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2,899,513

ELECTRICAL SWITCHES

Filed April 9, 1957

2 Sheets-Sheet 1

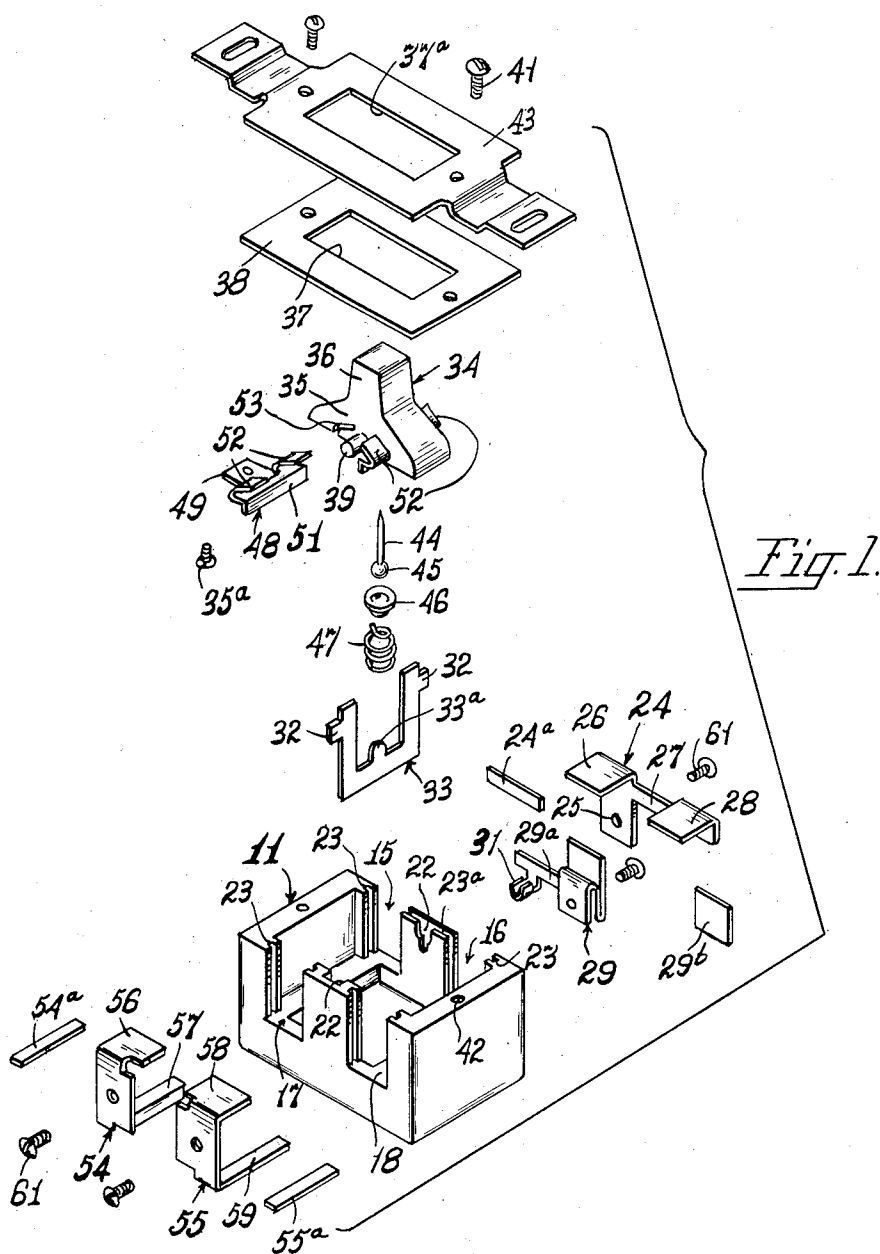
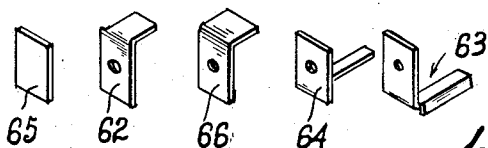


Fig. 1.

Fig. 7



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Fig. 2.

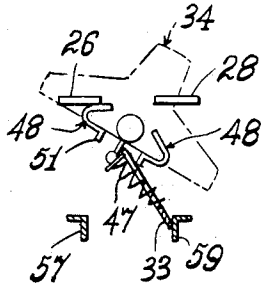


Fig. 3

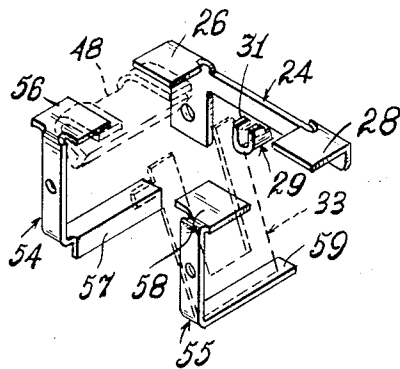


Fig. 4.

