April 3, 1962 A. R. NORDEN 3,028,459

SWITCH AND ENCLOSURE THEREFOR

Filed Feb. 19, 1959 3 Sheets-Sheet 1

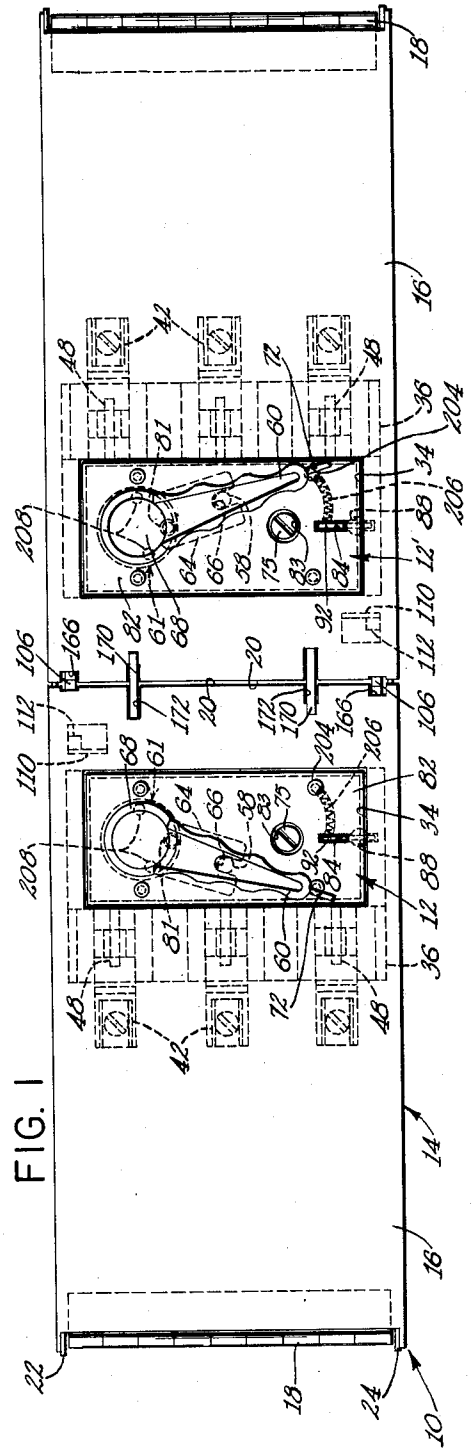


FIG. 1

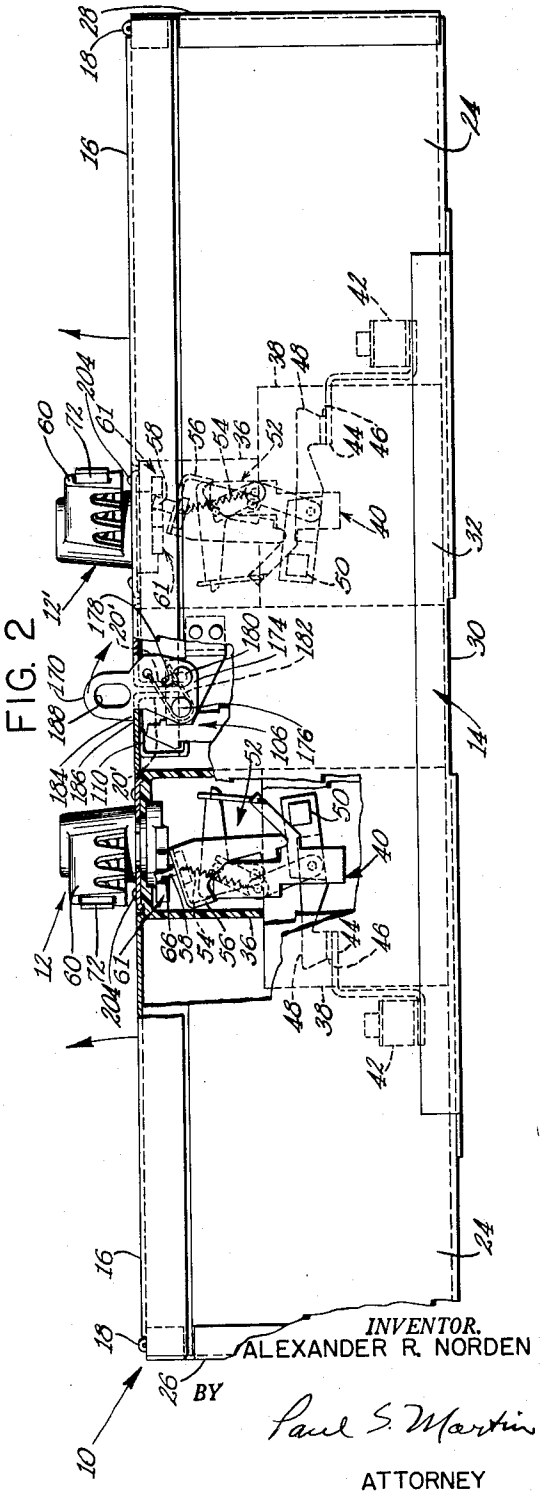


FIG. 2

INVENTOR.
ALEXANDER R. NORDEN
BY
Paul S. Martin
