Chapter 50

PUMP, FUEL, PUL 1003, Mk. 1, 2, 3 AND 4

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ILLUSTRATION

LEADING PARTICULARS

Pump, fuel, PUL 1003, *Mk.* 1	*Ref. No.* 5UE/6169
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Pump, fuel, PUL 1003, *Mk.* 3	*Ref. No.* 5UE/6480
Pump, fuel, PUL 1003, *Mk.* 4	*Ref. No.* 5UE/6787
Performance rating	100 *gallons per hour at* 11 *lb/in²minimum at* 26 *volts on AVTUR or AVTAG fuel*
Motor	26 *volt d.c. flameproof*
Current consumption	12·5 *amperes max. at* 26 *volts and* 15 *amperes max. at* 29 *volts*
Power output	32 *oz.in. torque at* 26 *volts, speed* 7800 *rev/min. and current* 12·5 *amperes max.*
Cable connection external	19 *amp.* 2-*pole socket*
internal	19 *amp.* 2-*pole plug*
Weight of complete unit of each mark	12 *lb.* 4 *oz.* (*approx.*)

Introduction

1. The type PUL.1003, Mk. 1, 2, 3 and 4 is an electrically driven fuel booster pump, which supplies fuel under pressure to the aircraft engine driven pump, including conditions of fuel de-aeration, vapour formation at high altitudes, high fuel temperatures, and during aerobatics. The pump may also be used for transferring fuel from auxiliary to main tanks.

2. The pump is installed vertically in the base of the aircraft fuel tank, or in a collector box, or sump, with the electric motor and pump inlet submerged in the fuel.

