Chapter 33

PUMP, FUEL, FB 11, Mk. 9

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Pump, fuel, FB 11, Mk. 9	Stores Ref. 5UE/6235
Delivery rate	400 gallons per hour
Delivery pressure	10 lb. per sq. in.
Nominal load	9 amp.
Nominal voltage	24 volts d.c.
Maximum voltage	29 volts d.c.
Minimum voltage	22 volts d.c.
Weight	8 lb.
Breeze plug CZ2750	Stores Ref. 5X/4007

Introduction

1. The FB 11, Mk. 9 fuel pump is of the hanging, side mounting type, and is designed to meet aircraft installation requirements, where the fuel tank depth is restricted within thin wing sections.

2. The pump is designed to deliver 400 gallons of fuel per hour, at a pressure of 10 lb. per sq. in., when operating on a 24 volt d.c. supply, and demanding a load of 9 amp. At a maximum voltage of 29 volts d.c., and an approximate 10 amp. load, increased capacity is obtainable at 10 lb. per sq. in.

3. It is intended primarily for use as a booster pump under all conditions of fuel temperature, rate of climb, altitude, etc., which can be experienced in flight. When intended for service the pump is secured by eight nuts, bolts and washers to the outside of the fuel tank; a suitably reinforced, flanged hole being provided in the tank wall for this purpose.

DESCRIPTION

4. A sectional view of the pump is shown (*fig.* 1), and consists mainly of an electrically driven motor, supported in the upper end of the pump body, and secured to it by six bolts, nuts and washers. The impeller is driven by the motor, being secured to it by a special coupling. By switching on the supply, the pump motor is started, and operation is automatic, the pump drawing fuel from the tank, and delivering it to the inlet side of the engine driven pump.

Pump casing

5. The pump casing consists of a light alloy casting, forming at one end the suction mounting flange for bolting the pump

