Chapter 2

PUMP, FUEL, SPE 807, Mk. 2

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Pump, fuel, SPE807, Mk. 2	Stores Ref. 5UE/
Operating voltage	112 volts d.c.
Normal current	2·5 amp.
Delivery rate	800 gallons per hour
Pressure	10 lb. per sq. in.
Cable connection (Breeze plug 5 pole)	Stores Ref. 5X/4005
Radio noise suppression capacitors	0·5 μF (2 off)
Weight	14 lb. 5 oz.

Introduction

1. The SPE 807, Mk. 2 fuel pump is an electrically driven, submerged fuel booster pump, designed to meet aircraft installation requirements, where the fuel tank depth is restricted in thin wing sections. The pump is known as the "inclined" tank (sump) mounting type, and is intended to be used in fuel tanks, where the bottom is sloped to suit the configuration of the aircraft. The pump is used for maintaining a supply of fuel to the aircraft engine pump under the varying fuel temperature conditions, rates of climb, altitudes, etc., which can be experienced in flight.

DESCRIPTION

General

2. SPE 807, Mk. 2 pump (*fig.* 1) comprises a horizontally mounted motor, driving a vertical impeller shaft at right angles to it, through reduction gearing. The pump is fitted with a sump, or dished baseplate, which is inclined at an angle from the horizontal axis of the motor. The fuel flows into the sump before passing into the pump, thus the tank may be completely emptied of fuel, either by the action of the pump, or by the removal of the drain plug, situated in the baseplate.

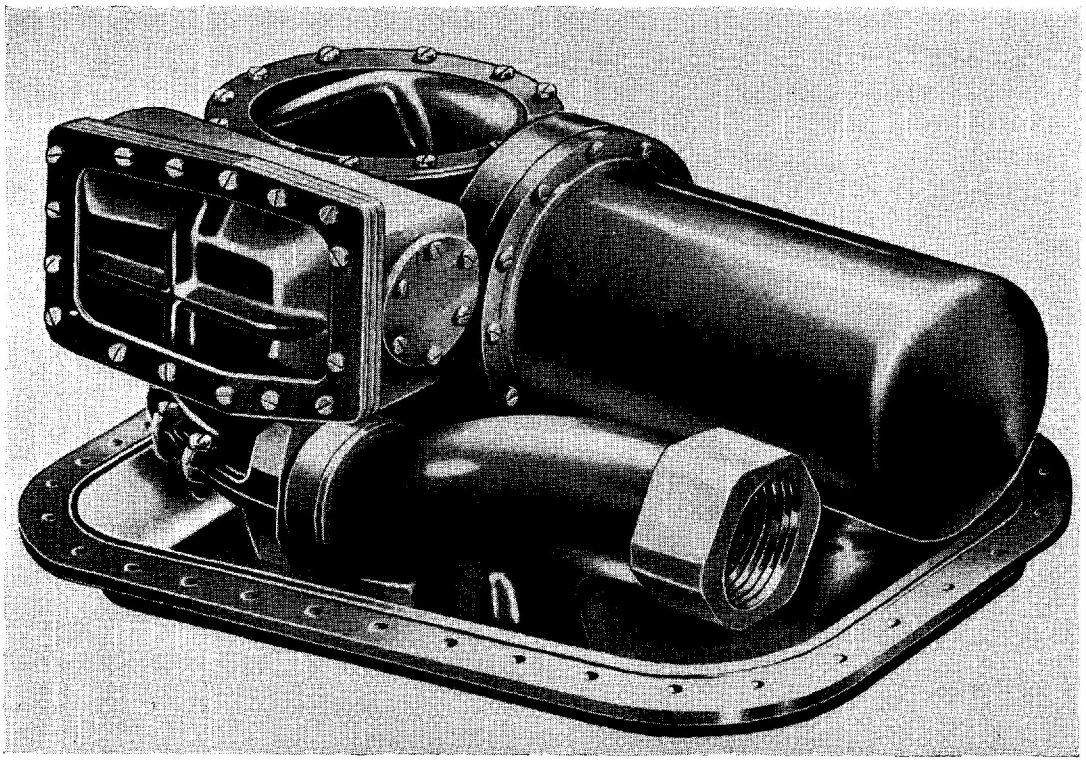

Fig. 1. General view of SPE 807, Mk. 2 fuel pump

Motor

3. The motor of the pump is a totally enclosed, compound wound, two-pole machine, provided with a suppressor unit, comprising two 0·5 microfarad capacitors for radio noise suppression (*fig.* 3). Under normal operating conditions, the motor speed is 9,750 r.p.m., with a current consumption of 2·5 amp.