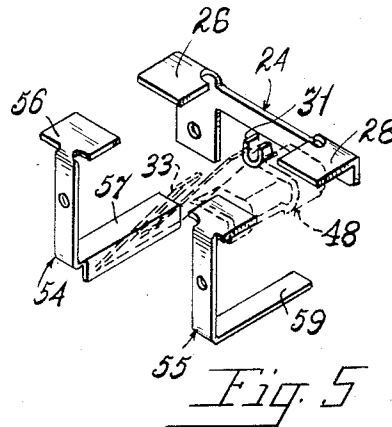
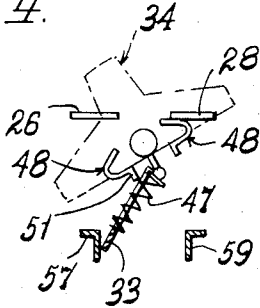
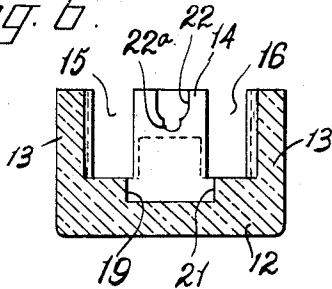


Fig. 6.



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ELECTRICAL SWITCHES

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7 Claims. (Cl. 200—67)

This invention relates to improvements in electric switches and more particularly to the structure and organization of a single or multi-pole switch for single and plural straight through or cross-over circuits, and is a continuation in part of my application Number 586,321 filed May 21, 1956 now abandoned.

The switch disclosed herein is a toggle type switch having novel contact structures therein arranged in a manner to permit it to be used in a multiple of different circuits. More specifically, the structure includes a hollow housing of insulating material having pairs of contact elements mounted in its side walls and to which the lines of two independent circuits may be connected. Mounted on the open top of the housing is an insulated cover plate underlying a conventional mounting strap and an insulation toggle type of lever mounted for rocking motion on integral trunnions journaled in suitable seats between the housing and cover plate. Oscillating means, in the form of a contact blade, is operably connected with the lever through a toggle type pin-spring connection and it is arranged to operate within the housing for selective contact with certain contact terminals on selected contact elements for closing selected circuits through the switch. The lever also carries rigidly on its bottom face and within the housing a pair of bridging conducting elements adapted for selective engagement with other contact terminals of the sets of contact elements for completing other circuits through the switch. The structure is such that when the switch lever is in one of its two spring biased positions, two straight line circuits are completed therethrough and when in its other spring biased position the circuits cross over in said switch so that two diagonally crossed circuits are completed. Otherwise stated, when the lever is in one of its positions, current in one circuit entering one of the terminals of one set of contact elements is carried straight across to a laterally opposed stationary terminal through one of the bridging elements on the lever, whereas current in another circuit flowing to another contact terminal of said set of contact elements is carried across to a terminal on a laterally opposed contact element through the spring biased contact blade. When the position of the lever is changed, current from said one first contact element is conducted to the contact element diagonally opposed thereto through the bridging elements on the lever whereas the contact blade will now complete a circuit diagonally opposed thereto.

The instant disclosure also includes modified forms of contact terminals which, when installed in the housing, afford different circuit paths for the circuits flowing there-through.

The structure by means of which the above noted and other advantages of the invention are attained will be described in the following specification, taken in conjunction with the accompanying drawings, showing a preferred embodiment of the invention, and several modified forms of contact terminals, in which:

Figure 1 is an exploded view, in perspective, of a four-way switch embodying features of the invention.

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Figure 2 is a fragmentary schematic view showing the lever and related parts in one position of use.

Figure 3 is a fragmentary schematic view showing lever in its other position of use.

Figure 4 is a perspective view of the contact arrangement, showing a lever carried bridging element and the spring biased contact blade in broken lines and in positions assumed when the lever is in the circuit closing position illustrated in Figure 2.

Figure 5 is a perspective view similar to Figure 4 but showing the other lever terminal and contact blade in the circuit closing positions illustrated in Figure 3.

Figure 6 is a vertical sectional detail view of the housing.

Figure 7 is a view illustrating a set of contact terminals of modified form.

