ADMIRALTY
AIR MINISTRY

ELECTRICAL MANUAL, STATIC CONSUMER EQUIPMENT (AIRBORNE)
This is A.L. No. 8 to A.P.4343E, Vol. 1

Section 1. List of Chapters: delete "(to be issued later)" after the title of Chapter 2, and write "(A.L.8)" in the outer margin against the deletion.
Insert this Chapter 2 to follow Chapter 1. Record the incorporation of this A.L. in the Amendment Record Sheet.

Chapter 2

ELECTRO-PNEUMATIC VALVES (DUNLOP)

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Pneumatic pressure	1,100 lb. per sq. in.
Voltage	24
Electromatic valve	Part No. AC1119
Pneumatic pressure	450 lb. per sq. in.
Voltage	24
Electromatic valve	Part No. AC1031
Pneumatic pressure	450 lb. per sq. in.
Voltage	24
Unimatic valve	Part No. AC1165
Pneumatic pressure	450 lb. per sq. in.
Voltage	24

Introduction

1. The valves covered in this chapter are fitted in aircraft pneumatic systems to provide an electrical control for various services. A full description of the components from a pneumatic aspect, including their method of operation, is given in A.P.4303B, Vol. 1, Sect. 5, and reference should also be made to the relevant aircraft handbook for information on pneumatic installations in particular aircraft.

DESCRIPTION

Duo-electric valve (AC1130)

2. This valve (*fig.* 1) incorporates a cylinder block and a valve block, together forming a case which encloses two pairs of solenoid-operated valves and a pair of piston-operated valves. To the cylinder block half of the casing is fitted a 4-pin Breeze plug, and into the end of the valve block are fitted four air connections, which connect to the inlet, delivery, and exhaust pipe lines.

3. Each solenoid valve assembly (*fig.* 2) consists of an inlet end plate, to which is fitted a spring-loaded, normally-closed inlet valve; this engages with a valve seat in the casing which communicates with the air passage system. On the other side of the inlet end plate is a leaf-spring resting on the end of the solenoid case. The valve action is dependent upon the alternate opening and spring closing of the two pairs of solenoid-operated valves, in conjunction with the mechanical opening and closing of the pneumatic valves, following the operation of the pistons which are linked to give alternating reciprocating action to the valves.

4. When the solenoid windings are energized, the inlet end plates at both ends are drawn to the solenoid core against the resistance of the leaf-springs, thereby opening the inlet valves. Only one solenoid is energized at a time, and as one solenoid is energized the other automatically becomes de-energized, allowing the valves of that

