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A. R. CELLERINI ET AL  
FUSIBLE ELECTRIC SWITCH

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2 Sheets-Sheet 1

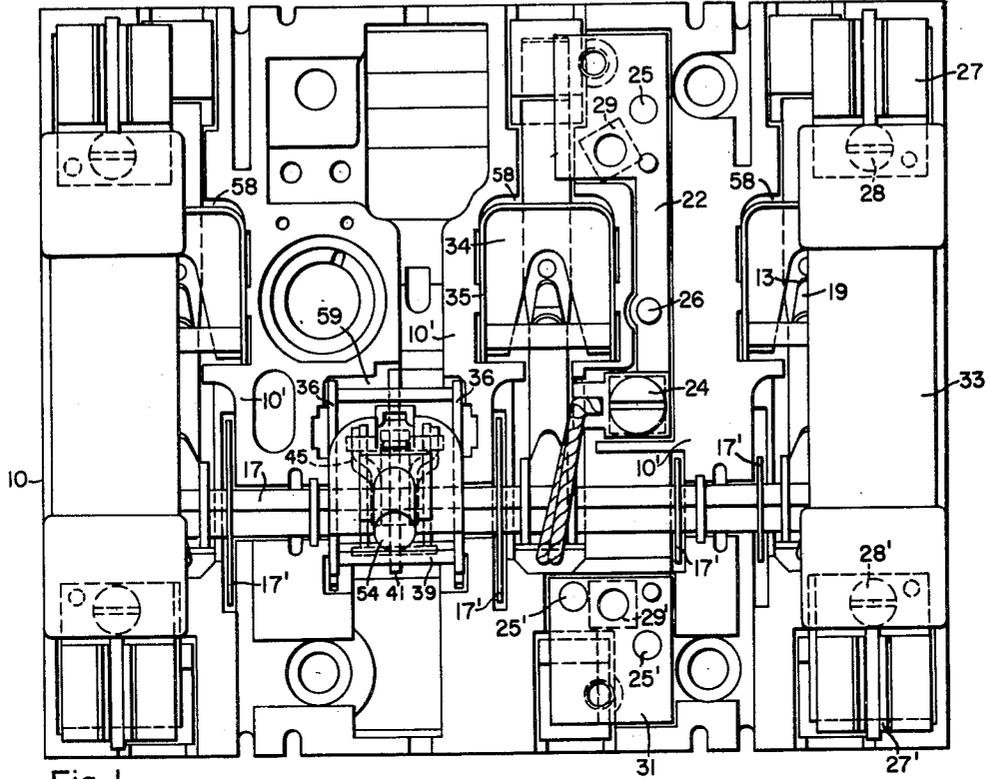


Fig. 1.

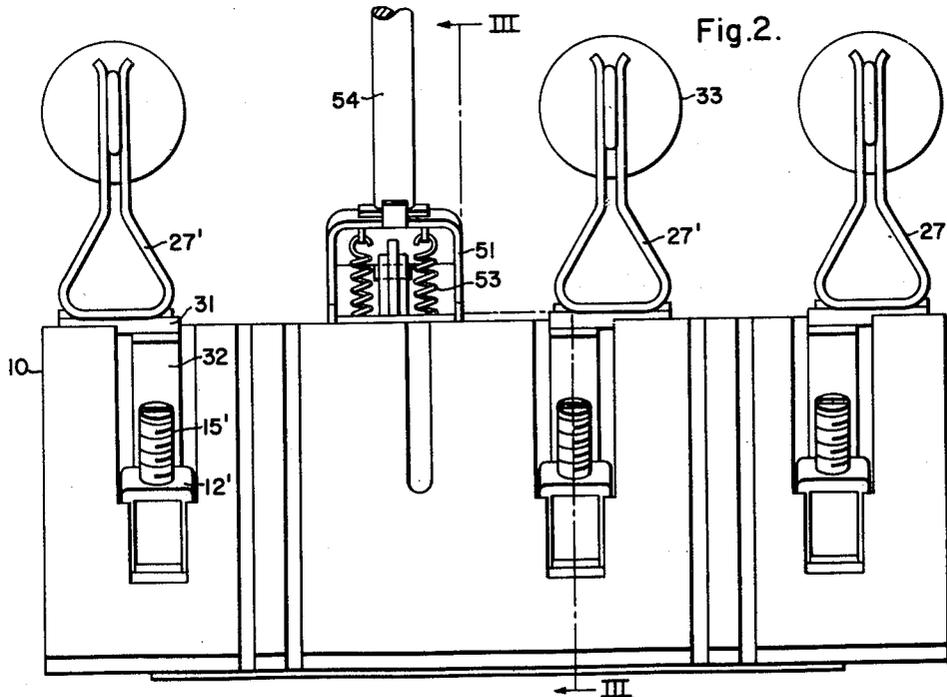


Fig. 2.