Referring to the accompanying drawings, the switch includes a housing 11 which is molded of insulation material and includes a bottom wall 12, end walls 13 and connecting side walls 14. Each side wall has extending downwardly from its free upper edge a pair of spaced apart slots or openings 15—16 and 17—18 respectively and, as best shown in Figure 6, the bottom wall is centrally recessed to provide opposed lateral shoulders 19, 21. The inside face of each side wall also is recessed, as at 22, and the side faces of the openings 15—18 are suitably grooved, as at 23, all for the purpose of mounting novel contact structures or elements in the body.

A contact element 24, including a body portion 25, is fitted into the grooves 23 of opening 15 and it has at its upper end a contact terminal 26. A side extension 27 on the body portion 25 is seated in groove extension 23a and carries a contact terminal 28 that overlies the opening 16 and extends inwardly from the respective side wall into the housing. A second contact element 29 is fitted into opening 16 and it has a lateral offset 29a which lies in groove extension 23a and has a substantially U-shape contact terminal 31 that extends inwardly from the related recess 22. This contact terminal 31 seats in a recess extension 22a (Fig. 6) and constitutes a bearing journal in which one side trunnion 32 of a contact plate 33 is journaled for suspension within the housing. The other trunnion 32 of said contact plate is seated in a corresponding recess extension in recess 22 in the other side wall. Insulators 24a and 29b are arranged between contact elements 24 and 29 to insulate one from the other.

A T-shape operating lever 34, of insulation material, including an elongated base 35 and a perpendicular hand engaging portion 36, is mounted in housing 11 with its portion 36 extending outwardly through registering openings 37—37a in a cover plate 38 and strap 43 respectively, to permit access to be had thereto. The cover plate overlies laterally aligned trunnions 39 integral with the base 35 for journalling the lever 34 for rocking movement in recesses 22. Screws 41 secure the cover plate 38 and strap 43 to the housing by threaded engagement in tapped holes 42 on the upper edges of end walls 13.

The lever 34 is operably connected to contact plate 33 by means of a pin 44 depending rigidly from and embedded in the bottom face of base 35, which pin has a spherical tip 45 over which is seated a cap 46. A compressed coil spring 47 is interposed between cap 46 and a tongue 33a on contact plate 33 so as to cause said plate to be snapped into one or the other of its extreme positions when the lever 34 is rocked about trunnions 39.

A pair of contact elements 48 are secured to the bottom face of the base 35 by means of screws 35a. Each of these elements includes an attaching portion 49 which terminates at one end in a downturned flange 51 and which has angularly upwardly extending wings 52 adapted to be seated in slots 53 in the lever base. The wings 52 func-

tion as contact bridges and serve to limit sweep of lever 34.

The housing also carries another pair of contact elements 54 and 55 which are mounted in the housing openings 17 and 18 respectively. Insulators 54a and 55a are seated on the top faces of the respective contact elements. The contact element 54 includes a contact terminal 56 on its upper end and an elongated contact terminal 57 on its lower end. The terminal 57 is arranged in surface abutment with shoulder 19 in the housing bottom wall. The contact element 55 includes an upper contact terminal 58 and a lower contact terminal 59, the latter being seated against the bottom wall shoulder 21. All of the contact elements 24—29—54 and 55 are retained in place by the cover plate 38.

Referring now to Figures 2 and 4 which illustrate one of the two positions assumed by lever 34, the lever is shown rocked to the right. When in this position, one of the two contact elements 48 on said lever is carried into electrical contact through wings 52 with contact terminals 26 and 56 so as to provide a straight through connection between the electric lines connected to contact elements 24 and 54. At the same time the contact plate 33 is carried into abutment with contact terminal 59 of element 55 to thereby complete a second straight through circuit between contact element 29 and contact element 55. Such positioning of the contact plate 33 is attained by reason of the spring-toggle connection 44—47 between lever 34 and plate 33 and swinging action of the plate is initiated during initial rocking of the lever by abutment of related flange 51 with the upper end thereof. There is thereby established two straight through circuits, one between contact elements 24 through contacts 26, 52 and 56 and 54 and the other between contact elements 29 and 55 through contacts 31, 32, 33 and 59.

When the lever is rocked into its other position, that is to the left as illustrated in Figures 3 and 5, the contact terminals 28 and 58 are bridged by the contacts 52 on the other lever contact element 52 of attachment to provide a cross-over circuit between contact elements 24 and 55 through contacts 52, 28 and 58. At the same time, contact plate 33 is snapped to the left by abutment of the related flange 51 with said plate, whereupon it is brought into contact with contact terminal 57 on contact element 54. The resulting circuit is through contact element 29, plate 33 and contact element 54 through contacts 31, 32, 33 and 57.

