

June 20, 1961

A. R. CELLERINI ET AL

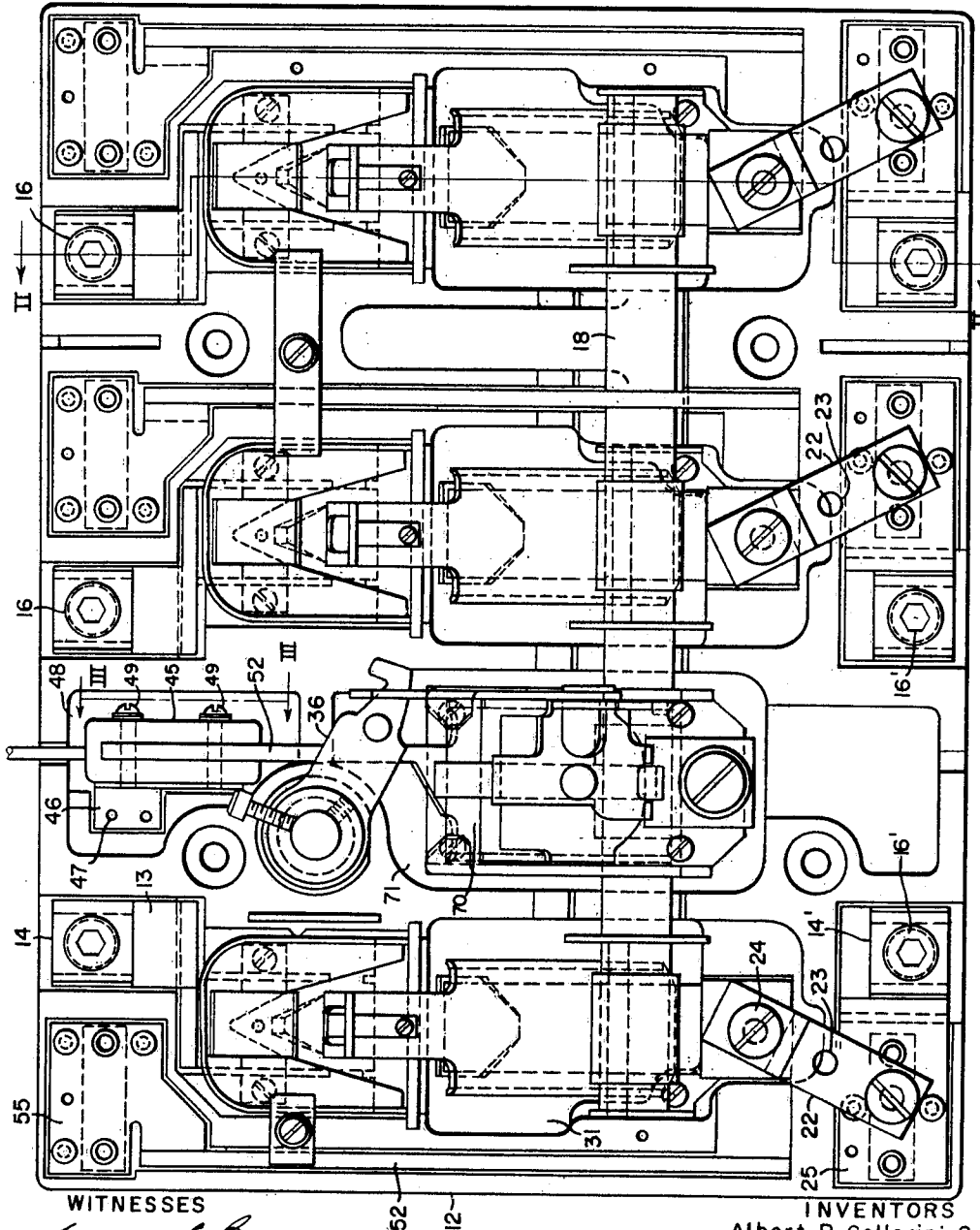
2,989,607

FUSIBLE ELECTRIC SWITCH

Filed June 13, 1958

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Fig. 1.