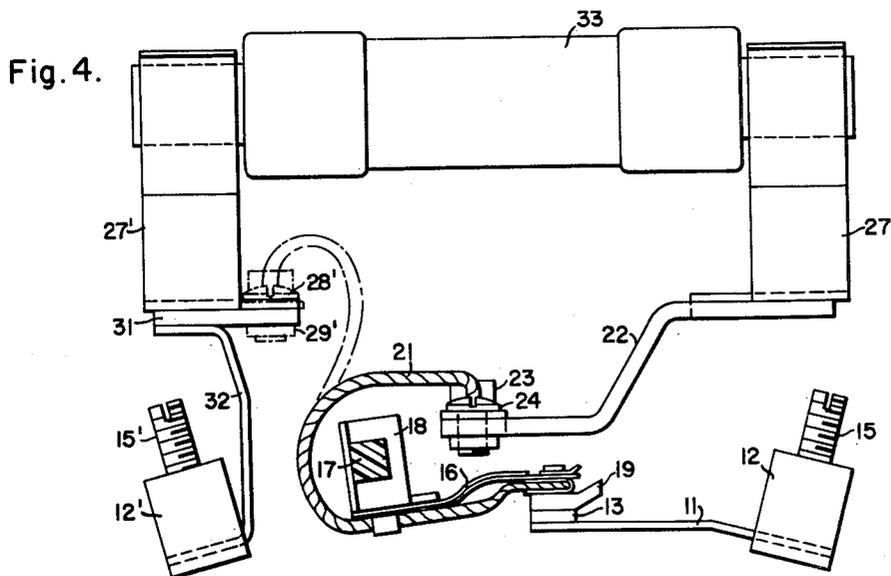
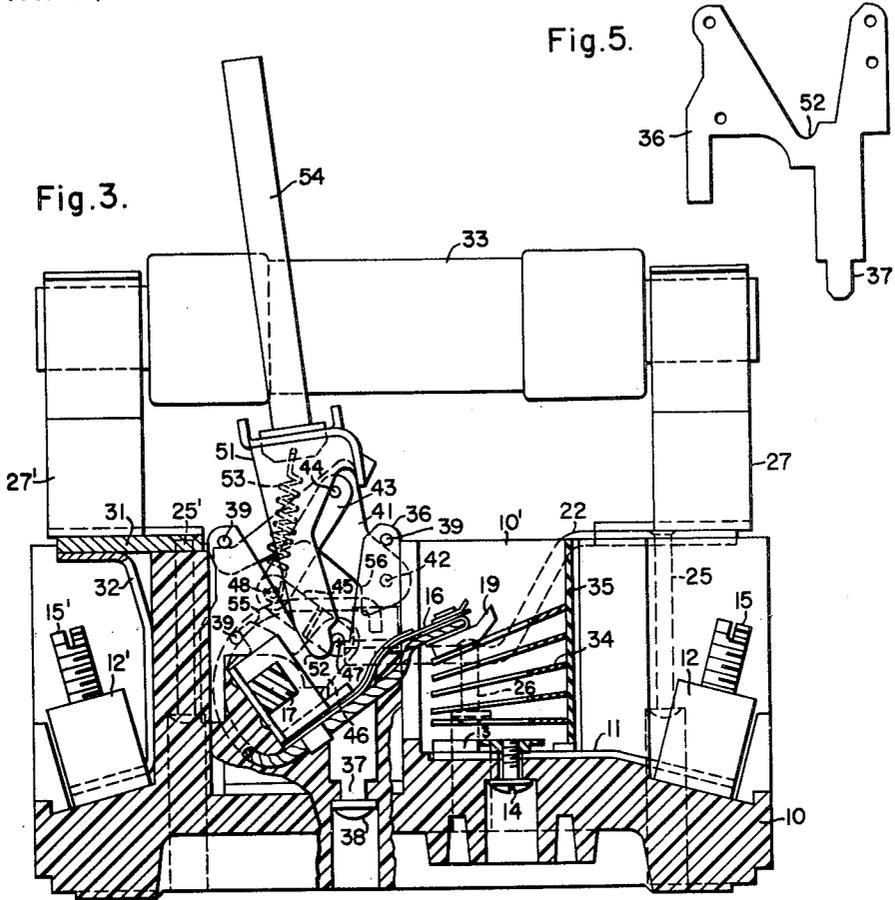
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**FUSIBLE ELECTRIC SWITCH**