ATTORNEY

April 3, 1962 A. R. NORDEN 3,028,459

SWITCH AND ENCLOSURE THEREFOR

Filed Feb. 19, 1959 3 Sheets-Sheet 2

FIG. 3

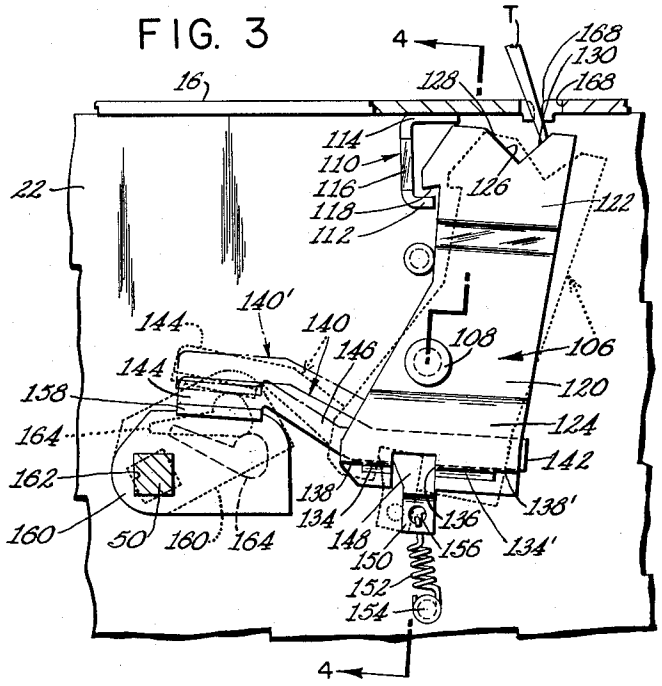


FIG. 4

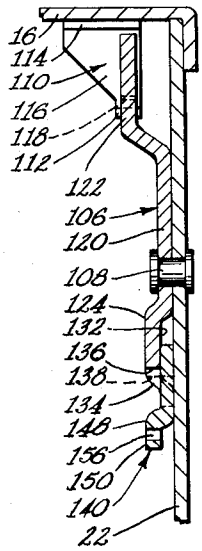
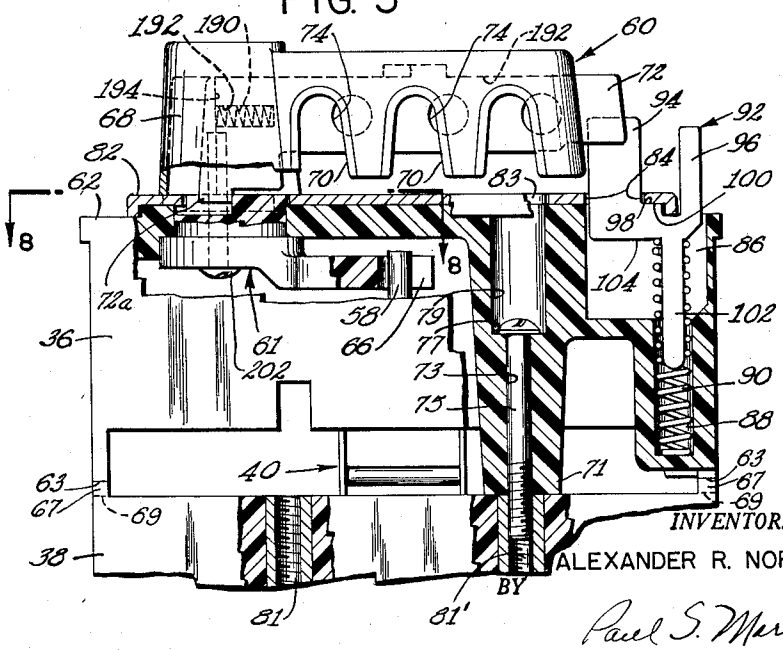