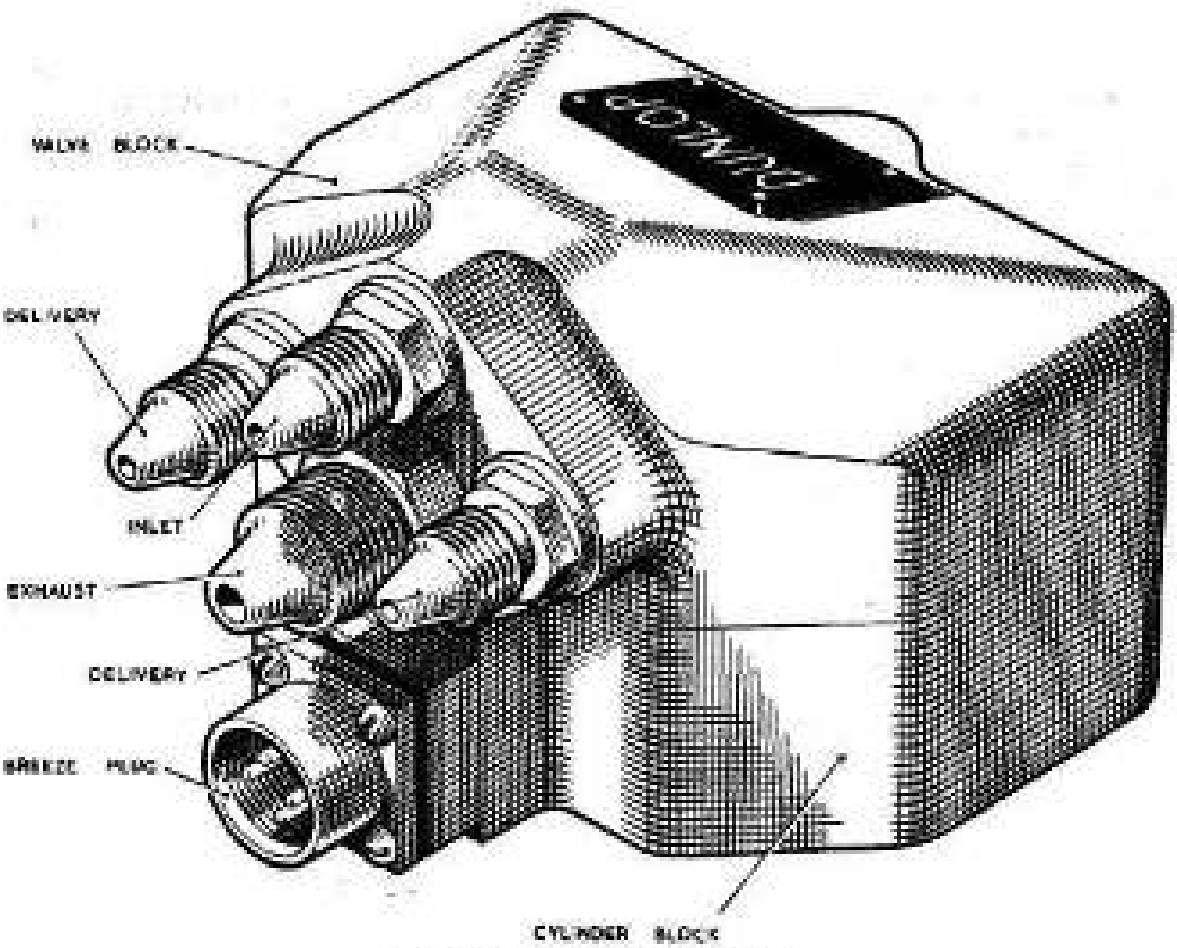

Fig. 1. Duo-electric valve (AC1130)

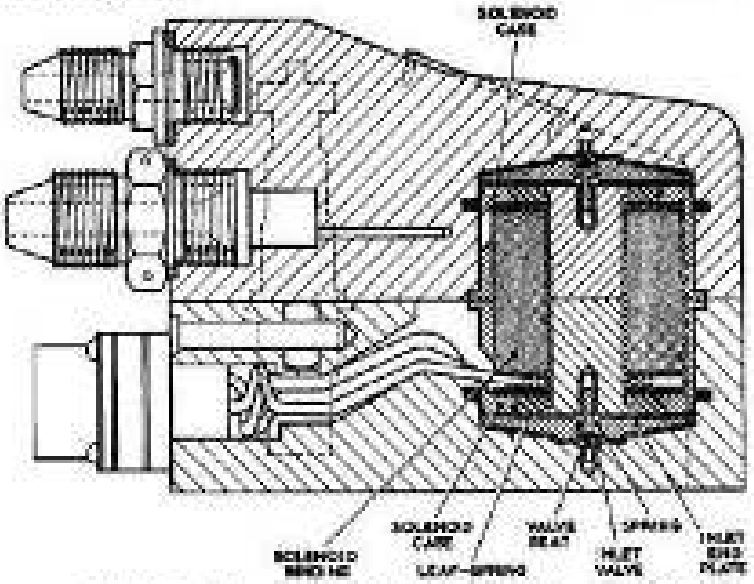

Fig. 2. Sectional view of duo-electric valve (AC1130)