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12 Claims. (Cl. 200—114)

Our invention relates, generally, to electric switches and, more particularly, to switches which are of the fusible type.

An object of our invention is to provide a fusible electric switch in which the fuses are mounted above the contact members, thereby decreasing the over-all length of the fusible switch.

Another object of the invention is to reduce the length of such fusible switches to a length no greater than the length of the fuses, and to this end the line and load wire terminals or connectors are mounted under the fuse clips and on the base of the switch.

Another object of our invention is to so mount the fuses on the top of the switch that the contact members of the switch are visible at all times from above the top of the switch.

A further object of our invention is to provide a switch which may be readily changed from a fused to a non-fused switch or vice versa.

Still another object of our invention is to provide a multipole switch having a toggle actuating mechanism which is deenergized electrically at all times.

A still further object of our invention is to provide a switch having a unitary molded insulating base upon which all the metal parts and fuses for the switch are mounted, thus eliminating any separate base member for the fuses.

Other objects of our invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with one embodiment of our invention, the toggle mechanism for actuating a three-pole switch is so located between two of the energized poles that the mechanism is electrically deenergized at all times. This is accomplished by providing the insulating base with three recesses for accommodating the three switch arms and their arc chambers, and with a fourth recess between the recesses for two of the switch arms in which the operating mechanism for the switch is placed. The three switch arms are operatively connected to the operating mechanism by an insulated tie bar going between the four recesses. The fuses are mounted on top of the switch and are so offset to one side that the contact members of the switch are visible from above the switch. The fuses may be omitted by changing the connections for the flexible shunts which connect the contact arms of the switch to the fuse terminals. All of the switch and fuse parts are mounted on a single molded insulating base with no fuse base mounted on top of the switch base.

For a better understanding of the nature and objects of the invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a view, in plan, of an electric switch embodying the principal features of the invention, one of the fuses and the fuse clips therefor being omitted;

Fig. 2 is a view, in end elevation, of the switch;

Fig. 3 is a view, in section, taken along the line III—III

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in Fig. 2, a portion of the base being broken away for clearness;

Fig. 4 is a view, in elevation, of the conducting members for one pole of the switch, and

Fig. 5 is a view, in side elevation, of one of the mounting plates for the toggle mechanism of the switch.

Referring to the drawings, and particularly to Figs. 1 and 2, the switch structure shown therein comprises a base 10 in which are disposed the terminal members, the contact members, the arc-extinguishers and the actuating mechanism for a three-pole manually operable switch. The base 10 is of a unitary structure and is preferably molded from a suitable insulating material. It is provided with a recess or compartment for the metal parts of each pole of the switch and a separate recess or compartment for the toggle actuating mechanism. It is also provided with numerous recesses for the screws and rivets which are utilized for attaching the metal parts to the base.

As shown more clearly in Fig. 4, each pole of the switch structure comprises a line terminal assembly which includes a conductor 11, a terminal clamp or collar 12 attached to one end of the conductor 11 and forming a solderless wire connector for connecting a line wire to the conductor 11, and a stationary contact member 13 secured to the other end of the conductor 11. The conductor 11 may be attached to the base 10 by means of a screw 14 as shown in Fig. 3. The collar 12 is provided with a threaded screw 15 for connecting a line conductor to the terminal.

A movable contact arm 16 is secured to an insulating shaft 17 by means of a clamp or bracket 18. A movable contact member 19 is attached to one end of the contact arm 16. As will be described more fully hereinafter, the shaft 17, which is rotatably mounted in the base 10, is rotated by a toggle mechanism to oscillate the contact arm 16, thereby engaging the contact member 19 with the contact member 13.