FIG. 5



INVENTOR.
ALEXANDER R. NORDEN
Paul S. Martin
ATTORNEY

April 3, 1962 A. R. NORDEN 3,028,459

SWITCH AND ENCLOSURE THEREFOR

Filed Feb. 19, 1959 3 Sheets-Sheet 3

FIG. 6

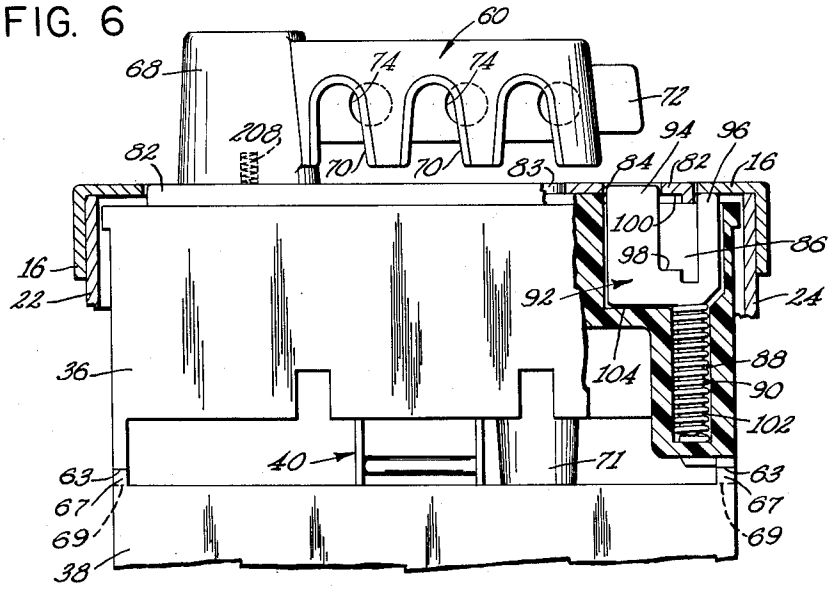


FIG. 7

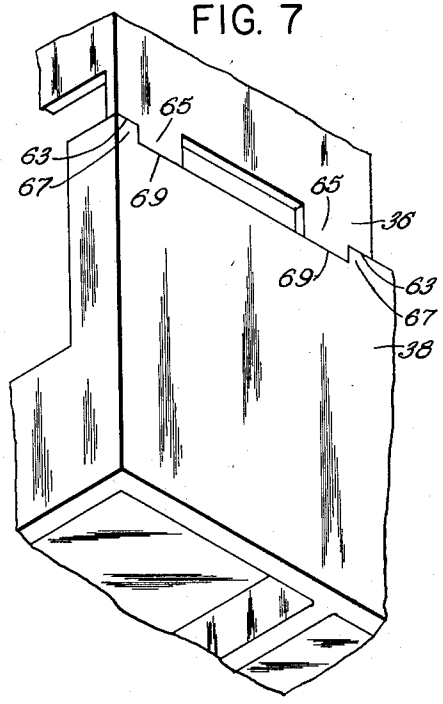
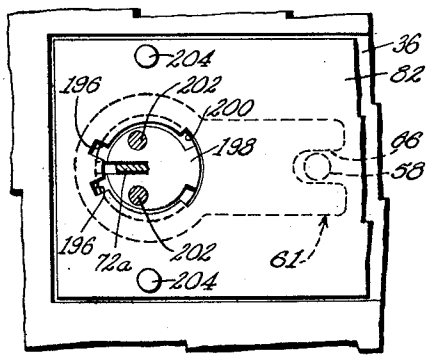


FIG. 8



INVENTOR.
ALEXANDER R. NORDEN

BY Paul S. Martin

ATTORNEY

United States Patent Office 3,028,459
Patented Apr. 3, 1962

3,028,459

SWITCH AND ENCLOSURE THEREFOR

Alexander R. Norden, New York, N.Y., assignor to Federal Pacific Electric Company, a corporation of Delaware

Filed Feb. 19, 1959, Ser. No. 794,316
13 Claims. (Cl. 200—50)

This invention relates generally to a switching device such as a switch or a circuit breaker and enclosure therefor and, more particularly, to the front operated type of switching device.

One important object of the present invention is the provision of a novel front operated switching device which is reversibly positionable with respect to a panel or enclosure in such manner that the actuating handle which has an off-center pivot may be oriented with the handle extending from the pivot in generally the same common direction independent of the selected position of the switching device. Pursuant to this object of the present invention the actuating handle is pivotally mounted on a cover part to swing across the face of the cover and is provided with a separable operative connection with the switch mechanism mounted on a base part, the operative connection being so symmetrically disposed as to permit the reversal of the base part with respect to the cover part. The handle swings through a relatively narrow angle so that it extends in the same general direction from its pivot that is located off-center of the cover. Accordingly for a given handle orientation the switch mechanism may be selectively disposed in bodily reversed positions. In the embodiment of the invention to be described hereinafter, a double branch switch enclosure is provided having similar switches in which one switch is reversed with respect to the other with the front operated actuating handles being oriented in a common direction.

Another important object of the present invention is the provision of a switch and enclosure therefor having a novel and improved interlock for the enclosure cover and the actuating handle of the switch. Pursuant to this object of the present invention, the enclosure is provided with an openable cover having an interlock controlled by the switch mechanism so that the interlock is effective to latch the cover closed in the "on" position of the switch and to release the cover to permit the same to be opened in the "off" position of the switch. As a further feature the interlock is defeatable in a novel and improved manner to permit the cover to be opened in the "on" position of the switch. The interlock is coupled to the actuating handle through the over-centering spring means of the switch mechanism whereby the interlock is controlled by the position of the contacts. In this manner the interlock cannot release the cover for opening movement unless the contacts are open. In the event the interlock is frozen in the interlocked position, the switch may nevertheless be thrown to the "off" position to open the contacts whereby the interlock does not override contact opening. Further pursuant to this object of the present invention, the interlock for the actuating handle is responsive to the position of the enclosure cover so that on the opening of the latter a blocking action comes into play to prevent the actuation of the handle, the blocking action being defeated on the closing of the cover.

Yet another object of the present invention is the provision of a switch or circuit breaker and enclosure therefor of generally improved design and construction, and which are eminently suitable for the accomplishment of their intended purposes.

The above and other objects, features and advantages of the present invention will be more fully understood from the following description considered in connection with the accompanying illustrative drawings.