4. The armature spindle is supported in shielded ball bearings, with a self-locking nut at the commutator end to secure it in position. A bevel gear on the driving shaft of the motor engages with a larger bevel gear on the pump spindle, and provides a reduction of 2 : 1. The motor unit is totally enclosed in a thin metal casing, which is clamped, so that it protrudes horizontally from the pump body.

Pump body

5. The main casting, or pump body, carries the vertical pump spindle, which is supported by a plain carbon bearing at the bottom, and by a shielded ball bearing at the top. The larger spiral bevel gear (*para.* 4), is keyed to the top of the pump spindle, and secured with a self-locking nut. The central bore of the casting contains a cylindrical bush, in which are the metal bellows gland, and the carbon bearing housing. The bush assembly may be removed complete, and is retained in position by a series of screws. An inspection cover, situated on the top of the pump casting, gives access to the bevel gearing (*fig.* 1).

Suppressor assembly

6. Fitted in a recess at the side of the pump body is a suppressor assembly (*fig.* 3), for radio noise suppression ; its position relative to the pump is shown as dotted lines (*fig.* 2). The suppressor assembly comprises two 0·5 microfarad capacitors ; an inspection cover provides easy access to the electrical connections.

Impeller

7. Below the carbon bearing is a spiral volute, formed between two flat castings, which are bolted together, and secured to the base of the main casting. On the lower end of the pump spindle in the volute chamber is the combined helico-centrifugal impeller, consisting of a triple bladed helix,

