Chapter 37

PUMP, FUEL, TYPE PDC.20 Mk. 2

(including inverted flight fuel valve)

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Pump, fuel, Type PDC 20 Mk. 2 ... ... (*including inverted flight valve*)	**Ref. No. 5UE/6709**
Motor unit (*A.E.I. Type LD.*1003 *Form* 7) ...	26*V d.c. flameproof continuously rated*
Rated output	... ... 20 *g.p.h.*
Fuel delivery pressure at rated voltage	... 9·0 *lb/in²* (*min.*)
Rated voltage	... ... 26*V d.c.*
Maximum current consumption under above conditions	... ... 3·9 *amp*
Electrical connection (*Plessey, Type CZ.* 76498)	*Ref. No.* 5*X*/6720
No flow delivery pressure (*max.*)	27 *lb/in²* (*at* 29*V d.c.*)
New brush length	0·571 *in.* (14·5 *mm.*)
Minimum brush length for re-use	0·276 *in.* (7·0 *mm.*)
Brush spring pressure	5 *oz.*±10 *per cent in working position*
Minimum permissible commutator diameter for re-use	0·581 *in.* (14·75 *mm.*)

Leading Particulars—cont.

	Depth	Width
Undercut commutator segments	0·020 *in.*	0·022 *in.*
Maximum commutator eccentricity with shaft journals	0·001 *in. total reading*	
Rotation (viewed from com. end)	*Anti-clockwise*	
Bearings		
Drive end	*Hoffman Type S3, 00 fit*	
Commutator end	*Hoffman Type S1, 00 fit*	
Bearings pre-packed with Silicon grease MS4	... *Ref. No. 33C/9424829*	
Delivery outlet	$\frac{3}{8}$ *in. B.S.P.*	
Gland drain	$\frac{1}{4}$ *in. B.S.P.*	
Weight of unit (complete)	5 *lb.* 9 *oz.*	

Note . . .

Dismantling of this fuel pump to inspect or replace brushes or bearings will necessitate the full retesting of the unit in accordance with the approved Schedule of Acceptance Tests.

Introduction

1. The fuel pump, Type PDC. 20 Mk. 2, shown partly sectioned in Fig. 1 is designed to supply fuel under pressure to an auxiliary power unit, and in addition it can be used as a small capacity booster pump, capable of maintaining the required fuel flow to the aircraft engine driven pumps under the varying fuel temperature and altitude conditions experienced in flight.

2. The pump is based mounted and is housed in an independent canister fitted with four weight operated valves. These valves remain open under normal flight conditions, but close when the aircraft is subjected to negative 'g' or inverted flight conditions to trap a quantity of fuel within the canister in order to ensure an uninterrupted fuel supply to the auxiliary power unit or engine driven pump.

DESCRIPTION

Pump unit

3. The pump (*fig.* 2), is of the direct drive type with a high altitude impeller carried on the armature stub-shaft; also attached to this shaft is the rotating carbon member of the fuel seal gland, which prevents fuel ingress into the motor unit. The metallic bellows unit which forms the stationary half of this gland is a shrink fit in the upper pump base casting. Any slight fuel leakage past the gland will be dissipated by a thrower arrangement on the motor shaft and then drained through channels in the pump casing, and external piping to atmosphere.

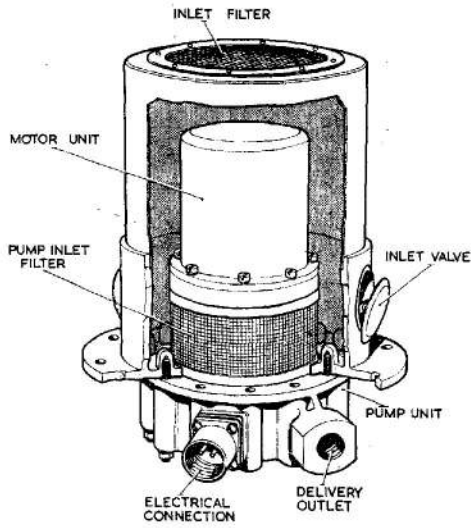

Fig. 1. Part sectional view of PDC20 Mk. 2 fuel pump and inverted flight valve

4. A wire mesh filter surrounds the fuel inlet to the pump to prevent the entry of foreign matter into the impeller which is surrounded by a vapour baffle to assist in the clearance of air and fuel vapour evolved.

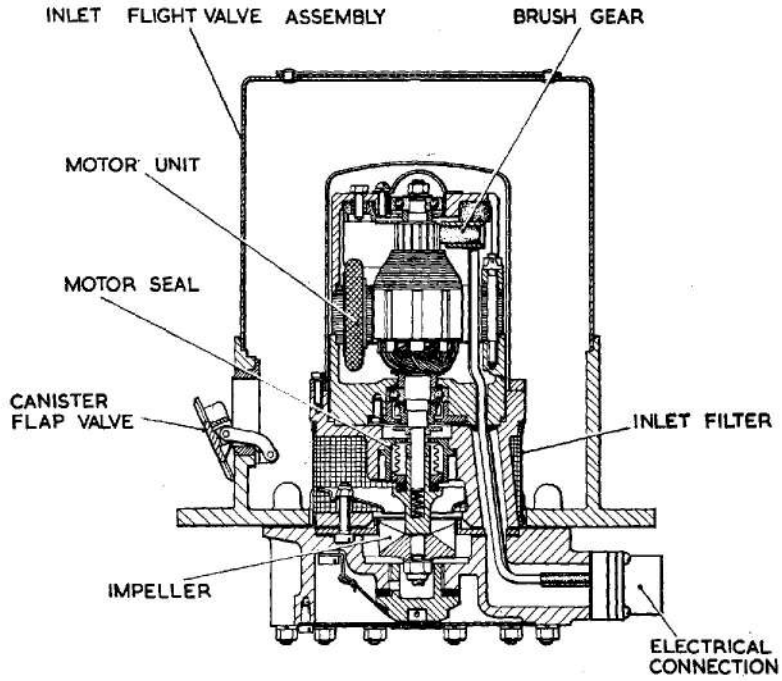

Fig. 2. Sectional view of PDC20 Mk. 2 fuel pump and inverted flight valve

Motor unit

5. The motor unit is a totally enclosed continuously rated 26 volt d.c. shunt wound machine, with an output of 0·07 h.p. The armature assembly is supported at each end by single row ball bearings. Both bearings are lubricated with Silicon grease MS4.

