July 18, 1933. H. J. COOK 1,918,248

INCLOSED SWITCH

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Fig. 1.

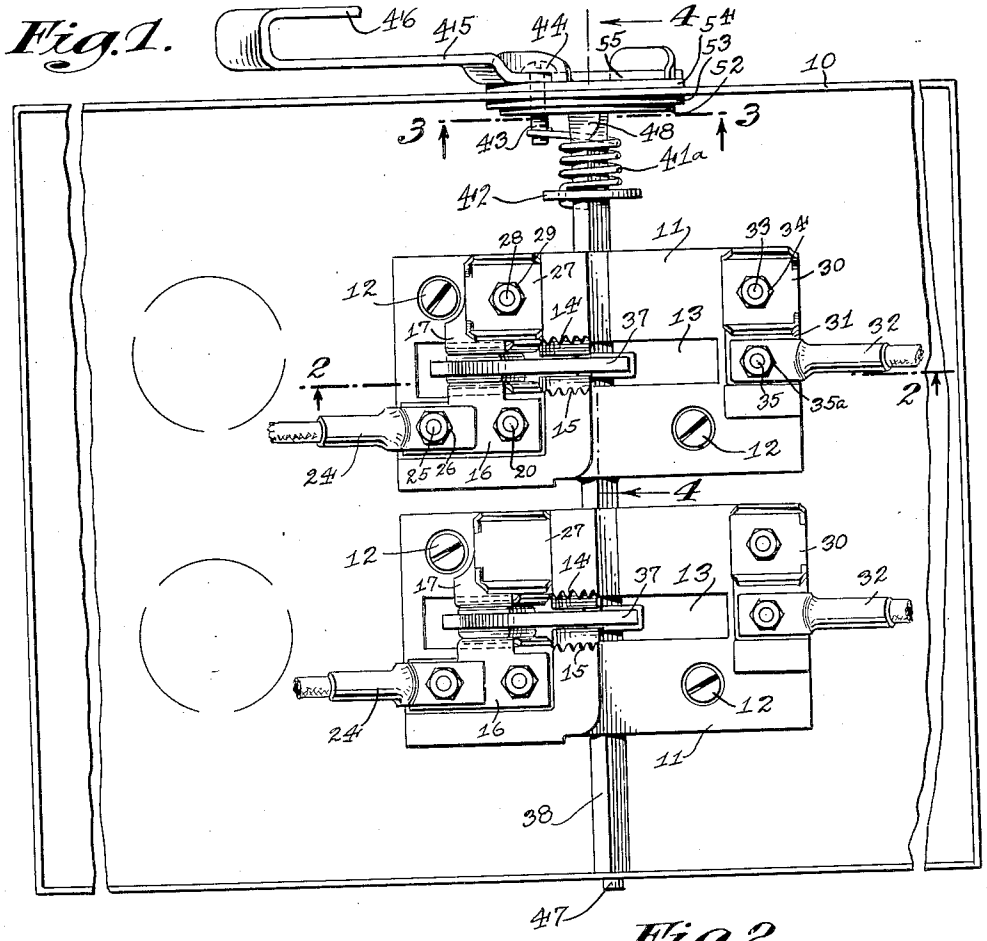


Fig. 2.

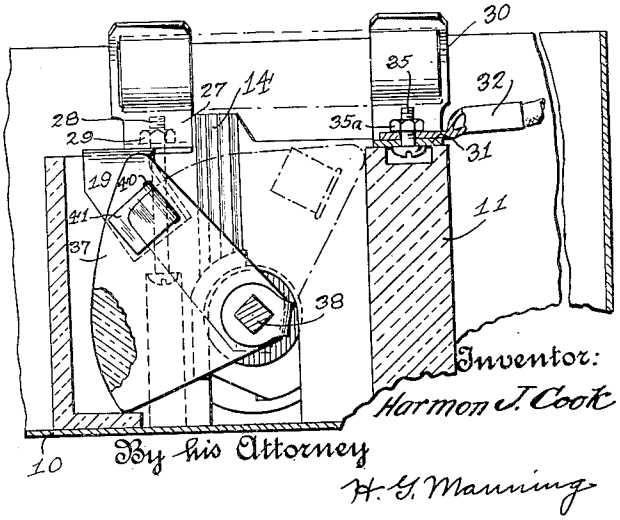
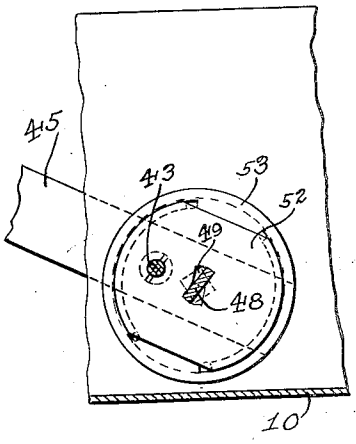


Fig. 3.