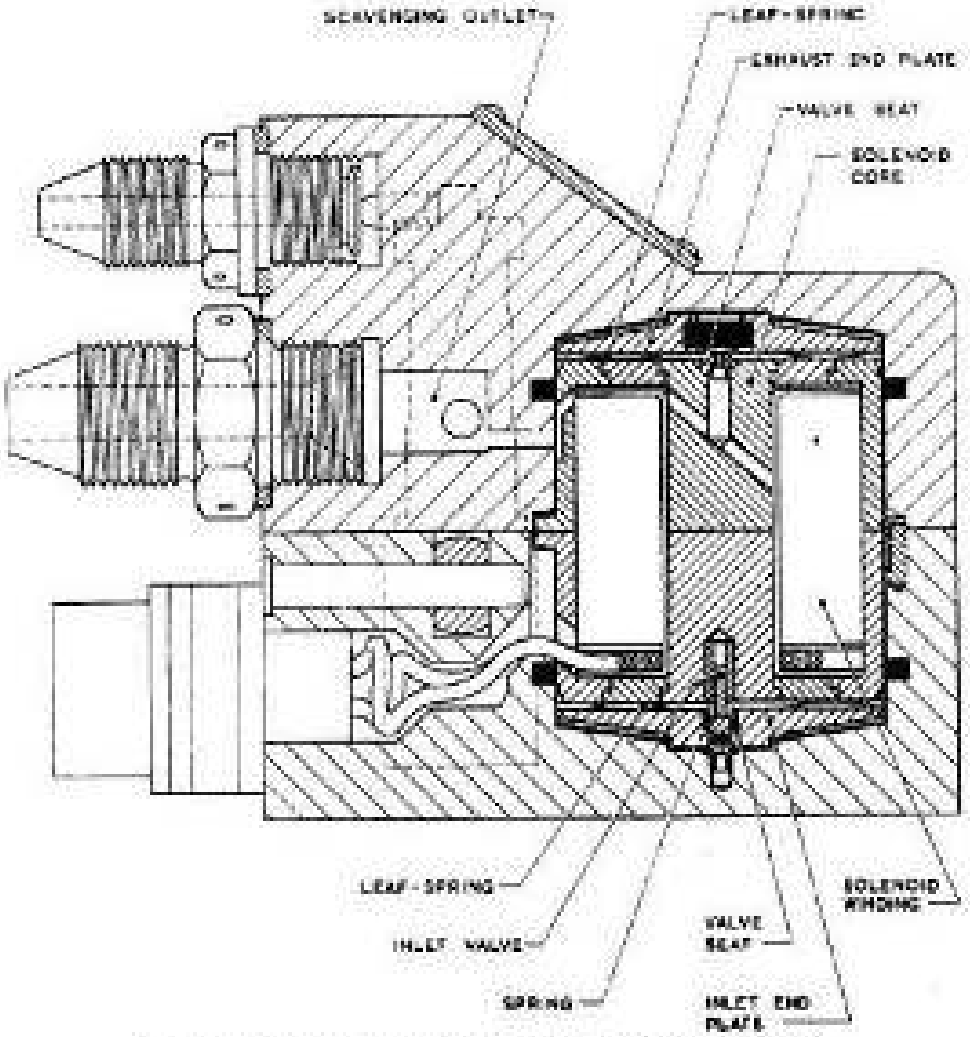

Fig. 3. Sectional view of electro-pneumatic valve (AC1810)

unit to close by spring pressure. When the current is switched off, all valves return to the closed position. This action of the solenoid valves controls the air flow to the piston-operated valves, and so controls the dependent pneumatic system.

Electro-pneumatic valve (AC1010)

5. This valve is of similar design to the duo-electric valve described above, but incorporates only one solenoid valve assembly and one pair of piston-operated valves. A 2-pin Breeze plug is fitted to the cylinder block portion of the casing, and the air connections to the valve block.

6. At one end of the solenoid assembly (*fig.* 3) is a normally-closed inlet valve, and at the opposite end a normally-open exhaust valve. The inlet valve is similar to those in the duo-electric valve, and connects with an air passage drilled in the casing. The exhaust valve, however, communicates with an air passage drilled through the centre of the solenoid core, and thence to the air system leading to the scavenging outlet.

7. When the solenoid winding is energized, both end plates are drawn to the solenoid core against the resistance of the leaf-springs; this opens the inlet valve, and closes the exhaust valve. This operation, in conjunction with the mechanical and pneumatic actuation of the piston-operated valves, controls the valve action. When the current is cut off, the inlet valve closes and the exhaust valve opens by spring return action.

Electromatic valve (AC1119)

8. The electromatic valve (*fig.* 4), which is designed to actuate a double-acting jack, is made up of three parts, a pressure base, a case, and a plug plate, secured together by a threaded centre spindle. To the pressure base are fitted the air connections, and at the opposite end of the valve is a 5-pin Breeze plug, mounted on the plug plate.

