Chapter 19

PRESSURE FUELLING VALVE, Mk. 12, SERIES 3

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Current consumption	*0·30 amp. at 24 volts continuous rating*
Operating voltage limits	*21–28 volts D.C.*
Normal operating voltage	*24 volts D.C.*
Resistance of solenoid coil	*80 ohms at 20 deg. C*

Introduction

1. The pressure fuelling valve, Mk. 12, Series 3 (Part No. 1112000/3) is an electrically operated differential valve which, when used in conjunction with a float switch and fitted in a fuel tank, provides automatic fuel shut-off at a predetermined level. A manual override switch, which enables the fuel to be shut-off when desired, may also be incorporated in the valve electrical circuit.

2. The Series 3 valve is identical with the Series 1 valve, described in Sect. 1, Chap. 18 of this Volume, except that it has an adapter assembly which includes top conduit fittings and a terminal block, together with a conduit assembly.

3. A more detailed description of the mechanical features and functioning tests of this valve will be found in A.P.4511, Vol. 1 and Vol. 6, Sect. 2, Chap. 3.

DESCRIPTION

General

4. The Series 3 valve (*fig.* 1) comprises three distinct assemblies; the body barrel containing the piston assembly, the solenoid assembly, and the adapter assembly.

Body barrel

5. Four outlet ports are arranged symmetrically around the body barrel (*fig.* 2) which also has two steps machined in the bore to provide seatings for the piston crown and the piston body.

6. A non-return valve is fitted to the hollow stem of the piston-crown stem and four holes in the crown communicate with the bore of the stem. A return spring acts against the lower face of the piston body and relief springs are fitted between the piston crown and the piston body.

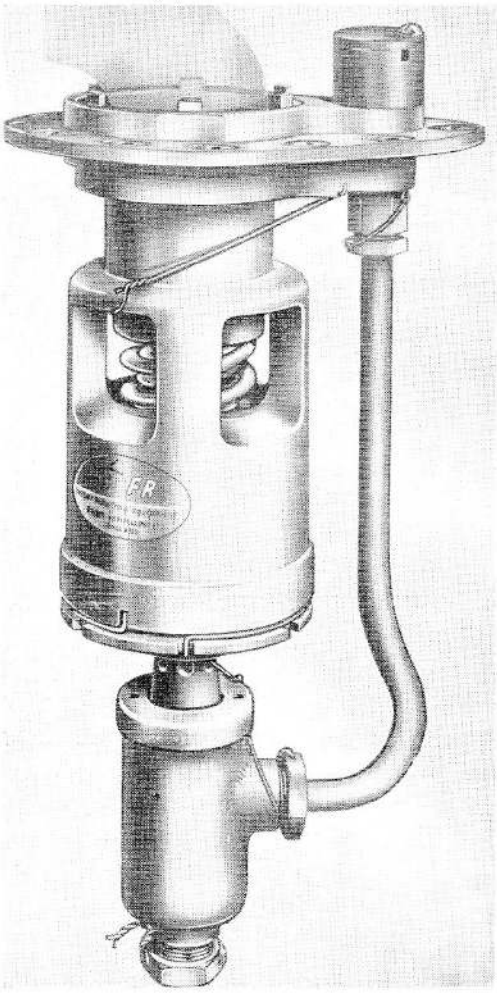

Fig. 1. Fuelling valve, Mk. 12, Series 3

Solenoid assembly

7. A union nut unites the solenoid assembly with the body barrel by means of a union collar on the solenoid throat. This throat has a ball seating pressed into it and also has six equally spaced outlet ports. A $\frac{9}{32}$ in. steel ball is held against the ball seating by a plunger which slides in a polished brass liner inserted in the centre of the winding bobbin. This plunger receives its upward thrust from a spring loaded brass plunger pin which is retained by a screwed cap.

8. The coil winding (*fig.* 3) is sealed by the use of O-section sealing rings at the top and the bottom of the winding bobbin. Fuel seeping past the plunger into the solenoid base is prevented from forming a hydraulic lock by a hole in the bottom cap which allows this fuel to escape.

Adapter assembly

9. The adapter consists of a cast elliptical flange for mounting the valve in the aircraft tanks. A conduit assembly brings the wires from the coil case up to the terminal block mounted on the adapter plate (*fig.* 2). Twelve counter-bored holes, spaced equally around the flange, allow the adapter to be bolted to the tank.

10. The body barrel is screwed into the underside of the larger of the two holes in the adapter plate against a laminated washer, and is secured by locking wire. This washer controls the angular position of the valve in relation to the adapter plate, laminations being removed until the correct position is obtained.