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Fig. 4.

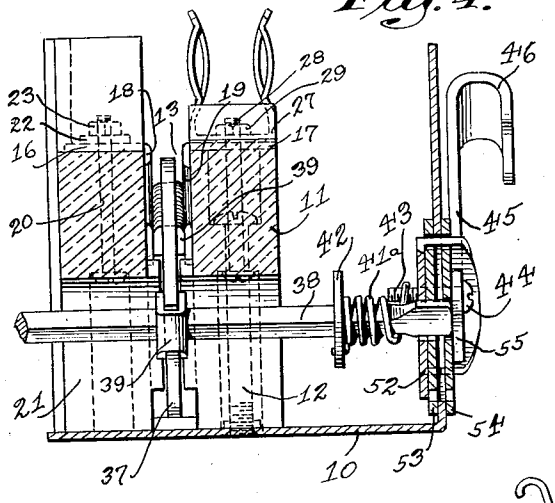


Fig. 5.

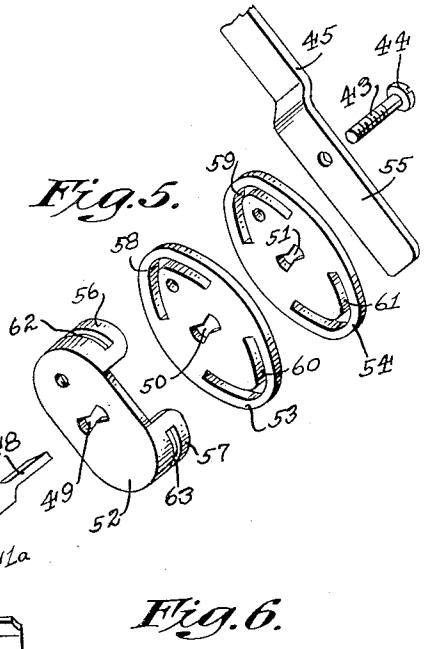


Fig. 7.

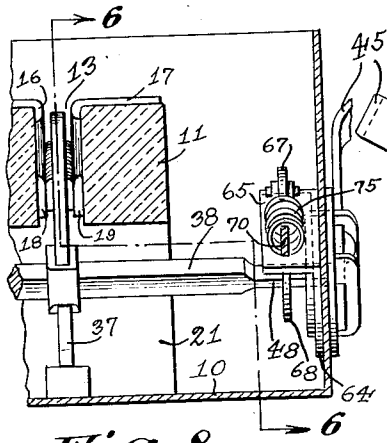


Fig. 6.

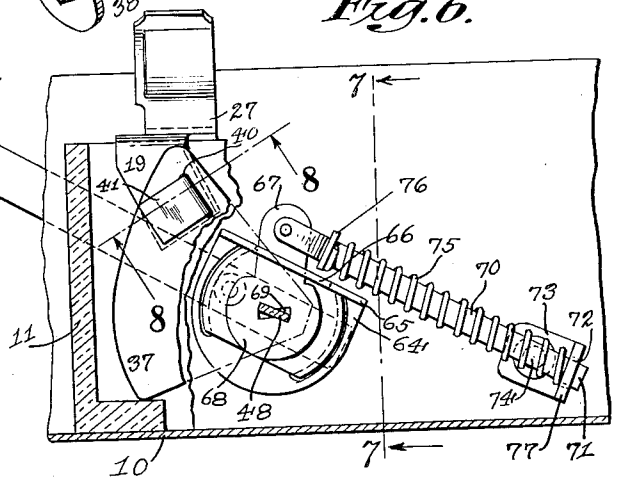


Fig. 8.

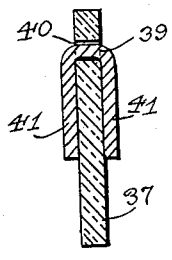
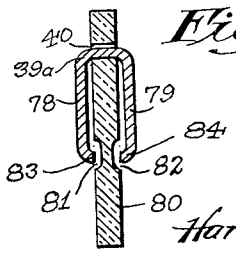


Fig. 9.



