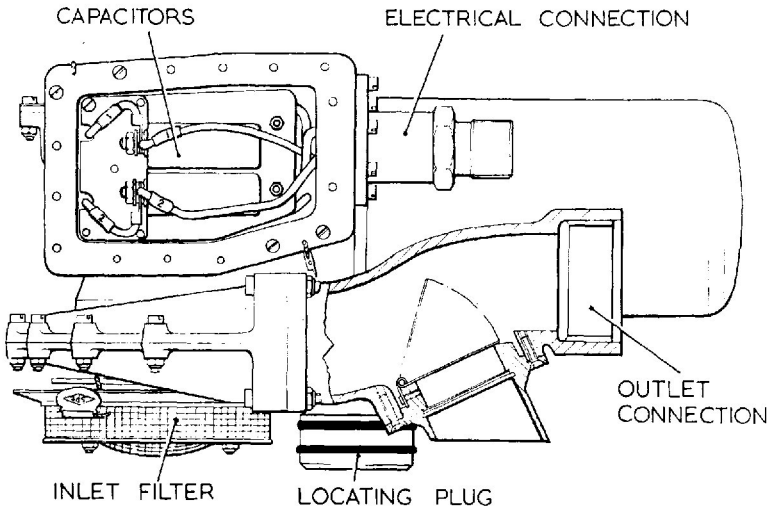

Fig. 2. Sectional view of SPE.802B Mk. 3, showing delivery outlet and by-pass valve assembly

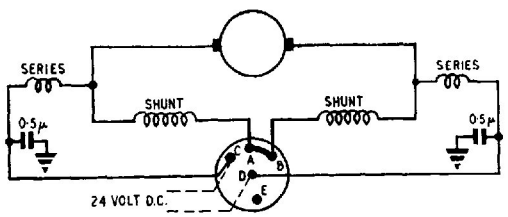

Fig. 3. Wiring diagram

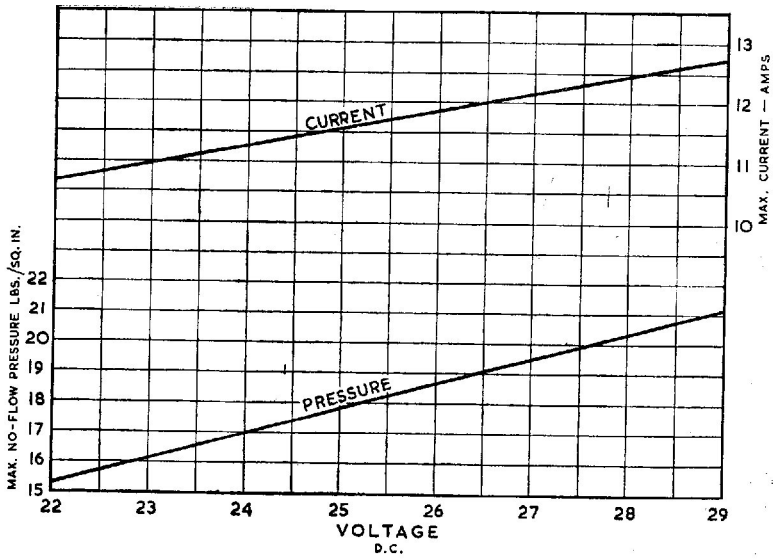

Fig. 4. Estimated current consumption and delivery pressure under no flow conditions SPE.802 Mk. 2 and 3 and SPE.802B Mk. 3

Note . . .

The above graphs are provided as a guide to the pump performance under no load conditions and figures derived from them at voltages other than 28.8 volt d.c. are not to be interpreted as forming part of the approved acceptance test specification for the pump.

Appendix 2

PUMPS, FUEL, SPE.1201 Mk. 1, 2 and 3

LIST OF CONTENTS

Note . . .

Dismantling these pumps to inspect or replace brushes or bearings will necessitate full re-testing of the unit in accordance with the approved Schedule of Acceptance Tests.

Introduction

1. The Type SPE.1201 fuel pumps are of the side mounting, right-angled drive type described in para. 13-16 of the basic chapter. Illustrations showing the main feature of this type of pump will be found at the end of this appendix.

Type differentiation

2. Basic differences between the various marks of SPE.1201 pumps are as follows:

SPE.1201 Mk. 1.—Basic design. Two-speed operation.

SPE.1201 Mk. 2.—Generally as SPE.1201 Mk. 1, but incorporates venting between motor unit and gear box, an improved thrower arrangement including labyrinth seal and a fuel trap to contain bellows seal leakage under negative 'G' conditions. Clearance between bellows seal body and carbon seal increased to avoid seizure during high altitude operations.

SPE.1201 Mk. 3.—Generally as SPE.1201 Mk. 2, but internal wiring changed to make pumps suitable for normal speed operations only. This effected in one of two ways—either (a) leads from stator to pins 'A' and 'B' of electrical connection coupled and soldered to pin 'A' or (b) shunt windings linked at stator and plug connections omitted.