A flexible conductor 21, which has one end attached to the contact arm 16 and the movable contact member 19, has the other end attached to a line side fuse terminal strip 22. The conductor 21 may be attached to the terminal 22 by means of a clip 23 and a screw 24. As shown in Fig. 3, the terminal strip 22 is attached to the base 10 by means of rivets 25 and 26. A fuse clip 27 is removably attached to the outer end of the terminal strip 22. As shown in Fig. 1, the fuse clip may be attached to the terminal strip by means of a screw 28 which is threaded into a nut 29 secured on the under side of the terminal 22.

A load side fuse terminal or plate 31 is attached to the base 10 by means of rivets 25', another fuse clip 27' is removably attached to the plate 31 by means of a screw 28' which is threaded into a nut 29' secured to the bottom side of the plate 31. A load side solderless terminal assembly, which includes a collar 12' and a conductor 32, is connected to the plate 31. One end of the conductor 32 may be brazed or soldered to the bottom side of the plate 31. The collar 12' is provided with a screw 15' for connecting a load conductor to the conductor 32. A fuse 33, which may be of the cartridge type, is installed between the fuse clips 27 and 27'.

It should be noted that the end portions of the integral insulating base 10 extend upwardly to a height sufficient to support the terminal strip 31 and the upper end of the conducting strip 22 with the fuse clips 27 and 27' directly thereon. Thus the fuses are mounted on the switch base itself and there is no need for a separate base for the fuses, as has been used before.

The over-all length of the combined switch and fuse unit is reduced by reason of the fact that both the line terminals 12 and the load terminals 12' are mounted on the switch base and are mounted in recesses in the two ends

of the base under the fuse terminals 27 and 27'. The fact that the line and load terminals do not extend outwardly beyond the fuse clips makes it possible to reduce the length of the complete device to the length required to accommodate the fuses which have a standard length for a given rating.

As explained hereinbefore, fuses are not required or desired for certain applications. Thus, it is desirable from a manufacturing viewpoint to provide a switch which may be readily changed from a fused switch to a non-fused switch. When fuses are supplied in the present structure an electrical circuit through the switch members extends from the line side terminal conductor 11 through the contact members 13 and 19, the flexible conductor 21, the line side fuse terminal 22 and the line side fuse clip 27, the fuse 33, the load side fuse clip 27', the load side fuse terminal 31 and the load side terminal conductor 32.

If fuses are not desired, the fuse clips 27 and 27' and fuse 33 may be omitted from each pole of the switch structure. In that case, the one end of the flexible conductor 21 is removed from the line side fuse terminal strip 22 and attached to the load side fuse terminal 31 as shown by the broken lines in Fig. 4. Then, the circuit through the switch extends from the line side terminal strip 11 through the contact members 13 and 19, the flexible conductor 21, the load side fuse terminal 31, and the load side terminal conductor 32. Thus, the switch may be readily changed from a fused to a non-fused switch without it being necessary to utilize external jumpers or connectors. The conductor 21 must be disconnected from the terminal 31 by removing the screw which attaches the conductor 21 to the terminal 31 before the clip 27' can be attached to the terminal 31 when changing from a non-fused to a fused switch. The screw for attaching the fuse clip must be inserted into the nut 29' from which the screw for attaching the conductor has been removed. Since, as shown in the drawing, there is only one nut 29' on each terminal 31 it is obvious that the fuse clip 27' cannot be attached to the terminal 31 without first disconnecting the conductor 21 from the terminal 31 by removing the screw 28' from the nut 29'.

In the interest of safety, it is desirable that the contact members of a switch be visible at all times in order to positively determine whether or not the contact members are open or closed. In order to reduce the size of a switch, it is desirable that the fuses be mounted on top of the base and over the other parts of the switch structure instead of at one end of the base as usually done heretofore.

In order that the fuses may be mounted on top of the switch without obscuring the contact members of the switch from view at all times, the fuse clips 27 are offset laterally on the fuse terminal members 22 and 31 as shown more clearly in Figs. 1 and 2. Thus, the contact members 19 and 13 are clearly visible from above the switch even when the fuses 33 are installed. An arc-extinguisher comprising a plurality of metal plates 34 and an insulating housing 35 is provided for each pole of the switch. However, the arc-extinguisher is so constructed that the contact members of the switch are visible from above the switch structure.

