Chapter 18

MAGNETIC SWITCHES, ROTAX, D9600 SERIES

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Introduction

1. Type D9600 series single-pole, latched-in switches are designed for use in circuits where it is required to switch a 112 volt line by remote control through a 28 volt solenoid. Auxiliary contacts are provided for switching 28 volt circuits, while manual and remote control magnetic tripping mechanisms are incorporated. Most types are fitted with a bi-metal element, and some incorporate an economy resistance. Details of individual types will be found in A.P.4343C, Vol. 1, Sect. 4.

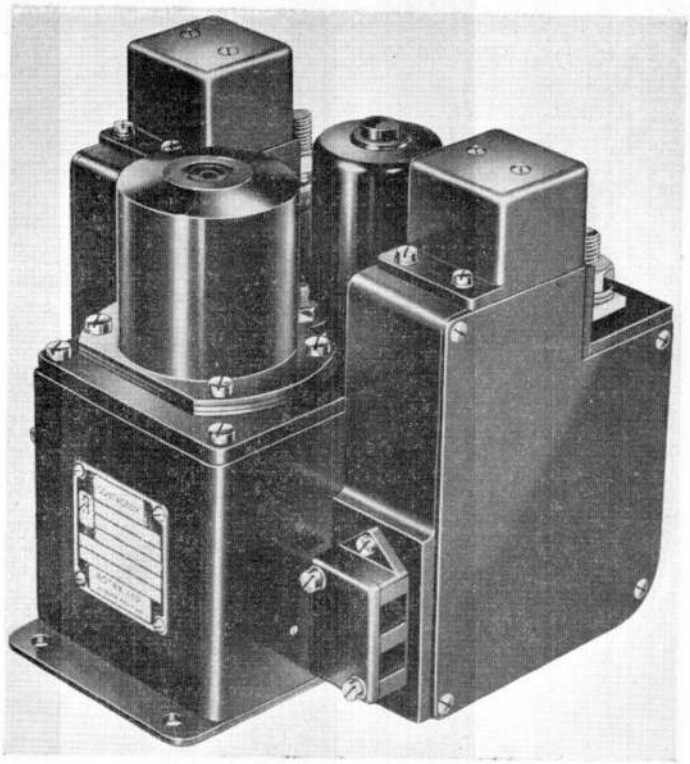

Fig. 1. A typical switch of the D9600 series

DESCRIPTION

2. The switch (*fig.* 1) consists of a toggle linkage set between the side plates of a switch frame which is mounted within a cast alloy body. Mounted on top of this body is the operating solenoid (whose plunger is connected to the toggle actuating pin) and the tripping coil assembly (which has the manual trip button projecting from it). An operating coil safety switch is fitted to one of the side plates and is actuated by an extension of the central hinge pin of the toggle.

3. Fitted to each side of the cast body is a moulded housing which contains one of the pairs of main contacts and also an auxiliary switch. Each main moving contact is fitted to an arm which is mounted on, but insulated from, a spindle which projects through the wall of the casting into the body. This spindle carries an actuating arm which engages the toggle mechanism. Each main moving contact is connected to an anchor post on the floor of its housing by a flexible copper braid, and the two posts are commoned through the body of the switch (via the bi-metal element, where fitted). The fixed main contacts are connected to external terminal posts on top of the housings by copper conductors. A de-ionizing grid, set within a moulded arc chute, is located above each pair of main contacts. The auxiliary switches are operated by cams fitted to the contact arm shafts.

4. A mechanical interlock is incorporated in these switches in order to ensure that, in the event of one pair of main contacts welding "on", the other pair will break the circuit independently, but will be prevented from reclosing until the weld has been remedied and the mechanism reset (*para.* 11). The contact shafts are independent and are rotated by the pushing action of a common toggle actuating pin on their two actuating arms. They are not therefore solidly connected, and differential movement of the contact arms can be obtained. The interlock consists of flat spring-steel strips, riveted to each actuating arm, which under normal conditions are deflected to rest one on each end of the actuating pin, but either of which will form a distance lock between the pin and its arm if the pin moves away from the arm.

Electrical connections

5. The main terminals are $\frac{5}{16}$ in. B.S.F. threads while all other terminals are 4 B.A. screw and washer assemblies. The operating coil and tripping coil terminals are set in a terminal block on the cast body between the

main terminals, while the auxiliary terminals are in blocks fitted to the ends of the moulded contact housings remote from the main terminals.

Operation

6. When the operating coil is energized, the plunger pulls the toggle linkage " overcentre " against the action of a return spring. One