LEADING PARTICULARS

Type	*SPE.*1201 *Mk.* 1	*SPE.*1201 *Mk.* 2	*SPE.*1201 *Mk.* 3
Ref. No.	*5UE/*	*5UE/6717*	*5UE/6717*
Motor unit.	24 *V. d.c.: flameproof: radio interference suppressed: suitable for two-speed operation.*	24 *V. d.c.: flameproof: radio interference suppressed: suitable for two-speed operation.*	24 *V. d.c.: flameproof: radio interference suppressed: suitable for two-speed operation.*
Rated output.	1200 *g.p.h.*	1200 *g.p.h.*	1200 *g.p.h.*
Fuel delivery pressure (at rated voltage).	11·0 *lb/in*^{2} *(min.).*	11·0 *lb/in*^{2} *(min.).*	11·0 *lb/in*^{2} *(min.).*
Rated voltage.	24 *V. d.c.*	24 *V. d.c.*	24 *V. d.c.*
Maximum current consumption (under above conditions).	15·0 *A.*	15·0 *A.*	15·0 *A.*
Voltage limits.	22·0—28·8 *V. d.c.*	22·0—28·8 *V. d.c.*	22·0—28·8 *V. d.c.*
Breeze electrical connection.	*Plessey CZ.*50374 *(Ref. No. 5X/*6327)	*Plessey CZ.*50374 *(Ref. No. 5X/*6327)	*Plessey CZ.*50374 *(Ref. No. 5X/*6327)
No flow delivery pressure (max.).	*Fig.* 4.	*Fig.* 4.	*Fig.* 4.
New brush length to centre of radius.	11·8 *mm.* (0·465 *in.*).	11·8 *mm.* (0·465 *in.*).	11·8 *mm.* (0·465 *in.*).
Brush spring pressure.	4·5 *oz. at* 7 *to* 9·5 *mm.* (0·2756 *to* 0·374 *in.*)	4·5 *oz. at* 7 *to* 9·5 *mm.* (0·2756 *to* 0·374 *in.*)	4·5 *oz. at* 7 *to* 9·5 *mm.* (0·2756 *to* 0·374 *in.*)
Minimum permissible brush length for refitting.	10·6 *mm.* (0·417 *in.*).	10·6 *mm.* (0·417 *in.*).	10·6 *mm.* (0·417 *in.*).
Minimum permissible commutator diameter for further use.	24·0 *mm.* (0·945 *in.*).	24·0 *mm.* (0·945 *in.*).	24·0 *mm.* (0·945 *in.*).
Undercut commutator segments.	0·036 *in. wide* x 0·020 *in. deep.*	0·036 *in. wide* x 0·020 *in. deep.*	0·036 *in. wide* x 0·020 *in. deep.*
Maximum commutator eccentricity with shaft journals.	0·001 *in. (total).*	0·001 *in. (total).*	0·001 *in. (total).*
Motor unit bearings.	*Hoffmann* 106 *PP.* *Hoffmann* 112 *PP.* *(pre-packed with XG/*295 *grease).*	*Hoffmann* 106 *PP.* *Hoffmann* 112 *PP.* *(pre-packed with XG/*295 *grease).*	*Hoffmann* 106 *PP.* *Hoffmann* 112 *PP.* *(pre-packed with XG/*295 *grease).*

LEADING PARTICULARS—*continued*

Type	*SPE.1201 Mk. 1*	*SPE.1201 Mk. 2*	*SPE.1201 Mk. 3*
Pump unit bearings.	*Hoffmann 112 PP. (pre-packed with XG/295 grease). (Plain carbon—fuel lubricated.*	*Hoffmann 112 PP. (pre-packed with XG/295 grease). Plain carbon—fuel lubricated.*	*Hoffmann 112 PP. (pre-packed with XG/295 grease). Plain carbon—fuel lubricated.*
Delivery outlet.	1½ *in. B.S.P.*	1½ *in. B.S.P.*	1½ *in. B.S.P.*
Gland drain.	¼ *in. B.S.P.*	¼ *in. B.S.P.*	¼ *in. B.S.P.*
Weight of unit.	16·5 *lb.*	16·75 *lb.*	16·75 *lb.*

