

[54] CONTROL SWITCH ASSEMBLY

3,604,874 9/1971 Puetz..... 200/153 G

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[57] ABSTRACT

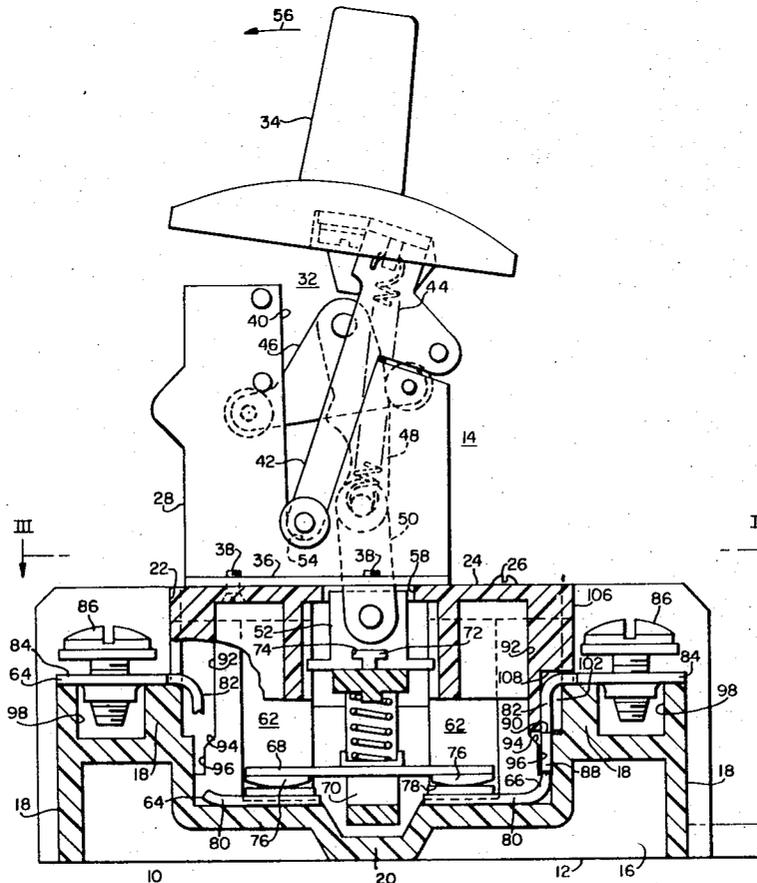
A switch device characterized by an electrically insulating base housing, a detachable insulating cover mounted on the base housing and an over-center toggle mechanism mounted on the cover external to the housing for opening and closing separable contacts in the housing which contacts comprise a plurality of stationary contact structures that are located and maintained in place by interfitting portions of the housing and cover, the stationary contact structures being movable into operating position within the housing by surface guide means integral with the housing wall; and means for moving movable contacts comprising a crossbar and connecting element which are detachable interlocked. The invention also includes means for actuating an auxiliary switch.

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[58] Field of Search 200/153 G, 332, 337, 16 A, 200/280, 281, 293, 307

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12 Claims, 10 Drawing Figures



