Oct. 3, 1933. C. E. AVERY 1,928,638

ELECTRIC SWITCH

Filed July 22, 1929

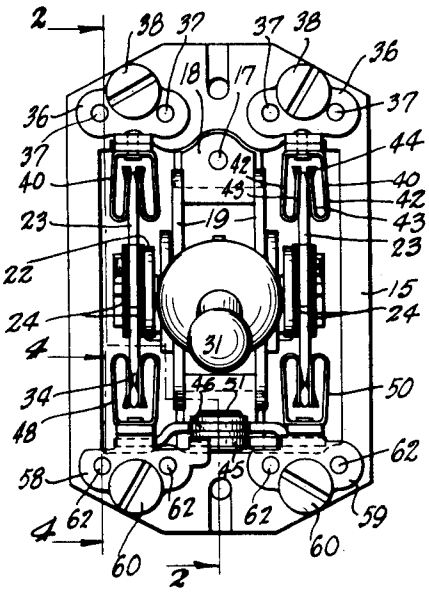


Fig. 1.

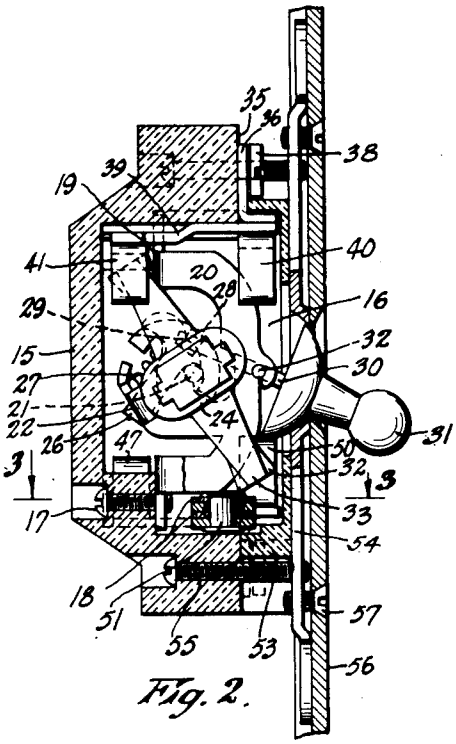


Fig. 2.

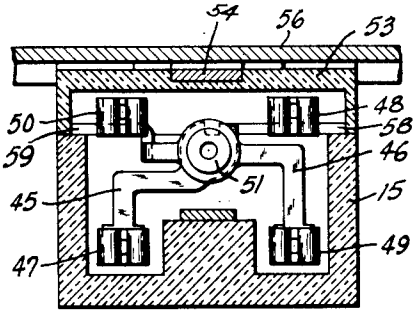


Fig. 3.

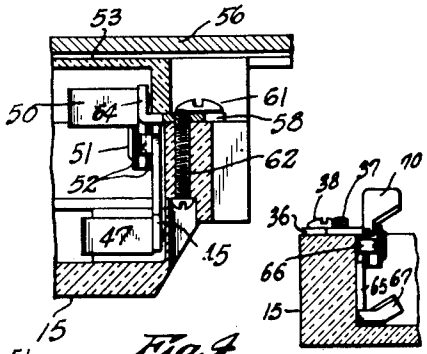
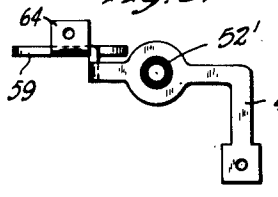
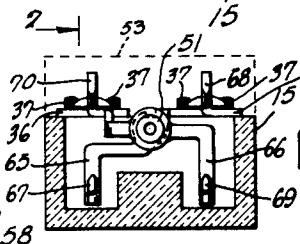


Fig. 4.





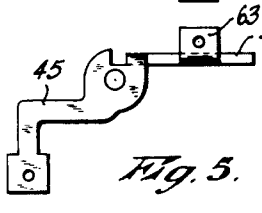


Fig. 5.

Fig. 6.