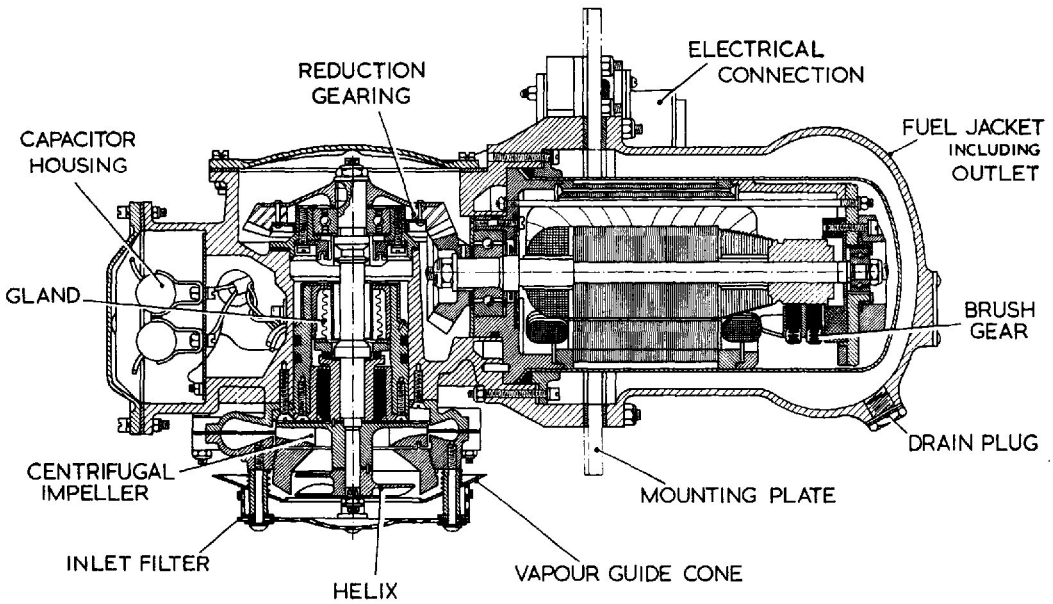

Fig. 1. Sectional view of SPE.1201 Mk. 3 fuel pump

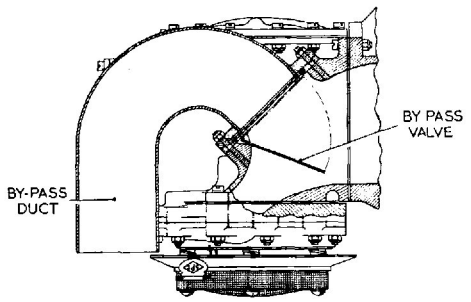

Fig. 2. Sectional view of SPE.1201 Mk. 3 by-pass valve and duct

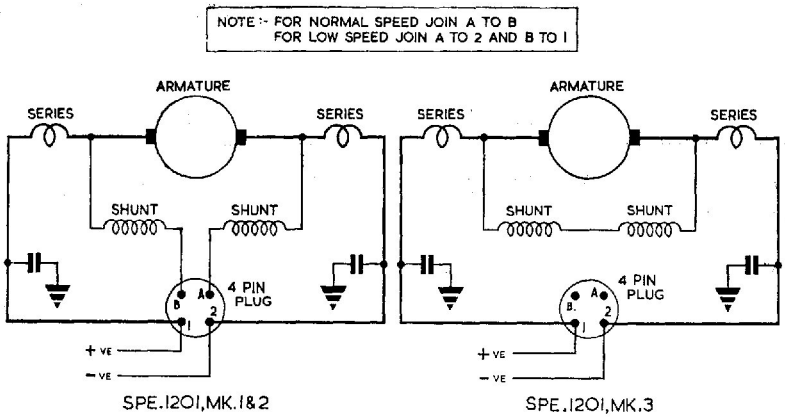

Fig. 3. Circuit diagrams

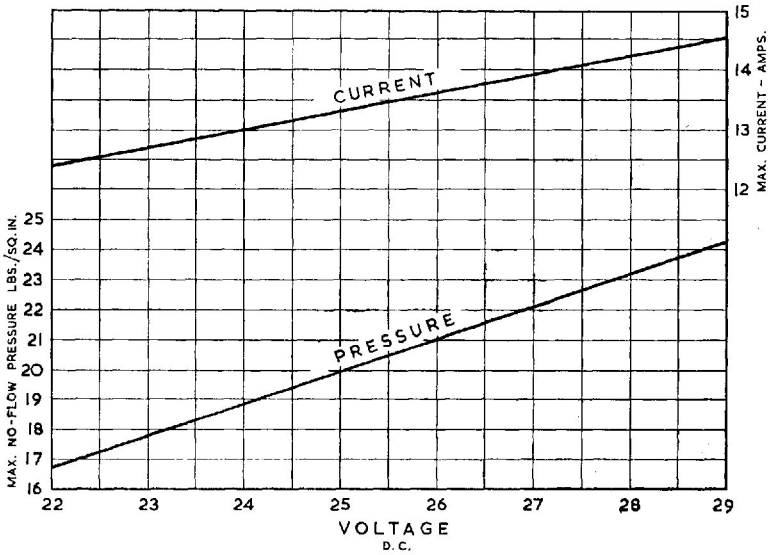

Fig. 4. Graph: estimated current consumption and delivery pressure under no-flow conditions

Note . . .

The above graphs are provided as a guide to the pump performance under no load conditions and figures derived from them at voltages other than 28·8 volt d.c. are not to be interpreted as forming part of the approved acceptance test specification for the pump.

Appendix 3

PUMPS, FUEL, SPE.1202 Mk. 1, 1A, 2 and 2A; SPE.1202B Mk. 2A and 3

LIST OF CONTENTS

Note . . .

Dismantling these pumps to inspect or replace brushes or bearings will necessitate full re-testing of the units in accordance with the approved Schedule of Acceptance Tests.

Introduction

1. The Type SPE.1202 fuel pumps are of the base flush mounting right-angled drive type described in para. 17-19 of the basic chapter. Illustrations showing the main features of this type of pump will be found at the end of this appendix.