The basic features of the 4-way switch described hereinabove can be utilized for the closing of other circuits by substituting contact elements of different specific construction for the elements disclosed herein above.

By omitting certain elements of the 4-way structure shown in Fig. 1 and substituting certain modified elements shown in Fig. 7, any one familiar with the art can construct various switch circuits covering the entire family of wall switches of which the following are representative.

For a one-circuit two-pole or a two-circuit one-pole "Off and On" switch, the elements 24, 54 and 55 are replaced by elements 62, 66 and 64, respectively.

For a one-circuit one-pole "Off and On" switch employing lower contact terminals only, parts 24, 54 and 55 are replaced by two elements 65 and an element 64, respectively.

For a three-way alternating circuit switch employing lower contact terminals only, replace parts 24, 54 and 55 with elements 65, 63 and 64 respectively.

For a one-circuit "Off and On" switch employing upper contact terminals only, replace parts 24, 29, 54 and 55 with elements 62, 65, 66 and 65 respectively.

When constructing a one-circuit "Off and On" or a three-way Switch using wiring elements 63 or 64 of Fig. 7, which employ lower contact terminals only, the contact terminals 56 and 58 of the four-way switch are not present, and the contact bridging elements 52 in this

instance merely operate to limit the sweep of toggle lever 34 to its extreme positions.

In a one-circuit "Off and On" or a three-way switch using wiring elements 62 or 66 of Fig. 7, and which employ upper contact terminals 26, 28, 56 and 58 only, said terminals are bridged 26 to 56 at one end of the switch or 28 to 58 at the other end of the switch by wings 52 on switch lever 34. The lower contact terminals 57 and 59 are not used in this instance and the plate 33 functions only as a spring carrying plunger which butts against shoulders 19 and 21 (Fig. 6) to restrict its oscillating movement to extreme positions.

Although a preferred embodiment and representative modifications thereof has been described in considerable detail hereinabove it will be understood that the description thereof is intended to be illustrative, rather than restrictive, as many details of the structure may be modified or changed without departing from the spirit or scope of the invention. Accordingly, I do not desire to be restricted to the exact construction disclosed.

I claim:

1. In an electric switch, a body of insulating material recessed from one face and including spaced side walls and a bottom wall, said side walls each having laterally aligned slotted openings one adjacent each end and opening onto the said one face, a first contact structure mounted in one of said openings, a bearing on said structure arranged inwardly of one side wall and midway between the openings therein, a bearing in the other side wall between the openings therein, a contact plate in said recess journaled in said bearings for oscillation longitudinally of the body, a lever, means operatively connecting the lever with the contact plate for moving the same into either one of its extreme positions, a second contact structure in the wall opening aligned laterally with the first contact structure, a contact terminal on said second contact structure overlying the bottom wall and engageable by the contact plate when said plate is in one extreme position adjacent an end of said recess, a third contact structure in another of said wall openings, a contact terminal on said third contact structure overlying the bottom wall and engageable by the contact plate when said plate is in its other extreme position, a fourth contact structure mounted in the wall opening aligned laterally with the wall opening containing the third contact structure, said third contact structure having a second contact terminal thereon and the fourth contact structure having a contact terminal laterally aligned with said second contact terminal, a contact element carried firmly by the lever and arranged to bridge said last two named contact terminals when the contact plate is in said one extreme position, a second contact terminal on said fourth contact structure, a second contact terminal on the second contact structure, and a contact element on the lever arranged to bridge said last two named contact terminals when the contact plate is in its said other extreme position.

2. In an electric switch, a body of insulating material recessed from one face and including spaced side walls and a bottom wall, said side walls each having laterally aligned slotted openings one adjacent each end and opening onto the said one face, a first contact structure mounted in said recess, a bearing on said structure arranged in the recess adjacent to one wall thereof, a bearing in the other side wall, a contact plate in said recess journaled in said bearings for oscillation longitudinally of the body, a lever, means operatively connecting the lever with the contact plate for moving the plate into either one of its extreme positions, a second contact structure in the recess, a contact terminal on said second contact structure engageable by the contact plate when said plate is in one extreme position, a third contact structure in said recess, a contact terminal on said third contact structure engageable by the contact plate when said plate is in its other extreme position,

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a fourth contact structure in said recess, said third contact structure having a second contact terminal thereon and the fourth contact structure having a contact terminal laterally aligned with said second contact terminal, a contact element carried by the lever engageable with said last two named contact terminals when the contact plate is in said one extreme position, a second contact terminal on said fourth contact structure, a second contact terminal on the second contact structure, and a contact element on the lever engageable with said last two named contact terminals when the contact plate is in its said other extreme position.