PRINCIPLE OF OPERATION

11. The principle of the valve is illustrated in fig. 4 and is as follows :—

Static condition

(1) When fuel is not flowing, the solenoid is de-energized, the piston is held in the closed position by the return spring, and

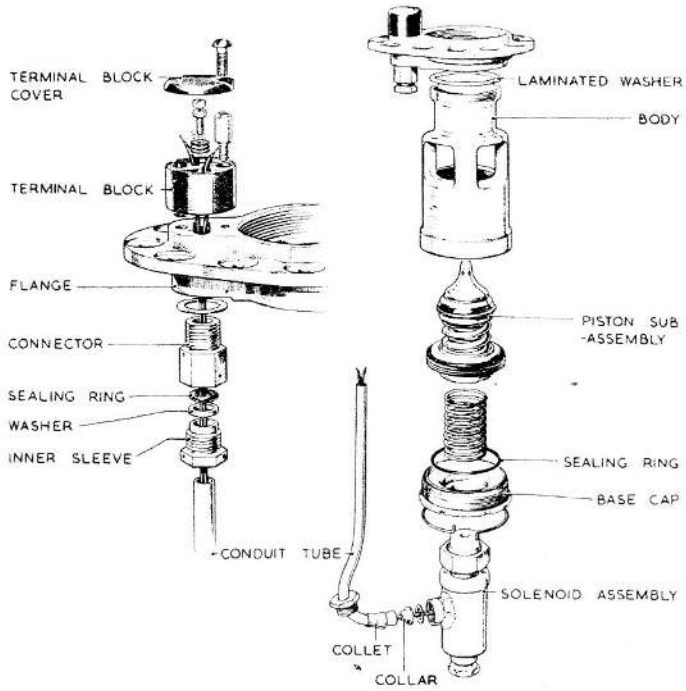

Fig. 2. Exploded view of fuelling valve

the rubber sealing ring on the piston crown seats against the upper step in the body barrel. The piston body seal is not seated against the lower step because there is no pressure in the lower chamber of the valve.

Flow condition

(2) When the solenoid is energized, the plunger is pulled down allowing the ball to lift off its seat. The fuel enters the valve, causes the piston assembly to move downwards, and flows through the ports in the body barrel out into the tank. Fuel will also flow through the four holes in the piston crown, through the hollow stem and non-return valve, into the lower chamber, and enter the tank via the ports in the solenoid throat.

Shut-off condition

(3) When the current to the solenoid is switched off, either by the action of a float switch or by a manual override switch, the solenoid return spring forces the ball back on to its seat and seals the lower half of the valve. Fuel will continue to flow through the hollow stem of the piston and, as the pressure on the piston crown is the same as the pressure acting on the underside of the piston body, the piston assembly will move upwards and close the valve; the area of the underside of the piston body being greater than that of the piston crown.

Relief condition

(4) If the inlet pressure rises above the shut-off pressure after the valve has closed, the relief springs between the piston crown and piston body will compress. The piston body will remain in the fully closed position while the piston crown moves downwards; thus fuel is allowed to enter the tank, and damage to the main fuel lines avoided. The relief pressure of the valve is 55/65 lb. per

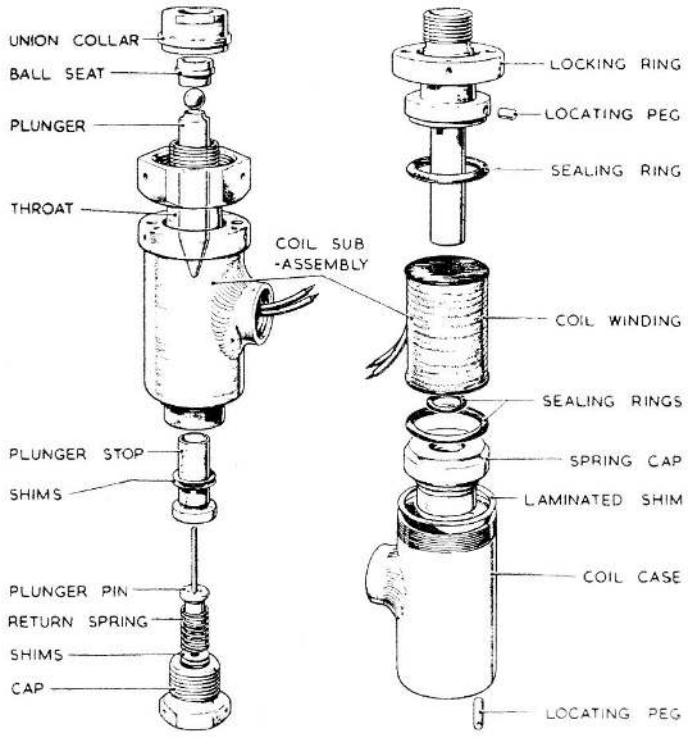

Fig. 3. Solenoid assembly—exploded

sq. in. while the maximum line pressure will not exceed 50 lb. per sq. in.

