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H. L. VAN VALKENBURG ET AL

2,304,972

ELECTRIC SWITCH

Filed Nov. 24, 1939

2 Sheets-Sheet 1

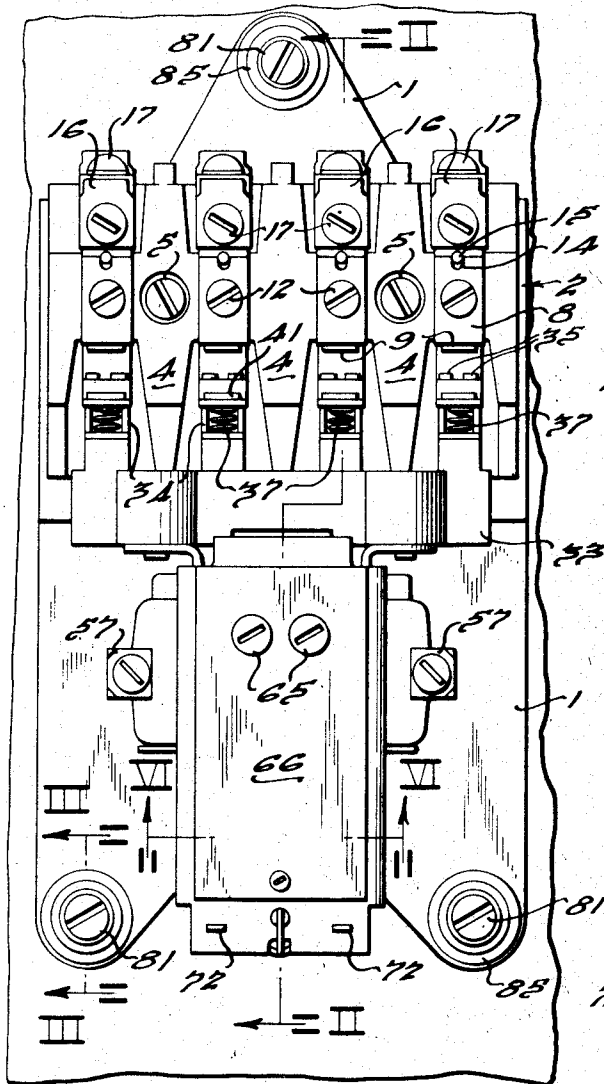


FIG. 1.

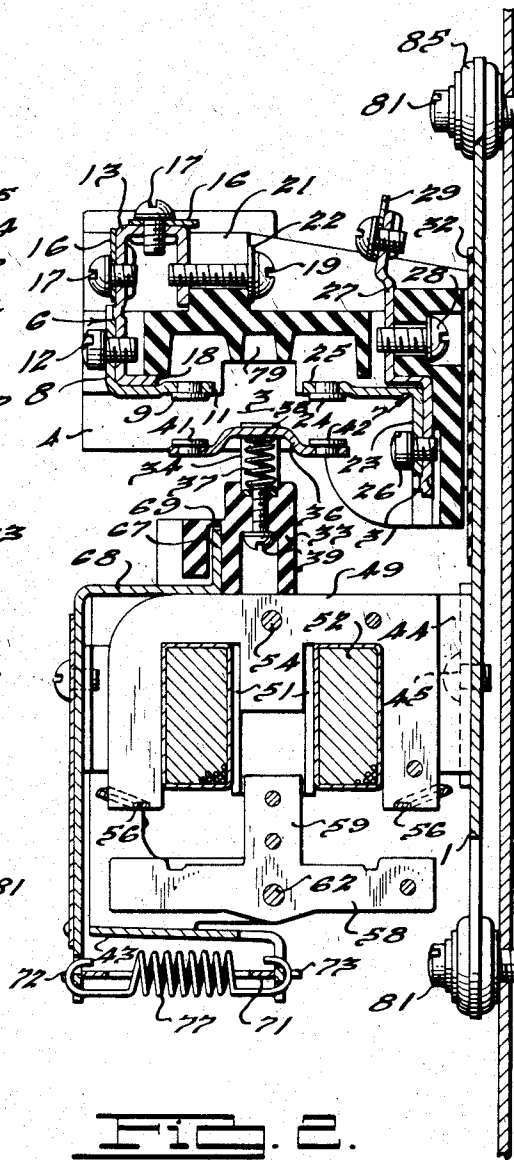


FIG. 2.

