Chapter 1

ELECTRO-HYDRAULIC VALVES (DOWTY)

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LIST OF ILLUSTRATIONS

Introduction

1. The magnet assemblies and solenoid control valves described in this chapter are fitted in hydraulic systems to give an electrical control for various services. The hydraulic components and their method of operation are described in A.P.1970D, Vol. 1, Book 3, Sect. 8, and reference should also be made to the relevant aircraft handbook for information on the electrical and hydraulic installations in particular aircraft.

DESCRIPTION

Magnet assembly, Type C2526Y, Mk. B

2. This magnet assembly (*fig. 1*) is fitted in the electro-hydraulic control valves, Types A39017Y, Mk. A, and A66035Y, Mk. A. These differ only in the locking of the air gap setting, which in the A39017Y, Mk. A, is made by a lock-nut, and in the A66035Y, Mk. A, by a stiff-nut. Each control valve incorporates two magnet assemblies.

3. The assembly is similar to the Type C796Y described in Chap. 13. Energization of the electro-magnet causes the armature to be attracted to the core. This movement, and the subsequent release of the armature when the magnet is de-energized, results in linear movement of the operating plate, this movement being transmitted to the lever. The relevant pilot valve is thereby alternately seated and unseated.

Solenoid control valve assembly, Type C2270Y

4. This assembly (*fig. 2*) is incorporated in the bomb door control units, Types C2281Y and C68860Y, and the undercarriage control units, Types C536Y and C68859Y. These units differ in that the former in each instance has a sealing ring of greater thickness incorporated, and a moulding ring fitted in place of the sealing ring and split washer at the base of the solenoid posts. The electrical control is provided by two solenoid control valve assemblies, indicated with heavy lines in fig. 2. That shown in section on the left of this illustration is the Type FAC/A/360, which differs from that on the right, the Type FAC/A/350, only in that the former is fitted with a 4-pole and the latter with a 2-pole Breeze plug.