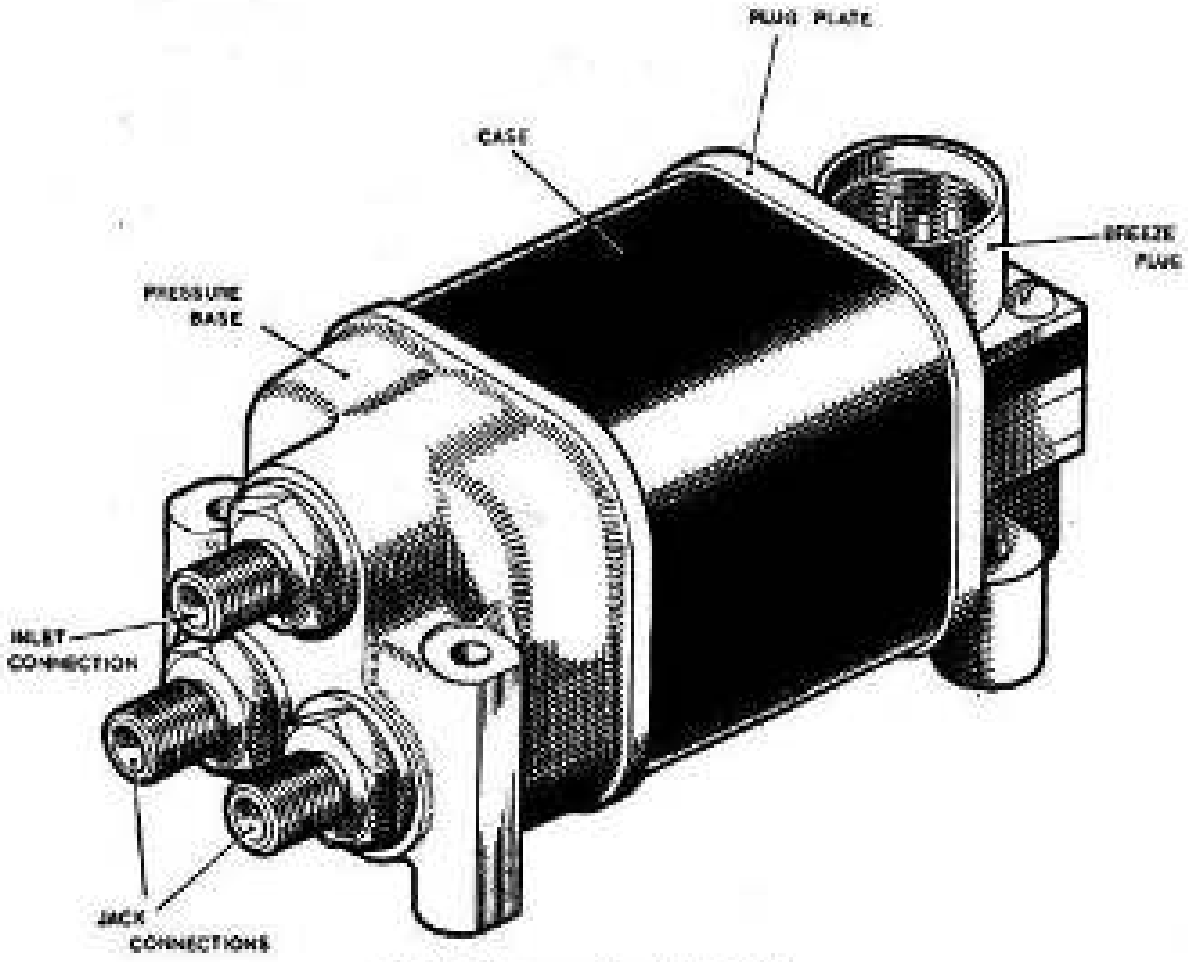

Fig. 4. Electromatic valve (AC1119)

9. The assembly incorporates four solenoid valves (*fig.* 5), two inlet valves and two exhaust valves, one of each being shown in the illustration. Each inlet valve assembly comprises a spring-loaded plunger, to the head of which is fitted an inlet valve. This normally engages with the valve seat, but energization of the winding attracts the plunger to the solenoid core, thus opening the valve. When the winding is de-energized, the plunger returns to the closed position by spring pressure.

10. Each exhaust valve assembly incorporates a plunger and push-rod, to the head of which is fitted an exhaust valve; the push-rod is spring-loaded to remain normally in the open position. When the winding is energized, the plunger is attracted inside the solenoid, thus driving the push-rod to close the valve; de-energization of the winding causes the valve to open again due to spring pressure.