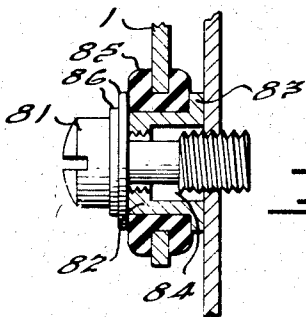


FIG. 3.

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2 Sheets-Sheet 2

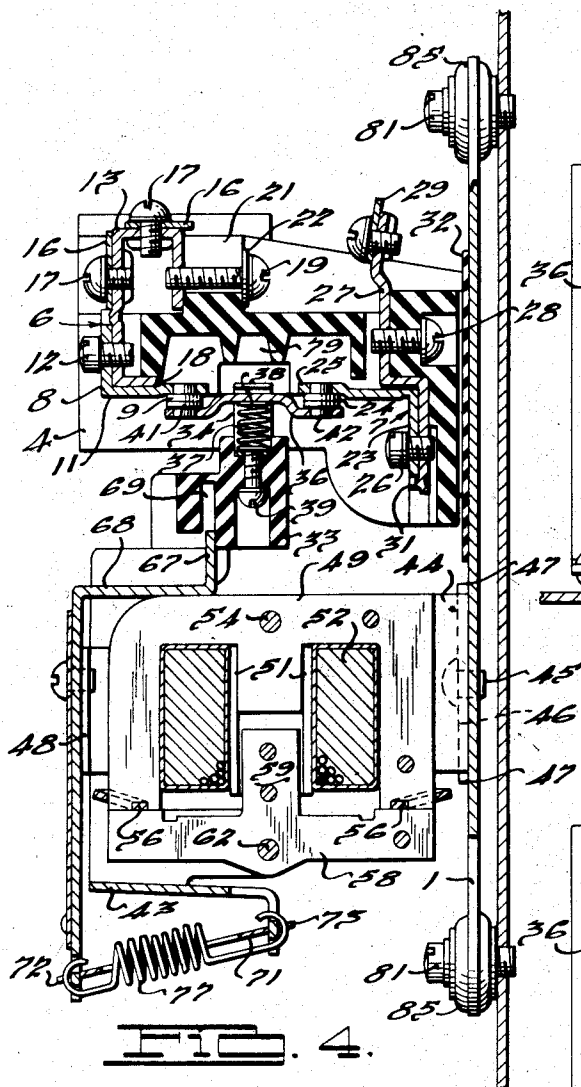


FIG. 4.

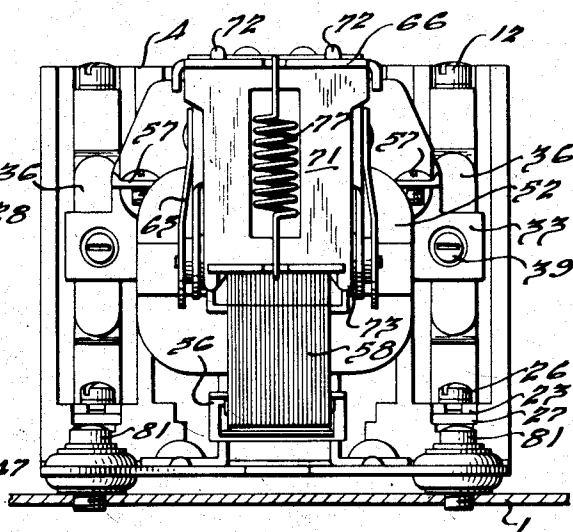


FIG. 5.

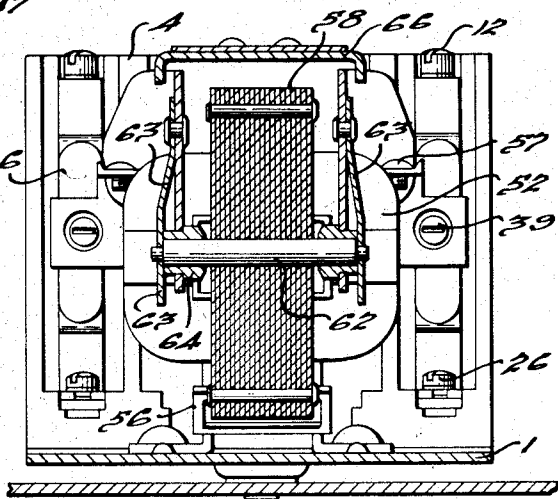


FIG. 6.