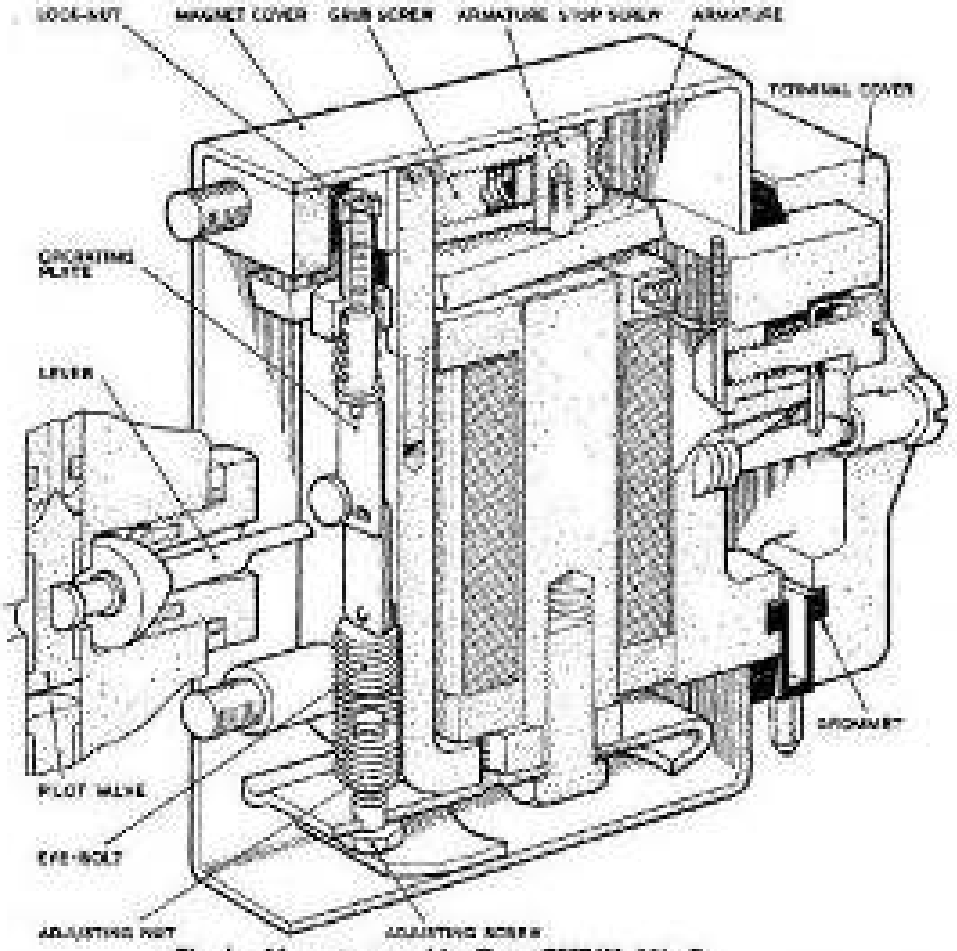

Fig. 1. Magnet assembly, Type C2826Y, Mk. 8

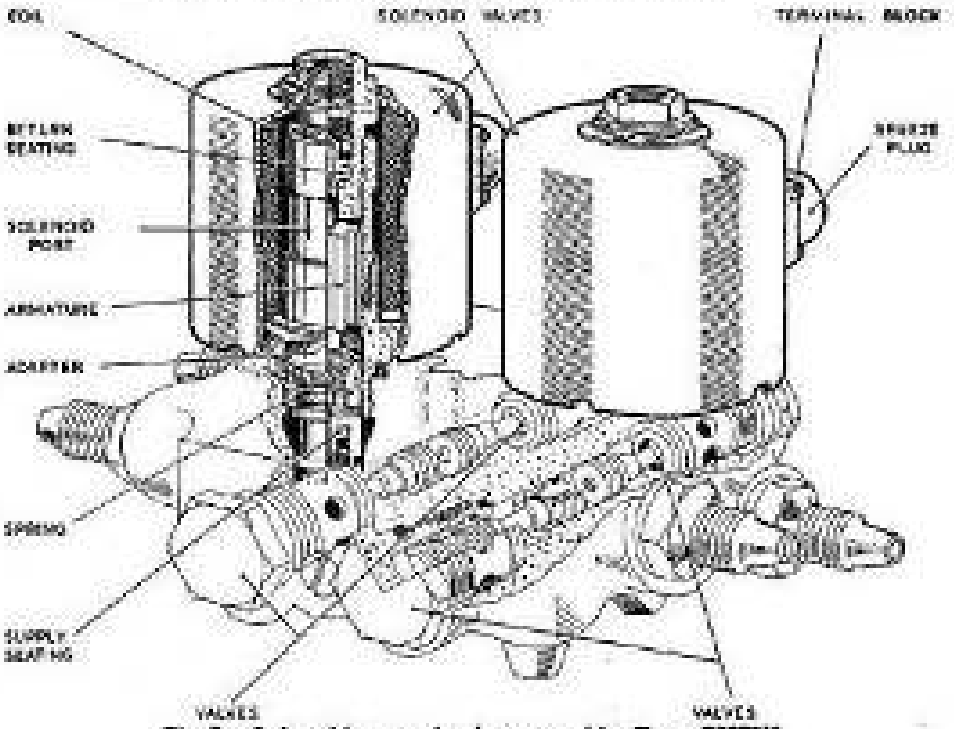

Fig. 2. Solenoid control valve assembly, Type C2270Y

5. These solenoid valve assemblies each control a pair of opposed spring-loaded hydraulic valves which are normally closed. Inside the solenoid post on each solenoid valve is a soft-iron armature, with a needle valve at each end. This is spring-loaded to remain normally in the down position, with the hydraulic connection to "supply" closed. The solenoid post is screwed into the housing which contains the solenoid winding, so that when the winding is energized, the armature is attracted upwards inside the coil.

6. Energization of the winding therefore moves the armature so that the valve element seats on the "return" seating, opening the valve to "supply." Pressure acting on the two opposed valves causes them to open, allowing hydraulic fluid to flow to the appropriate jack.

7. When the winding is de-energized, the armature is returned by spring pressure to its original position, thus closing the valve to "supply." The two opposed valves are closed