Inverted flight canister

6. The complete pump assembly is bolted to a stud ring in the base of the inverted flight canister which is in turn bolted through its flange to a stud ring in the base of the fuel tank. Four weight operated flap valves (*fig.* 2) are equally spaced around the lower cast portion of this chamber, and under normal operating conditions remain in the open position, closing only when the aircraft is subjected to negative 'g' or inverted flight conditions. The chamber is completed by a light alloy casing, the upper end of which incorporates an inlet filter.

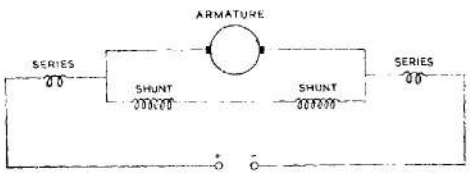

Fig. 3. Circuit diagram

OPERATION

7. Fuel from the tank enters the inverted flight chamber through the four open flap valves and also (if the fuel level in the tank is sufficiently high) through the top of the casing chamber. It is then further screened by the pump unit, wire mesh filter, before being drawn into the eye of the motor driven impeller. From here it is forced through a spiral channel in the pump base into the fuel delivery line to the auxiliary power unit or engine driven pump.

8. When the aircraft is manœuvred beyond the vertical bank position and towards fully inverted flight position, or is otherwise, subjected to negative 'g' conditions the weight

operated valves will close. The construction of the tank in which the valve is fitted will be such that the open end of the chamber remains in fuel and that there will be sufficient fuel surrounding the pump to maintain a normal fuel delivery for a pre-determined minimum period.

REMOVAL

9. Before attempting to remove a pump ensure that the tank has been drained of fuel, and that the aircraft electrical supply to the pump is switched off. The exact method of removing the assembly will be found detailed in the appropriate Aircraft Handbook, but in general it will comprise the following operations: —

(1) The disconnection of the fuel delivery connection, the gland drain connection and the aircraft electrical supply plug to the pump unit.

(2) The removal of the nuts and spring washers securing the inverted flight valve chamber to the aircraft fuel tank and withdrawal of the assembly.

(3) The separation of the pump unit from the inverted flight valve assembly.

INSTALLATION

10. The installation of a new assembly, or of the pump unit only, should be preceded by the following checks: —

(1) Ensure that the unit has not been stored for longer than the specified maximum period (i.e. 12 months in the original packing or 3 years when special packing has been provided).

(2) Inspect the exterior of the assembly for evidence of damage. Check for any signs of corrosion, blend out locally, observed areas and apply a protective finish (e.g. cromatic acid solution).

(3) Ensure that the complete assembly is scrupulously clean externally.

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

Starting check

11. It is recommended that a starting check be made on the pump before installation. To do this the gland seal faces should be first lubricated by immersing the assembly upside down in a small tank of AVTUR fuel to within $\frac{1}{4}$ in. of the inverted flight valve chamber mounting flange, for a few seconds only. Remove the pump assembly after immersion, and allow it to drain; return it to its correct way up after a short period of time.

12. Take care during this operation to prevent fuel coming into contact with the electrical connection or entering the gland drain tapping either during or after immersion.

13. Apply a 26 volt d.c. supply to the pump and check that it starts immediately. Check the starting of the pump several times by interrupting the supply. If the pump fails to start immediately on any of these tests, it should be returned through stores for further serviceability testing using approved equipment.

14. The preceding 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.

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

(1) Smear the mating surfaces of the inverted flight chamber flange and the tank stud ring with an approved jointing compound, fit a new gasket, and secure the pump and valve assembly in position.

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

(3) Wire lock all the external connections to the assembly.

SERVICING

16. At periods laid down in the Aircraft Servicing schedule, check all pipe connection joints to the pump and tighten where necessary. Test the pump as detailed in para. 17. Unserviceable pumps are to be returned through the stores for repair in accordance with current authorised procedure.

Electrical test

17. In accordance with the Aircraft Servicing Schedule check the pump motor to ascertain that it is functioning correctly. The

pump should be replaced by a new or reconditioned one if there is any indication of erratic performance, such as excessive current consumption. The pump must be on load during these tests i.e. immersed in fuel.

18. Check the position of the aircraft switches and fuel cocks by reference to the appropriate Aircraft Handbook. Connect a suitable ammeter to the aircraft test socket, (where a test socket is not provided the fuse in the pump circuit can be removed and the suitably ammeter inserted in circuit), with the pump running observe the current consumption, which should be between 3·5 to 3·9 amp. Remove the ammeter after this test. (Replace fuse removed).

Operational test

19. On satisfactory completion of the electrical test the pump should be checked for proof of performance against the figures quoted in the Leading Particulars. Failure of the pump to obtain the quoted pressure or fuel delivery could be caused by a faulty motor, a damaged impeller or an incorrect loading of the bellows gland.

Insulation resistance

20. Using a 250V insulation resistance tester measure the insulation between each pin and earth, the measured resistance should not be less than 50,000 ohms.