Type differentiation

2. Basic differences between the various marks of SPE.1202 pumps are as follows:

SPE.1202 Mk. 1.—Basic design.

SPE.1202 Mk. 1A.—Generally as SPE.1202 Mk. 1, but internal wiring changed to make pump suitable for normal speed operation only. This effected in one of two ways—either (a) leads from stator to pins 'A' and 'B' of electrical connection coupled and soldered to pin 'A', or (b) shunt windings linked at stator and plug connection omitted.

SPE.1202 Mk. 2.—Basically as SPE.1202 Mk. 1, but incorporates venting between motor unit and gear box, and an improved thrower arrangement including labyrinth seal. Clearance between bellows seal body and carbon seal increased to avoid seizure during high altitude operations.

SPE.1202 Mk. 2A.—Generally as SPE.1202 Mk. 2, but internal wiring changed to make pump suitable for normal speed operation only. Method as detailed above for SPE.1202 Mk. 1A.

SPE.1202B Mk. 2A.—Similar to SPE.1202 Mk. 2A, but motor unit fitted with brushes incorporating nimonic alloy springs.

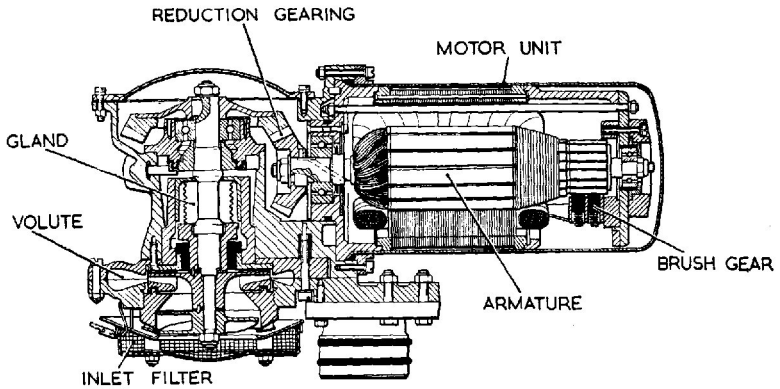

Fig. 1. Sectional view of SPE. 1202B Mk. 2A pump

LEADING PARTICULARS

Types	*SPE.*1202 *Mk. 1 and 2*	*SPE.*1202*B* *Mk. 1A and 2A*	*SPE.*1202*B* *Mk. 2A and 3*
Ref. No.	5*UE*/ (*Mk.* 1) 5*UE*/6675 (*Mk.* 2).	5*UE*/ (*Mk.* 1*A*). 5*UE*/6760 (*Mk.* 2*A*).	5*UE*/6886 (*Mk.* 2*A*). 5*UE*/ (*Mk.* 3).
Motor unit.	24 *V. d.c.: flameproof: radio interference suppressed: suitable for two-speed operation.*	24 *V. d.c.: flameproof: radio interference suppressed: single speed.*	24 *V. d.c.: flameproof: radio interference suppressed: single speed.*
Rated output.	1200 *g.p.h.*	1200 *g.p.h.*	1200 *g.p.h.*
Fuel delivery pressure (at rated voltage).	11·0 *lb/in*^{2} *(min.).*	11·0 *lb/in*^{2} *(min.).*	10·5 *lb/in*^{2} *(min.).*
Rated voltage.	24 *V. d.c.*	24 *V. d.c.*	24 *V. d.c.*
Maximum current consumption (under above conditions).	15·0 *A.*	15·0 *A.*	14·5 *A.*
Voltage limits.	22·0—28·8 *V. d.c.*	22·0—28·8 *V. d.c.*	22·0—28·8 *V. d.c.*
Electrical connection.	*Special plug and socket—2 7-amp and 2 19-amp pins*	*Special plug and socket—2 7-amp. 2 19-amp pins not used.*	*Special plug and socket—2 19-amp pins. 2 7-amp pins not used.*
No flow delivery pressure (maximum).	*Fig.* 4.	*Fig.* 4.	*Fig.* 4.
New brush length (to centre of radius).	11·8 *mm.* (0·465 *in.*).	11·8 *mm.* (0·465 *in.*).	11·8 *mm.* (0·465 *in.*).
Minimum permissible brush length for refitting.	10·6 *mm.* (0·417 *in.*).	10·6 *mm.* (0·417 in.).	10·6 *mm.* (0·417 *in.*).
Brush spring pressure.	4·5 *oz. at* 7 *mm.* to 9·5 *mm.* (0·2756 *to* 0·374 *in.*).	4·5 *oz. at* 7 *mm. to* 9·5 *mm.* (0·2756 *to* 0·374 *in.*).	4·5 *oz. at* 7 *mm. to* 9·5 *mm.* (0·2756 *to* 0·374 *in.*).
Minimum permissible commutator diameter for re-use.	24·0 *mm.* (0·945 *in.*).	24·0 *mm.* (0·945 *in.*).	24·0 *mm.* (0·945 *in.*).
Undercut commutator segments.	0·036 *in. wide* x 0·020 *in. deep.*	0·036 *in. wide* x 0·020 *in. deep.*	0·036 *in. wide* x 0·020 *in. deep.*
Maximum commutator eccentricity with shaft journals.	0·001 *in. total reading*	0·001 *in. total reading*	0·001 *in. total reading*