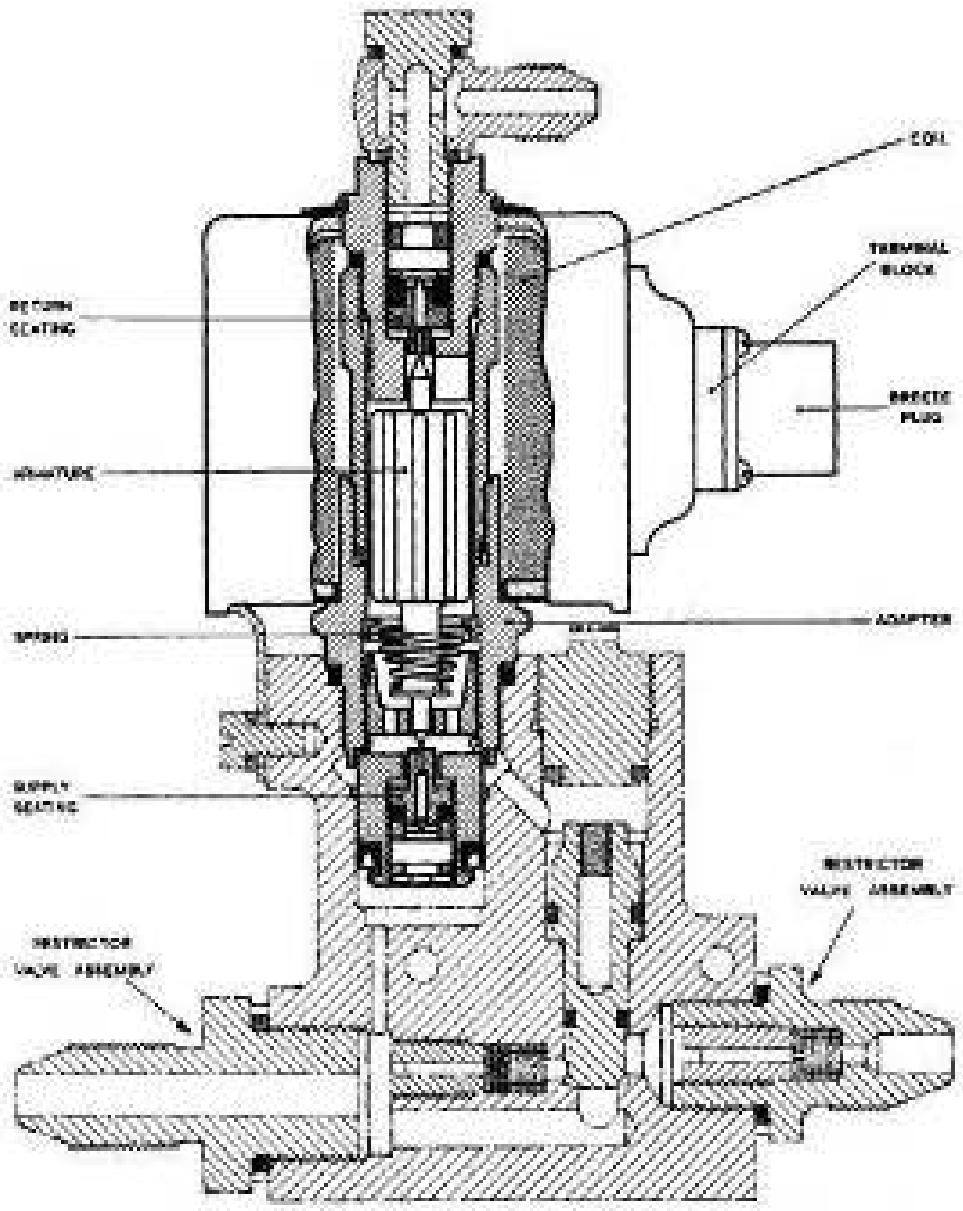

Fig. 1. Solenoid restrictor valve, Type C881Y

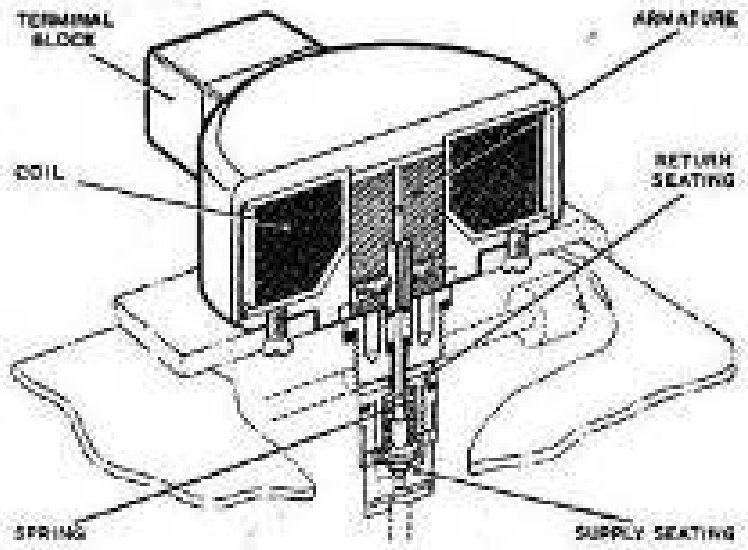

Fig. 4. Solenoid assembly, Type D238Y

by spring pressure, as there is no longer sufficient hydraulic pressure to keep them open; the supply to the jacks is then cut off for as long as the winding remains de-energized.