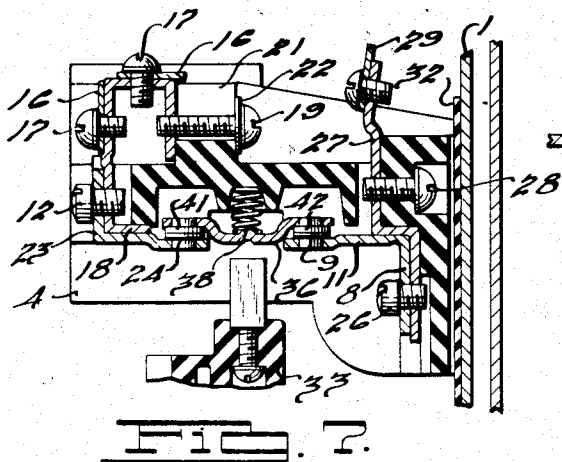


FIG. 7.

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ELECTRIC SWITCH

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Application November 24, 1939, Serial No. 305,880

9 Claims. (Cl. 200-165)

This invention relates to electromagnetically operated electric switches and has for its general object the provision of an electric switch of sturdy and economical construction with improved operating characteristics and provision for easy accessibility and ready convertibility of its operating parts.

Another object of this present invention is the provision of an electric switch in which the co-operating contacts may be readily changed from normally open to normally closed, and vice versa, in the field and without the addition of any parts.

Another object of the present invention is the provision of an electric switch having an improved means of mounting the movable contacts in their normally closed position.

Other objects and features of this invention will be readily apparent to those skilled in the art from the specification and appended drawings illustrating certain preferred embodiments in which:

Figure 1 is a front elevational view of an electromagnetic switch according to the present invention.

Figure 2 is a sectional view on the line II—II of Figure 1.

Figure 3 is a sectional view on the line III—III of Figure 1 enlarged and showing the construction of the mounting means.

Figure 4 is a view similar to Figure 2 but with the contacts in the closed position.

Figure 5 is a bottom plan view of the electromagnetic switch of the present invention.

Figure 6 is a sectional view taken on line VI—VI of Figure 1.

Figure 7 is a view showing the contacts in normally closed position.

The electric switch, according to the present invention, comprises a rear supporting plate 1 upon which is mounted, by means of studs 5, a contact block 2 having a plurality of individual switching recesses 3 formed therein by plurality of spaced barrier walls 4. Within each recess 3, at the front and rear thereof, are mounted stationary contact assemblies 6 and 7. The contact assemblies 6, mounted at the front in each chamber 3, are identical to one another, and the contact assemblies 7, mounted at the rear, are also identical. Each stationary contact assembly 6 comprises an L-shaped contact element 8 having a contact face 9 secured to the outside of a leg 11. The contact element 8 in turn is secured as by a stud 12 to a C-shaped conductor 13 supported at the front of block 2 in a manner to be hereinafter described. The contact element 8

is cut away as at 14 to engage with a teat 15 provided upon the conductor 13 for properly positioning the element 8. Carried upon the upper portion of the conductor 13 and at right angles to one another are terminal clamps 16 and their cooperating terminal screws 17. The conductor element 13 is held in position upon the block 2 by means of a horizontal leg 18 at the bottom which bears against the contact block, and a return bent portion at the top secured by stud 19 to an upstanding ledge 21 on the block.

Disposed at the rear of a recess 3 is the stationary contact assembly 7 comprising an L-shaped contact element 23 having a contact face 24 secured upon the inner face of its leg 25. It is to be noted that the contact face 22 is disposed upon a different face of its supporting leg than is the contact face 9 upon the corresponding leg 11. The contact element 23 is secured as by a stud 26 to a conductor element 27 which extends through an opening in the roof of the block 2 to the exterior thereof and is secured to the block by a stud 28. This conductor element carries at its outer extremity a terminal clamp 29 similar to the terminal clamp 16. A teat 31 is provided upon the lower extremity of the conductor 27 to cooperate with a cutaway portion on contact element 23 to position it. An insulating sheet 32 is disposed between the rear face of block 2 and the supporting plate 1.