LEADING PARTICULARS—*continued*

Type	*SPE.1202 Mk. 1 and 2*	*SPE.1202B Mk. 1A and 2A*	*SPE.1202B Mk. 2A and 3*
Motor unit bearings.	*Hoffmann* 106 *PP.* *Hoffmann* 112 *PP.* (*pre-packed with XG/295 grease*).	*Hoffmann* 106 *PP.* *Hoffmann* 112 *PP.* (*pre-packed with XG/295 grease*).	*Hoffmann* 106 *PP.* *Hoffmann* 112 *PP.* (*pre-packed with XG/295 grease*).
Pump unit bearing.	*Hoffmann* 112 *PP.* (*pre-packed with XG/295 grease*). *Plain carbon—fuel lubricated.*	*Hoffmann* 112 *PP.* (*pre-packed with XG/295 grease*). *Plain carbon—fuel lubricated.*	*Hoffmann* 112 *PP.* (*pre-packed with XG/295 grease*). *Plain carbon—fuel lubricated.*
Delivery outlet.	1½ *in. B.S.P.*	1½ *in. B.S.P.*	1½ *in. B.S.P.*
Gland drain.	¼ *in. B.S.P.*	¼ *in. B.S.P.*	¼ *in. B.S.P.*
Weight of unit.	13·0 *lb.*	13·0 *lb.*	13·0 *lb.*

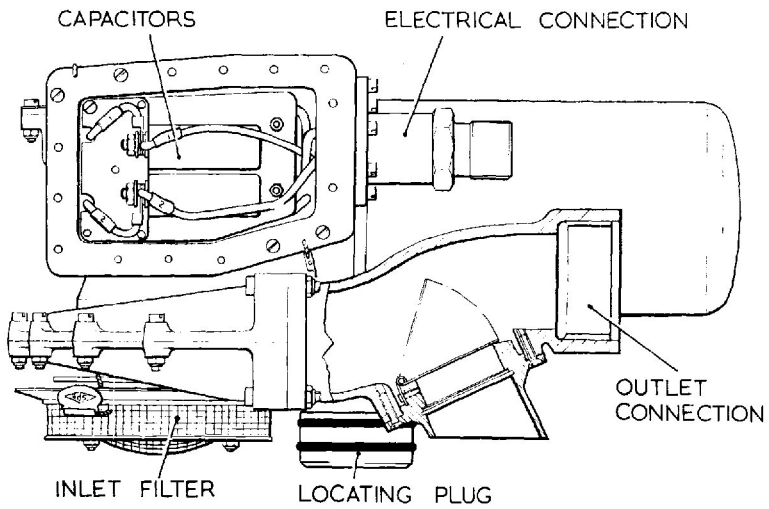

Fig. 2. Sectional view of SPE.1202B Mk. 2A showing delivery outlet and by-pass valve assembly

SPE.1202B Mk. 3.—Generally similar to SPE.1202B Mk. 2A, but incorporates (a) a brazed armature assembly to give greater reliability, (b) a modified brush box assembly for improved insulation, and (c) an external sleeve to improve rigidity of stator assembly.

