Chapter 15 PRESSURE SWITCH

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LIST OF ILLUSTRATIONS

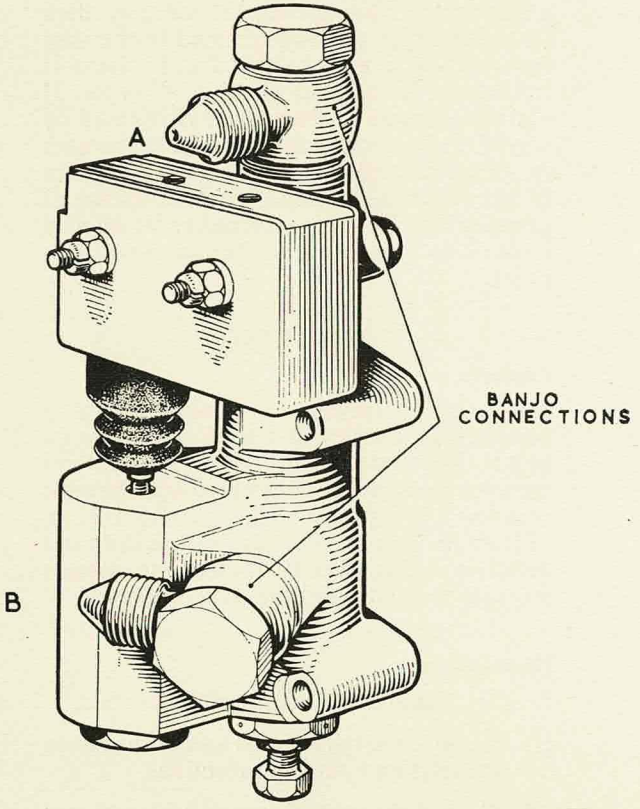

Fig. 1. Pressure switch assembly

Introduction

1. The assembly described and illustrated in this chapter is a basic type the variants of which are given in appendices. It consists of a pressure switch fitted with pipe connections suitable to the service in which the assembly is used. The pressure switch breaks an electrical circuit when a specific hydraulic pressure is reached and remakes the circuit after a given pressure drop.

Description

Body and plunger (fig. 1)

2. The body of the unit is provided with an inlet and an outlet connection, two bosses for mounting bolts and two bosses to which a micro-switch is secured. It has two interconnected chambers, the larger of which, A, contains a shuttle valve and its ancillary parts. This chamber has one open end forming the

inlet connection while the other end is closed by a screwed and sealed cylinder; holes in the wall of this cylinder allow fluid to pass to the outlet connection of the body. The small chamber, B, houses a spring-loaded plunger and is closed at one end by a screwed and sealed plug; the plunger passes through the end wall of the chamber to make contact with the micro-switch plunger. The plug retains the plunger, spring, plunger guide and washer; the plunger has a relieved head and is sealed in its guide which in turn is sealed in the chamber.

Cylinder, piston and valve (fig. 1)

3. The cylinder contains a sealed piston that forms a seat for a main spring that loads a valve stop; the position of the piston, and consequently the spring loading, is regulated by an adjusting bolt tapped through and locked in the end of the cylinder. The valve stop is located in the bore of an outlet seat and is in contact with the stem of the shuttle valve, keeping the valve on an inlet seat until cut-out pressure is reached. The cylinder also retains the outlet and inlet seats, each of which are sealed by a rubber ring, and a distance sleeve that is interposed between the seats. The length of the distance sleeve regulates the length of travel of the shuttle valve. The shuttle valve moves, under hydraulic pressure, in a shuttle sleeve which itself may travel in the distance sleeve against the resistance of a spring that bears on the outlet seat.