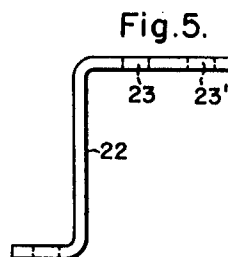
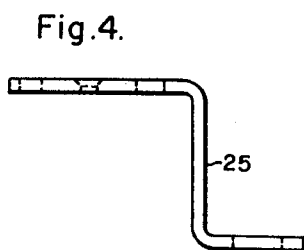
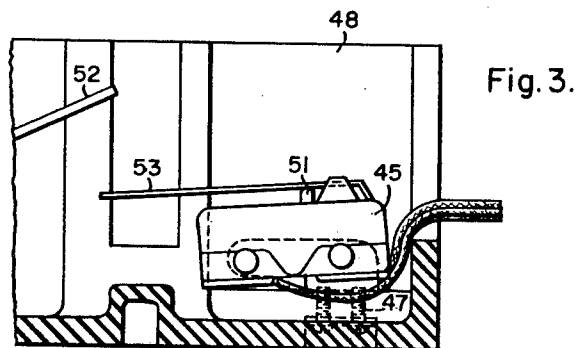
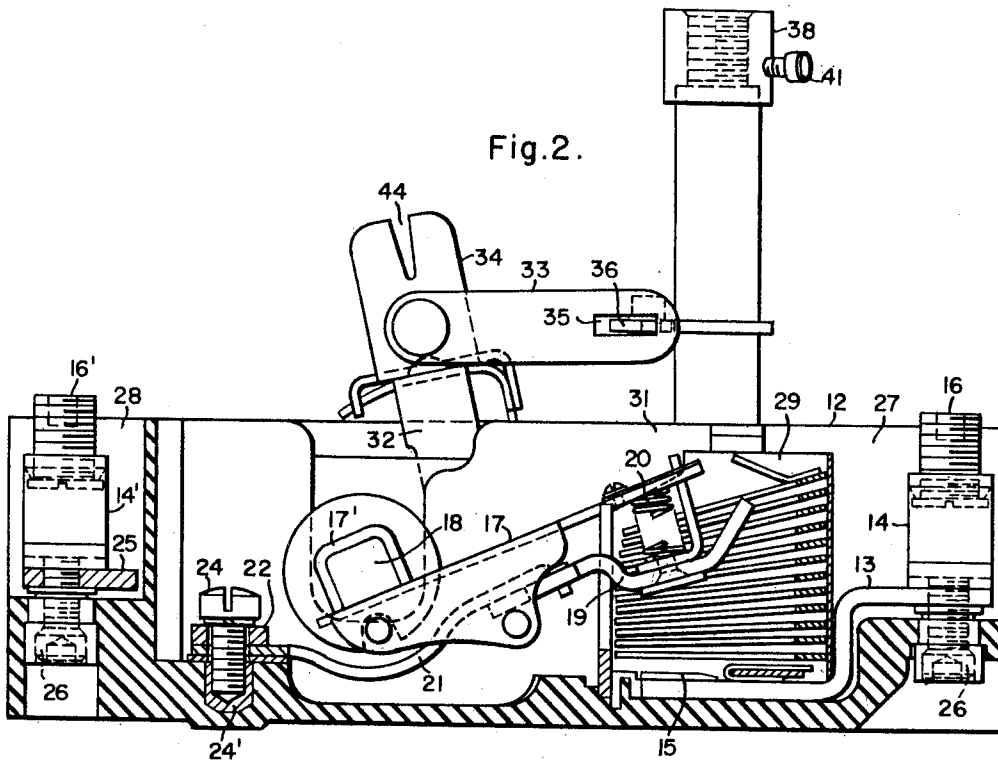
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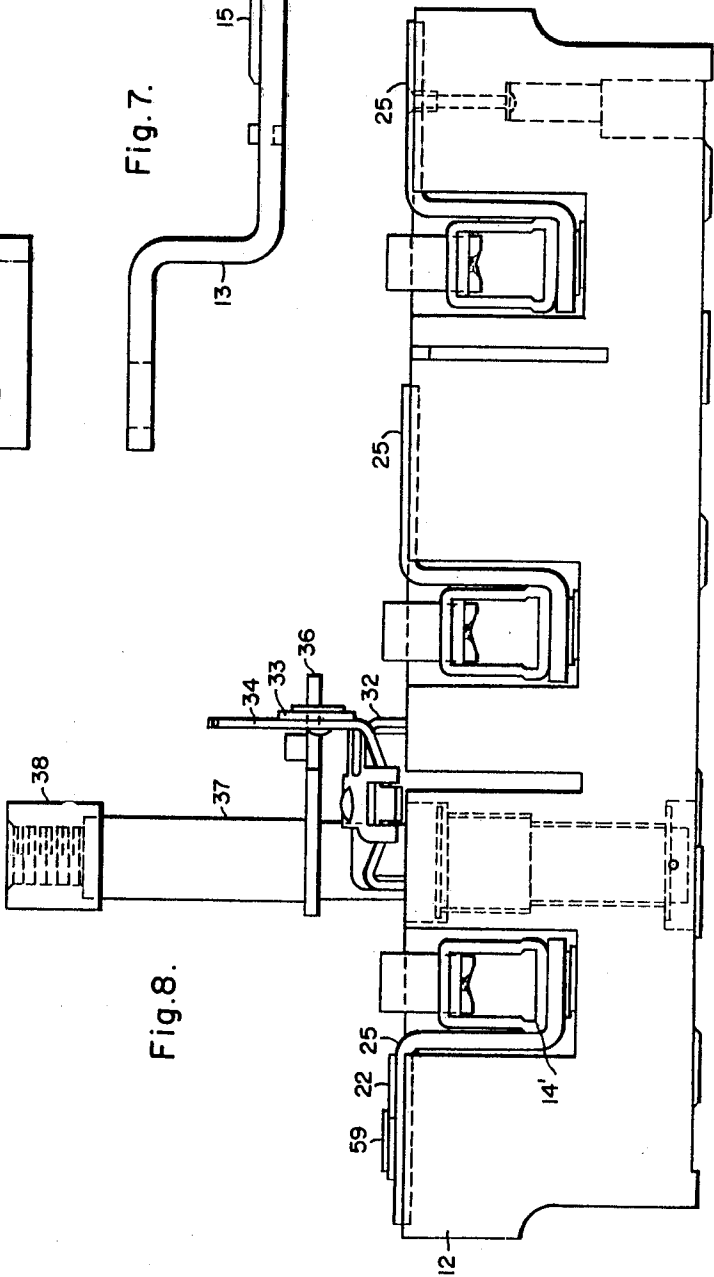
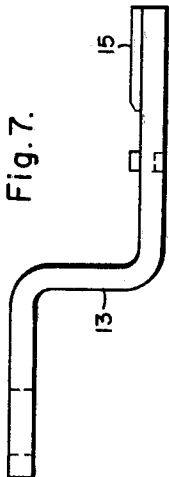
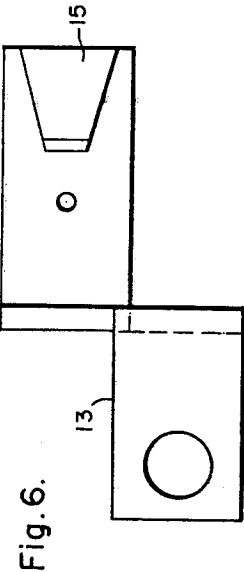
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A. R. CELLERINI ET AL