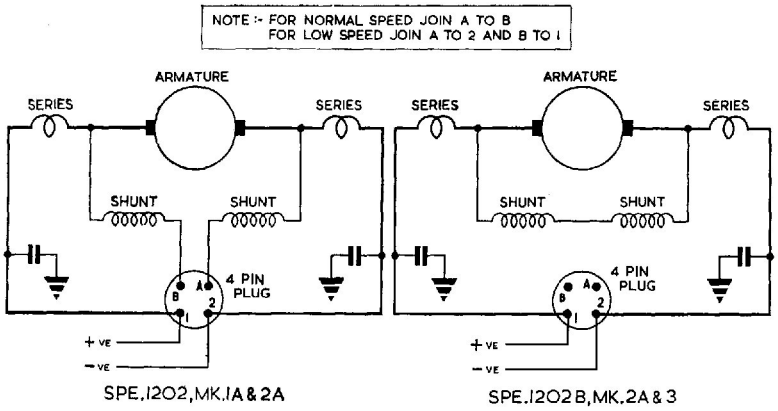

Fig. 3. Circuit diagrams

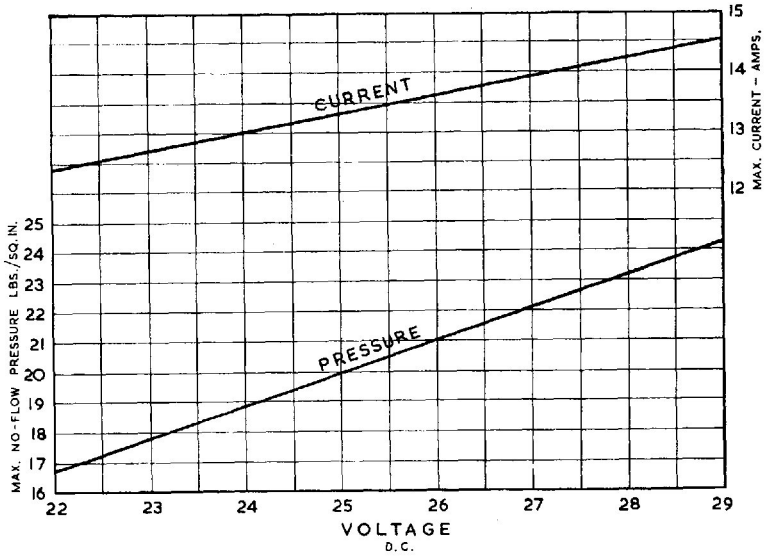

Fig. 4. Estimated current consumption and delivery pressure under no-flow conditions (SPE.1202 Mk. 1 and 2: SPE.1202 Mk. 1A and 2A only)

Notes . . .

The above graphs are provided as a guide to pump performance under no-flow conditions and figures derived from them at voltages other than 28·8 V. d.c. are not to be interpreted as forming part of the approved acceptance test specification for the pump.

SPE.1202B Mk. 2A and 3 only: Maximum no-flow delivery pressures 0·5 lb/in² less than figures indicated by graph throughout voltage range. Maximum current consumption 0·5 amps less than figures indicated throughout voltage range.

Appendix 4

PUMPS, FUEL, SPE.1203 Mk. 1; SPE.1203A Mk. 1, 1A, 2 and 2A; SPE.1203B Mk. 1A and 2A

LIST OF CONTENTS

Note . . .

Dismantling these pumps to inspect or replace brushes or bearings will necessitate full re-testing of the units in accordance with the approved Schedule of Acceptance Tests.

Introduction

1. Type SPE.1203 fuel pumps are of the base sump mounting right-angled drive type described in para. 20-22 of the basic chapter. Illustrations showing the main features of this type of pump will be found at the end of this appendix.

Type differentiation

2. Basic differences between the various marks of SPE.1203 pumps are as follows:

SPE.1203 Mk. 1.—Basic design.

SPE.1203A Mk. 1.—Generally as Mk. 1, but electrical connection on underside of sump turned through 90°.

SPE.1203A Mk. 1A.—Generally as Mk. 1, but internal wiring changed to make pump suitable for normal speed operation only. This effected in one of two ways—either (a) leads from stator to pins 'A' and 'B' of electrical connection coupled and soldered to pin 'A', or (b) shunt windings linked at stator and plug connections omitted.

SPE.1203A Mk. 2.—Basically as SPE.1203A Mk. 1, but incorporates venting between motor unit and gear box and an improved thrower arrangement incorporating labyrinth type seal. A fuel trap to contain bellows seal leakage under negative 'g' conditions is also fitted.

SPE.1203A Mk. 2A.—Basically as SPE.1203A Mk. 2, but internal wiring changed to make pump suitable for normal speed operation only. Method as detailed above for SPE.1203A Mk. 1A.

SPE.1203B Mk. 1A.—Basically as SPE.1203A Mk. 1A, but fitted with brushes incorporating Nimonic alloy springs. Performance requirements amended (see leading particulars). Gear box and capacitor housing covers integral with gaskets.

SPE.1203B Mk. 2A.—Basically as SPE.1203A Mk. 2A, but fitted with brushes incorporating Nimonic alloy springs. Performance requirements amended (see leading particulars). Gear box and capacitor housing covers integral with gaskets.