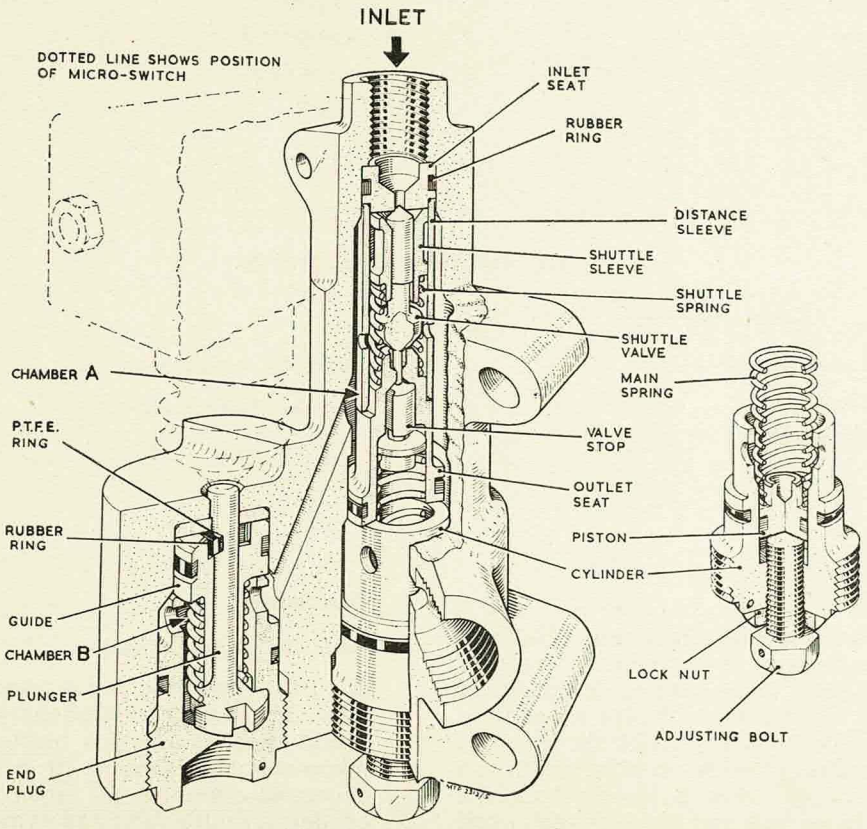

Fig. 2. Pressure switch

Principle of operation

Cut-out

4. Below the specified cut-out pressure, the shuttle valve is held on the inlet seat by the valve stop and main spring and there is no flow of fluid within the unit (*A in fig.* 3). When cut-out pressure is reached (*B in fig.* 3) the shuttle valve is forced down on the outlet seat, the shuttle sleeve moves down on the valve and the system pressure then has access, by way of the slots in the end of the shuttle sleeve, the holes in the distance sleeve and by the interconnecting passage, to chamber B where it lifts the plunger to operate the micro-switch.

Cut-in

5. When the system pressure on the shuttle valve drops to the point at which it is overcome by the main spring, the valve is lifted from the outlet seat and reseated in the inlet seat. At the same time the shuttle sleeve is restored to its original position (*C in fig.* 3) and the pressure in chamber B is released by way of the interconnecting passage to chamber A, thence through the outlet seat and cylinder to the outlet connection. With the release of pressure the plunger is returned to its original position by its spring and the micro-switch is re-set.

SERVICING

Leakage

6. If there is leakage from joints sealed by bonded seals check that the adapter or banjo bolt is tightened normally. If this is ineffective the joint faces must be examined and the seals renewed. Leakage around the cylinder or plug, or from the plunger or adjusting bolt indicates defective sealing rings. In all cases the surfaces must be examined and the rings renewed.

Dismantling

7. (1) Remove the micro-switch.

(2) Remove the banjo bolts and bodies from the inlet and outlet connections.

(3) Slacken the adjusting bolt lock-nut and remove the bolt.