The movable contact assembly comprises an insulating supporting block 33 having mounted thereon a plurality of generally U-shaped supports 34 which have their free ends bent inwardly as at 35 to maintain a contact plate 36 within the legs of the U-shaped supports. Within each of the U-shaped supports 34 is disposed a compression spring 37 adapted to bias the movable contact plate 36 against the bent portion 35. The spring 37 is maintained in place by spaced spring seats provided by a pressed out portion 38 on contact plate 36 and the extremity of a stud 39 which secures the U-shaped support 34 to the contact block 33. Upon the movable contact plate 36 and at the ends thereof are disposed contact surfaces 41 and 42 adapted to cooperate with the stationary contact faces 9 and 24. The thickness of contact plate 36 is less than the distance between the bent portions 35 so that the contact plate may be easily inserted edgewise and then upon being turned flat will be pressed against these bent portions by biasing spring 37. The insulating contact block 33 is secured to a movable generally U-shaped supporting member 43 and is movable thereby to

carry the movable contacts into engagement with the stationary contacts. The stationary magnet structure 49 is made up of generally E-shaped magnetic laminations and a pair of supporting brackets 44 riveted together into a rigid structure. The brackets have front flanges 48 for the reception of other parts and rear flanges 44 which are secured to plate 1 by studs 45 to support the magnet structure in place. Pressed out portions 47 are provided on the plate 1 to assist in properly positioning the bracket flanges. Disposed about the central leg of the magnet 49 are two U-shaped guide pieces 51 over which is fitted an operating coil 52 having terminals 57. The coil 52 is maintained in place upon this central leg by means of the L-shaped straps 53 having leg portions engageable with the bottom face of the coil. A stud 54 secures both the U-shaped guide pieces 51 and a pair of L-shaped straps 53 to the magnet 49. A shading coil 56 is placed upon each of the other legs of the E-shaped magnet 49. Cooperating with the magnet 49 is a T-shaped armature 58 having its leg 59 disposed within the opening between the opposed U-shaped guide pieces 51 and movable therein upon energization of the coil 52. The lower leg portions of the U-shaped supporting member 43 are provided with openings therethrough adapted to receive a removable pin 62. A pair of swinging resilient arms 63 are mounted on opposite sides of the supporting member 43 and serve to maintain the pin 62 in place. Pivotal support is provided upon pin 62 is the armature 58, the pin passing through an opening in the head portion thereof. Spacers 64 are carried by the supporting member 43 and serve to properly position the armature 58 upon pin 62. Thus, when armature 58 moves vertically upon energization of coil 52, the supporting member 43 will move in the same direction through its connection by pin 62 to said armature 58.

In front of the supporting member 43 and rigidly secured to the brackets 44 by studs 65 threaded into the bent portions 48 of the brackets is a guide member 66. A vertical leg 67 spaced backwardly by the horizontal leg 68 of the guide member is received within a slot 69 extending into the base of the contact block 33 to guide the contact block in its reciprocary movement. While the guide member 66 is in place the supporting member 43 though reciprocally movable cannot be removed from the switch. A flat hinge plate 71, having a pair of eared portions 72 and 73 at each end, interconnects the lower ends of guide member 66 and supporting member 43. The ears 72 are received in slots provided in the guide member 66 and the ears 73 are received in slots provided in a flange 76 on the supporting member 43. A spring 77 interconnects the guide member 66 and the flange 76 and exerts its bias upon said members so as to hold the eared portions 72 and 73 of the plate 71 within their respective slots. The provision of the pivotal construction serves to properly position the moving parts of the switch with respect to their cooperating parts and to provide for substantially rectilinear movement of the armature and movable contacts. This arrangement also permits the armature and movable contacts to be readily removed from and assembled on the switch. The spring 77 further provides a biasing force which assists the force of gravity in returning the switch parts to "off" position.