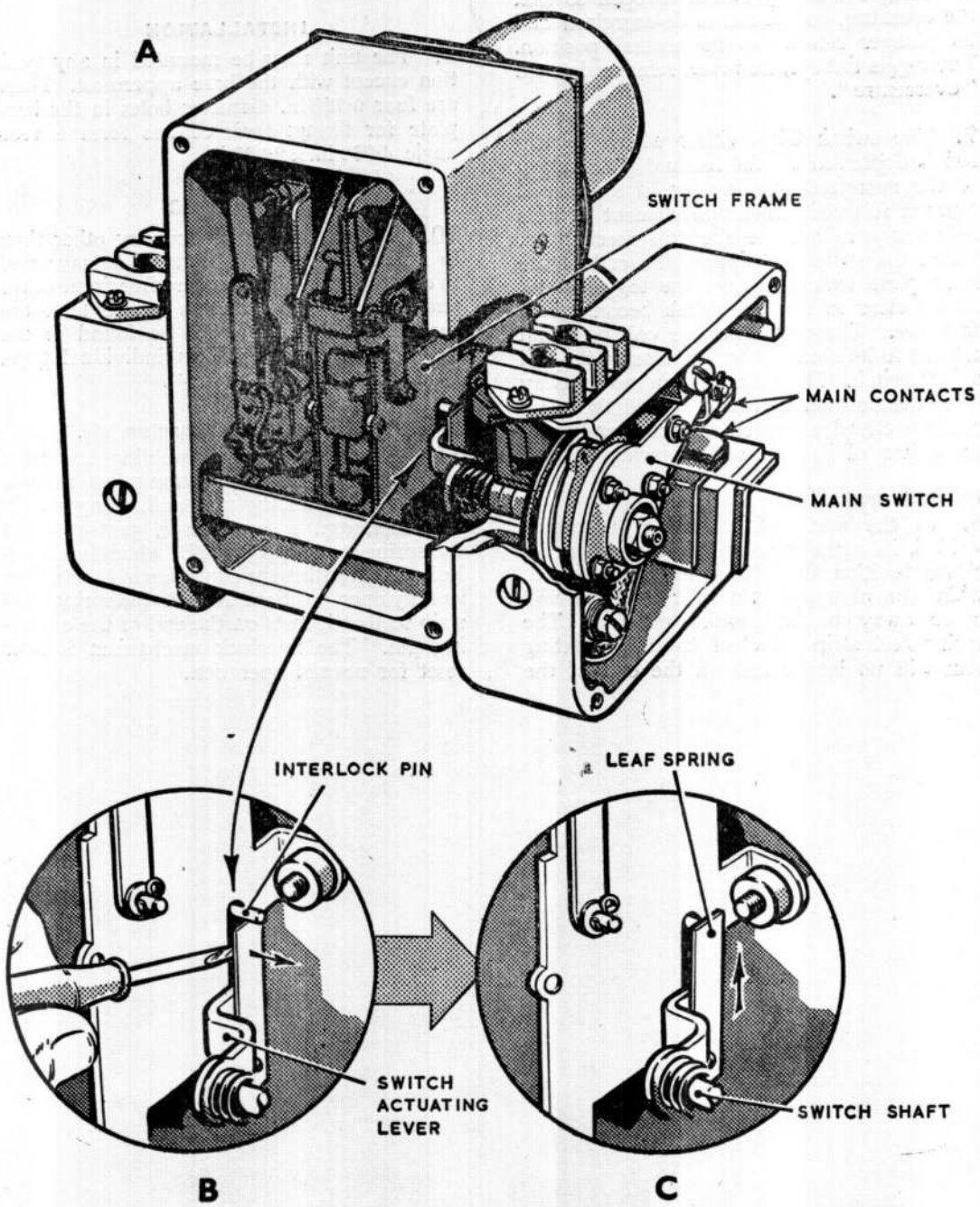

Fig. 2. Method of resetting interlock

end of the linkage is hinged to a further crank which is prevented from moving because its arm abuts the latch plate. The other end, however, carries the transverse actuating pin which operates the main contact arms. The main contacts close and the auxiliary switches are operated, while the centre hinge pin of the linkage allows the operating coil safety switch to open so that the operating coil becomes de-energized and its plunger returns to its normal position. The toggle linkage, however, remains latched "overcentre".

7. The switch trips, either when the trip rod is depressed by the manual push-button or the energized tripping, or, if a bi-metal element is fitted, when the element deflects sufficiently to operate the trip mechanism. When the switch is tripped, the end of the latch plate which engages the toggle crank moves clear so that the crank becomes free to move. The toggle linkage collapses and returns to its normal position, closing the coil safety switch. The actuating pin moves away from the position in which it held the main contacts closed, and each contact opens under the action of its own return spring.

Interlock mechanism

8. In the event of a contact becoming welded, its actuating arm will remain in the closed position after the switch has tripped, while the actuating pin of the toggle will move away to its normal position. The spring-steel strip attached to the actuating arm will no longer rest on the end of the actuating pin, but will spring in and abut on its periphery, forming a distance lock between the arm and the pin. If the operating coil again be energized, the toggle will not operate, because the movement of the actuating pin is restricted by the spring-steel strip, and the unwelded main contact cannot therefore be closed.

INSTALLATION

9. The unit may be mounted in any position except with the base uppermost. There are four 0·196 in. diameter holes in the base plate for fixing; their centres form a rectangle 4·750 in. × 2·000 in.

SERVICING

10. Little servicing is necessary other than to inspect the unit for signs of damage and to ensure that all contacts are free from burns and pitting. In instances where tests are recommended, details will be found in the appropriate chapter for an individual type. (A.P.4343C, Vol. 1, Sect. 4).

Resetting the interlock mechanism (*fig.* 2)

11. After the cause of welding has been established and remedial action taken, remove the base plate of the unit and, using a suitable tool, e.g., a screwdriver, gently deflect the spring-steel strip (*fig.* 2B) which has interlocked, permitting the contact arm to return to its fully open position. Release the spring-steel strip so that it rests on the end of the actuating pin. The interlock mechanism is now reset for normal operation.

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