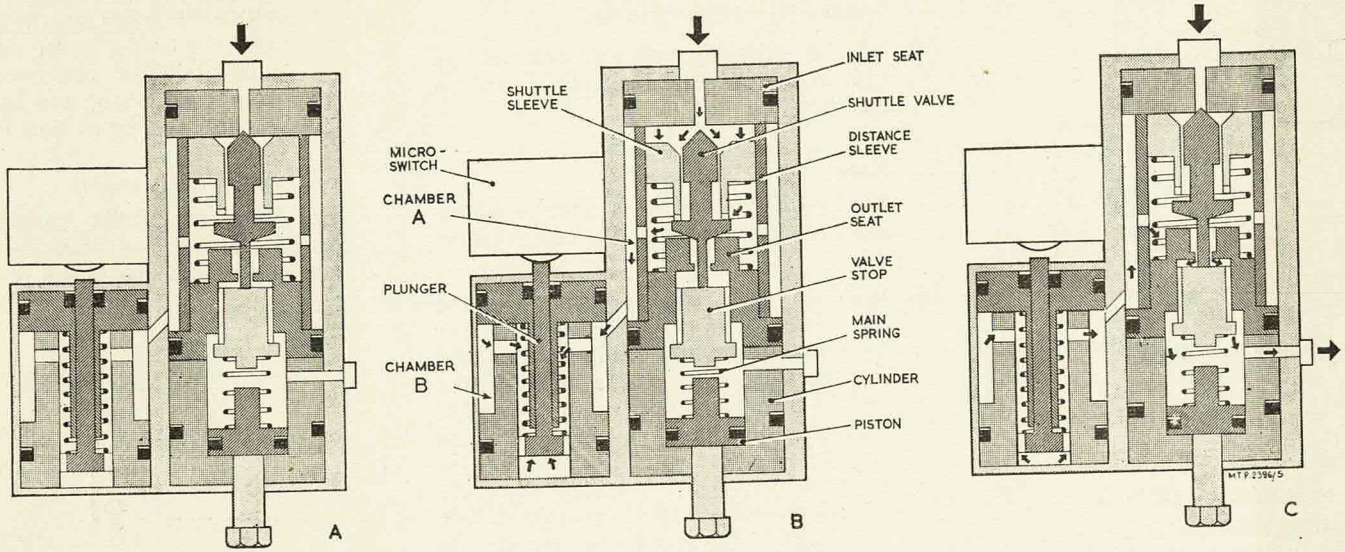

Fig. 3. Functional diagram

(4) Unscrew the cylinder containing the piston and main spring; use a soft drift inserted in the base of the cylinder to push out the piston.

(5) Use a soft drift inserted in the inlet connection to push out the remainder of the valve assembly.

(6) Unscrew the end plug from the plunger chamber and remove the plunger and spring.

(7) Insert a soft drift into the plunger stem hole and push out the plunger guide and washer.

(8) Remove all sealing rings.

Assembling

8. New sealing rings must be fitted throughout and they should be lubricated with grease XG-315. Metal parts should be lubricated with clean oil OM-15.

(1) Insert the inlet seat into the valve chamber, chamfered face leading; ensure that it seats squarely in the bore of the chamber.

(2) Fit the distance sleeve, chamfered face leading, on to the outlet seat and lower the shuttle sleeve spring into position in the distance sleeve.

(3) Fit the shuttle valve into the slotted end of the shuttle sleeve and insert this assembly into the distance sleeve; larger end of the shuttle valve leading; rotate the shuttle sleeve to ensure that it seats squarely on the spring.

(4) Insert the above valve assembly into the chamber; ensure that the distance sleeve abuts the inlet seat.

(5) Fit the valve stop, stem leading, into the outlet seat.

(6) Fit the piston and main spring into the cylinder and the cylinder into the valve chamber, and tighten it against the outlet seat.

(7) Screw the adjusting bolt, with the lock nut, into the cylinder to approximately half its length but do not lock until final adjustment is made when testing.

(8) Fit the washer, chamfered face leading, into the plunger chamber followed by the guide, plunger seal leading.