The toggle mechanism for actuating the contact members of the switch may be of a type previously utilized in manually operable switches. The mechanism is supported between a pair of spaced mounting plates 36 one of which is shown in detail in Fig. 5. Each plate 36 is provided with an extension 37 which projects through an opening in the base 10 and may be riveted to secure the plate to the base as shown at 38 in Fig. 3. The two supporting plates 36 may be secured together by spacing studs 39.

A cradle member 41 is disposed between the plates 36 in a fixed position. One end of the cradle member 41 is attached to a stud 42 which extends between the plates 36 and is attached to the plates. The other end

of the cradle member 41 is anchored under one of the spacing studs 39 as shown in Fig. 3.

A toggle link 43 is pivotally connected to the cradle member 41 by a pin 44. Another toggle link 45 is pivotally connected to an actuating arm 46 by means of a pin 47. The toggle links 43 and 45 are pivotally connected together by a toggle pin 48. The actuating arm 46 is secured to the shaft or cross bar 17 to which the contact arms 16 are connected, as previously explained. The actuating arm 46 is connected to the cross bar 17 in between two of the contact arms 16 and since the cross bar is insulated, the operating mechanism is not electrically alive.

A generally U-shaped operating lever 51, which is inverted, is pivotally mounted in rounded bottoms 52 of V-shaped notches in the mounting plates 36. Overcenter toggle springs 53 are connected between the toggle pin 48 and the base of the U-shaped lever 51. An operating handle 54 is attached to the base of the lever 51 and extends upwardly between the fuses.

The contact members of the switch are shown in the open position in Fig. 3. The opening movement of the contact members is limited by a projection 55 on the actuating arm 46 which engages one of the spacing studs 39. In order to close the contact members of the switch the operating handle 54 is moved to the right or clockwise as shown in Fig. 3. The overcenter springs 53 cause the toggle members 43 and 45 to straighten, thereby moving the actuating arm 46 downwardly and rotating the shaft 17 clockwise to cause the contact members 19 to engage the fixed contact members 13. The toggle links 43 and 45 pass slightly overcenter, the toggle pin 48 engaging a projection 56 on the cradle member 41 to limit the closing movement of the toggle mechanism. Thus, the contact members are closed with a quick or snap action. Likewise, the contact members are opened with a quick or snap action when the operating handle 54 is moved to the position shown in Fig. 3.

In switches previously constructed and having toggle actuating mechanisms of the present type, the toggle mechanism has been mounted on one pole of the switch structure. This arrangement has the disadvantage of the toggle mechanism being electrically energized which is undesirable from a safety standpoint, particularly when the switch is utilized on relatively high voltages.

As shown more clearly in Figs. 1 and 2, the toggle mechanism in the present structure is offset from the center pole of the switch and is disposed between two of the poles. Since the shaft 17 is composed of an insulating material, the toggle mechanism is electrically deenergized at all times, thereby increasing the safety features of the switch.

The three switch arms with their contacts and arc chambers are mounted in three recesses 58 in the base 10 of insulating material, which has integral barrier walls 10' defining the recesses. There is also a fourth recess 59 as shown in Fig. 1 between the barrier walls 10' for receiving the operating mechanism which is thus electrically isolated from the live parts of the three pole units. The cross bar 17 which extends across the four recesses is insulated and has cemented thereon insulating washers 17' for increasing the electrical creepage along the cross bar and preventing flash-over through the holes in the barrier walls 10' through which the cross bar extends. This provides the necessary electrical insulation between the adjacent poles of the switch and between the operating mechanism and the poles of the switch on each side of it.

From the foregoing description it is apparent that we have provided a relatively small and compact switch in which all of the metal parts of the switch are mounted in a single unitary base with fuse members mounted on top of the base. If desired, the fuse members may be omitted from the structure and connections readily made for operating the switch as a non-fused switch. The

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fuses are so mounted that the contact members of the switch are visible at all times, and the actuating mechanism is so mounted that it is electrically deenergized at all times.

Since numerous changes may be made in the above described construction and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all the matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim as our invention:

1. In a three-pole electric switch, in combination, an insulating base, an insulating shaft rotatably mounted in said base, a contact arm for each pole of the switch, said contact arms being secured to said shaft, an actuating arm secured to the shaft between two of said contact arms, a toggle mechanism connected to the actuating arm for rotating said shaft and oscillating said contact arms, operating means for operating the toggle mechanism, and said toggle mechanism being offset from the center pole and disposed between the same two of said contact arms as said actuating arm where it and said operating means are electrically deenergized at all times.