In the drawings:

FIG. 1 is a front view of a double branch switch enclosure formed according to the present invention with both switches in an "on" or circuit closed condition and with the enclosure covers closed;

FIG. 2 is a side elevational view thereof with a schematic partial showing of the switch mechanism of one switch with the other switch and enclosure thereat being partially broken away to reveal structural details of the switch;

FIG. 3 is a fragmentary side elevational view showing the cover interlock and associated switch mechanism, the solid line position of the parts corresponding to the "on" position of the switch and the dotted line position corresponding to the "off" position of the switch;

FIG. 4 is a sectional view taken on the line 4—4 of FIG. 3;

FIG. 5 is a side elevational view of the switch with portions broken away to reveal structural details of the handle and handle interlock, the switch being shown mounted in the enclosure with the cover thereof removed;

FIG. 6 is a view similar to FIG. 5 showing the enclosure cover in the closed position;

FIG. 7 is a partial perspective view illustrating the manner of interlocking the cover and base parts of the switch;

FIG. 8 is a plan cross-sectional view of the apparatus in FIG. 5 along the line 8—8 therein.

Referring to the drawings, and more particularly to FIGS. 1 and 2 thereof, there is shown a double branch enclosure 10 having switches 12 and 12' secured therein, the switches being of identical construction but reversibly disposed as will be described in detail below. The enclosure 10 is preferably of sheet metal construction and comprises a recetacle part 14 having openable covers 16 hinged to opposite ends thereof as indicated at 18. The covers 16 are individually movable between open and closed positions and in their closed positions their inner edges 20 are disposed in closely adjacent relation at the longitudinal center of the enclosure. The receptacle part 14 comprises opposite sidewalls 22 and 24, end walls 26 and 28, and a bottom wall 30 having a pan 32 secured thereto, said pan defining a mounting platform for the switches. The covers 16 are suitably hinged to the end walls 26 and 28, and the confronting edges 20 of said covers have inturned flanges 20'. The covers 16 have openings 34 which register with the switch cover blocks 36 for exposing the latter in the closed position of the covers 16.

The switches 12, 12' are of basically conventional construction, departing from conventional construction in the respects to be described in detail below. Each switch comprises interfitting detachably secured cover and base parts 36 and 38, respectively which house the switch mechanism 40, the part 38 being suitably secured to the bottom pan 32. The parts 36 and 38 are preferably molded of a suitable insulating material. The switch includes the usual terminals 42 which are adapted for connection into a circuit to be controlled. The switch is of the three pole type, each being provided with an associated pair of stationary and movable contacts 44 and 46, respectively, the movable contacts being mounted on movable contact members 48 which in turn are mounted for actuation by the bar 50 which has an axis of rotation extending longitudinally of the switch. Thus the bar 50 provides for the simultaneous actuation of the movable contact members of the three poles. The contact members 48 are movable to "open" and "closed" positions by the operating mechanism indicated generally at 52, which is provided with overcentering spring mechanism. The switch is of the quick make and break type and operatively associated with mechanism 52 are the over-

centering springs 54. The mechanism 52 is thus of the quick make and break type and includes an operating member 56 having a projecting pin 58 which is pivotally movable in a path disposed transversely of the switch to actuate the movable contact members 48.

Pursuant to the present invention, the pin 58, which provides a separable operating connection with handle 60, is disposed for movement along a path coincident with a transverse median line of the switch cover part and the extreme "on" and "off" positions thereof are equidistant from the center of the switch cover part and equidistant from the center of such median line. Differently expressed, the intermediate point of the path of transverse movement of the pin 58 is coincident with the center of the switch cover part which is at the intersection of the longitudinal and transverse axes thereof, this arrangement providing for the reversibility of the cover and base parts of the switch with respect to each other. The handle 60 is of the front mounted twist type and is suitably secured to the operating arm 61 which is journalled to rotation on the front wall 62 (see FIG. 5) of the cover block 36, the operating arm being mounted on the underside of said wall. The operating arm terminates in a forked fitting 64 which defines slot 66, the latter detachably receiving the pin 58 of the switch to form an operative connection therewith. The handle 60 is pivotally movable between "on" and "off" positions, which are equidistant from the center of the switch cover, to concomitantly actuate pin 58 along a transverse median path. In FIG. 1 the base part 38 of the switch 12' is shown reversed from the base part 38 of switch 12, the cover parts being disposed in the same direction. This selective reversal of direction of the base parts with respect to the cover parts is made possible by the symmetrical positioning of the operative connection between the pin 58 and slot 66 as described above. In FIG. 1 both handles 60 are shown in an "on" position and are pivotally movable towards each other to open the respective switches, the handles being symmetrically positioned on the enclosure and extending in a downward direction, the operative connections 58, 66 of switch 12 being opposite to the corresponding connections of switch 12'. It will be understood that the base and cover parts of the breaker may be secured in interfitting relation in both relative dispositions as exemplified by switches 12 and 12'. More particularly, as shown in FIG. 7, at each corner portion of the bottom edge of the cover part 36 there is provided a cutout and projection 63 and 65, respectively which are formed complementary to the projections 67 and edge portions 69, respectively at the top of the base part 38 for interlocking the base and cover parts of the switch in either relative disposition as described above. Thus both ends of both the cover and base parts are similarly symmetrically formed so that the cover part may be secured to the base part in interlocking relation therewith in the selected relative disposition. Asymmetrically positioned along the longitudinal axis of the cover part is a projecting fitting 71 which defines an aperture 73 for the screw 75 which seats on the shoulder 77 defined by the counterbore 79 which is open to the front of the cover part, the screw 75 being received in a registering threaded fitting 81 or 81' of the base for securing the base and cover parts in assembled relation. In one relative disposition of the cover and base parts, the screw 75 is received in fitting 81' as shown in FIG. 5 and in the opposite relative disposition the screw 75 will be received in registering fitting 81 for securing the parts in assembled relation.