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UNITED STATES PATENT OFFICE

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INCLOSED SWITCH

Application filed March 11, 1930. Serial No. 434,867.

This invention relates to safety electric switches, and more particularly to a switch housed in a casing, and adapted to be operated manually by a handle outside of said casing.

One object of the present invention is to provide a safety switch of the above nature in which the number of electrical contact points has been greatly reduced from the number employed in previous switches of this nature, thereby reducing heat losses and the amount of copper or other conductive metal.

A further object is to provide a safety switch of the above nature, in which the movable part of the switch is pivotally mounted within an insulating block, the switch being opened by swinging the movable contact member through a substantially horizontal arc, thus eliminating the space at the top of the casing usually required in switches in which the movable contact is opened by an upward movement.

A further object is to provide a safety switch of the above nature in which the fixed contacts, the fuse clips, and the lead-in wire lugs are exposed at the top of the insulating block so as to be accessible for renewal and repairs.

A further object is to provide a safety switch of the above nature having an improved type of operating rod for the movable switch member, said rod being adapted to be assembled in position in the bottom of the casing without spreading apart or otherwise injuring the sides of said casing.

A further object is to provide a safety switch of the above nature which will be relatively simple in construction, inexpensive to manufacture, strong and neat in appearance, compact, easy to assemble and manipulate, and very efficient and durable in use.

With these and other objects in view there have been illustrated on the accompanying drawings two forms in which the invention may be conveniently embodied in practice.

Fig. 1 represents a fragmentary top view of the safety switch and casing, with the cover of said casing removed.

Fig. 2 is a longitudinal sectional view of one of the switches shown in Fig. 1, the section being taken along the line 2—2 of Fig. 1, looking in the direction of the arrows.

Fig. 3 is a sectional view of the quick-break mechanism for connecting the operating handle with the operating rod.

Fig. 4 is a transverse sectional view taken along the line 4—4 of Fig. 1.

Fig. 5 is a perspective view, with the parts shown in separated relation, of the handle operating rod and the quick-break mechanism.

Fig. 6 is a longitudinal sectional view of a modified form of quick-make and quick-break mechanism for operating the switch, the section being taken along the broken line 6—6 of Fig. 7.

Fig. 7 is a transverse sectional view taken along the line 7—7 of Fig. 6.

Fig. 8 is a sectional view of the contact member, the section being taken through the movable insulating member, along the line 8—8 of Fig. 6.

Fig. 9 is a sectional view similar to Fig. 8 of a modified form of U-shaped contact member, having a loose fit within the insulating movable member by which it is carried.

Referring now to the drawings in which like reference numerals denote corresponding parts throughout the several views, the numeral 10 indicates a casing which is preferably rectangular in shape and has a front opening adapted to be closed by a removable hinged cover member, not shown. In the following description, the casing and switches are assumed to be lying in a horizontal position, the front opening thus being at the top.

Mounted within the casing 10, adjacent the center thereof, are a pair of parallel switch-holding blocks 11 of any suitable insulating material, such as porcelain. The blocks are secured to the base 10 in any suitable manner, as by screws 12, having their lower ends threaded into the bottom of the casing 10. Since both of the switches shown on the drawings are identical in construction, a description of one of them will be sufficient to completely disclose the invention.

The switch block 11 is provided with a vertical slot 13 extending completely therethrough, said slot having a pair of opposed vertically corrugated sections 14 and 15 at the central portion thereof. The corrugated sections 14 and 15 serve to increase the amount of cooling by air convection up through the slot 13.

Resting upon the top of the block 11 are a pair of angular fixed contact members 16 and 17, said contact members having laterally inclined parallel arms 18 and 19 located in vertical planes and depending into the slot 13. The angular contact member 16 is secured to the block 11, as by a screw bolt 20, having a head seated in a slot 21 cut transversely in the bottom half of the block 11, said bolt 20 being secured in position by a washer 22 and nut 23 located on the top thereof.

Current is supplied to the contact member 16 by means of a conductor-lug 24 secured to said contact member 16, as by a bolt 25 and nut 26. Resting upon the fixed contact member 17 is a U-shaped resilient fuse clip 27 and said contact member 17 and clip 27 are secured to the block 11, as by a bolt 28 and nut 29. The slip 27 together with a similar U-shaped resilient clip 30 at the other end of said block 11 serves to detachably hold a cartridge fuse, not shown. The fuse clip 30 rests upon a flat plate 31 connected to a conductor lug 32, as by a bolt 35 and nut 35*a*, said fuse clip 30 and lead-in plate 31 being connected to the block 11, as by a bolt 33 and nut 34.