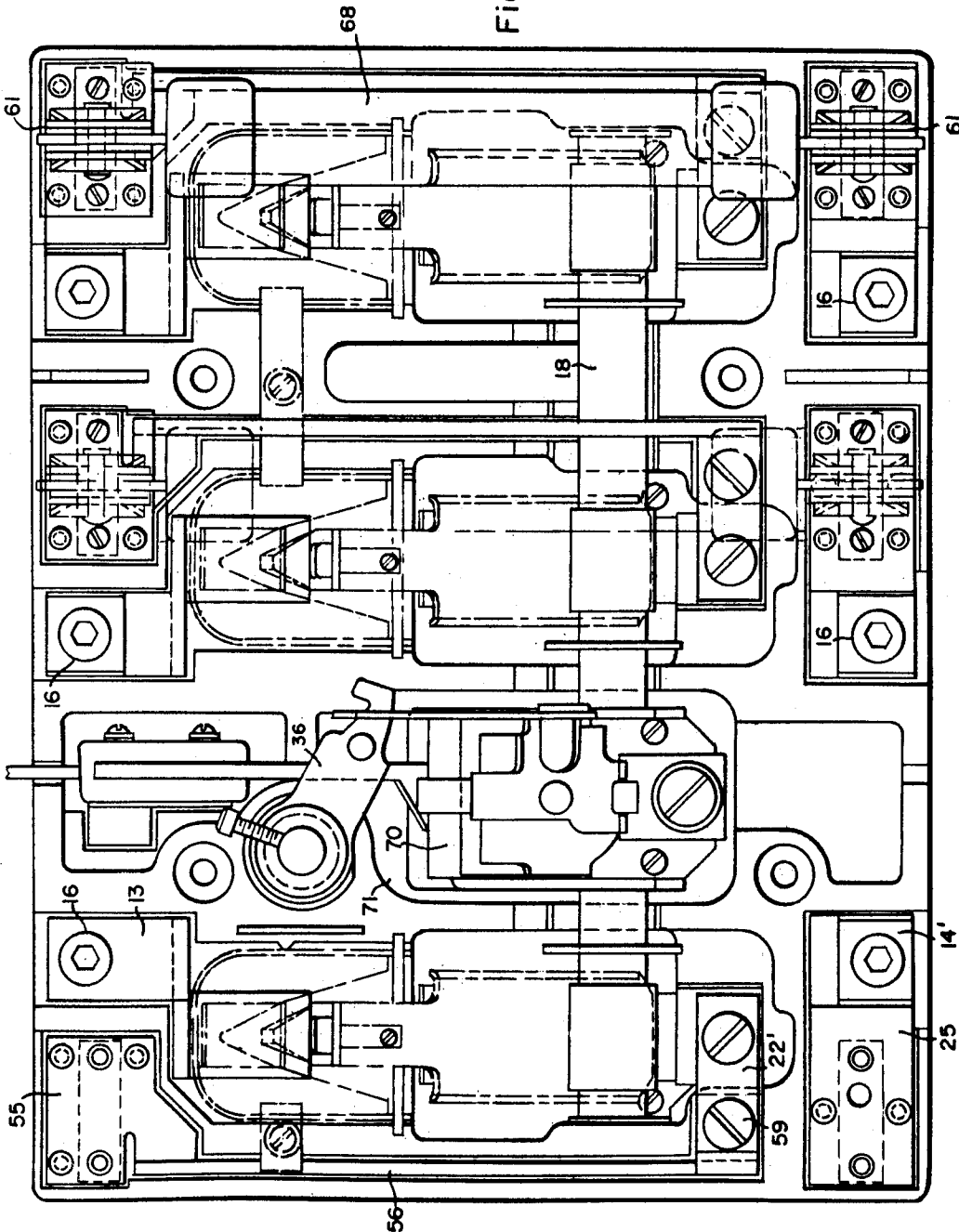
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Fig. 9.



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Fig. 10.

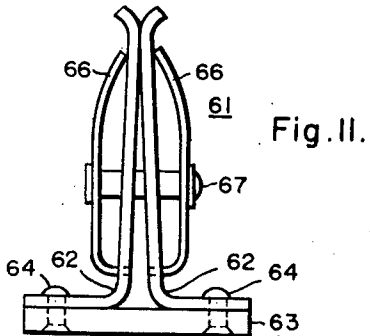
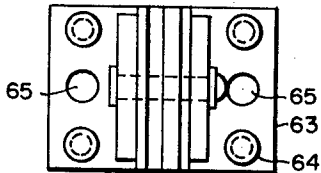


Fig. 11.