DESCRIPTION

General

3. The pump unit comprises three main sub-assemblies, namely: the motor and

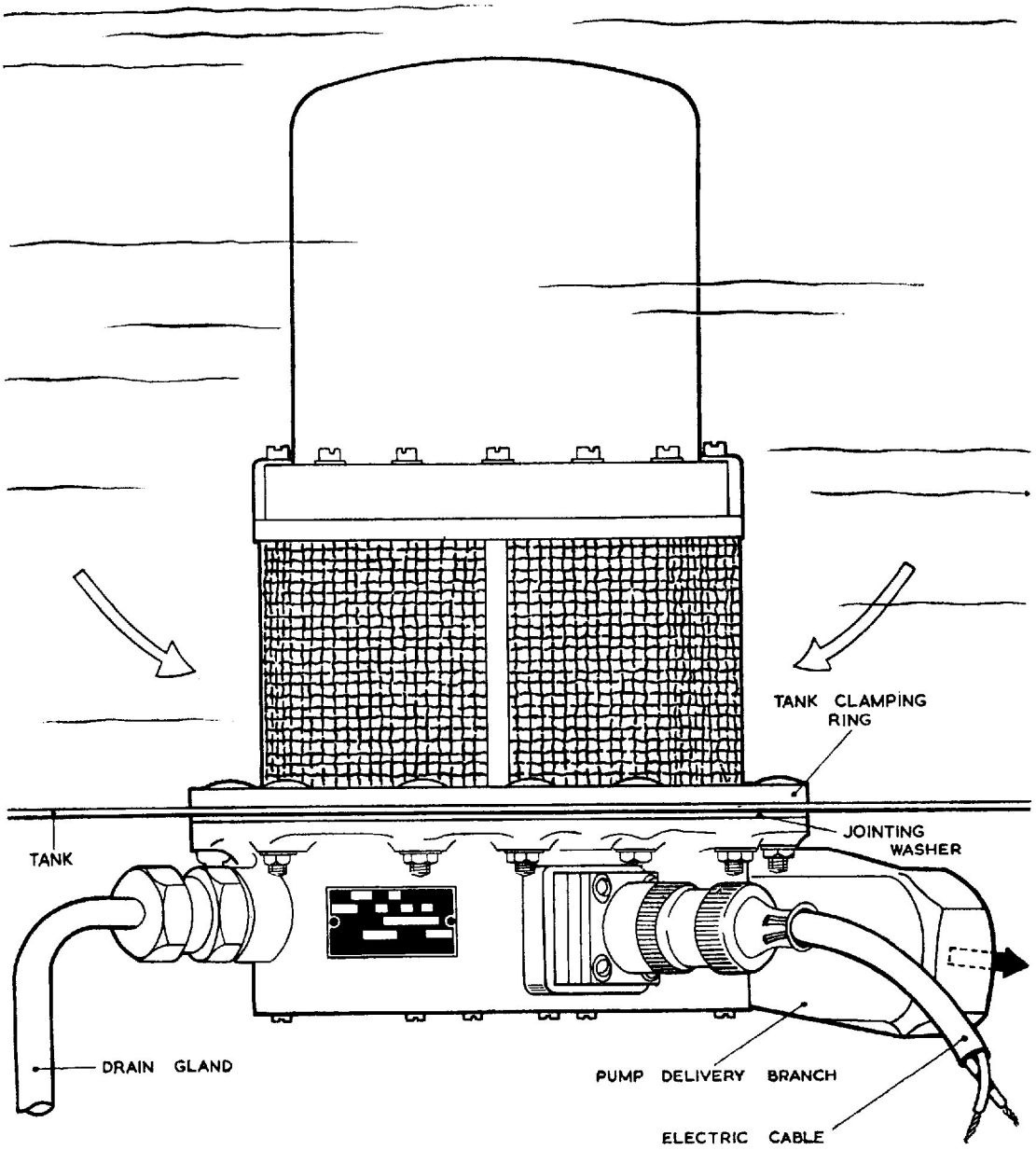

Fig. 1. General view of pump fitted in fuel tank

casing, the portway casting and the pump base.

Pump base assembly

4. The pump base assembly, which has a circular flange with fourteen $\frac{7}{32}$ in. holes for attachment to the fuel tank mounting ring, carries the $1\frac{1}{4}$ in. B.S.P. fuel outlet, $\frac{1}{4}$ in. B.S.P. gland drains, motor breather and the electrical connection Breeze plug. This assembly is the only part of the pump that projects outside the fuel tank.

5. The spiral volute is cast into the pump base and opens out into the fuel outlet connection. A $\frac{3}{4}$ in. B.S.P. plug is provided in the centre of the pump base to blank off the fuel drain connection.

6. Located at the delivery end of the volute, above the fuel outlet is a by-pass flap valve

to prevent pressure drop when the fuel is being drawn from the tank by the engine driven pump, with the booster pump idle.

Portway casting assembly

7. The portway casting comprises mainly, two circular end flanges separated by three hollow ducts. The upper flange mates with the motor unit, whilst the lower flange mates with the pump base; the three sub-assemblies then becoming a pump unit assembly. Two hollow ducts act as motor breathers and one as the gland drain. The electrical supply leads to the motor pass from the Breeze plug via one of the motor breather ducts.

8. Contained in a central housing is a Flexibox fuel sealing gland which prevents ingress of fuel to the motor. Attached to the base of the casting is the impeller slip-ring suction cover, and vapour deflector which diverts vapour away from the fuel inlet to the impeller.

9. The bottom flange of the portway casting spigots into the pump base, the two castings being secured together by studs. A rubber bonded cork joint is placed between the mating faces of the two castings. A 10 mesh filter completely surrounds the fuel inlet to prevent particles of foreign matter from fouling the impeller and entering the pump.

Motor unit

10. The motor is flameproof and of the series wound type, designed to give 32 oz. in. torque at 26 volt d.c. at 7800 rev/min. with a maximum current consumption of 12·5 amperes. When operating at 29-volt d.c. the current should not exceed 15 amperes.

11. The brushgear is of unit construction, the brush boxes being secured to a bakelite carrier, the complete unit being retained in position by two screws and brushgear nut assemblies.

12. The inner race of the drive end bearing is locked to the armature spindle by a twicklip. Between the inner race and the twicklip is fitted a thrower which throws off any fuel leakage past the Flexibox seal, which would endanger the motor lower bearing. The commutator end bearing is locked to the spindle (together with a fan and grease shield) by a nut and tab washer in the Mk. 1, 2 and 3 pumps. The Mk. 4 pump is fitted with double shielded bearings, the separate grease shield is replaced by an extra shim washer.