Electromatic valve (AC1031)

11. This 5-way electromatic valve (*fig.* 6) is controlled by an inching control system or by a manually-operated switch in the pilot's cockpit, and actuates one single-acting jack (air cleaner) and two double-acting jacks (hot air flaps and radiator flaps). Ten solenoid-operated valves are contained within a case positioned between a pressure base and a pressure plate; these can be seen in the right-hand part of fig. 6, where the pressure plate has been removed. The pressure base has the five air connections fitted to it, and on the under side the 9-pin Breeze plug.

12. The unit houses seven inlet and three exhaust solenoid assemblies; these assemblies are in general the same as those in the AC1119 electromatic valve, and energization of the solenoids opens the inlet valves and closes the exhaust valves in a similar manner. A diagram showing the electrical connections is given in fig. 7; pin 9 of the Breeze plug is not connected.

Unimatic valve (AC1165)

13. This valve (*fig.* 8) is similar to the electromatic valve described above, but is designed to actuate a single-stroke spring-return jack, and incorporates two solenoid-operated valves instead of four, and is fitted with a 2-pin Breeze plug. The inlet valve and exhaust valve follow the same design, the inlet valve being normally closed and the exhaust valve normally open.

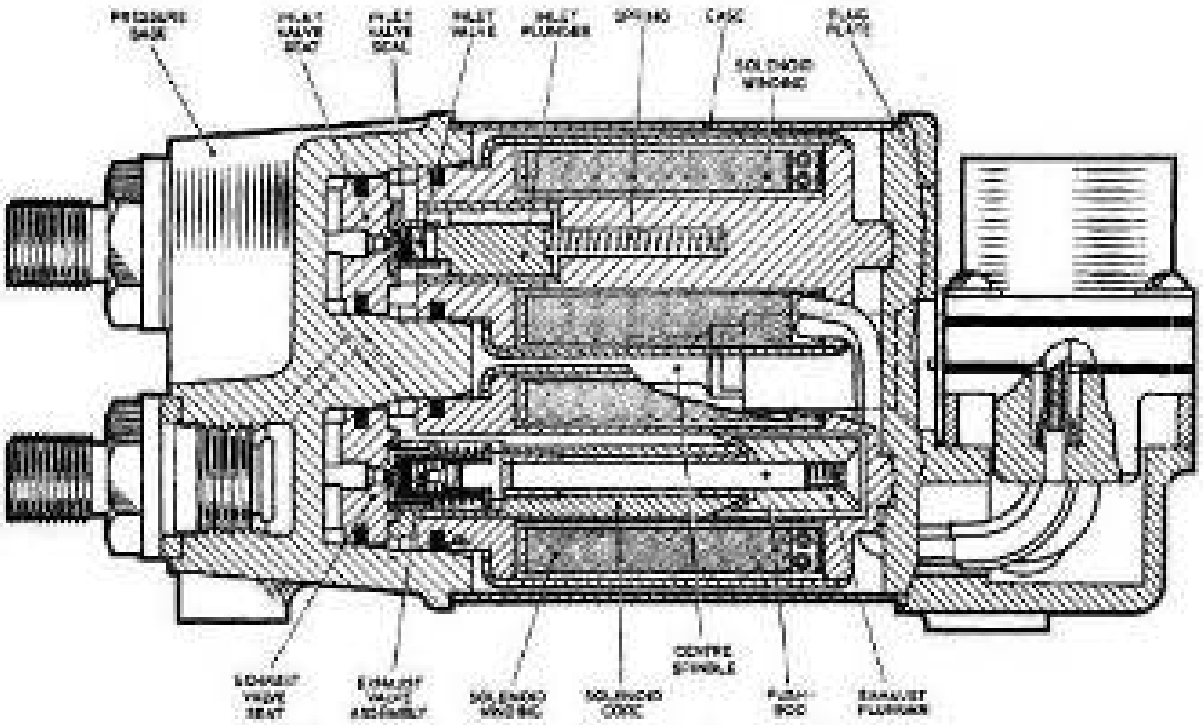

Fig. 5. Sectional view of electromatic valve (AC1119)