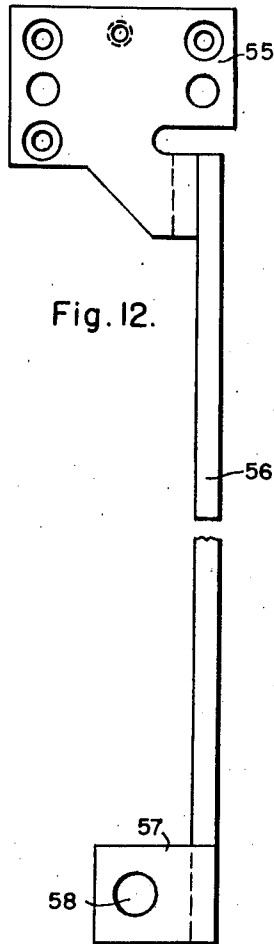


Fig. 12.

Fig. 13.

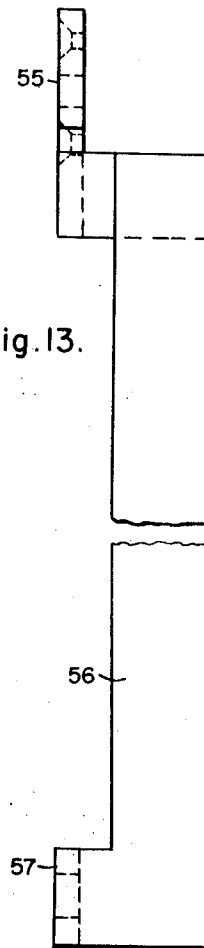
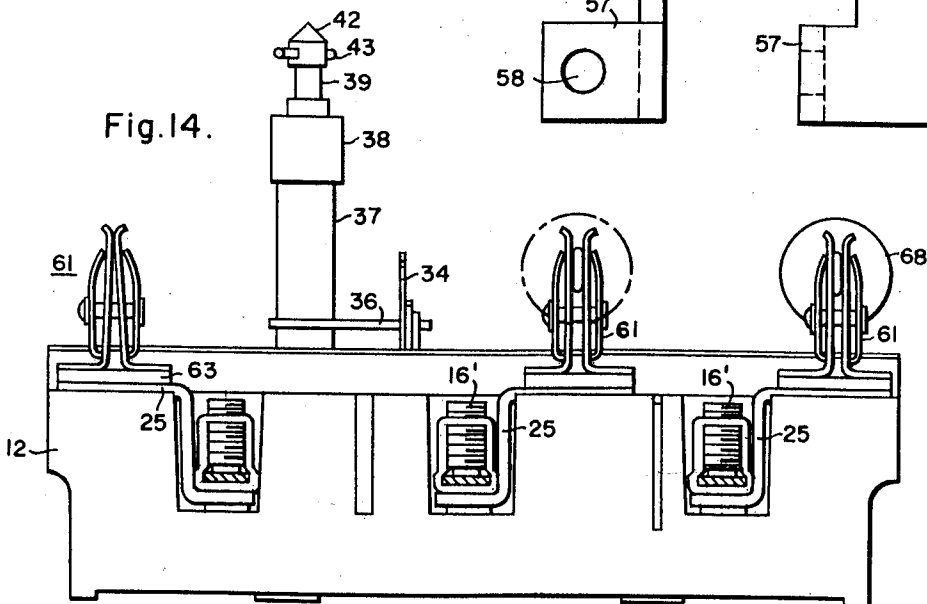


Fig. 14.



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FUSIBLE ELECTRIC SWITCH
Albert R. Cellerini, Beaver, and Louis N. Ricci, Chip-
pewa Township, Beaver County, Pa., assignors to West-
inghouse Electric Corporation, East Pittsburgh, Pa., a
corporation of Pennsylvania
Filed June 13, 1958, Ser. No. 741,829
11 Claims. (Cl. 200—114)

This invention relates, generally, to electric switches
and, more particularly, to switches which are of the fusible
type, such as, for example, the switch described in a co-
pending application of A. R. Cellerini and H. D. Dorfman,
Serial No. 619,582 filed October 31, 1956, now Patent No.
2,849,572 granted August 26, 1958.

An object of this invention is to provide an improved
switch which has readily accessible terminals for the mak-
ing of external connections to the switch.

Another object of the invention is to provide a switch
having fuse clips which are attachable from above the
switch.

A further object of the invention is to provide a switch
which may be operated by means of an ordinary tool,
such as a screwdriver, when the normal operating means is
disconnected from the operating mechanism.

Still another object of the invention is to provide a
switch which may be readily changed from a fused to a
non-fused switch or vice versa without utilizing flexible
shunts.

A still further object of the invention is to preclude the
possibility of making the wrong connections when chang-
ing from a non-fused to a fused switch.

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

In accordance with one embodiment of the invention,
the fuses for a switch are mounted on top of the switch
base and are so offset to one side that the contact mem-
bers of the switch are visible from above the switch. The
line terminals and the load terminals are offset to the other
side of the center line through the contact members, there-
by facilitating the making of wiring connections to the
switch. The fuse clips are fastened to adapters which are
attached to the tops of flat conductors from above the
switch. When the cover of the enclosure is open, thereby
disconnecting the actuating handle from the operating
mechanism, the switch may be operated by inserting a
screwdriver in a slot provided in the operating mechanism.
Rigid connectors are provided for changing the switch
from a fused to a non-fused switch or vice versa. It is
difficult to make the wrong connections when changing
from a non-fused to a fused switch.