Installation

12. An approved jointing compound may be used for fitting the valve into the tank, but it is important to ensure that no surplus compound is allowed to fall on to any part of the valve. It is also essential that a good bonding is established between the valve adapter and the tank shell.

SERVICING

13. The following paragraphs give details of the electrical tests applicable to the solenoid unit of this valve. Servicing of the complete valve including functional tests is covered in A.P.4511, Vol. 1 and Vol. 6, Sect. 2, Chap. 3.

Testing

14. Measure the coil resistance of the solenoid coil winding ; this must not be less than 80 ohms at 20 deg. C.

15. Ensure that the insulation resistance of the solenoid coil is adequate. The insulation resistance between any part of the valve and either of the two solenoid coil leads must not be less than 2 megohms measured with a 250-volt insulation resistance tester.

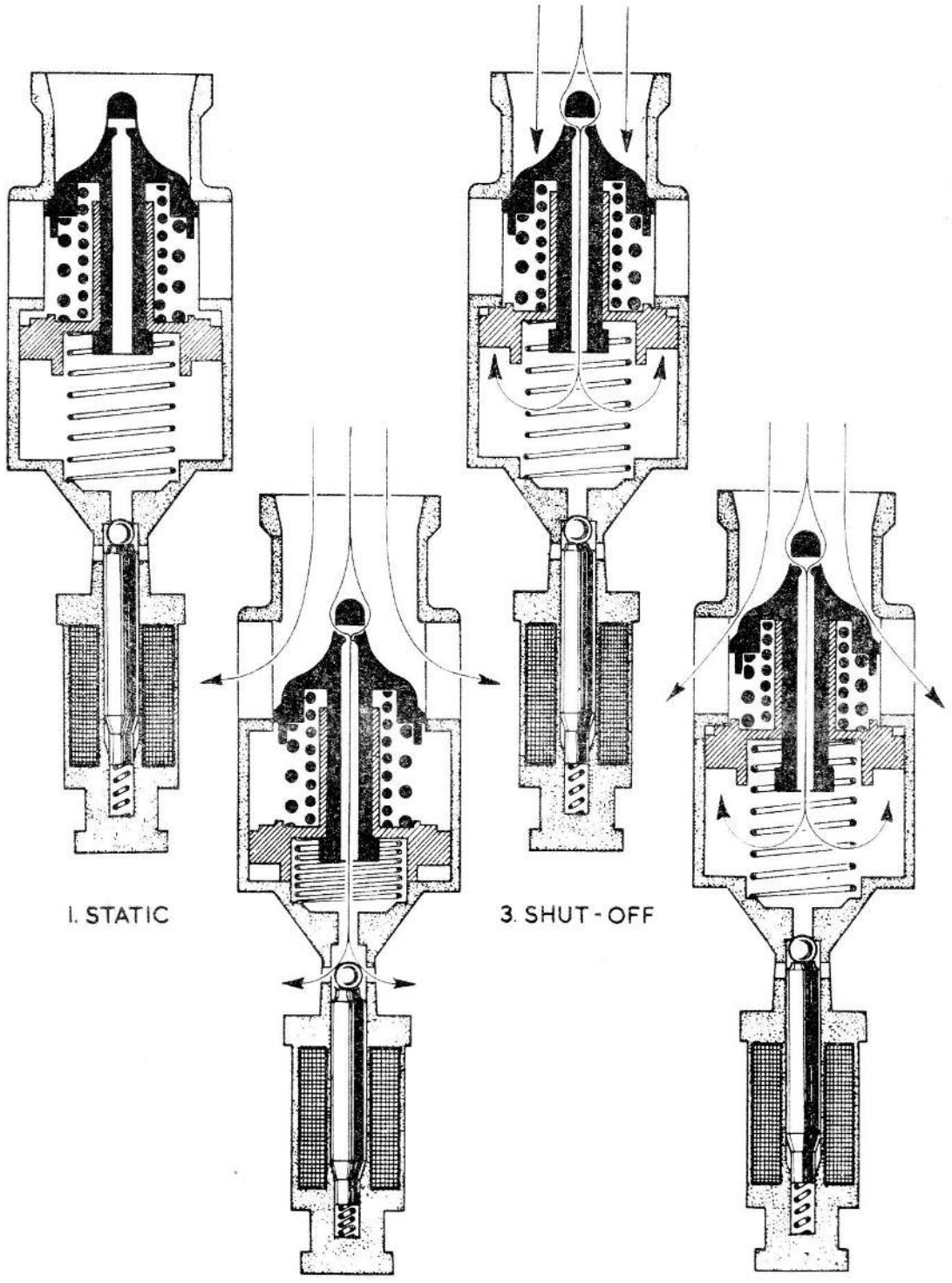

Fig. 4. Functional diagram

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