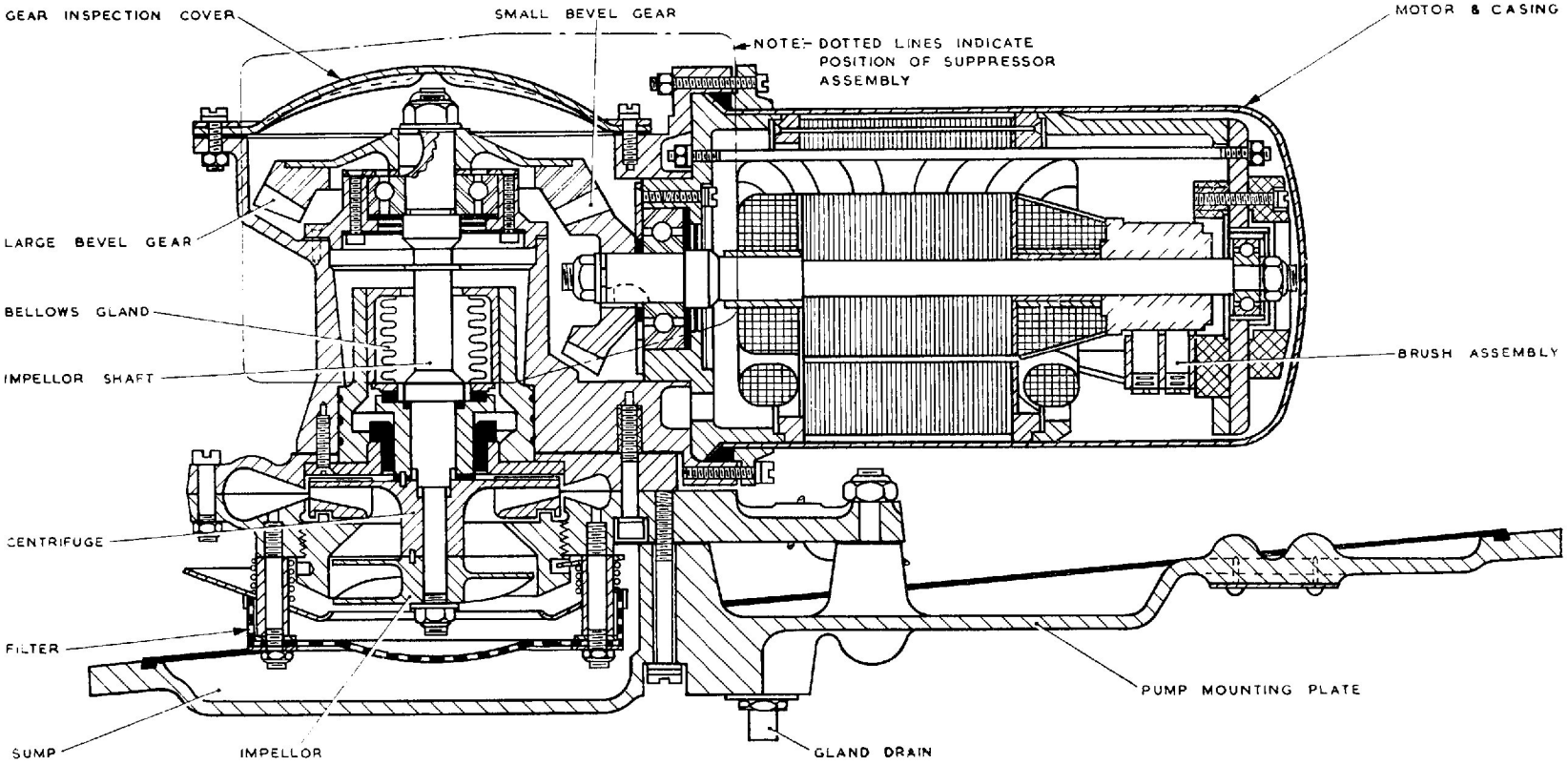

Fig. 2. Sectional view of SPE 807, Mk. 2 fuel pump

surmounted by a five vaned centrifuge, secured on the spindle with a self-locking nut.

By-pass valve

8. The by-pass valve consists of a seating ring, to which is hinged a flap valve. This valve is built into the pump base, adjacent to, and connecting with, the delivery outlet. When the pump is in operation, the flap is kept closed by the pressure of fuel in the delivery outlet, but opens by the pressure of fuel underneath it, when the pump is idle.

Filter

9. In order to prevent the entry of foreign matter to the pump, a wire gauze filter surrounds the fuel intake below the impeller. A thin metal flange surrounds the top of the filter. forming a trap for any foreign matter which may be drawn towards it from the tank floor, at the same time, assisting in the separation of air bubbles from the main fuel stream.

Operation

10. Fuel from the tank enters the pump through the gauze filter, where the impeller helix, driven by the motor armature, through right angle bevel gearing (*para.* 4), draws the fuel stream into the centrifuge, at the lower end of the impeller, from which, it is forced into the spiral volute, and thence, through the pump outlet, to the fuel line.

11. Under conditions when the pump is supplying fuel in excess of engine requirements, the impeller continues to rotate, but the pressure is maintained within predetermined limits.

12. When the pump is idle, the pressure on the top of the by-pass flap is relieved. As a result, the valve opens, allowing fuel to pass from the tank directly into the outlet duct, drawn by the action of the engine driven pump.

13. Under conditions of sudden de-aeration, due to high rates of climb, and other manoeuvres, the temporary removal of fuel from the vicinity of the impeller, is overcome by the centrifugal action of the helix blades, from the tips of which, air bubbles are dispelled, passing over the vapour guide cone, and back into the tank.

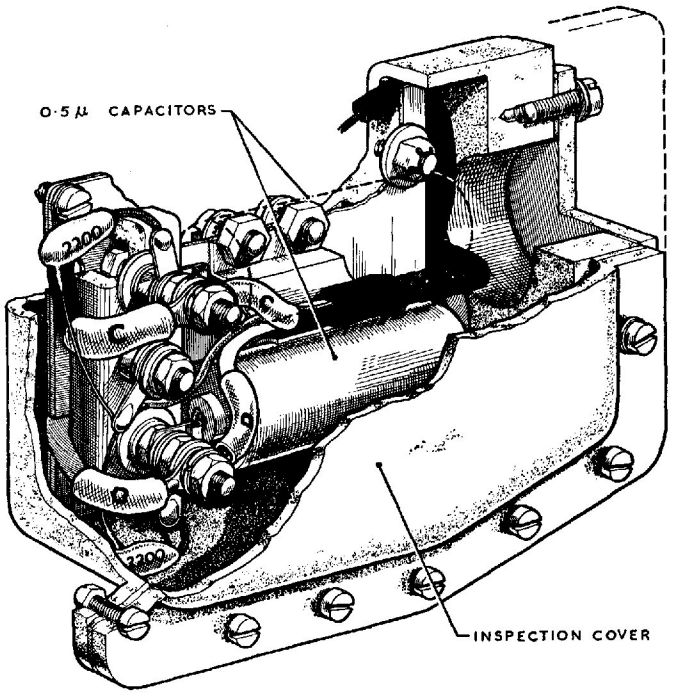

Fig. 3. Sectional view of suppressor assembly

INSTALLATION

14. Whenever it is necessary to fit a new pump, it is important to ensure that the tank has been emptied of fuel, and that the pump motor is on open circuit. The drain plug in the baseplate should be eased off to ensure complete draining.