In order to electrically connect the two depending arms 18 and 19 of the fixed contact members 16 and 17, provision is made of a pivotally mounted disc-shaped movable insulating member 37 formed substantially in the shape of a sector of a circle. The movable insulating member 37 is rigidly mounted on a squared operating rod 38, journaled in the sides of the casing 10.

In order to form a support for a U-shaped clip 39, the insulating member 37 is provided with a radial slot 40 for holding the U-shaped clip 39, the side arms 41 of which embrace the opposite sides of said insulating member 37. The arms 41 of said U-shaped clip 39 are spaced apart slightly farther than the distance between the depending arms 18 and 19 of the fixed contact members 16 and 17, whereby when the movable insulating member 37 has been swung to the closed position, shown in full lines in Figs. 2 and 6, the U-shaped clip 39 will be tightly wedged between said arms 18 and 19.

When the insulating member 37 is swung to the "off" position shown in dotted lines in Fig. 2, the U-shaped clip 39 will at first move slowly against the friction of the arms 18 and 19, and then by reason of the lost-motion in the handle connection to be hereinafter more fully described, will snap suddenly out from between the arms 18 and 19 under the influence of a coiled spring 41*a*. The spring 41*a*, as clearly shown in Figs. 1, 4, and 5 has one end connected to a washer 42 which is rigidly mounted on the operating rod 38, and the other end of said spring is connected to a screw 43, the head 44 of which is located on the outside of the casing, engaging the outer surface of an offset handle member 45, the outer extremity 46 of which is reversely bent for convenience in manipulation.

One end of the operating rod 38 is provided with a reduced circular bearing section 47 adapted to be journaled in a similar shaped aperture in the side of the casing 10. The other end of the operating rod 38 is provided with a flattened section 48 which is adapted to pass successively through key-hole slots 49, 50 and 51 formed in a connecting plate 52, an interior washer 53, and an exterior washer 54, respectively, the end of the flattened section 48 being held in contact with the lower portion 55 of the handle 45.

The key-hole slots 49, 50 and 51 are flared somewhat at their outer ends, so as to permit a certain amount of lost motion or back-lash with respect to the flattened end 48 of the rod 38 for producing a quick opening action of the switch, as described above. The connecting plate 52 has a pair of circular outer flanges 56 and 57 adapted to fit within a circular aperture in the casing 10 and to pass through slots 58, 59, 60 and 61 in the washers 53 and 54, respectively. The flanges 56 and 57 are provided with slots 62 and 63 within which the lower portion 55 of the handle 45 is adapted to fit, as clearly shown in Figs. 1 and 5. The flanges 56 and 57 serve as swivel members journaled in the large circular aperture in the handle end of the casing 10.

Operation

In operation, assuming the switch to be in the closed position shown in Fig. 2, when it is desired to open the switch, it will only be necessary for the operator to grasp the outer bent-back extremity 46 of the handle 45 and swing the same about its axis on the operating rod 38 until the U-shaped clip 39 of the movable insulating member 37 passes beyond the edge of the inclined depending arms 18 and 19 of the fixed contact members 16 and 17. The spring 41*a* will then come suddenly into action and produce a quick-break of the switch.

In a modified form of the invention shown in Figs. 6 and 7, the switch is similar in all respects to that previously shown in Figs. 1 to 5, except that provision is made of mechanism for producing a "quick-make" as well as a "quick-break". This mechanism comprises an inside washer 64 having a rearwardly extending straight flange 65 provided

with a slot 66, through which extends the reduced end 67 of an operating plate 68. The plate 68 has a flared key-hole slot 69 at its center similar to the slots 49, 50, and 51, and said slot 69 is loosely fitted over the flattened end 48 of the operating rod 38.

Pivotally connected to both sides of the reduced end 67 of the plate 68 is a forked rod 70 having its other extremity 71 passing loosely through an aperture 72 in an angle bracket 73 swiveled as by a pin 74 to the side of the casing 10.

In order to cause the switch to open and close suddenly so as to prevent delayed arcing contacts, provision is made of a helical spring 75 surrounding the forked rod 70, one extremity of said spring engaging a collar 76 fixed on said forked rod 70 and the other extremity of said spring engaging the upstanding portion 77 of the angular bracket 73.