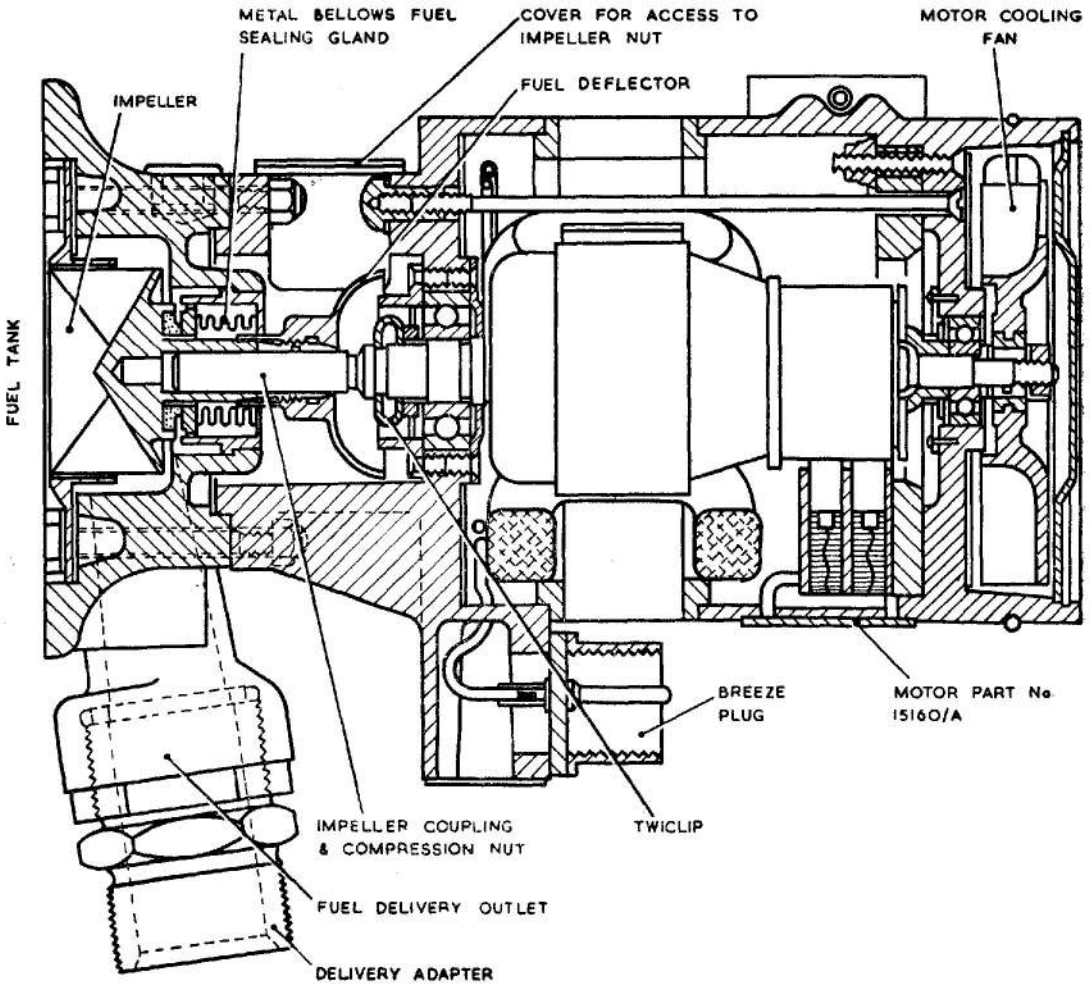

Fig. 1. Sectional view of fuel pump

direct to the wall of the tank. The casing also embodies an angular fuel delivery discharge connection, fitted with a 1 in. B.S.P./A.G.S. coupling, which is screwed into the connection, tightened against a fibre washer and locked in position with 18 to 22 s.w.g. locking wire. The face of the mounting flange is recessed to accommodate a suction cover, through which the inlet of the impeller projects. A cork joint is interposed between the casing of the pump and the suction cover. In the side of the pump casing is a breather provided with a fine mesh gauze grid to prevent the ingress of foreign bodies. Ducts are cored in the pump casing to provide for the two gland drains, the motor ventilation, and, also, for the input leads to the motor. There are two $\frac{1}{4}$ in. B.S.P. gland drain connections, fitted diametrically opposite, only one being in use at one time, the other gland drain being blanked, either, for normal or inverted pump mounting.

Motor

6. The driving motor is of the fan-cooled, flame-proof, compound wound type, and is designed to operate on 24 volts d.c., the range being a minimum of 16 volts d.c. for starting, to 22 to 29 volts d.c. for running. The power output is approximately 0·19 b.h.p. at 29 volts d.c.

7. The motor comprises a commutator and armature of the high speed type, the shaft of which is supported at each end in ball bearings, lubricated with high melting, low freezing point grease. The bearings are housed in their respective end frames of the motor body, the centre, or yoke, contains the motor field windings. The end frames and

the yoke are held together by two through bolts, passing, via the yoke, from one end frame to the other.

8. The motor drive-end frame is provided with gauze covered, flame proof apertures, to which the pump casing is secured. In addition it carries the electrical two-pin plug, and alternative gland drain adapters, one of which is fitted with a blanking cap There is also an aperture with a cork-lined cover, secured by two screws, this aperture provides access to the coupling between the motor and the pump.

9. The commutator-end frame houses the commutator and brush-gear, special twin sets of carbon brushes are fitted for efficient operation at high altitudes. An extension on the commutator end of the armature shaft carries the six-bladed fan which draws cooling air through the interior of the motor. The commutator end frame is closed by a metal disc, secured in position by a circlip, sprung into a groove machined in the interior of the end frame. The drive-end is secured by a twiclip which is sprung into a groove, machined in the end frame, and can be adjusted by two distance washers.

Impeller

10. The impeller is of the single entry, end-suction type, and is designed to give maximum performance at high altitudes. It is mounted on the end of the motor shaft by means of a slotted cone nut collet coupling device, similar to a chuck in operation, which when tightened up, grips the driving motor extension shaft. In order to avoid any possibility of the impeller slipping round the motor shaft, the coupling is provided with a small shouldered pin, passing through a hole bored at right angles to the axis of the shaft. When the impeller is assembled over the shaft, the pin passes down any one of the four slots cut in the impeller hub, until the impeller is in its correct axial position, i.e., when the tips of the blades are flush with the suction cover. The motor extension shaft enters a blind hole in the hub of the impeller, to prevent fuel by-passing the gland from the inlet side. The periphery of the impeller runs in the bore of the suction cover with a coarse running clearance, to reduce pressure leakage, but at the same time, to permit the escape of vapour and air, back to the suction space.