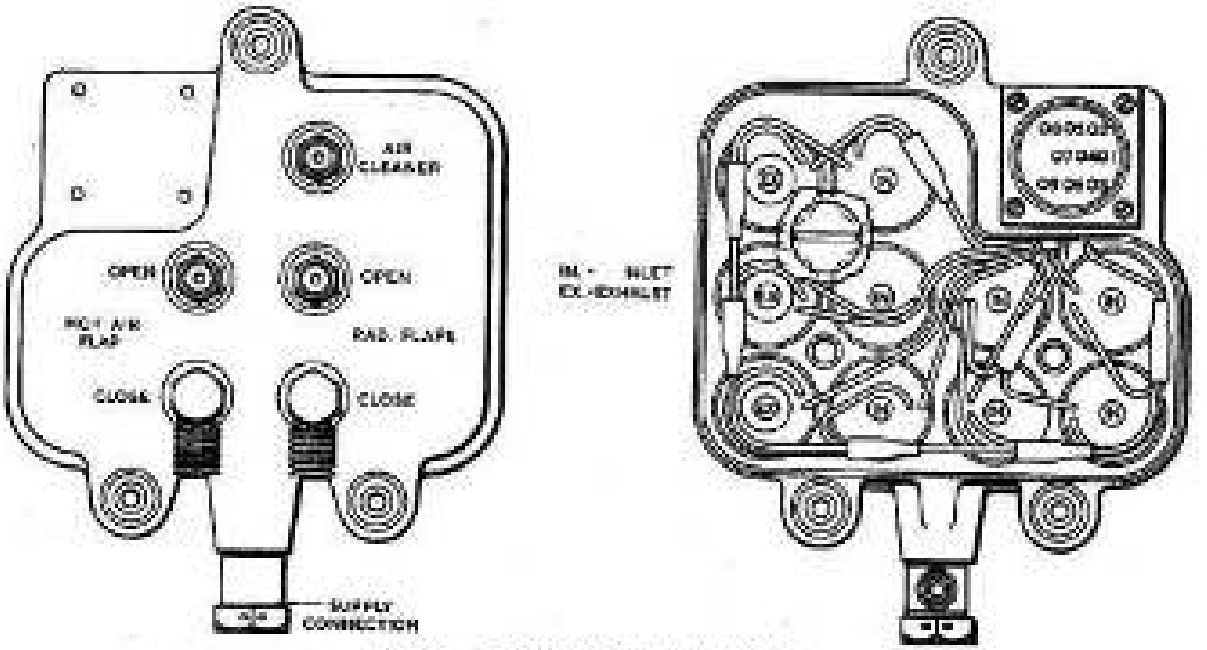

Fig. 6. Electromatic valve (AC1031)

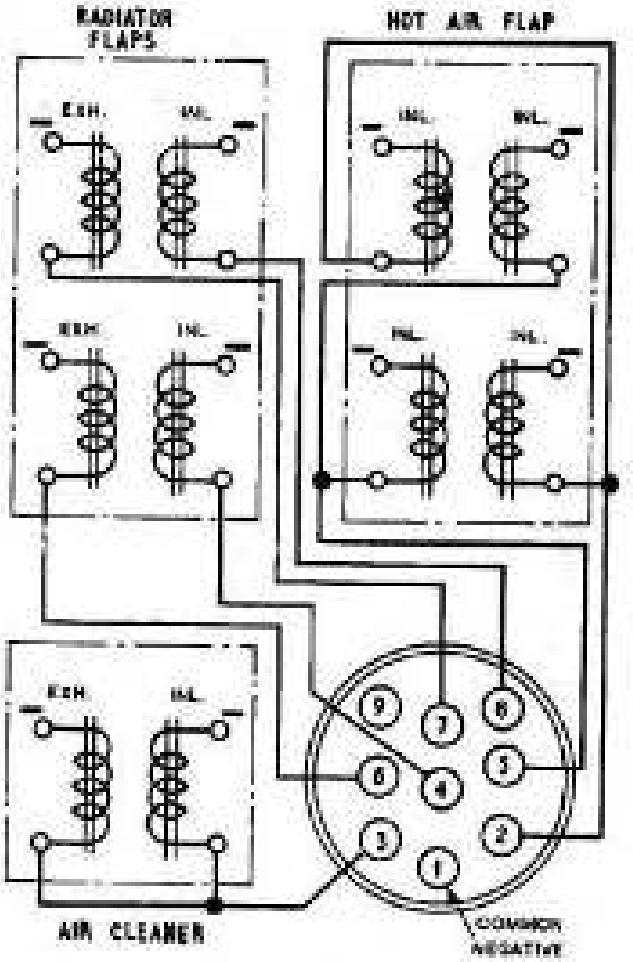

Fig. 7. Diagram of connections for electromatic valve (AC1031)