Solenoid restrictor valve, Type C883Y

8. This restrictor valve [*fig.* 3] is connected in the wing flaps circuit to provide a positive restriction throughout the full range of flap operation. It also provides an increased restriction to return flow from the flap jack between the MAXIMUM LIFT and UP position on the upward movement only.

9. The solenoid valve assembly, shown with heavy lines in the illustration, is the Type FAC/A/350, as fitted to the solenoid control valve assembly, Type C2270Y (para. 4). In the restrictor valve, Type C883Y, however, the solenoid valve controls the movement of a slide valve, which introduces a second restrictor valve into the circuit to provide the increased restriction.

Solenoid assembly, Type D238Y

10. This solenoid assembly [*fig.* 4], which is incorporated in the wing folding control unit, Type C717Y, operates on a similar principle to the one fitted to the solenoid control valve assembly, Type C2270Y, though it is of a different design. Three of these solenoid assemblies are fitted to the control unit, Type C717Y.

11. The solenoid assembly, which is shown with heavy lines in fig. 4, comprises a coil, and an armature secured by a grub screw to the stem of a normally-closed, double-ended pilot valve in the control unit. When the coil is energized, the armature moves upward to open the pilot valve, which will remain open for as long as the coil is energized.

SERVICING

12. The following paragraphs give details of various tests applicable to the electro-hydraulic components covered in this chapter. No dismantling is permissible, apart from the removal of the components for renewal.

Magnet assembly, Type C2526Y, Mk. 3

13. Check the resistance of the winding; the reading should be between 135 and 155 ohms.

14. Check the insulation between the winding and core; the reading should be not less than 20 megohms when measured with a 250-volt insulation resistance tester.

15. Check that the magnet operates correctly when the winding is energized on 16 volts, with the magnet fully adjusted and assembled to the hydraulic unit.

16. For functional tests relating to the whole assembly, reference should be made to A.P.1803D, Vol. 1, Book 3, Sect. 8, Chap. 10.

Solenoid control valve assembly, Type C2270Y

17. To remove the solenoid valve assembly, Type FAC(A/350) or Type FAC(A/360) unscrew the body/hd. adapter annotated in fig. 2. The solenoid post can then be unscrewed by turning the adapter at the other end of the coil.

18. Test the solenoid post as follows :—

(1) Apply hydraulic pressures at the union up to 200 lb. per sq. in., checking carefully for leakage at each 50 lb. per sq. in. stage. There must be no leakage.

(2) Raise the pressure slowly to 3,000 lb. per sq. in., and maintain this pressure for 2 min. There must be no leakage.

(3) Release the pressure, and repeat the test given in sub-para. (1).

19. With the solenoid post assembled in the solenoid valve, check the resistance of the winding ; the reading should be 62 ± 4 ohms at 15·6 deg. C.

20. Check the insulation resistance between the winding and the housing ; the reading should be not less than 30 megohms when measured with a 250-volt insulation resistance tester.

21. For functional tests relating to the whole assembly, reference should be made to A.P.1803D, Vol. 1, Book 3, Sect. 8, Chap. 8.

Solenoid restrictor valve, Type C633Y

22. The solenoid valve assembly, Type FAC(A/350, is removed from the restrictor valve in the same manner as from the solenoid control valve assembly, Type C2270Y (*para.* 17). The tests given in para. 18 to 21 also apply, and for functional tests relating to the restrictor valve as a whole, reference should be made to A.P.1803D, Vol. 1, Book 3, Sect. 8, Chap. 5.

Solenoid assembly, Type 9218Y

23. To remove the solenoid assembly, remove the studs securing the base plates to the main body. Unscrew the screws to detach the solenoid from the base plate. Slacken the grub screw, and withdraw the armature, taking care not to bend the stem of the pilot valve.

24. With the solenoid assembled, check that it will operate correctly when the winding is energized on 22 volts.