3. In an electric switch, a body of insulating material recessed from one face, a first contact structure mounted in the body, a bearing on said structure arranged in the recess, complemental bearing means in the body, a contact plate in said recess journaled in said bearings for oscillation longitudinally of the body, a lever, toggle means operatively connecting the lever with the contact plate for moving the plate into either one of its extreme positions, a second contact structure in the body, a contact terminal on said second contact structure engageable by the contact plate when said plate is in one extreme position, a third contact structure in the body, a contact terminal on said third contact structure engageable by the contact plate when said plate is in its other extreme position, a fourth contact structure aligned with the third contact structure, said third contact structure having a second contact terminal thereon and the fourth contact structure having a contact terminal laterally aligned with the second contact terminal, a contact element carried by the lever engageable with said last two named contact terminals when the contact plate is in said one extreme position, a second contact terminal on said third contact structure, a second contact terminal on the fourth contact structure, and a contact element on the lever engageable with said last two named contact terminals when the contact plate is in its said other extreme position.

4. In an electric switch, a body of insulating material recessed from one face and including spaced side walls and a bottom wall, said side walls each having laterally aligned slotted openings one adjacent each end and opening onto the said one face, a first contact structure mounted in one of said openings, a bearing on said structure arranged inwardly of one side wall and midway between the openings therein, a bearing in the other side wall between the openings therein, a contact plate in said recess journaled in said bearings for oscillation longitudinally of the body, a lever, spring means operatively connecting the lever with the contact plate for moving the plate into either one of its extreme positions, a second contact structure in the wall opening aligned with the first contact structure, a contact terminal on said second contact structure overlying the bottom wall and engageable by the contact plate when said plate is in one extreme position, a third contact structure in another of said wall openings, a contact terminal on said third contact structure overlying the bottom wall and engageable by the contact plate when said plate is in its other extreme position, a fourth contact structure mounted in the wall opening aligned with the wall opening containing the third contact structure, said third contact structure having a second contact terminal thereon and the fourth contact structure having a contact terminal laterally aligned with the said second contact terminal, and a contact element carried by the lever engageable with said last two named contact terminals when the contact plate is in said one extreme position.

5. In an electric switch, a body of insulating material having a recess in one face defining a bottom wall, end walls and connecting side walls, a first contact structure mounted on one side wall having a bearing disposed in said recess, a laterally aligned bearing in the other side

wall, an oscillatable contact plate in said recess and journaled in said bearings, means to oscillate said plate and for retaining it in either of its extreme positions, a pair of contact structures carried on the other side wall and each having a contact terminal extending into the recess adjacent to the bottom wall for selective abutment by the contact plate when the plate is in an extreme position so as to limit movement of the plate and to conduct current from the first contact structure through the plate to the abutted one of said pair of contact terminals, a fourth contact structure communicating with said recess, and contact elements on the oscillating means for providing an electrical bridge between the fourth contact structure and the one of the pair of contact structures not in electrical connection with the contact plate.

6. In an electric switch, a body of insulating material having a recess in one face defining a bottom wall and side walls, a first contact structure mounted on one side wall in said recess and having a bearing disposed in the recess, a laterally aligned bearing in the other side wall, an oscillatable contact plate journaled in said bearings, means operably connected with and actuable to oscillate said plate and to retain it in an extreme position, a pair of contact structures mounted on said other side wall and each having a contact terminal extending into the recess adjacent to the bottom wall for selective abutment by the contact plate when said plate is in an extreme position to conduct current from the first contact structure through the plate to the abutted one of said pair of contact structures, a fourth contact structure mounted on the said one side wall and communicating with said recess, and contact elements on the oscillating means for providing an electrical bridge between the fourth contact structure and the one of the pair of contact structures not in electrical connection with the contact plate.

7. In an electric switch, a body of insulating material recessed from one face and including spaced side walls, a first contact structure mounted in one wall, a bearing on said contact structure, a contact plate in said recess and journaled in said bearing and in the other side wall for oscillation relative to the body, a toggle lever operably connected to said contact plate for moving it into either one of its extreme positions, a second contact structure mounted in said other side wall, a contact terminal on said second contact structure engageable by the contact plate when said plate is in one of its extreme positions to establish an electrical circuit between said first and second contact structures, third and fourth contact structures one mounted in each side wall, and an electric contact element carried by the toggle lever for bridging the third and fourth contact structures to establish an electric circuit between said third and fourth contact structures when the first and second contact structures are bridged by the contact plate.

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