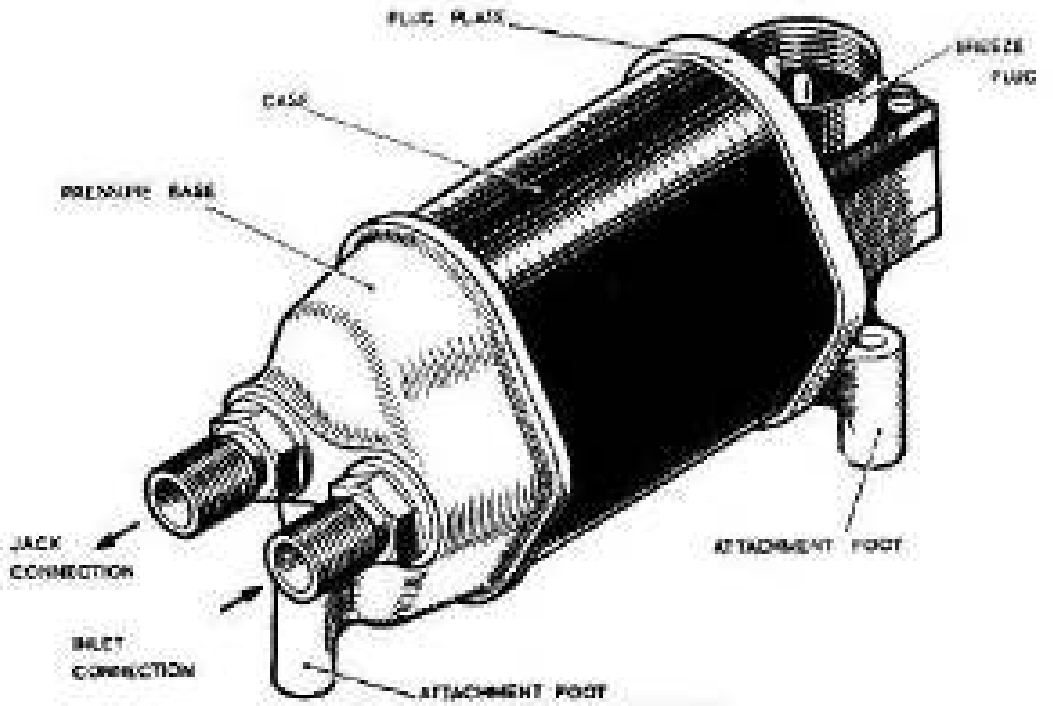

Fig. 6. Unimatic valve (AC1165)

14. When the solenoids are energized the inlet valve is opened and the exhaust valve closed, which controls the flow of air in the dependent pneumatic system.

SERVICING

15. The following paragraphs give details of various electrical tests applicable to the solenoids incorporated in the electro-pneumatic components covered in this chapter. Servicing of the complete units, including functional tests, is covered by A.P.4343B, Vol. 1.

Duo-electric valve (AC1138) and electro-pneumatic valve (AC1010)

16. Measure the insulation resistance of the solenoid to earth on a standard insulation resistance tester. The reading should be not less than 100 megohms.

17. Measure the coil resistance on an electrical bridge. At a temperature of 60 deg. F. the reading should lie between 130 and 140 ohms.

Electromatic valve (AC1119) and unimatic valve (AC1165)

18. Measure the insulation resistance to earth on a standard insulation resistance tester. The reading should be not less than 100 megohms.

19. Measure the coil resistance on an electrical bridge. At a temperature of 60 deg. F. the reading should lie between 197 and 220 ohms.

Electromatic valve (AC1031)

20. Measure the insulation resistance of the solenoid to earth on a standard insulation resistance tester. The reading should be not less than 50 megohms.

21. Check the unit for continuity, using a low reading bonding tester (Stores Ref. 5G/1618 or 2126). Neglecting the mounting bushes, plug pins and non-metallic parts of the plug, the resistance between any two points must not exceed 0·05 ohm.

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