LEADING PARTICULARS

Type	*SPE.*1203 *Mk.* 1 *SPE.*1203*A Mk.* 1 & 2	*SPE.*1203*A, Mk.* 1*A* *SPE.*1203*A Mk.* 2*A*	*SPE.*1203*B Mk.* 1*A* *and* 2*A*
Ref. No.	5*UE*/ (*Mk.* 1). 5*UE*/6284 (*A Mk.* 1) 5*UE*/ (*A Mk.* 2)	5*UE*/6751 (*A Mk.* 1*A*) 5*UE*/6751 (*A Mk.* 2*A*)	5*UE*/ (*B Mk.* 1*A*). 5*UE*/ (*B Mk.* 2*A*).
Motor unit.	24 *V. d.c.: flameproof: radio interference suppressed: suitable for two-speed operation.*	24 *V. d.c.: flameproof: radio interference suppressed: single speed.*	24 *V. d.c.: flameproof: radio interference suppressed: single speed.*
Rated output.	1200 *g.p.h.*	1200 *g.p.h.*	1200 *g.p.h.*
Fuel delivery pressure (at rated voltage).	11·0 *lb/in*^{2} *(min.).*	11·0 *lb/in*^{2} *(min.).*	10·5 *lb/in*^{2}.
Rated voltage.	24 *V. d.c.*	24 *V. d.c.*	24 *V. d.c.*
Maximum current consumption under above conditions).	15·0 *A.*	15·0 *A.*	14·5 *A.*
Voltage limits.	22·0—28·8 *V. d.c.*	22·0—28·8 *V. d.c.*	22·0—28·8 *V. d.c.*
'Breeze' electrical connection.	*Plessey CZ.*50374 (*Ref. No.* 5*X*/6327).	*Plessey CZ.*50374 (*Ref. No.* 5*X*/6327).	*Plessey CZ.*50374 (*Ref. No.* 5*X*/6327).
No flow delivery pressure (max.).	*Fig.* 4.	*Fig.* 4.	*Fig.* 4.
New brush length (to centre of radius).	11·8 *mm.* (0·465 *in.*).	11·8 *mm.* (0·465 *in.*).	11·8 *mm.* (0·465 *in.*).
Minimum permissible brush length for re-use.	10·6 *mm.* (0·417 *in.*).	10·6 *mm.* (0·417 *in.*).	10·6 *mm.* (0·417 *in.*).
Brush spring pressure.	4·5 *oz. at* 7 *mm. to* 9·5 *mm.* (0·2756 *to* 0·374 *in.*).	4·5 *oz. at* 7 *mm.* to 9·5 *mm.* (0·2756 *to* 0·374 *in.*).	4·5 *oz. at* 7 *mm. to* 9·5 *mm.* (0·2756 *to* 0·374 *in.*).
Minimum permissible commutator diameter for re-use.	24·0 *mm.* (0·945 *in.*).	24·0 *mm.* (0·945 *in.*).	24·0 *mm.* (0·945 *in.*).
Undercut commutator segments.	0·036 *in. wide* x 0·020 *in. deep.*	0·036 *in. wide* x 0·020 *in. deep.*	0·036 *in. wide* x 0·020 *in. deep.*
Maximum commutator eccentricity with shaft journals.	0·001 *in. total reading.*	0·001 *in. total reading.*	0·001 *in. total reading.*
Motor unit bearings.	*Hoffmann* 106 *PP.* *Hoffmann* 112 *PP.* (*pre-packed with XG*/295 *grease*).	*Hoffmann* 106 *PP.* *Hoffmann* 112 *PP.* (*pre-packed with XG*/295 *grease*).	*Hoffmann* 106 *PP.* *Hoffmann* 112 *PP.* (*pre-packed with XG*/295 *grease*).

LEADING PARTICULARS—*continued*

Type	*SPE.1203 Mk. 1* *SPE.1203A Mk. 1 & 2*	*SPE.1203A Mk. 1A* *SPE.1203A Mk. 2A*	*SPE.1203B* *Mk. 1A and 2A*
Pump unit bearings.	*Hoffmann 112PP. (pre-packed with XG/295 grease).* *Plain carbon—fuel lubricated.*	*Hoffmann 112PP. (pre-packed with XG/295 grease).* *Plain carbon—fuel lubricated.*	*Hoffmann 112 PP. (pre-packed with XG/295 grease).*
Delivery outlet.	*Stud ring.*	*Stud ring.*	*Stud ring.*
Gland drain.	*¼ in. B.S.P.*	*¼ in. B.S.P.*	*¼ in. B.S.P.*
Weight of unit.	*15 lb.*	*15 lb.*	*15 lb.*