For a better understanding of the nature and objects of
the invention, reference may be had to the following de-
tailed description taken in conjunction with the accom-
panying drawings, in which:

FIGURE 1 is a view, in plan, of a portion of an unfused
electric switch embodying the principal features of the
invention;

FIG. 2 is a view, partly in section and partly in eleva-
tion, taken generally along the line II—II in FIG. 1;

FIG. 3 is a view, partly in section and partly in eleva-
tion, taken along the line III—III in FIG. 1;

FIG. 4 is a view, in elevation, of a connector utilized in
the switch;

FIG. 5 is a view, in elevation, of another connector
utilized in the switch;

FIGS. 6 and 7 are views, in plan and elevation, respec-
tively, of a terminal conductor utilized in the switch;

FIG. 8 is a view, in end elevation, of the structure
shown in FIG. 1;

FIG. 9 is a view, similar to FIG. 1, of a fused switch,
some of the fuses and one pair of fuse clips being omitted;

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FIGS. 10 and 11 are views, in plan and in elevation,
respectively, of a fuse clip utilized on the switch;

FIGS. 12 and 13 are views, in plan and side elevation,
respectively, of a fuse terminal and connector utilized in
the switch, and

FIG. 14 is a view, in end elevation, of the switch shown
in FIG. 9.

As explained hereinbefore, the switch structure herein
described is an improvement on the type disclosed in a
copending application of A. R. Cellerini and H. D. Dorf-
man, Serial No. 619,582, filed October 31, 1956, now
Patent No. 2,849,572 granted August 26, 1958. As shown
in the drawings, and particularly FIG. 1, the switch struc-
ture comprises a base 12 in which are disposed the ter-
minal members, the contact members, the arc extinguishers
and the actuating mechanism for a three-pole manually-
operable switch. The base 12 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 compart-
ment for the toggle actuating mechanism. It is also pro-
vided 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. 2, each pole of the
switch structure comprises a line terminal assembly which
includes a conductor 13, a terminal clamp or collar 14 at-
tached to one end of the conductor 13 for connecting a
line conductor to the conductor 13 and a stationary con-
tact member 15 secured to the other end of the conductor
13. The collar 14 is provided with a threaded screw 16
for connecting a line conductor to the terminal.

A movable contact arm 17 is secured to an insulating
shaft 18 by means of a clamp or bracket 17'. A movable
contact member 19 is pivotally attached to the contact arm
17. A spring 20 is disposed between the contact member
19 and the contact arm 17 to determine the contact pres-
sure between the contact members 15 and 19 when they
are engaged. As will be described more fully hereinafter,
the shaft 18, which is rotatably mounted in the base 12
and disposed parallel to the base, is rotated by a toggle
mechanism to oscillate the contact arm 17 thereby engag-
ing the contact member 19 with the contact member 15.

A flexible conductor 21, which has one end attached
to the contact member 19, has the other end attached to a
connector 22 by means of a screw 24 which is threaded
into a metal insert 24' in the base 12. As shown more
clearly in FIG. 5, the connector 22 is generally of a Z-
shape. As shown, the upper horizontal leg of the con-
nector may be provided with two holes 23 and 23'. These
holes are so spaced that when the connector 22 is in the
position shown in FIG. 1, the hole 23' may be utilized
to connect the connector 22 to a load-side fuse terminal
25 which is attached to the base 12.

When the connector 22 is connected directly to the load-
side fuse terminal 25, the switch is utilized as a non-fused
switch. A circuit extends from the line-side terminal con-
nector 14 through the conductor 13, the contact members
15 and 19, the flexible conductor 21, the connector 22, the
fuse terminal 25 and the load-side terminal connector 14'
which is attached to the load-side fuse terminal 25 by
means of a screw 26 (FIG. 2).

As shown in FIG. 4, the fuse terminal 25 is generally
of a Z-shape. Thus, the upper portion of the terminal
25 is at a higher level than the lower portion to which the
terminal connector 14' is attached.

As shown in FIG. 2, the line-side terminal assembly
for each pole is disposed in a recess 27 in the base 12
and the load-side terminal assembly for each pole is dis-
posed in a recess 28 in the base 12. An arc extinguisher
29 and the contact members for each pole are disposed in
a recess 31 in the base 12. As explained in the afore-

said copending application of Cellerini and Dorfman, the toggle actuating mechanism 70 is disposed in a separate recess 71 located between two poles of the switch, thereby keeping the actuating mechanism deenergized at all times.

The toggle mechanism for actuating the contact members of the switch may be of a snap-acting type previously utilized in manually operable switches. This mechanism is more fully described in a copending application of A. R. Cellerini, Serial No. 619,582, filed October 31, 1956, now Patent No. 2,849,572 granted August 26, 1958. As shown in FIGS. 2 and 8, the mechanism 70 is operated by a generally U-shaped lever 32 which is inverted. A link 33 is pivotally connected to a bracket 34 which is attached to the base of the operating lever 32. The link 33 has an opening 35 therein through which one end of an operating arm 36 extends. The arm 36 is secured to a sleeve 37 which is rotatably mounted in the base 12. The sleeve 37 is rotated to operate the switch mechanism in a manner which will be described more fully hereinafter.

As described in the aforesaid copending application of Cellerini, it is desirable to provide for mounting switches of the present type in enclosures which may be of different depths. As shown in FIG. 2, an internally threaded member 38 is secured to the upper end of the sleeve 37. As shown in FIG. 14, an operating shaft 39 is adjustably threaded into the member 38. Thus, the vertical height of the upper end of the shaft 39 may be adjusted according to the depth of the enclosure in which the switch is mounted. The shaft 39 may be retained at the desired height by means of a set screw 41 which extends through the member 38 to engage the shaft 39.