It will be observed that the base part projects laterally beyond the cover part to enclose the switch mechanism. The aforedescribed interlocking connection between the cover and base parts of the switch provides for the absorption of the torque of the handle 60 by the entire casing of the switch which forms a rigid unitary structure in the assembled relation of the cover and base parts. The handle 60 is carried by the switch casing itself and not by the enclosure cover to thereby eliminate alignment problems in providing a separable connection between the switch and cover carried handle and the attendant necessary cover reinforcement to absorb the torque of the twist operating handle.

The actuating handle 60 is pivoted at one end with the pivot axis being disposed off-center of the cover part, that is along the longitudinal axis of the cover part but spaced from the transverse axis thereof, the actuating handle swinging through a relatively narrow angle across the face of the cover part. More particularly, the actuating handle pivotally moves within the confines of opening 34, the handle clearing the cover 16 at said opening. Thus the actuating handle with its off-center pivot may be oriented with the handle extending from the pivot in generally the same common direction independent of the selected position of the reversibly positionable switching device. The pivotal axis of the handle 60 is disposed perpendicular to the cover 16 in the closed position thereof.

With reference to FIGS. 5 and 6, the handle 60 comprises a hub 68 which is secured to the arm 61, the handle being hollowed out and open at the rear. The handle is provided with a series of three apertures 70 which are dimensioned to receive the shank of the padlock, the handle having a longitudinally reciprocable flat locking slide 72 provided with apertures 74 which register with apertures 70 in the locking position of the slide for externally locking the operating handle by one or more padlocks.

Secured to the face of the cover block is a metal plate 82 which is provided with a suitable opening for the extension therethrough of the arm 61.

The plate 82 is provided with a longitudinal slot 84 which communicates with the slot 86 extending into the cover part 36, the slot 86 having a circular closed bottom recess 88 in which a compression spring 90 is seated. The plate 82 is also provided with an aperture 83 in registry with counterbore 79 for the reception of screw 75. Axially movable in slot 86 is a handle interlock member 92 which is constituted by a flat plate having a handle blocking part 94 and a cover actuator part 96 in longitudinally spaced relation, the part 94 extending through slot 84 of plate 82. The portion 98 of the member 92 seats against the bottom portion 100 of the plate 82 to limit the extension of the member 92 outwardly of the cover block. The member 92 has a depending part 102 which extends into the spring 90, the latter serving to bias the member 92 to its extended handle blocking position shown in FIG. 5. The spring 90 seats against the bottom of recess 88 at one end and seats against the edge 104 of member 92 at the opposite end. In the extended handle blocking position of member 92, which position the latter assumes with the companion cover 16 open, the part 94 is disposed in the path of movement of the handle to thereby block the movement thereof out of position. With reference to FIG. 6, on closing the cover, the latter depresses the part 96 inwardly of the cover block to thereby concomitantly retract the part 94 out of the path of movement of the actuating handle. Thus the part 96 is disposed to coact with the cover and is responsive to cover position, the opening of the cover providing for the automatic extension of the part 94 by spring bias to handle blocking position. It will be understood that the slot 86 is of requisite depth to provide for the movement of the member 92 therein to the fully retracted position.

Pursuant to the present invention, an interlock and cover latch is provided for each of the covers 16, the interlock being controlled by the switch mechanism so as to be effective to latch the cover closed in the "on" position of the switch and to release the cover to permit the same to be opened in the "off" position of the switch. The interlock for each cover 16 comprises an interlock member 106 (FIG. 3) pivotally mounted on a companion

sidewall 22, 24 of the enclosure by means of the pivot pin 108, the member 106 being operatively associated with a catch 110. The catch is constituted by a U-shaped part having laterally spaced differential length legs 112 and 114 which are interconnected by a base portion 116, the longer leg 114 being suitably secured to the inside face of the cover with the shorter leg 112 defining a latch portion which is disposed to interlock with a companion latch portion 118 of the member 106. The member 106 is preferably of stamped integral metallic construction and comprises a base part 120 and laterally offset parts 122 and 124, the part 122 having a V notch 126 at the top thereof defined by the shoulders or cam edges 128 and 130. The part 124 defines a longitudinal slot 132 (FIG. 4) extending transversely of member 106 and depending from part 124 in the plane of part 120 are portions 134 and 134' which are spaced from each other to define a notch 136 therebetween. The portions 134 and 134' have shoulders 138 and 138', respectively which are coincident with the top edges thereof and which coact with the auxiliary lever 140, the latter being preferably of stamped metallic construction. The lever 140 comprises coplanar longitudinal straight portions 142 and 144 and an intermediate inclined portion 146, the portion 142 being normally seated against the shoulders 138 and 138' and between the part 124 and the enclosure sidewall in slot 132. The portion 142 has a depending coplanar portion 148 which extends in notch 136 in substantially flush relation with portions 134 and 134', the portion 148 having a laterally offset terminal part 150. The interlock spring 152 has one end interengaged with the pin 154, which is secured to the enclosure sidewall, and its opposite end is engaged in the aperture 156 of part 150. The spring 152 is effective to bias the member 106 and the lever 140 in a counterclockwise latching direction viewing FIG. 3, and in normal operation the member 106 and lever 140 operate conjointly as a unitary assembly.