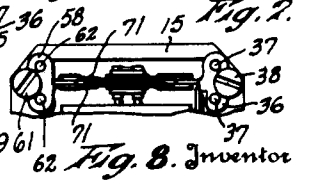


Fig. 8.

Inventor

Charles E. Avery

By

Worster & Davis

Attorneys

Patented Oct. 3, 1933 1,928,638

UNITED STATES PATENT OFFICE

1,928,638

ELECTRIC SWITCH

Charles E. Avery, Bridgeport, Conn., assignor to Harvey Hubbell, Incorporated, Bridgeport, Conn., a corporation of Connecticut

Application July 22, 1929. Serial No. 379,954

4 Claims. (Cl. 200—166)

This invention relates to electrical switches, and has for an object to provide a greatly simplified four way switch construction.

It is also an object of this invention to provide an improved construction of stationary and movable contacts in a switch which will give a better and more reliable contact at or immediately after closing a circuit when the current is the greatest to prevent undue sparking and injury to the contacts at this time.

It is a further object of this invention to provide an improved switch element which may be more easily constructed and with much less liability of short circuiting than in similar devices in the prior art, and to provide a corresponding contact element which will make a more positive contact than in the prior art devices.

With the foregoing and other objects in view, the invention consists in certain novel features of construction and arrangement of parts as will be more fully described in connection with the accompanaying drawing.

In this drawing,

Fig. 1 is a top plan view of a switch according to this invention showing a four way construction.

Fig. 2 is a longitudinal section thereof substantially on line 2—2 of Fig. 1.

Fig. 3 is a transverse section substantially on line 3—3 of Fig. 2.

Fig. 4 is a detail section substantially on line 4—4 of Fig. 1.

Fig. 5 is a side elevation of the two cross over supports for one set of contacts and shown in separated relation.

Fig. 6 is a section similar to Fig. 3 showing how the improved cross over arrangement can be used with the old type of male stationary contacts.

Fig. 7 is a detail section substantially on line 7—7 Fig. 6, and

Fig. 8 is a top plan view of one side of a switch using the contacts of Fig. 6 and showing the female type of movable contact element.

The embodiment of my invention shown comprises an insulating body member 15 in the present case molded in one piece, with a pocket 16 in which the switch mechanism is mounted. I do not, however, wish to be limited to this specific construction of the body member as any of the usual forms may be employed, as for instance, where the body is made in two sections secured together. The switch mechanism is secured to the bottom wall of the pocket by means of suitable screws 17 threaded into the base 18 of the bracket 19, the bracket in the present case being substantially U-shaped with spaced upright side members 20. Mounted in each side member 20 is a pivot 21 carrying a substantially U-shaped support 22 for either one or two switch members 23, there being two in the present showing mounted on opposite sides of the frame 20. It is carried to swing with the support on the pivot pins, and is insulated from the support by suitable fibre washers 24.

Mounted between the arms 20 of the bracket and projecting through an opening in support 22 is a T-shaped rocker 26, shown in partly dotted outline in Fig. 2. About the stem of the rocker 26 is a coil spring 27, forming a part of a load and fire toggle switch device. In the top of the rocker 26 is a notch 28 in which projects the shoulder 29 of an oscillating lever 30 to which is affixed the toggle handle 31. Lever 30 is pivoted to bracket 20 at 32, and when handle 31 is pivoted, it moves rocker 26, compressing spring 27 until the rocker is past dead center, whereupon the spring expands, completing the oscillation of the rocker and throwing the switch member 23. Although a particular toggle switch is described, the invention is not limited to use with this switch, but any other toggle switch or push button switch may be used.