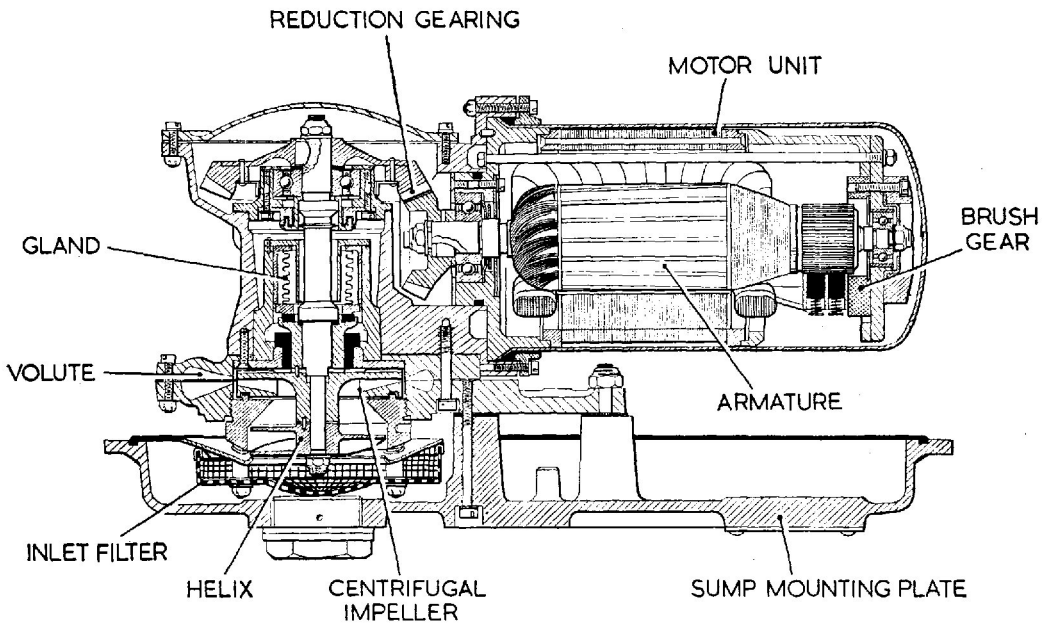

Fig. 1. Sectional view of SPE.1203B Mk. 2A fuel pump

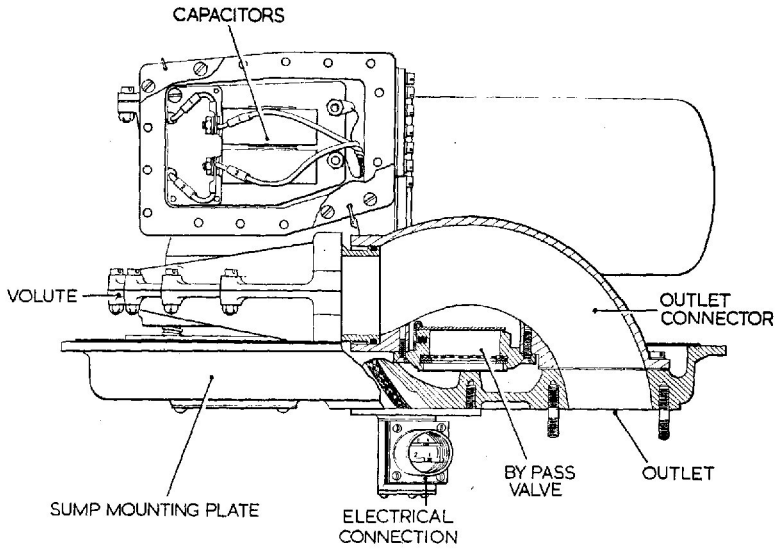

Fig. 2. Sectional view of SPE.1203B Mk 2A fuel pump showing delivery outlet and by-pass

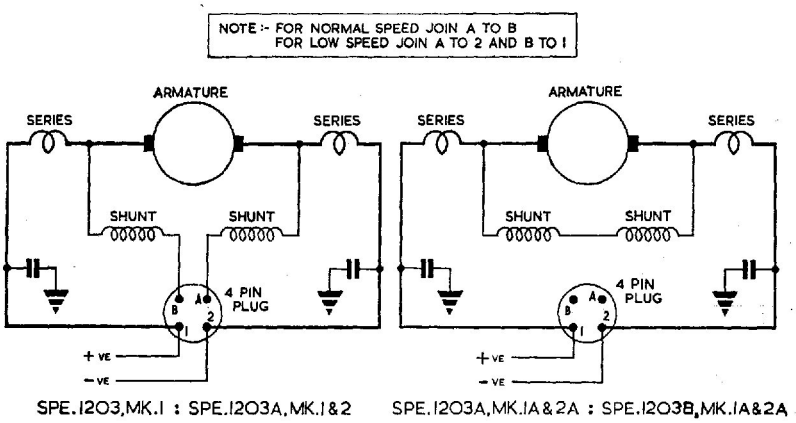

Fig. 3. Circuit diagram

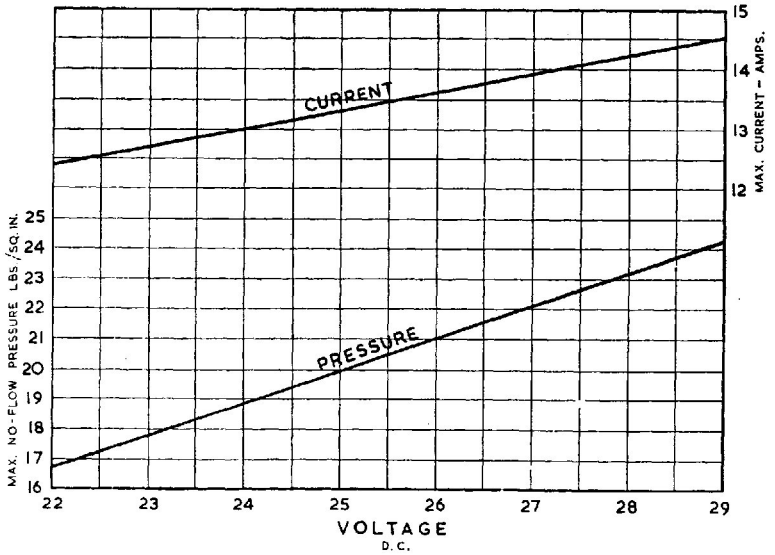

Fig. 4. Estimated current consumption and delivery pressure under no-flow conditions, SPE.1203 Mk. 1, SPE.1203A Mk. 1 and 2, SPE.1203 Mk. 1A and 2A only

Note . . .

The above graphs are provided as a guide to pump performance under no-flow conditions and figures derived from them at voltages other than 28·8 *V. d.c. are not to be interpreted as forming part of the approved acceptance test specification for the pump.*

*SPE.*1203*B Mk.* 1*A and* 2*A only: Maximum no-flow delivery pressures* 0·5 *lb/in*^{2} *less than figures indicated by graph throughout voltage range. Maximum current consumption* 0·5 *amps less than figures indicated throughout voltage range.*

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