(9) Fit the plunger spring over the guide and insert the plunger into the bore of the guide, taking care not to displace the sealing rings.

(10) Fit the end plug, tightening it against the guide.

(11) Fit the micro-switch on to the cylinder and secure it with the bolts, the washers and the nuts. Carry out the tests as detailed in *para.* 9 (1 to 5).

(12) Fit the banjo body, with a bonded seal each side, to the inlet connection; secure it, facing across and at 90 degrees to the micro-switch, with the banjo bolt.

(13) Fit the other banjo body, with a bonded seal each side, to the outlet connection; secure it, facing towards the plunger and at 90 degrees to the unit axis, with the banjo bolt.

(14) Carry out the tests as detailed in *para.* 10.

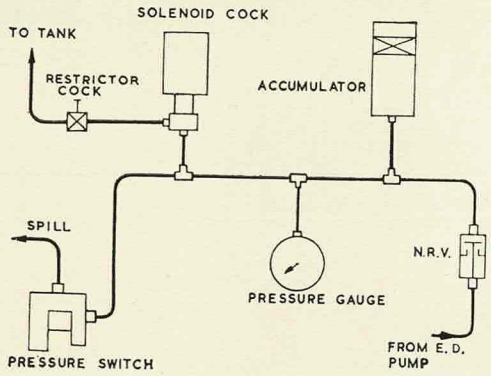

Fig. 4. Hydraulic test diagram

Testing

Pressure switch unit

9. Carry out all tests using oil OM-15.

(1) With the adjusting bolt removed, apply a pressure of 5400 lb/in² at the inlet and hold it for two minutes. Leakage is not permissible.

(2) Apply a pressure of 500 lb/in² at the outlet and hold it for two minutes. Leakage is not permissible.

(3) Fit the adjusting bolt and connect the unit to a hydraulic circuit *(fig.* 4) and an electrical circuit *(fig.* 5).

Note . . .

The length of pipe between the accumulator and the unit is to be as short as possible.

(4) Build up pressure at the inlet and set the adjusting bolt so that at 4550/4650 lb/in² the unit cuts out and the light is switched off; the solenoid cock will then vent the system through the restrictor cock. The unit must cut in and switch the light on at a pressure of 1850/2250 lb/in² when the solenoid cock will close and allow the system pressure to build up to 4550/4650 lb/in² again. The input flow rate and the restrictor cock opening are to be adjusted to give a cycling rate of 3 to 5 cycles/min.; 25 to 30 cycles are to be completed.

(5) With the unit cut in, i.e. the light switched on, apply and maintain a pressure of 3950/4050 lb/in² at the inlet. Leakage from the outlet must not exceed 0·30 cu.in/min. The clearance between the operating plunger and the micro-switch plunger must be at least 0·010 in.

Pressure switch assembly

10. With the outlet connection blanked, apply a pressure of 4600 lb/in² at the inlet connection. Leakage is not permissible.

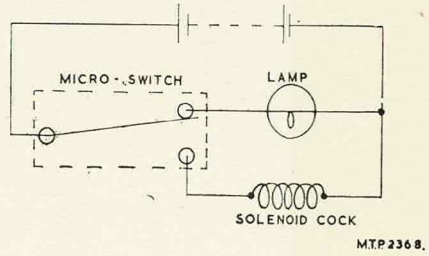

Fig. 5. Electrical test circuit

Appendix 1 PRESSURE SWITCH Type No. 1.00316.001

incorporating **PRESSURE SWITCH Type No. 1.00314.001**

Introduction

1. This assembly is identical to that described and illustrated in the chapter.

Appendix 2 PRESSURE SWITCH Type No. 1.00317.001

incorporating **PRESSURE SWITCH Type No. 1.00314.001**

Introduction

1. This assembly differs from that described and illustrated in the chapter only in that cone adapters are substituted for the banjo connections at inlet and outlet.

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