Chapter 25

ELECTRO-PNEUMATIC VALVE, DOWTY, TYPE C8421Y

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LIST OF ILLUSTRATIONS

Introduction

1. This unit is essentially a ball-type stop valve operated by a solenoid. It serves as a pilot valve which controls the flow of hot air to the hollow blades of a compressor on certain types of aircraft engine. The flow is either OFF or ON as necessary; when OFF, the solenoid is in the energized state.

DESCRIPTION

Valve (*fig. 1*)

2. A bore through the body of the unit houses two opposing assemblies. At one end, a flanged sleeve in the bore is secured against a ball seat by four bolts. A spring loaded plunger carried in the sleeve projects through the seat to contact a ball which is guided by the end of a piston. The piston is retained in position by a screwed plug which is recessed to house a spindle seal, a cup washer and a plain washer. The piston travel is adjusted to within measurements by inserting shims between the plain washer and the piston. The piston is counterbored to receive a spindle, holes at the bottom of the counterbore facilitating the displacement of air when the piston moves.

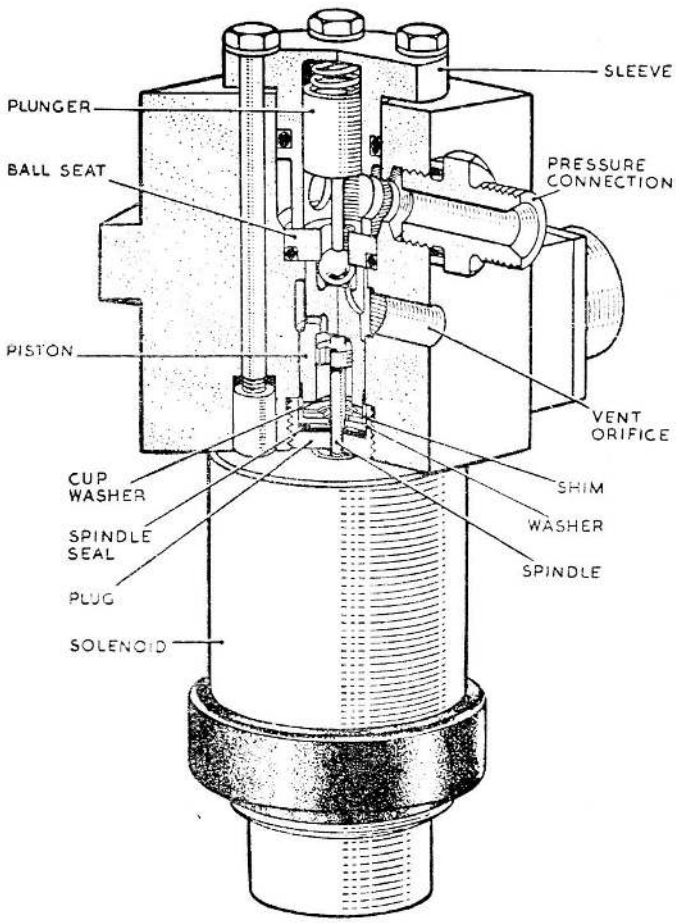

Fig. 1. Electro-pneumatic valve, Type C8421Y

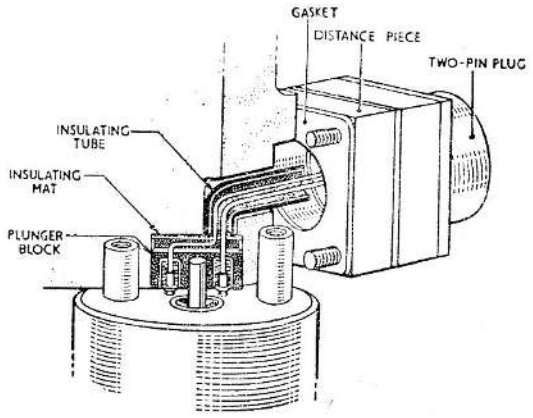

Fig. 2. Wiring details

3. The sleeve housing is intersected by a tapped hole which receives the pressure connection union. Holes through the wall of the sleeve and slots at the inner end of the piston provide a passage from the pressure connection to a vent orifice when the ball is lifted from the seat.

4. The solenoid is secured to the valve body by two of the four bolts securing the sleeve at the other end, the bolts engaging with the threaded sleeves projecting from the solenoid. The mating face of the valve body is recessed to house an insulating mat and plunger block. Two wires, connecting with the two spring-headed plungers, run through an insulating tube to connect with the two pins of the two-pole plug.