As also shown in FIG. 14, a generally cone-shaped cap 42 is mounted on the upper end of the shaft 39 and a pin 43 extends through the cap 42 and the shaft 39. As described in the aforesaid copending application of Cellerini, the cap 42 and the pin 43 are disposed in a recess provided in an operating handle which is rotatably mounted on the cover of the enclosure for the switch and engages the cap 42 and the pin 43 when the cover is closed. Thus, the shaft 39 and the sleeve 37 may be rotated by means of the handle to operate the switch mechanism.

It is desirable to be able to operate the switch mechanism when the cover of the enclosure is open and the operating handle is disengaged from the cap 42. With this end in view, a slot 44 (FIG. 2) is provided in the upper end of the bracket 34, which as previously explained, is attached to the operating lever 32. Thus, the switch may be operated by inserting a screwdriver or similar tool in the slot 44 and utilizing the screwdriver as a means for actuating the lever 34 to operate the switch mechanism. The screwdriver or other tool is utilized as a lever to obtain a mechanical advantage, thereby enabling the switch mechanism to be actuated without attaching a handle to the cap 42 on the shaft 39.

As explained in the aforesaid copending application of Cellerini, it is frequently advisable to provide an auxiliary switch or auxiliary contact members which are operated in conjunction with the main contact members of a switch of the present type. The auxiliary contact members may be utilized in control and indicating circuits for the main switch. As shown in FIGS. 1 and 3, an auxiliary switch 45 is mounted on a bracket 46 which is attached to the base 12 by means of screws 47. The switch 45 is disposed in a recess 48 in the base and is attached to the bracket 46 by means of screws 49. The switch 45 may be of a snap-acting type available on the open market and the contact members of the switch are actuated by a plunger 51. As shown in FIGS. 1 and 3, an arm 52 is oscillated by the shaft 18 to engage a lever 53 on the switch 45 to depress the plunger 51 when the shaft 18 is rotated to operate the main contact members of the switch. Thus, the auxiliary switch is operated in conjunction with the main contact members of the switch as previously

explained. The switch 45 is of a spring-return snap-acting type. Thus, the plunger 51 is returned to its uppermost position when pressure is removed from the lever 53 by disengaging the arm 52 from the lever 53.

In order to facilitate the making of electrical connections to the switch, the terminal connectors 14 and 14', are offset to one side of the center line through the contact members of the switch. As shown in FIGS. 6 and 7, the line terminal conductor 13 is offset in a vertical plane and also in a horizontal plane. Thus, the terminal connector 14 which is attached to the conductor 13 is offset from the center line through the contact members of the switch. Likewise, the terminal connector 14', which is in alignment with the connector 14, is offset from the center line through the switch. As previously explained, the connector 14' is attached to the Z-shaped fuse terminal 25.

As shown in FIG. 1, the load-side fuse terminal 25 and a line-side fuse terminal 55 are offset to the other side of the center line through the switch. Thus, when fuses are provided for the switch, as will be described more fully hereinafter, they do not extend over the terminal screws 16 and 16' and do not interfere with the making of electrical connections to the switch.

As explained hereinbefore, it is desirable to be able to utilize the present switch either as a non-fused switch or as a fused switch. In order to utilize the switch as a fused switch, a fixed connector 56 extends along one side of each pole of the switch. The main central portion of the conductor 56 is on edge and lies in a plane generally perpendicular to the base of the switch, so that heavy currents may be conducted and still keep the width of the switch to a minimum. As shown in FIGS. 12 and 13, one end of the connector 56 is attached to the line-side fuse terminal 55, preferably by brazing the connector 56 to the fuse terminal 55. The other end of the connector 56 has an offset portion 57 provided with an opening 58. As shown in FIG. 9, a connector 22', which is similar in shape to the connector 22 but having a shorter upper horizontal leg, may be attached to the end 57 of the connector 56 by means of a screw 59 which is inserted into the opening 58.

If it is not desired to provide a separate connector 22', similar to the connector 22, the connector 22 may be rotated about the screw 24 to a position in which the screw 59 may be inserted through the opening 23 in the connector 22. Thus, the same connector 22 may be utilized to connect the switch either as a fused or a non-fused switch, or as previously stated a separate connector 22' may be provided when the switch is connected as a fused switch. In either case, the connector 22 must be disconnected from the fuse terminal 25 before a fuse clip can be attached to this terminal to utilize the switch as a fused switch. Thus, the possibility of an error being made in changing the connections from a non-fused to a fused switch is precluded. The same screw 59 may be utilized for connecting the connector 22 to the fuse terminal 25 or to the connector 56. If a separate connector 22' is provided, the screw 59 may be utilized to attach this connector to the connector 56.

As shown in FIGS. 9 and 14, a fuse clip 61 may be attached to each fuse terminal 25. Likewise, another clip 61 may be attached to each fuse terminal 55. Heretofore, fuse clips or holders of a type for receiving blade type fuses have been so constructed that they can be attached to conductors by screws coming up from the bottom of the conductor.

In the present switch, it is not feasible to utilize screws which must be inserted from the bottom of the switch to attach the fuse clips to the fuse terminals or conductors. Thus, as shown more clearly in FIGS. 10 and 11, one of the present fuse clips comprises a pair of oppositely disposed generally L-shaped blades 62 which are attached to an adapter 63 by means of rivets 64. The rivets 64 are flush with the bottom of the adapter 63, whereby permitting the adapter to be mounted on the surface of a

terminal. Two holes 65 are provided in the adapter 63 for receiving screws for attaching the adapter to the fuse terminal. Thus, the fuse clips may be attached to the fuse terminals by screws which are inserted from above the clips. Oppositely disposed pressure springs 66 may be fastened on the blades 62 by means of a rivet 67 in a manner well known in the art. In this manner, the contact pressure between the blades 62 and the blade of the fuse may be increased.