The portion 144 has a laterally projecting flange 158 which is adapted to cooperate with the interlock lever 160 and is disposed in the path of movement thereof. The lever 160 has a quadrilateral opening 162 for the reception of the bar 50 which actuates said lever. Laterally projecting from the lever 160 is a cam part 164 which engages flange 158 to conjointly rotate the member 106 and lever 140 in a clockwise direction viewing FIG. 3 and disengage the latch portion 118 from catch 110, on the actuation of the switch to "off" position. In the "on" position of the switch, the parts shown in FIG. 3 are in the solid line position with cam part 164 being spaced from flange 158 and the member 106 being biased into interlock with the catch 110 so that the cover is latched closed due to the interengagement of latch portions 112 and 118. In the "off" position of the switch, the parts are in the dotted line position and the cam part 164 has been rotated by the bar 50 to correspondingly actuate member 106 and lever 140 against the bias of spring 152 and thereby release the latch portions 112 and 118 from interengagement and condition the cover for opening movement.

Each cover can be conditioned for opening movement in the "on" position of the switch by defeating the interlock 106. The confronting edges 20 of the covers in the region of the interlocks have defined therebetween slots 166, said edges having turned down flanges 168 thereat. A tool T, such as a screwdriver, may be inserted in a slot 166 as shown in FIG. 3 and depressed against the inclined cam edge 130 to pivot interlock 106 in an unlatching direction to the dotted line position to clear catch 110. It will be understood that on the withdrawal of the tool from the slot, the interlock will be spring returned to the solid line latching position.

With reference to FIGS. 1 and 2, each cover is also provided with an associated cover latch 170 which projects through a companion slot 172 defined in the covers. Latch 170 is pivotally mounted on the pin 176 of a bracket 174 which is secured to an enclosure sidewall 22, 24. The latch 170 is slotted as indicated at 178 for the reception of the stop pin 180 which is fixed to bracket 174, the pin 180 coacting with said slot to limit the extent of pivotal movement of the latch. The latch is provided with a torsion spring 182 to bias the same in a latching direction. In the latch closed condition of the cover, the shoulder 184 of the latch 170 is interengaged with the portion 186 of the cover to thereby prevent the cover from being opened, the latch 170 being pivotally movable in the direction of the arrow against the bias of spring 182 to disengage the latch from the cover to condition the latter for opening movement. The covers may be externally locked by passing padlocks through the apertures 188 of the latches, the padlocks thereby blocking the opening movement of the covers. From the above it will be apparent that both the switch controlled interlock 106 and cover latch 170 must be released to condition the cover for opening movement. In the "off" position of the switch, the interlock 106 will be released so that the manipulation of the cover latch to released position will condition the cover for opening movement, the cover being spring projected to open position under the action of spring biased member 92.

In the event the interlock 106 is frozen in the solid line interlocked position for any reason, the switch may nevertheless be thrown to the "off" position pursuant to the instant construction. In such event the actuation of the cam part 164 will pivotally lift lever 140 about shoulder 138' to position 140' against the action of spring 152, there being provided sufficient clearance in slot 132 to permit this movement of lever 140 relative to interlock 106. Thus in normal operation member 106 and lever 140 operate conjointly as a unitary assembly and in the event of a frozen interlock the switch may be thrown "off" by the movement of lever 140 relative to member 106, as illustrated in FIG. 3.

The interlock lever 160 is conveniently formed as an integrally molded part. The lever 160 and consequently the cover interlock is controlled by the position of the contact arms, the actuating handle being coupled to the interlock through the overcentering springs 54. Thus the cover interlock cannot release the cover for opening movement unless the contacts open. If the contacts should weld or otherwise be stuck closed, the handle may be moved to the "off" position through the springs 54 but the cover interlock will not release. Thus the handle gives a true indication of switch condition at all times pursuant to the present construction. As aforenoted, in the event the interlock member 106 is frozen in the interlocked position, the switch may nevertheless be thrown "off" to open the contacts.

Slide 72 was described as a locking slide. It achieves this purpose by virtue of structural detail in FIGS. 5 and 8. Locking slide has a downward projection 72*a* suitably received in a slot in forked operating arm 61 of molded insulation, and the slide is biased to the horizontally projected position shown by compression spring 190 received in slot 192 in slide 72, spring 190 pressing against inside shoulder portions 194 of the handle.

Slide 72 can be manually pushed to the left in FIG. 5 so that holes 74 line up with notches 74 for receiving one or more padlocks. This can be done only when the handle is in either the "on" or the "off" positions, for only then can slide portion 72*a* enter one of the slots 196 in plate 82. So long as padlocks arrest slide 72, portion 72*a* remains in one of the slots 196 and prevents handle operation. When the slide is freed by removal of all padlocks from the handle, spring 190 restores the locking slide to its projected position.

So long as the handle is locked, accidental operation of the handle is impossible. If the handle is not locked, its slide 72 projects so that, when the cover is open unintentional operation of the switch, as from "off" to "on" is blocked by projecting interlock 92. However,

it may be desirable to defeat this interlock as for test purposes. In that event, by deliberately depressing interlock **92**, the service man can free the handle for switch operation.