2. In an electric switch, in combination, an insulating base, a line terminal assembly attached to said base, a contact member secured to said line terminal assembly, a contact arm having a contact member secured thereto, actuating means for oscillating said contact arm to cause its contact member to engage the contact member on the line terminal assembly, a line side fuse terminal attached to said base and disposed above said line terminal assembly, a flexible conductor connecting said contact arm to said fuse terminal, a load side fuse terminal attached to said base, a load terminal assembly connected to said load side fuse terminal and disposed underneath said load side fuse terminal, and fuse clips attached to said fuse terminals for receiving fuses, said fuse clips being offset laterally from said contact members and disposed at a higher level than the contact members whereby the contact members are visible from above the fuses when they are installed in the fuse clips.

3. An electric switch comprising a unitary insulating base, a line terminal assembly attached to said base, a contact member secured to said line terminal assembly, a contact arm having a contact member secured thereto and engageable with the contact member on the line terminal assembly, actuating means for oscillating said contact arm, a line side fuse terminal attached to said base and disposed above said line terminal assembly, a flexible conductor connecting said contact arm to said line side fuse terminal, a load side fuse terminal attached to said base, a load side terminal assembly connected to said load side fuse terminal and disposed below said fuse terminal, and fuse clips attached to said fuse terminals for receiving fuses, said fuse clips being offset laterally from said contact members and disposed at a higher level than the contact members whereby the contact members are visible from above the fuses when they are installed in the fuse clips.

4. In a three-pole electric switch, in combination, an insulating base, an insulating shaft rotatably mounted in said base, a contact arm for each pole of the switch, said contact arms being secured to said shaft, an actuating arm secured to the shaft, a snap-acting mechanism connected to the actuating arm for rotating said shaft and oscillating said contact arms, operating means for operating the snap-acting mechanism, and said actuating arm being offset from the center pole and disposed between two of said contact arms whereby the snap-acting mechanism and said operating means are electrically deenergized at all times.

5. In a three-pole electric switch, in combination, an insulating base, an insulating shaft rotatably mounted in said base, a line terminal assembly for each pole attached

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to said base, a contact member secured to each line terminal assembly, a contact arm for each pole secured to said shaft, each contact arm having a contact member secured thereto and engageable with the contact member on the corresponding line terminal assembly, an actuating arm secured to the shaft, a snap-acting mechanism connected to the actuating arm for rotating said shaft to oscillate said contact arms, operating means for operating the snap-acting mechanism, a line side fuse terminal for each pole attached to said base and disposed above said line terminal assembly, a flexible conductor connecting each contact arm to the line side fuse terminal for the corresponding pole, a load side fuse terminal for each pole attached to said base, a load side terminal assembly for each pole connected to the corresponding load side fuse terminal and disposed below said fuse terminal, said flexible conductors being removable from said line side fuse terminals and attachable to said load side fuse terminals, fuse clips attached to said fuse terminals for receiving fuses, said fuse clips being offset laterally from said contact members and disposed at a higher level than the contact members whereby the contact members are visible from above the fuses when they are installed in the fuse clips, and said snap-acting mechanism being offset from the center pole of the switch and disposed between two of said contact arms where it and said operating means are electrically deenergized at all times.

6. In a multipole electric switch, a base of insulating material having barrier walls defining a plurality of recesses, a plurality of pole units for the switch each including a movable contact arm, each of said pole units being in one of said recesses, another of said recesses being off-center of the switch and having no pole unit of the switch therein, an operating mechanism in the last said off-center recess, actuating means connected to said operating mechanism, an insulated cross bar extending into all of said plurality of recesses and connected to said contact arms and said operating mechanism, to actuate all of the contact arms upon operation of the operating mechanism, and said operating mechanism and said actuating means being insulated from said pole units to keep the operating mechanism and the actuating means electrically deenergized at all times.

7. In a multipole electric switch, a base of insulating material, a plurality of movable contact arms mounted on the base, a plurality of fixed contacts on the base each engageable by one of the movable contact arms, a plurality of wire-receiving connectors positioned at one end of the base inwardly of said end of the base and connected each to one of said fixed contacts, a plurality of terminal strips each electrically connected to one of said movable contact arms and each extending to a raised portion of the base at a level above said wire-receiving connectors, one of said connectors being underneath each one of said terminal strips, a plurality of terminal strips mounted on raised portions of the base at the other end thereof, a plurality of wire-receiving connectors positioned at said other end of the base inwardly of said end of the base and under the level of the last said terminal strips, and each being electrically connected to one of the last said terminal strips.