As shown in FIGS. 9 and 14, a fuse 68 may be inserted in the fuse clips 61. When fuses are provided for the switch the electrical circuit through each pole of the switch extends from the line side terminal connector 14 through the conductor 13, the contact members 15 and 19, the flexible conductor 21, the connector 22 or 22', the connector 56, the line-side fuse terminal 55, the fuse 68, the load side fuse terminal 25 and the load-side terminal connector 14'.

As previously explained, if it is desired to utilize the switch as a non-fused switch, the fuse clips 61 of the fuses 68 may be removed and the connector 22 utilized to connect the flexible conductor 21 directly to the load-side fuse terminal 25. It will be noted that the connectors 22 and 22', which are utilized in changing the switch from a fused to a non-fused switch or vice versa, are of a rigid type. Thus, it is not necessary to utilize flexible shunts or conductors in changing the connections for the switch. As previously explained, the present switch is constructed for relatively heavy duty and is capable of the carrying of 200 amperes or more of current. Therefore, it is not feasible to utilize flexible conductors in making changes in the switch connections since the flexible conductors would necessarily be heavy and difficult to utilize in making a changeover from fused to non-fused operation or vice versa.

From the foregoing description, it is apparent that the present switch is suitable for relatively heavy duty service. The switch is so constructed that electrical connections may be readily made to the switch and it may be readily connected for either fused or non-fused operation. The fuse clips may be readily attached to the switch when changing from non-fused to fused operation. The operating mechanism may be actuated for testing or inspection purposes without it being necessary to provide an extra operating handle in addition to the handle attached to the cover of the enclosure for the switch.

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 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. An electric switch comprising a unitary insulating base, a line terminal conductor attached to said base and having a laterally offset portion, a contact member secured to said line terminal conductor, a contact arm having a contact member secured thereto and engageable with the contact member on the line terminal conductor, actuating means for oscillating said contact arm, a line terminal connector on the offset portion of the line terminal conductor, said connector being offset to one side of the center line through said contact members, a line side fuse terminal offset to the other side of said center line, a load side fuse terminal disposed in alignment with the line side fuse terminal, a load terminal connector on the load side fuse terminal, said load terminal connector being in alignment with the line terminal connector, and conductors for connecting the contact arm to the line side fuse terminal for fused operation of the switch.

2. An electric switch comprising a unitary insulating base, a line terminal conductor attached to said base and having a laterally offset portion, a contact member secured to said line terminal conductor, a contact arm hav-

ing a contact member secured thereto and engageable with the contact member on the line terminal conductor, actuating means for oscillating said contact arm, a line terminal connector on the offset portion of the line terminal conductor, said connector being offset to one side of the center line through said contact members, a line side fuse terminal offset to the other side of said center line, a load side fuse terminal disposed in alignment with the line side fuse terminal, a load terminal connector on the load side fuse terminal, said load terminal connector being in alignment with the line terminal connector, and conductors for connecting the contact arm to the load side fuse terminal for non-fused operation of the switch.

3. An electric switch comprising a unitary insulating base, a line terminal conductor attached to said base and having a laterally offset portion, a contact member secured to said line terminal conductor, a contact arm having a contact member secured thereto and engageable with the contact member on the line terminal conductor, actuating means for oscillating said contact arm, a line terminal connector on the offset portion of the line terminal conductor, said connector being offset to one side of the center line through said contact members, a line side fuse terminal offset to the other side of said center line, a load side fuse terminal disposed in alignment with the line side fuse terminal, a load terminal connector on the load side fuse terminal, said load terminal connector being in alignment with the line terminal connector, and conductors for connecting the contact arm to the line side fuse terminal for fused operation of the switch, one of said conductors being movable to connect the contact arm to the load side fuse terminal for non-fused operation of the switch.

4. An electric switch comprising a unitary insulating base, a line terminal conductor attached to said base, a contact member secured to said line terminal conductor, a contact arm having a contact member secured thereto and engageable with the contact member on the line terminal conductor, actuating means for oscillating said contact arm, a line terminal connector on the line terminal conductor, said connector being offset to one side of the center line through said contact members, a line side fuse terminal offset to the other side of said center line, a load side fuse terminal disposed in alignment with the line side fuse terminal, a load terminal connector on the load side fuse terminal, said load terminal connector being in alignment with the line terminal connector, a flexible conductor having one end attached to the contact arm, a generally Z-shaped connector connected to the other end of the flexible conductor, and a fixed conductor having a generally flat central portion lying in a plane perpendicular to said base to connect said Z-shaped connector and said line side fuse terminal for a fused switch.

5. An electric switch comprising a unitary insulating base, a line terminal conductor attached to said base, a contact member secured to said line terminal conductor, a contact arm having a contact member secured thereto and engageable with the contact member on the line terminal conductor, actuating means for oscillating said contact arm, a line terminal connector on the line terminal conductor, said connector being offset to one side of the center line through said contact members, a line side fuse terminal offset to the other side of said center line, a load side fuse terminal disposed in alignment with the line side fuse terminal, a load terminal connector on the load side fuse terminal, said load terminal connector being in alignment with the line terminal connector, a flexible conductor having one end attached to the contact arm, a generally Z-shaped connector connected to the other end of the flexible conductor, a fixed conductor having a generally flat central portion lying in a plane perpendicular to said base to connect said Z-shaped connector and said line side fuse terminal for a fused switch, and said Z-shaped connector being movable to connect the flexible

conductor to the load side fuse terminal for a non-fused switch.