Molded insulating arm **62** swings inside cover **36** and in its end positions it engages the inside walls of the cover so as to confine the handle within the opening **34** of the cover. Projection **198** of arm **61** works within cut-out **200** in plate **82** (FIG. 8) to further insure limiting the sweep of the handle. Screws **202** join the handle **60** to arm **61**, which function as a unit and are thus pivotally assembled to cover **36—82**.

A safety feature is included in the apparatus, shown in FIGS. 1 and 6, for insuring the operating handle against becoming an electrical hazard to personnel. Handle **60** of the metal is well insulated from all possible connection to the internal switch parts. However to eliminate electrical hazard, handle **60** and metal plate **82** are both electrically connected to each other by compression springs **208**, and an electrical path from these is completed via rivet **204** (four of which hold plate **82** to cover **36**) and spring **206** in a groove in cover plate **36**, to bear against interlock member **92** which, in turn, touches the inside surface of the metal door of the grounded enclosure.

Various additional modifications of the above embodiments of the invention will readily occur to those skilled in the art, and therefore the invention should be broadly construed in accordance with its full spirit and scope.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A switching device, comprising base and cover parts interlockably engageable along their meeting edges for securement to each other in either of two mutually reversed casing defining relationships, said cover having a center point that occupies the same position relative to said base for both said reversed relationships, said base part having circuit controlling mechanism, said cover having an elongated external handle movable between "on" and "off" positions for correspondingly actuating said mechanism and said handle being pivoted to said cover part near one end thereof and extending generally in the same direction in both said "on" and "off" positions, and means providing an operative connection between said handle and said mechanism, said last named means including a pin carried by said circuit controlling mechanism and an arm fixed to said handle and having a slot that meshes with said pin when said base and cover are engaged in either of said relationships, said pin having a path of movement whose center substantially coincides with the aforementioned center point of said cover, and the path of said pin from the center of its path of travel to either extreme being short relative to the distance between the pivotal axis of said handle and said center point of said cover.

2. Enclosed switching apparatus, including an enclosure having a door covering the front thereof, a switching device within the enclosure including a contact member movable between "on" and "off" positions, a front operated handle movable about an axis perpendicular to the door when closed to operate the switching device, said door having an opening that is fully occupied by the switching device when the door is closed and the handle being disposed forward of the door to constitute a front operated switching device, a cover catch and a latch within the enclosure coacting with said cover latch when the handle has operated said contact member to its "on" position, and a yieldable drive connection from said contact member to said latch normally operable to release the door catch when the handle is operated to operate the contact member to the "off" position, the drive connection yielding to allow opening of the switching device in response to opening operation of the handle in the event of the cover catch being jammed.

3. Enclosed switching apparatus, including an enclosure having a door covering the front thereof, a switching device within the enclosure including a contact member movable between "on" and "off" positions, and operating mechanism therefor comprising over-centering spring means, a front operated handle movable about an axis perpendicular to the door when closed to operate said contact member through the intermediation of said over-centering spring means, said door having an opening that is fully occupied by the switching device when the door is closed and the handle being disposed forward of the door to constitute a front operated switching device, a cover catch and a latch within the enclosure coacting with said cover catch when the handle has operated said contact member to its "on" position, and a yieldable drive connection from said contact member to said latch normally operable to release the door catch when the handle is operated to operate the contact member to the "off" position, the drive connection yielding to allow opening of the switching device in response to opening operation of the handle in the event of the cover catch being jammed.

4. Enclosed switching apparatus, including an enclosure having a door covering the front thereof, a switching device within the enclosure including a contact member movable between "on" and "off" positions, and operating mechanism therefore comprising over-centering spring means, a front operated handle movable about an axis perpendicular to the door when closed to operate said contact member through the intermediation of said over-centering spring means, said door having an opening that is fully occupied by the switching device when the door is closed and the handle being disposed forward of the door constitute a front operated switching device, a cover catch and a latch within the enclosure coacting with said cover latch when the handle has operated said contact member to its "on" position, and a drive connection from said contact member to said latch operable to release the door catch when the handle is operated to operate the contact member to the "off" position.

5. Enclosed switching apparatus, comprising a switch unit including a contact member movable between "on" and "off" positions, and quick make and break operating mechanism therefor comprising over-centering spring means, and a front operated actuating handle pivotally movable between "on" and "off" positions to operate said contact member through the intermediation of said over-centering spring means, a casing in which said unit is mounted, an openable cover for said casing, and interlocking means for said cover comprising releasably interengageable latch parts carried by said casing and cover, respectively, said casing latch part being operatively associated with said handle through said over-centering spring means and normally responsive to the movement thereof whereby in the "on" position thereof said latch parts are interengaged to latch said cover closed, the pivotal movement of said handle to said "off" position being effective to concomitantly open said contact member and release said latch parts to condition said cover for opening movement, said handle being pivotally movable to "off" position through said over-centering spring means without releasing said latch parts in the event of the contact member being jammed in the "on" position.

6. An enclosure comprising a casing having an openable cover, a switch unit mounted in said casing having a contact member movable between "on" and "off" positions, operating mechanism therefor including over-centering spring means, and an actuating handle projecting through said cover in the closed position thereof and pivotally movable to "on" and "off" positions for correspondingly actuating said contact member through said over-centering spring means, and interlocking means for said cover comprising a stationary latch part carried by said cover, and a pivotally movable interlocking member carried by said casing and releasably engageable with said latch part for latching said cover closed, said unit

having a part coupled with said contact member for conjoint movement therewith and normally responsive to the movement of said handle, said part being out of engagement with said interlocking member in the "on" position of said handle to interlock said member with said latch part, said part being normally pivotally movable into engagement with said interlock member on the movement of said handle to said "off" position to release said member from interlock with said latch part and thereby condition said cover for opening movement, said handle being pivotally movable to "off" position through said over-centering spring means without releasing said member from interlock in the event of said contact member being jammed in the "on" position.