The operation and function of the parts will now be described:

The switch, as shown in Figures 1 and 2, is in the "off" position. Upon energization of coil 52, the armature 58 will be attracted to the E-shaped stationary magnet 49 and through the pin 62 will move the supporting member 43 vertically, stretching the spring 79 and carrying the insulating supporting block 33 secured to said member 43 in a like direction to move the contact surfaces 41 and 42 into engagement with the stationary contacts 9 and 24 and complete the circuit through the switch. Upon the deenergization of the coil 52, the armature 58 will move away from the stationary contact structure under the force of gravity assisted by the spring 77, thus moving the block 33 and associated movable contacts downwardly to separate the movable contacts from the stationary contacts. The contacts are guided in their reciprocary movement into and out of engagement by the cooperation of flange 67 of the guide member 66 with slot 69 in the base of the contact carrying block 33.

The contact arrangement above described is adapted for the ready conversion of the cooperating stationary and movable contacts into either the normally closed or normally open type. In the device shown in Figure 2, the contacts have been illustrated as of the normally open type. To change to a normally closed type, illustrated in Figure 7, it is only necessary to turn the contact plate 36 on edge and slip it out from between the legs of the U-shaped support 34 through the space provided between the bent portions 35; remove the contact elements 8 and 23, place the contact plate 36 within the upper portion of contact chamber 33 with its contact surfaces 41 and 42 facing downwardly and with the biasing spring 37 disposed within a recess 79 provided in the roof of block 2 to exert its bias against the back of the contact plate 36 then remount the contact elements 8 and 23 upon the block 2 but interchange their positions upon the block so that the element 23 will be secured to conducting element 13 at the front of the contact chamber and the element 8 will be secured to the conducting element 27 disposed in the rear of the contact chamber. This reversal of position will cause the contact surfaces 9 and 24 carried by said elements to now be facing upwardly instead of downwardly and the movable contacts 41 and 42 will be placed into engagement therewith under the bias of spring 37 to thereby furnish a normally closed switch. It is to be noted that there has been no addition of elements, merely a simple interchange of parts. With the arrangement of parts, energization of coil 52 will cause the supports 34 to engage contact plates 38 and move them upwardly to disengage the contacts.

To mount the supporting plate 1 upon a panel or other surface for operation, there is provided a novel mounting means shown in detail in Figure 3, and comprising a mounting screw 81 having threads upon its extremity, a sleeve 82 having a headed portion 83 and a longitudinal bore 84 therethrough with the extremity of said bore opposite said head being threaded, and a rubber grommet 85 fitting over the sleeve 82 and having a peripheral slot receiving the edges of an opening in the plate 1. To mount the plate 1, the grommet 85 is fitted into the opening in plate 1, the sleeve 82 inserted therethrough so that the head 83 bears upon the rear portion of the grommet, and the mounting screw 81 threaded through the sleeve and into a threaded opening in the surface to which it is to be attached. Washers 86 are disposed upon the screw 81 between the head of the

screw and the end of the sleeve 82. By this construction, an entirely resilient mounting for the switch supporting plate is provided which will minimize both transmission and reception of vibration from the switch operating parts.

While certain preferred embodiments of this invention have been specifically disclosed, it is understood that the invention is not limited thereto, as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims:

What is claimed is:

1. In an electric switch, an insulating structure, a pair of spaced stationary contacts mounted on said structure, a movable contact adapted to cooperate with said stationary contacts to bridge the same, means for effecting movement of said movable contact into and out of engagement with the stationary contacts, said stationary contacts being of dissimilar form and non-interchangeable with their contact surfaces facing in the same direction, but readily interchangeable when said contact faces are reversed, and said stationary contacts being non-reversible with respect to contact facing without said interchange, said movable contact being inversely mountable to cooperate with said stationary contacts in either position to provide a normally open or a normally closed switch optionally without additional parts.
2. In an electric switch, an insulating block having a plurality of contact recesses therein, a plurality of stationary contacts disposed within said chambers at the front and rear thereof, a plurality of bridging movable contacts adapted to cooperate with said stationary contacts, operating means for moving the movable contacts, said front and rear stationary contacts being of dissimilar form and non-interchangeable with their contact surfaces facing in the same direction but readily interchangeable when the facing of their contact surfaces is reversed and non-reversible without interchange, said contact surfaces cooperating with normally open movable contacts when facing in one direction and when interchanged and reversed cooperating with normally closed movable contacts.
3. In an electric switch, an insulating block, a plurality of stationary contacts mounted adjacent to the front thereof, a plurality of stationary contacts mounted adjacent to the rear thereof, a plurality of movable contacts adapted to bridge the aligned front and rear stationary contacts, operating means for moving the movable contacts, said front stationary contacts being non-interchangeable with said rear stationary contacts except when the direction in which the contact surfaces face is reversed and said contacts being non-reversible with respect to the facing of their contact surfaces except upon interchange of the front and rear stationary contacts, and said movable contacts being readily reversibly mountable for cooperation with said interchangeable stationary contacts in both positions to provide a normally open or a normally closed switch without additional parts.
4. In an electric switch, an insulating block having a plurality of contact recesses therein, a pair of horizontally spaced stationary contacts disposed within each of said recesses, movable contacts adapted to bridge said stationary contacts, supporting means for said movable contacts movable in said recesses to move said movable contacts, operating means having an operative connection with said movable contact sup-