The switch member 23 is a male switch element as at 33, and is beveled on its entering side as at 34. Shoulders 35 are provided by the body member 15 to which are affixed the lead connections 36 by means of screws 37, while binding screws 38 provide means for attaching lead wires thereto. At the opposite end of the body block are mounted lead connections 58 and 59 carrying binding screws 60 and secured to the body by screws 62. Attached to the lead connections 36 are contacts. At one end of body 15 the lead connections 36 have depending straps 39, and have upper contacts 40 and lower contacts 41 at each end of strap 39. These contacts comprise U-shaped spring member 42, preferably of sheet metal, having inturned prongs 43, thereby providing female contact members, and flaring wings 44 on each contact provide a more certain entrance for the male switch element 23. This movable male switch element and stationary, flared wing female contact have a material advantage when the circuit is first closed over the old type of movable switch element and stationary contact.

A common construction of switch at the present time is to make the stationary contacts the male elements and construct the movable contact of two substantially flat sheet metal spring members

arranged side by side and insulated from the rocking support. When the movable switch element is shifted to engage the stationary contacts in such a construction the spring plates of the movable element are separated by the stationary contact moving in between them, and due to the length of the movable contact plates, their construction and means of mounting there is considerable lateral vibration of these plates at this time because the contacts move to closed position with a very rapid movement. For this reason there is not a good and reliable surface contact or engagement between the stationary and movable contacts when the circuit is first closed and for a short time immediately thereafter. This is because the vibration of the contacts breaks the continuity of the circuit. Furthermore, this happens at the time of greatest load and for the period when the greatest current is flowing. Therefore, considerable trouble has been experienced with these switches, particularly in the contacts burning and deteriorating and soon failing, and also in the fire hazard. This is particularly true where the switch is used in circuits employing the modern gas or nitrogen filled lamps. It is a characteristic of these lamps that when cold and first lighted they permit a very large current to pass often as high as ten times the normal current required after they become heated. Thus, for example, in a circuit which normally requires ten amperes the current may be as high as one hundred amperes for the short time immediately after the circuit is closed while the lamps are heating up. While this heating requires only a short time, usually only a fraction of a second, still the heavy load and large current have a very injurious effect on the switch contacts, actually melting portions of their surfaces and causing sparks of molten metal when the switch is closed. With my new construction and arrangement of switch contacts shown I have greatly reduced and practically over-come this difficulty. Actual tests have shown that with my new contacts there is much less sparking at the contact surfaces when the switch is closed than in the old type of switches with the same load and conditions, and that the switch can be operated much longer before failing. There is also a greater danger in the old switches of the sparks igniting dust, lint and the like which accumulates in the wall boxes, causing fires. With my new construction of contacts it is easier to get the contacts in proper relative positions and maintain them therein than in the old forms as the movable switch element is merely a flat bar and the stationary or female contacts are on one piece. Also as will be seen in Fig. 1 the outer arms 42 are of greater length than the inner arms 43, so that these different lengths give different periods of vibration which tend to neutralize or dampen each other, and thus the contacts if they do vibrate do not vibrate as a whole, and maintain more nearly the proper contact with the movable switch element as the switch is closed.

At the other end of the body 15 the lead contacts 58 and 59 have criss-crossed depending straps 45 and 46 respectively so that the lower contact 47 is connected to the same lead connection 58 as is the diagonally opposite upper contact 48, and likewise lower contact 49 is connected to the same lead 59 as is its diagonally opposite upper contact 50. The straps 45 and 46 are held firmly by the rivet 51 and are insulated from each other by suitable fibre washers 52 and bushing 52' about the rivet. The straps 45 and 46 are preferably in one piece with the members 58 and 59 respectively, and these members have integral ears 63 and 64 extending laterally therefrom to which the upper contacts 48 and 50 are respectively connected.

When assembled, the cover 53 is held on the body 15 by the strap 54 which is screwed thereto as at 55. Strap 54 then provides means for holding the whole mechanism to the wall outlet box (not shown) and face plate 56 may be secured thereto by means of screws 57.

As shown, the upper and lower contacts provide a four way switch, but it may easily be converted into a one-way, two-way or three-way switch by the omission of appropriate upper and/or lower contacts, and by appropriate wiring. Or the four-way switch shown may be used with three-way switches for controlling the same lamp from three different floors. With this arrangement the lamp may be controlled from any floor regardless of the position of the switch on the other floors, and if there are more than three floors it is merely necessary to add an additional four-way switch for each additional floor.