7. An enclosure comprising a casing having an openable cover, a switch unit mounted in said casing having a contact member movable between "on" and "off" positions, operating mechanism therefor including over-centering spring means, and an actuating handle projecting through said cover in the closed position thereof and pivotally movable to "on" and "off" positions for correspondingly actuating said contact member through said over-centering spring means, and interlocking means for said cover comprising a stationary latch part carried by said cover, and a pivotally movable interlocking member carried by said casing and releasably engageable with said latch part for latching said cover closed, said unit having a part coupled with said contact member for conjoint movement therewith and normally responsive to the movement of said handle, said part being out of engagement with said interlocking member in the "on" position of said handle to interlock said member with said latch part, said part being normally pivotally movable into engagement with said interlocking member on the movement of said handle to said "off" position to release said member from interlock with said latch part and thereby condition said cover for opening movement, said interlocking member being constituted by plural parts normally movable in unison between latching and releasing positions under the control of said unit part, said plural parts being relatively movable in one direction to provide for the movement of one of said parts to released position on the movement of said handle to "off" position with the other part in latched position.

8. In combination with a switch unit having a front operated actuating handle pivotally movable to "on" and "off" positions, a casing in which said unit is mounted, an openable cover for said casing, and interlocking means for said cover comprising releasably interengageable latch parts carried by said casing and cover, respectively, said casing latch part being operatively associated with said handle and normally responsive to the movement thereof whereby in the "on" position thereof said latch parts are interengaged to latch said cover closed, the pivotal movement of said handle to said "off" position being effective to release said latch parts to condition said cover for opening movement, said casing latch part being constituted by a pivotally movable assembly comprising plural parts normally movable in unison between latching and releasing positions under the control of said handle, said plural parts being relatively movable in one direction to provide for the movement of one of said parts to released position on the movement of said handle to "off" position with the other part in latched position.

9. Enclosed switching apparatus including a switching device having an actuating handle movable to a plurality of positions, a casing in which said device is mounted, an openable cover for said casing having an opening occupied by the switching device with the handle projecting externally thereof, and interlocking means for said cover and said handle comprising a part movable between an extended handle blocking position to prevent the movement of the handle out of position and a retracted handle releasing position, said part being in said extended position with said cover open, and actuating means for said part responsive to the position of said cover whereby on the closing of said cover the latter engages said actuating means to retract said part and thereby release said handle for movement to another position.

10. Enclosed switching apparatus including a switching device having an actuating handle movable to a plurality of positions, a casing in which said device is mounted, an openable cover for said casing having an opening occupied by the switching device with the handle projecting externally thereof, a latch for said cover movable between cover latched and cover released positions, and interlocking means for said handle comprising a part movable between an extended handle blocking position to prevent the movement of the handle out of position and a retracted handle releasing position, said part being spring-biased against the inside of said cover whereby on the actuation of said latch to said cover released position said part projects said cover open and moves into said extended position, and actuating means for said part responsive to the position of said cover whereby on the closing of said cover the latter engages said actuating means to retract said part and thereby release said handle for movement to another position.

11. Enclosed switching apparatus, including detachably connected base and cover parts secured to each other in casing defining relation, said base having cooperable contacts and operating mechanism therefor and said cover including an operating handle and a separable and reversible mechanical coupling to said mechanism, in combination with an enclosure for said switching apparatus including a door having an opening therein disposed to expose said handle and the adjoining portion of cover part, and means for preventing inadvertent operation of the handle out of its position prevailing when the door is opened regardless of which reversible position of the cover part is used, said means including a member retractably carried by said cover part and spring biased to projecting position into the path of the handle, said member having a lateral extension engaged and depressed by said door upon closing and effective to withdraw said member from the operative path of said handle.

12. Enclosed switching apparatus including an enclosure including a door having an opening therein, a switching device within said enclosure and having a front operating handle and having a cover part closing said opening, said handle projecting exteriorly of said door, a door catch and a latch cooperable therewith within said enclosure, a mechanical coupling from said switching device to said latch effective to cause latching or release of said door catch successively when said switching device is closed or open, and said switching device including a door-actuated interlock forming part of said switching device and normally blocking operation of said switching device, said door-actuated interlock having a part operable by said door upon closing thereof to release said switching device for operation.

13. Enclosed switching apparatus including a metal enclosure, a front metal door having an opening therein, switching apparatus mounted in said enclosure and having a portion thereof exposed through said opening and an exposed operating handle, at least part of the exposed portions of the switching apparatus being of metal, and means for grounding said metal exposed part including a spring-biased metal member engaging said door in the closed position thereof and connected to said metal exposed part.

References Cited in the file of this patent

UNITED STATES PATENTS

1,643,806	Davies	Sept. 27, 1927
2,639,356	Savage	May 19, 1953
2,646,488	Platz	July 21, 1953
2,695,934	Wills	Nov. 30, 1954
2,789,169	Duvall et al.	Apr. 16, 1957