porting means to provide for movement of the movable contacts to perform the switching operation, said horizontally spaced contacts being of dissimilar form and non-interchangeable with their contact surfaces facing in the same direction but readily interchangeable when the facing of the contact surfaces is reversed and being non-reversible with respect to contact surface facing without interchange, and said movable contacts being inversely mountable so as to cooperate with said interchangeable stationary contacts in each of their positions to provide a switch of the normally open or normally closed type without additional parts.

5. In an electric switch, an insulating block having a plurality of contact chambers therein, a plurality of stationary contacts disposed therein at the front and rear thereof, a plurality of terminal means connected to said stationary contacts, movable contacts adapted to bridge said stationary contacts, a member movable for moving said movable contacts, said front and rear stationary contacts being of dissimilar form and non-interchangeable except upon reversal of the direction of their contact surfaces facing and their contact surfaces being non-reversible without interchange of the front and rear contacts, said movable contacts being inversely mountable to cooperate with said interchangeable stationary contacts in each of their positions to provide a switch of the normally open or normally closed type.

6. In a switch, an insulating structure, a pair of horizontally spaced stationary contacts mounted on said structure, terminal means cooperating with each of said spaced stationary contacts, movable contacts adapted to bridge said spaced stationary contacts, a movable operator, said movable contacts being optionally mountable either upon said insulating structure, facing downwardly or upon said movable operator facing upwardly, operating means for said movable operator, said horizontally spaced stationary contacts being readily interchangeable with one another to cooperate with said movable contact in both positions to provide a switch of the normally open or normally closed type.

7. In a switch, an insulating block having a plurality of contact receiving recesses therein, a pair of horizontally spaced stationary contacts mounted within each recess, terminal means cooperating with each of said stationary contacts, movable contacts adapted to bridge said stationary contacts, operating means, said movable contacts being optionally mountable in two operating positions, said stationary contacts being readily interchangeable with one another and in one relation supporting said movable contacts in one operating position within said recesses in normally closed relation, said movable contacts being mountable upon said operating means in their second operating position and cooperating with said stationary contacts when interchanged in normally open relation.

8. In an electric switch, an insulating block having a plurality of contact chambers therein, terminals means mounted at the front and rear of said insulating block and extending within said contact chambers, oppositely extending contact carrying elements secured to said terminal means, movable contacts adapted to bridge the contacts carried by said elements, the front and rear elements being readily interchangeable and adapted in one position to support the movable contacts within the contact chambers to provide a nor-

mally closed circuit control, resilient means biasing said movable contacts against the contacts on said elements when in said one position, means movable to move said movable contacts to disengaged position, said means being adapted to support said movable contacts in a second position for cooperation with the contact carrying elements when interchanged to provide a normally open circuit control, and operating means for effecting movement of said movable member.

9. In an electric switch, an insulating block having a plurality of contact chambers therein, terminal means mounted at the front and rear of said insulating block and extending within said chambers, oppositely extending contact carrying elements secured to said terminal means and with the contact surfaces thereon disposed up-

wardly, movable contacts bridging said contact surfaces and supported within said contact chamber by said contact carrying elements to thereby provide normally closed circuit control, means movable to move said movable contacts to disengaged position, said contact carrying elements being readily interchangeable with each other to cause the contact surfaces thereon to face downwardly, the movable contacts being adapted to be supported by said movable means and to be moved thereby into engagement with said contact surfaces, when facing downwardly to provide normally open circuit control, and operating means for effecting movement of said movable member to perform the switching operation.

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