In the operation of the modified form of the invention, when the operating handle 45 is pulled to swing the switch from the "on" position shown in Fig. 6 to the "off" position, the operating plate 68 will be rotated slowly about the operating rod 38 as an axis until the reduced end 67 comes into alinement with the forked rod 70, or in other words, until the parts are at the "dead" point.

Further motion of the handle will cause the parts to leave the "dead" point and the spring 75 will come into play and produce a sudden separation of the U-shaped clip 39 from the fixed contact arms 18 and 19.

In closing the switch, the operation will be the reverse of that just described, and the contacts will be moved into engagement suddenly in the same manner as they are separated in opening the switch.

In Fig. 9 a modified form of U-shaped contact-bridging clip 39*a* is shown. This clip has its side arms 78 and 79 loosely spaced from the insulating disc 80, the latter having a pair of sockets 81 and 82 to receive the inwardly bent extremities 83 and 84. By means of this construction, the U-shaped bridging clip 39*a* will accommodate itself to any irregularities or lack of parallelism between the depending arms 18 and 19 of the fixed contacts. Otherwise, its operation is exactly the same as that of the first form of U-shaped clip.

One important feature of the present invention is the production of a safety switch having an extremely low over-all height and short over-all length, thereby economizing in space while at the same time sacrificing none of the safety requirements. In fact, the only limitation on the length of the switch casing is the length of the fuse.

A further advantage is that all of the moving parts of the switch remain at all times below the top of the block and the operating rod will be covered by said block. Thus, in case of injury to the quick-break mechanism, there will be no danger that the spring will fly out and cause a short circuit.

A further advantage is that at the point of breaking the circuit, arcing across the space between the fixed contacts is entirely prevented by reason of the fact that the insulating member is then in the path of the arc.

A further advantage is that the body of air in the slot of the block not only prevents arcs from bridging the space across said slot, but also serves as an obstacle against the grounding of arcs to the bottom of the casing by way of the operating rod.

While there have been disclosed in this specification two forms in which the invention may be embodied, it is to be understood that these forms are shown for the purpose of illustration only, and that the invention is not to be limited to the specific disclosures but may be modified and embodied in various other forms without departing from its spirit. In short, the invention includes all the modifications and embodiments coming within the scope of the following claims.

Having thus fully described the invention, what is claimed as new, and for which it is desired to secure Letters Patent, is:

1. In an electric switch, an insulating block having a substantially rectangular slot extending therethrough, fixed angular contact members located on the surface of said block at opopsite sides of said slot, an insulating substantially triangular disc located in said slot and having a resilient movable contact member passing therethrough, said movable contact member having portions lying on opposite sides of said disc for connecting said fixed contact members, said disc being pivotally mounted in said block near one corner of said slot.

2. In an electric switch, an insulating block having an angular slot, fixed angular contact members located on the surface of said block at opposite sides of said slot, an insulating sector-shaped disc located in said slot and having a loosely mounted U-shaped movable resilient bridging contact member passing therethrough, the legs of said movable contact member lying on opposite sides of said disc for connecting said fixed contact members, said discs being pivotally mounted in said block near one corner of said slot.

3. In an electric switch, an insulating block having a substantially rectangular slot extending therethrough, opposed fixed angular contact members located on the surface of said block at opopsite sides of said slot and near one corner of said slot, an insulating disc located in said slot and having a movable contact member passing therethrough, said movable contact member having portions lying on opposite sides of said disc for connecting said fixed contact members, said disc

being pivotally mounted in said block near the corner of said slot diagonally opposite from said contact members.

4. In an electric switch, an insulating block having a slot extending therethrough, said slot having a vertical side, fixed angular contact members located on the surface of said block at opposite sides of said slot, a rotatable insulating disc located in said slot and having a resilient movable contact member passing therethrough, said movable contact member having portions lying on opposite sides of said disc for connecting said fixed contact members, said disc being pivotally mounted near the bottom of said slot adjacent said vertical side.

5. In an electric switch, an insulating block having a substantially rectangular slot extending therethrough, fixed angular contact members located on the surface of said block at opposite sides of said slot, an insulating substantially triangular disc located in said slot and having a movable contact member passing therethrough for connecting said fixed contact members, said disc being pivotally mounted in said block near one corner of said slot.

HARMON J. COOK.