15. Having ensured that the tank is empty, disconnect the fuel delivery pipe (the connection of which, is inside the fuel tank), the gland drain pipe, and the electrical supply cable from the Breeze plug, CZ.2686/2.

16. Remove the securing nuts from the studs protruding through the pump flange and, taking care to support the weight of the pump during this operation, carefully remove the pump through the tank aperture.

17. Examine the new pump to be fitted, and make sure that it is clean externally. Remove all transit covers, and any protective material which may be present when received from stores; insert the pump carefully through the aperture in the fuel tank, locating the mounting studs through the hole in the flange. Screw on and tighten the securing nuts equally all round. The rubber sealing strip, let into a slot around the flange, makes it unnecessary to use either a gasket or jointing compound. After attaching the delivery pipe, the gland drain pipe, and the electrical connection, all unions, union nuts, etc., must be wire locked.

SERVICING

Electrical test

18. A routine electrical check should be made, to ascertain that the pump motor is functioning satisfactorily. The pump must be renewed, if there is any indication of erratic performance, such as, excessive current consumption, or low insulation resistance. These tests are to be carried out with the motor under normal load; it is therefore ESSENTIAL THAT THE PUMP IS IMMERSED IN FUEL.

19. Before applying the electrical test, ascertain the position of the aircraft pump test socket and switches, by reference to the appropriate 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.

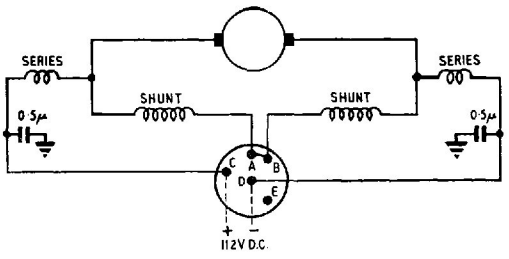

Fig. 4. Wiring diagram

20. The interpretation of the readings obtained in the test detailed in the previous paragraph is as follows:—

(1) A steady reading, not exceeding 2·5 amp. indicates that the motor is satisfactory.

(2) A reading in excess of 2·5 amp. indicates a faulty motor, or a rise in torque loading, due to obstruction of the moving parts on the fuel flow.

(3) A fluctuating reading indicates faulty contacts, brushes, or commutator.

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

21. When these tests have been completed, release the test switch, and disconnect the ammeter from the test socket.

Operational test

22. Upon the satisfactory completion of the electrical tests, the pump should be tested for pressure and rate of delivery. The pressure at 13·3 gallons per minute should be 10 lb. per sq. in. Failure to obtain this pressure, and rate of delivery, could be caused by a faulty motor, a damaged impeller, or, an incorrect loading on the bellows gland, and measures should be taken to ascertain the cause of failure.

Routine inspection

23. In addition to the normal inspection of the pump, it is advisable to carry out routine inspections at the intervals specified, and care should be taken to conform with the following points:—

(1) Check all pipe connection joints to the pump, and tighten if necessary, also examine the joint between the pump and fuel tank for leakage, and correct if necessary.

(2) Test the pump as specified in para. 18 to 22. If the pump is found to be defective, it must be removed from the fuel tank, and a replacement fitted, as described in para. 14 to 17.

(3) Ensure that the by-pass is operating correctly. To do this, turn on the tank selector cock, and the appropriate master cock; then switch on the pump, and observe the fuel pressure, as indicated by the aircraft fuel pressure gauge, or, fuel pressure warning light.

Very low pressure, or, failure to extinguish the warning light, indicates that the by-pass valve is not operating efficiently. In certain installations, the fuel pressure warning light may be set to operate at a pressure higher than that at which the pump is rated. The warning light setting for the particular installation should therefore be checked, before rejecting a suspected pump.

Note . . .

It is essential that the idle cut-off control should be in the cut-off position throughout this test, when it is applied to installations incorporating engines fitted with Bendix, or other types of injection carburettors.

24. At the periods laid down in the appropriate Servicing Schedules, all pumps are to be replaced by new, or reconditioned pumps drawn from Stores. When this is done, the procedure will, in general, be, as described in para. 14 to 17 ; old, or faulty pumps MUST be returned to a Repair Depot, or, to the manufacturers for reconditioning.