13. The armature spindle extends through the Flexibox seal and carries the impeller complete with carbon insert; this makes a seal against the face of the Flexibox seal. A soft aluminium washer is fitted between the impeller and the retaining nut to prevent fuel from creeping up the spindle.

14. The complete motor is covered with an outer casing, the base flange of which is clamped to the back of the motor flange, which in turn is clamped to the top flange of the portway casting by means of twelve screws and spring washers. Nebar joint rings are fitted between each of these flanges.

15. The motor unit which spigots into the portway casting comprises a yoke, pole pieces and field coils with drive end and commutator end covers. These sub-assemblies contain the armature, and are clamped together by through bolts, nuts and tab washers. The commutator end cover contains the brushgear and brushes.

Differences between Mk. 1, 2, 3 and 4 pumps

16. The Mark 1, 2, 3 and 4 pumps differ as follows:—

(1) Mk. 1; as introduced.

(2) Mk. 2; holes added around the centre of the motor fan, also a hole added to the motor mounting flange and a dowel added to the portway casting for location purposes.

(3) Mk. 3; Nobrac type G.S.F.M.1 carbon brushes are introduced, superceding Morgan type K.C.E.G.11.

(4) Mk. 4; Double shielded ball bearings and stainless steel vapour deflector are introduced.

Operation

17. The pump is rated to deliver 1000 gallons per hour of AVTUR or AVTAG fuel at 11 lb/in² minimum pressure, when operating at 26 volt d.c. input with a maximum current consumption of 12·5 amperes. It is also suitable for other grades of aviation fuel including 100 Octane.

18. Fuel from the tank enters the pump through the gauze filter into the eye of a mixed flow type centrifugal impeller driven by the motor, and is forced, via the spiral volute in the pump base and thence from the outlet connection into the main fuel line. A by-pass flap valve is fitted near the fuel outlet to prevent pressure drop when fuel is being drawn from the tank by the engine driven pump with the booster pump idle.

19. Under conditions in which the booster pump is supplying fuel in excess of engine requirements, the impeller continues to rotate, but the pressure is held within predetermined limits.

INSTALLATION

20. The pump is attached by its casting flange to the mounting rig surrounding the circular hole provided in the bottom of the fuel tank, or sump. Jointing material is used between the tank mounting ring and the pump flange.

21. Fourteen 2 B.A. studs hold the pump in position, and two $\frac{1}{4}$ in. B.S.F. extraction holes are provided in the pump flange to simplify removal of the pump from the tank.

22. All transit plugs must be removed before installation.

23. Care must be exercised to ensure that the drain pipe exit from the $\frac{1}{4}$ in. B.S.P. gland drain connection is in a suction area on the aircraft to prevent possible pressurising of the gland drain during flight.

24. After connecting up the fuel outlet, gland drain pipes and electrical connection, all unions, union nuts, etc. must be wire locked.

SERVICING

Periodic inspection in service

25. Examine all pipe connection joints and the joint between the pump and fuel tank for leakage, which can be corrected by fitting new joint washers.

26. Examine the electrical connection and ensure that all screws and nuts are tight and locking wires intact.

27. Examine the gland drain for leakage; the maximum permissible leak is two drops per minute with the pump running. Leakage in excess of this will necessitate pump removal for overhaul.

28. The pump should be removed if there is any indication of erratic performance, such as excessive current consumption, low delivery pressure, or, if the insulation resistance falls below 50,000 ohms when measured with a 250-volt insulation resistance tester.

Maximum current at no-fuel flow

29. With the pump full of fuel and all cocks closed, run the pump from a 28-volt d.c. supply; the current must not exceed 15 amperes. Information on test procedure is contained in A.P.4343, Vol. 1, Sect. 16.

Note . . .

It is recommended that the pump be removed for Bay Servicing in accordance with the instructions contained in the relevant Aircraft Servicing Schedule.

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