Metallic bellows gland

11. This fuel sealing gland is located on the armature shaft, directly above the impeller, and is fitted to prevent fuel seeping through to the motor lower bearing, and causing damage to the motor performance. A fuel deflector is fitted above the fuel sealing gland, and assists in deflecting any fuel leakage from the motor lower bearing.

12. The gland comprises a brass backplate, to which is sweated a brass bellows, with a bronze seal ring to the other end. The seal ring is guided by four splines cut round its outer circumference, and engaging with four lugs projecting from the backplate. These parts form a gland unit which is pressed into the pump casing. The bronze seal ring, which is stationary, rubs on a rotating carbon ring, shrunk permanently into the back of the impeller.

OPERATION

13. The impeller, driven at constant speed, accepts fuel from the tank, via the suction cover, and forces it through the fuel delivery outlet, and fuel line to the inlet side of the engine driven pump.

14. 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.

15. The type of impeller used in the pump, ensures maximum performance of the pump under conditions of sudden, and rapid de-aeration, due to high rates of climb, or other manoeuvres. It also assists in quick recovery from vapour locking, caused by the temporary removal of fuel from the vicinity of the impeller.

INSTALLATION

16. When it is necessary to install a new pump, ensure that the fuel tank has been emptied, before removing the old pump.

17. To remove the old pump, disconnect the fuel delivery pipe, and the electrical supply from the Breeze connection. Next, remove the eight studs, with their associated nuts and washers, securing the pump on its seating, on the outside of the fuel tank.

18. Before installing the new pump, make sure that it is clean externally, and that

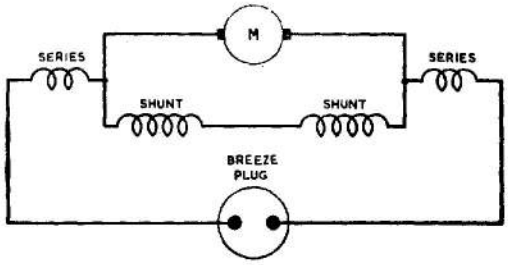

Fig. 2. Circuit diagram

any adhesive tape, or protecting plugs over the pump apertures, have been removed. Ascertain that the pump motor turns freely by hand. In addition, ensure that the Langite joint washer, which is fitted between the mounting flange of the pump and the tank is in good condition, if in doubt, replace it with new. Secure the new pump to the fuel tank, and tighten up the nuts to the studs, with their associated washers, which are provided for securing the pump to the tank.

SERVICING

Electrical test

19. A routine electrical test must be made to ascertain that the motor of the fuel pump is operating correctly.

20. Having ascertained the position of the aircraft fuel pump test socket, and switches, by reference to the appropriate Aircraft Handbook, proceed as follows :—

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

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

(3) Switch on the pump by pressing the switch on the test panel, NOT THE NORMAL PUMP SWITCH, for a period of not less than half a minute.

During this period, the current consumption of the motor should be noted, and the readings, as registered by the ammeter, should be interpreted as follows :—

(a) A steady reading of not less than 9 amp. indicates that the motor is satisfactory.

(b) A reading appreciably in excess of the figure in (1) indicates that the pump motor is defective.

(c) A fluctuating reading indicates faulty contacts, defective brushes, or a faulty commutator.

(d) A zero reading indicates either a blown fuse, defective wiring or switch, or complete motor failure.

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

Operational test

22. When the electrical tests have been completed, the pump should be tested to observe the pressure of fuel being delivered. The pressure should be 10 lb. per sq. in. minimum. If this pressure is not obtained, the fault may probably be traced to a damaged impeller, or, incorrectly loaded gland bellows.

Routine inspection

23. When examining the pump at the appropriate inspection periods, care is to be taken to conform to the following points.

(1) Examine the fuel outlet pipe coupling, and the pump-to-tank Langite washer for fuel tightness.

(2) Test the pump as detailed in para. 19 to 21. If the pump is found to be faulty, it must be returned to Stores, and a replacement fitted.

24. The pump is unlikely to be defective if it delivers fuel at a pressure in excess of 10 lb. per sq. in.

25. At the periods laid down in the appropriate Servicing Schedules, all faulty pumps are to be replaced by new, or reconditioned pumps drawn from Stores. Old pumps are to be returned to the manufacturers for reconditioning.

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