From the foregoing description it will be seen that the depending straps with their upper and lower contacts provide a construction which may be easily assembled in the insulating body, while the new construction and arrangement of the male switch and female contacts is a material improvement over the old constructions in length of service, reliability, and decreased fire hazard. It will also be apparent that the same body element may be used for switches of other types and hence the different types may be assembled in a body member made from a single mold, thereby greatly simplifying manufacture. In Figs. 6 to 8 is shown how the cross over straps 65 and 66, corresponding to straps 45 and 46 respectively, and the means for mounting them can be used to carry straight male stationary contacts 67, 68, 69 and 70 corresponding to the female contacts 47, 48, 49 and 50 respectively. These male contacts are preferably stamped from sheet metal in one piece with their respective straps and then bent to the proper position for use. With this type of stationary contact is ordinarily used a female movable contact comprising two thin metal spring plates 71 carried by the rocking support 22 and insulated therefrom. When the switch is closed the two plates of the movable contact engage the opposite sides of the stationary male contacts as indicated in Fig. 8. This is to show that the cross over straps and their means of mounting in the body are not limited to use with the specific contact construction shown in Figs. 1 to 5.

As the cross over straps or connections 45 and 46 are in one piece with the members 58 and 59, these cross overs and the contacts 47 and 49 are secured in the body by the screws 62. Extra mountings and insulating elements for the lower contacts are therefore, unnecessary, the only insulation required being between the cross overs and this is a simple bushing 52' and washers 52.

Having thus set forth the nature of my invention, what I claim is:

1. In a switch, an insulating body member, a pivoted male switch element, a supporting member including means for connection to a lead wire mounted on said body member and against an inner wall thereof, and a female contact mounted on said supporting member and extending out-

wardly thereof substantially at right angles thereto and comprising a strip of resilient sheet metal of substantially U-shape with the free ends of the side portions extending inwardly adjacent each other and in the same general direction as the side members, said free end portions converging slightly toward each other and being adapted to receive the male switch element between them, contacting first at their extreme tips and lying flat against the male element after it is fully entered.

2. In a snap switch including a rocking member operated for a quick closing action by means of a spring in which energy is first stored and then released to give the quick action, said member being a substantially flat bar mounted to rock in the plane of the bar, a stationary contact comprising a strip of resilient sheet metal of substantially U-shape with the opposite side portions curved inwardly toward each other and extending toward the connecting bar portion and providing substantially flat opposing surfaces, and said side portions extending in the general direction of the movable bar so that the bar will enter between said opposing surfaces laterally from one side.

3. In a snap switch including a rocking member operated for a quick closing action by means of a spring in which energy is first stored and then released to give the quick action, said member being a substantially flat bar mounted to rock in the plane of the bar and having its edge portions flattened adjacent its ends to provide wedge-like portions, a stationary contact to cooperate therewith comprising a strip of resilient sheet metal of substantially U-shape with the free ends of the opposite side portions curved inwardly toward each other and extending toward the connecting bar portion and providing substantially flat opposing surfaces to receive the rocking member between them, said free end portions converging somewhat toward each other so as to be nearer together adjacent their free ends than at the curved portions, and said rocking member adapted to have its wedge-like edge portion enter between said free ends of the free end portions of the stationary contact.

4. In a snap switch including a rocking member operated for a quick closing action by means of a spring in which energy is first stored and then released to give the quick action, said member being a substantially flat bar mounted to rock in the place of the bar, a stationary contact to cooperate therewith comprising a strip of resilient sheet metal of substantially U-shape with the free ends of the opposite side portions curved inwardly toward each other and extending toward the connecting bar portion, said end portions extending in the general direction of the movable bar so that the bar will enter between them laterally from one side, said end portions including flat sides arranged in opposing relation to engage the sides of said rocking bar and said portions also converging toward each other so as to be nearer together adjacent their free ends then at the curved portions to engage the bar first at a distance from said curved portions.

CHARLES E. AVERY.