8. In a multipole electric switch, a base of insulating material, a plurality of movable contact arms mounted on the base, a plurality of fixed contacts on the base each engageable by one of the movable contact arms, a plurality of wire-receiving connectors positioned at one end of the base adjacent said fixed contacts and electrically connected thereto, a plurality of rigid fuse terminal strips each having a portion extending toward said end of the base nearest the fixed contacts, a plurality of flexible conductors, each flexible conductor being fastened at one end to one of said movable contact arms, each flexible conductor being fastened at its other end to one of said rigid fuse terminal strips extending to said end of the base nearest the fixed contacts, a plurality of fuse terminal strips adjacent the other end of the base, a plu-

rality of wire-receiving connectors positioned adjacent the other end of the base and connected each to one of the last said fuse terminal strips, and said wire-receiving connectors being all mounted under fuse terminal strips at the respective ends of the base.

9. In a fused multipole electric switch, an integral base of insulating material, a plurality of movable switch arms mounted on the integral base, a plurality of contacts on the integral base each engageable by one of the movable switch arms, a plurality of pairs of fuse terminal strips individually mounted directly on the integral base carrying the movable switch arms, said pairs of fuse terminal strips being mounted adjacent the opposite ends of the integral base at a height to support fuses mounted therebetween at a level above the movable switch arms, line terminal connectors adjacent one of the ends of the integral base and connected to said contacts engageable by the switch arms, means electrically connecting the movable switch arms to the fuse terminal strips at the end of the base having the line terminal connectors, load terminal connectors at the other end of the base connected to the fuse terminal strips at said other end of the base, and said line and load terminal connectors being all mounted under fuse terminal strips at the respective ends of the base.

10. In a fused multipole electric switch, an integral base of insulating material, a plurality of recesses in said base, a plurality of movable switch arms mounted on the integral base, a plurality of contacts on the integral base each engageable by one of the movable switch arms, a plurality of pairs of fuse terminal strips individually mounted directly on the integral base carrying the movable switch arms, said pairs of fuse terminal strips being mounted adjacent the opposite ends of the integral base at a height to support fuses mounted therebetween at a level above the movable switch arms, line terminal connectors adjacent one of the ends of the integral base and connected to said contacts engageable by the switch arms, means electrically connecting the movable switch arms to the fuse terminal strips at the end of the base having the line terminal connectors, load terminal connectors at the other end of the base connected to the fuse terminal strips at said other end of the base, and said line and load terminal connectors being all mounted in said recesses in the ends of the integral base under the fuse terminal strips at the respective ends of the integral base.

11. In an electric switch, in combination, an insulating base, a line terminal assembly attached to said base, a fixed contact member connected to the line terminal assembly, a movable contact member engaging the fixed contact member, a line side fuse terminal attached to said base at one side of the base, a load side fuse terminal attached to the base at the opposite side of the base, a load terminal assembly connected to said load side fuse terminal, a flexible conductor for connecting the movable contact member to the load side fuse terminal, threaded means for attaching one end of the flexible conductor to the load side fuse terminal, said flexible conductor being of sufficient length to permit said one end of the conductor to be removed from the load side fuse terminal and attached to the line side fuse terminal, and fuse clips for attaching to said fuse terminals, the load side fuse clip being attachable to the load side fuse terminal after said threaded means is removed to disconnect the flexible conductor from the load side fuse terminal.

12. In an electric switch, in combination, an insulating base, a line terminal assembly attached to said base, a fixed contact member connected to the line terminal assembly, a movable contact member engaging the fixed contact member, a line side fuse terminal attached to said base at one side of the base, a load side fuse terminal attached to the base at the opposite side of the base, a load terminal assembly connected to said load side fuse terminal, a flexible conductor for connecting the movable contact member to the load side fuse terminal, threaded means for attaching one end of the flexible conductor to the load side fuse terminal, said flexible conductor being of sufficient length to permit said one end of the conductor to be removed from the load side fuse terminal and attached to the line side fuse terminal, and fuse clips for attaching to said fuse terminals, said threaded means being removable from the load side fuse terminal along with said one end of the flexible conductor to permit attaching a fuse clip to the load side fuse terminal.

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