6. An electric switch comprising a unitary insulating base, a line terminal conductor attached to said base, a contact member secured to said line terminal conductor, a contact arm having a contact member secured thereto and engageable with the contact member on the line terminal conductor, actuating means for oscillating said contact arm, a line terminal connector on the line terminal conductor, said connector being offset to one side of the center line through said contact members, a line side fuse terminal offset to the other side of said center line, a load side fuse terminal disposed in alignment with the line side fuse terminal, a load terminal connector on the load side fuse terminal, said load terminal connector being in alignment with the line terminal connector, a flexible conductor having one end attached to the contact arm, a generally Z-shaped connector connected to the other end of the flexible conductor, a fixed conductor having a generally flat central portion lying in a plane perpendicular to said base to connect said Z-shaped connector and said line side fuse terminal for a fused switch, and said Z-shaped connector being disconnectable from said fixed conductor and connectable to the load side fuse terminal to change the switch from a fused to a non-fused switch.

7. An electric switch comprising a unitary insulating base, a line terminal conductor attached to said base, a contact member secured to said line terminal conductor, a contact arm having a contact member secured thereto and engageable with the contact member on the line terminal conductor, actuating means for oscillating said contact arm, a line terminal connector on the line terminal conductor, said connector being offset to one side of the center line through said contact members, a line side fuse terminal offset to the other side of said center line, a load side fuse terminal disposed in alignment with the line side fuse terminal, a load terminal connector on the load side fuse terminal, said load terminal connector being in alignment with the line terminal connector, a flexible conductor having one end attached to the contact arm, a generally Z-shaped connector connecting the other end of the flexible conductor to the load side fuse terminal for a non-fused switch, a fixed connector having a generally flat central portion lying in a plane perpendicular to the base and connected to the line side fuse terminal, and said Z-shaped connector being disconnectable from the load side fuse terminal and connectable to said fixed connector to change the switch from a non-fused to a fused switch.

8. An electric switch comprising a unitary insulating base, a line terminal conductor attached to said base and having a laterally offset portion, a contact member secured to said line terminal conductor, a contact arm having a contact member secured thereto and engageable with the contact member on the line terminal conductor, actuating means for oscillating said contact arm, a line terminal connector on the offset portion of the line terminal conductor, said connector being offset to one side of the center line through said contact members, a line side fuse terminal offset to the other side of said center line, a load side fuse terminal disposed in alignment with the line side fuse terminal, a load terminal connector on the load side fuse terminal, said load terminal connector being in alignment with the line terminal connector, connectors for connecting the contact arm to the line side fuse terminal for fused operation of the switch, and said connectors being shaped to permit the fuse terminals to be on a higher level than said contact members.

9. An electric switch comprising a unitary insulating base, a line terminal conductor attached to said base

and having a laterally offset portion, a contact member secured to said line terminal conductor, a contact arm having a contact member secured thereto and engageable with the contact member on the line terminal conductor, actuating means for oscillating said contact arm, a line terminal connector on the offset portion of the line terminal conductor, said connector being offset to one side of the center line through said contact members, a line side fuse terminal offset to the other side of said center line, a load side fuse terminal disposed in alignment with the line side fuse terminal, a load terminal connector on the load side fuse terminal, said load terminal connector being in alignment with the line terminal connector, connectors for connecting the contact arm to the line side fuse terminal for fused operation of the switch, said connectors being shaped to permit the fuse terminals to be on a higher level than said contact members, and fuse clips attached to said fuse terminals by means extending through the fuse clips into said terminals.

10. An electric switch comprising a unitary insulating base, a line terminal conductor attached to said base, a contact member secured to said line terminal conductor, a contact arm having a contact member secured thereto and engageable with the contact member on the line terminal conductor, actuating means for oscillating said contact arm, a line terminal connector on the line terminal conductor, said connector being offset to one side of the center line through said contact members, a line side fuse terminal offset to the other side of said center line, a load side fuse terminal disposed in alignment with the line side fuse terminal, a load terminal connector on the load side fuse terminal, said load terminal connector being in alignment with the line terminal connector, conductors for connecting the contact arm to the line side fuse terminal for fused operation of the switch, a fuse adapter attached to each fuse terminal, and a pair of oppositely disposed generally L-shaped jaws having their bases attached to each adapter.

11. An electric switch comprising a unitary insulating base, a line terminal conductor attached to said base, a contact member secured to said line terminal conductor, a contact arm having a contact member secured thereto and engageable with the contact member on the line terminal conductor, actuating means for oscillating said contact arm, a line terminal connector on the line terminal conductor, said connector being offset to one side of the center line through said contact members, a line side fuse terminal offset to the other side of said center line, a load side fuse terminal disposed in alignment with the line side fuse terminal, a load terminal connector on the load side fuse terminal, said load terminal connector being in alignment with the line terminal connector, conductors for connecting the contact arm to the line side fuse terminal for fused operation of the switch, a fuse adapter attached to each fuse terminal, a pair of oppositely disposed generally L-shaped jaws having their bases attached to each adapter, and oppositely disposed spring members attached to the legs of said jaws.

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