Solenoid A5151Y

5. The solenoid unit essentially comprises a coil and armature assembly located in a yoke assembly fitted with the necessary electrical connections.

6. The coil winding is wound onto a fibre glass sleeve, the ends of the wire being soldered into contact pins carried in insulating bushes located in holes in the end plate. The two threaded sleeves and a hollow soft iron core are mounted on the end plate, and the whole is located in a recess in the yoke which is spun over to retain it. The two threaded locating sleeves vary in length to eliminate the possibility of mis-mating with the unit to which it is coupled. A shallow slot is machined in the face of the end plate to provide an air vent.

7. The armature assembly comprises a soft-iron armature in which are located soft-iron sectors. These seat in a recess machined in the yoke and are retained by a rubber clamping ring. A threaded bush, secured to the armature by a lip, which is spun over, carries a locking spring. A sector anti-vibration spring is located against the sectors and the whole assembly is retained by a cover which is spun over a lip on the end of the yoke.

8. A plunger carrying a collar and a spring is located in the bore of the armature bush and the solenoid core and retained by an adjusting nut. This adjusting nut is locked by the locking spring which has two arms diametrically opposite each other. There are, however, an odd number of notches cut in the edge of the nut and therefore a half-notch adjustment is provided. A rubber shroud which covers the end of the assembly is fixed with a protective cap to prevent manual operation of the solenoid by depression of the plunger through the rubber shroud.

OPERATION

Solenoid

9. When the solenoid is mounted on the valve, the contact pins mate with contacts in the spring loaded plunger blocks on the valve body. In the de-energized condition a small spring in the pilot valve bore holds

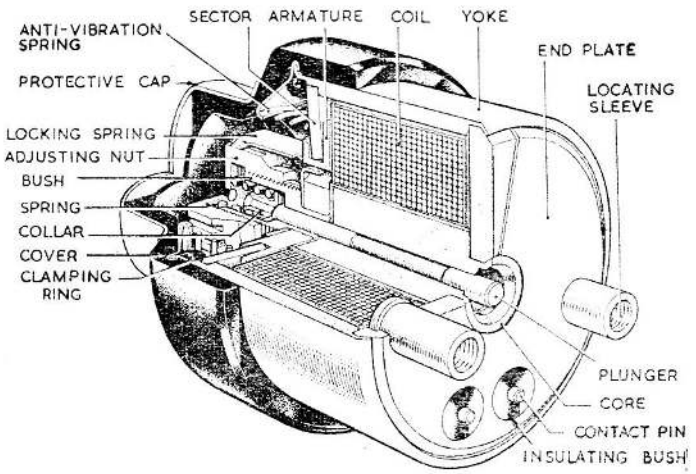

Fig. 3. Solenoid unit, Type A5151Y, Mk. 21

the armature assembly away from the coil against the pressure of the light anti-vibration spring.

10. When the coil is energized, it attracts the armature assembly and this movement is transmitted by the plunger and the spindle to operate the valve. The spring in the adjusting nut provides the slight amount of flexibility necessary.

Valve

11. When the solenoid is de-energized, the ball and piston are held away from the ball seat by the spring-loaded plunger in the valve bore. As a result air in the pipe attached to the pressure connection can escape to atmosphere via the vent orifice.

12. When energized, the piston is thrust against the ball by the extending movement of the solenoid plunger against the spindle located in the piston bore until the ball seals off the orifice in the ball seat. The plunger in the sleeve is driven back against its spring. The free passage through the valve is thus sealed off and pressure can build up in the pipe attached to the pressure connection. This condition is shown in fig. 1.

INSTALLATION

13. The letters A and B are marked on the terminal plug, and it is important that, on installation, pin A must be connected to the earthed side of the battery, when an earthed return wiring system is employed.

SERVICING

Valve

14. Should leakage occur, it will result in a failure to build up pressure in the pipe unit to the valve. If the seals in the sleeve or seat are concerned, they must be renewed. In the case of the ball valve, if cleaning is not effective, or if damage is evident, the faulty items must be renewed.

Solenoid

15. Should any fault occur in the solenoid or if damage is sustained, the unit must be returned to store and a new unit fitted to the valve.

TESTING

Resistance test

16. Measure the resistance of the solenoid coil winding ; this must be within the limits 68–72 ohms (corrected to 20 deg. C).

Insulation resistance

17. The insulation resistance between the body of the solenoid and each pin of the two pole plug should not be below 20 megohms when measured with a 250-volt insulation resistance tester.