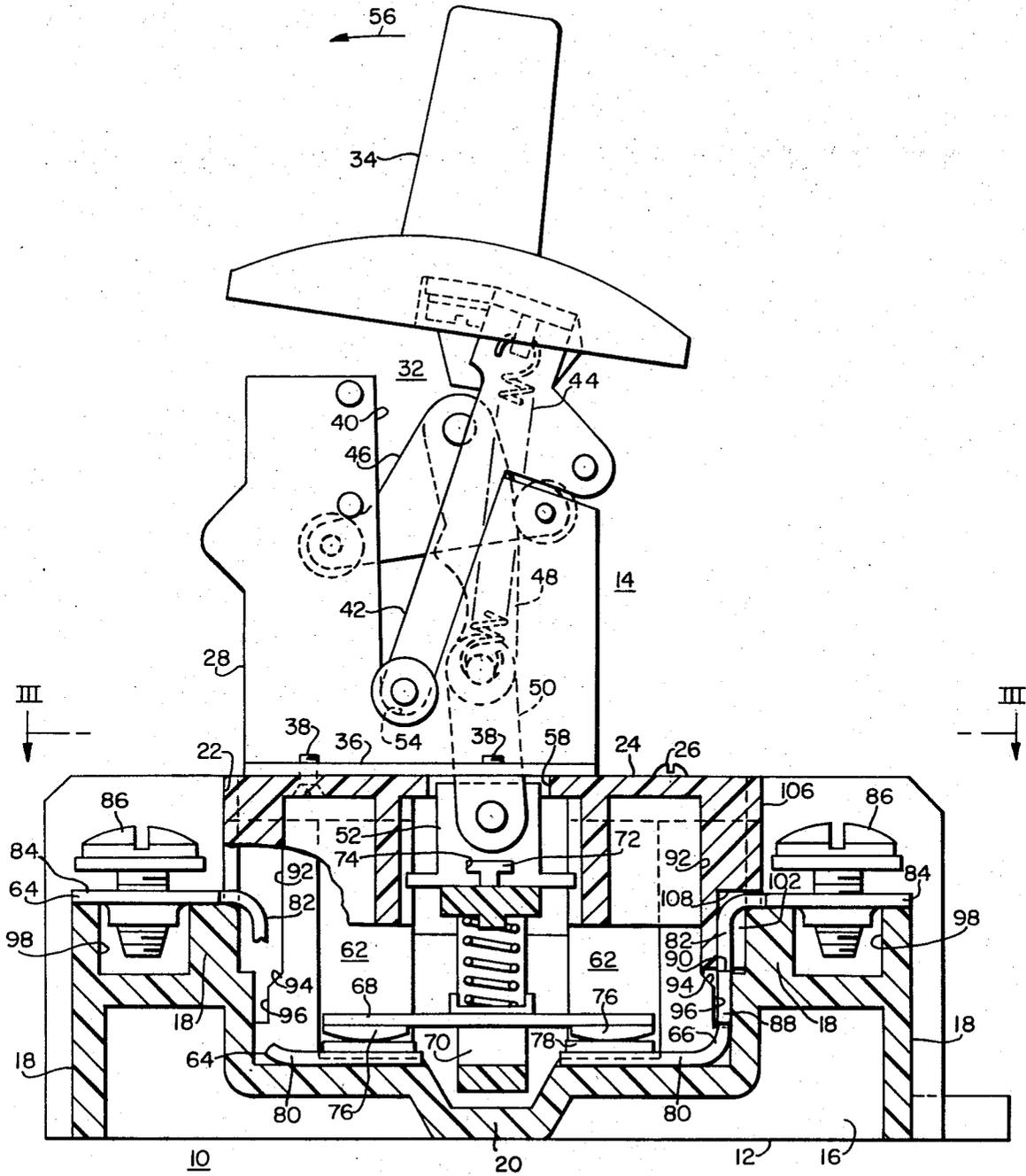
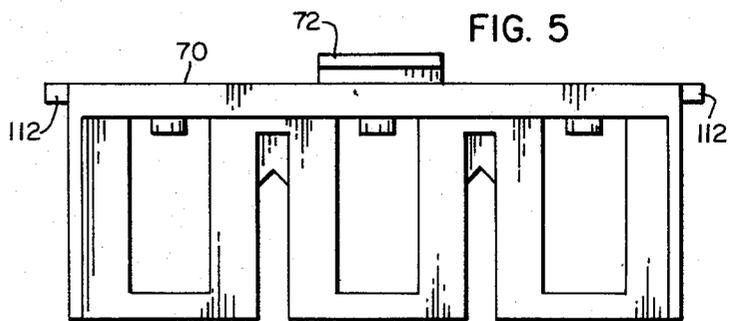
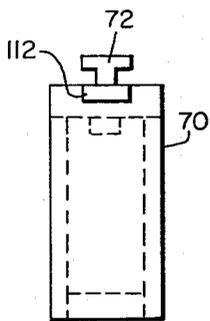
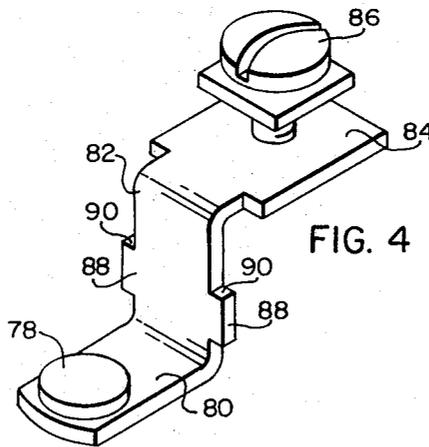
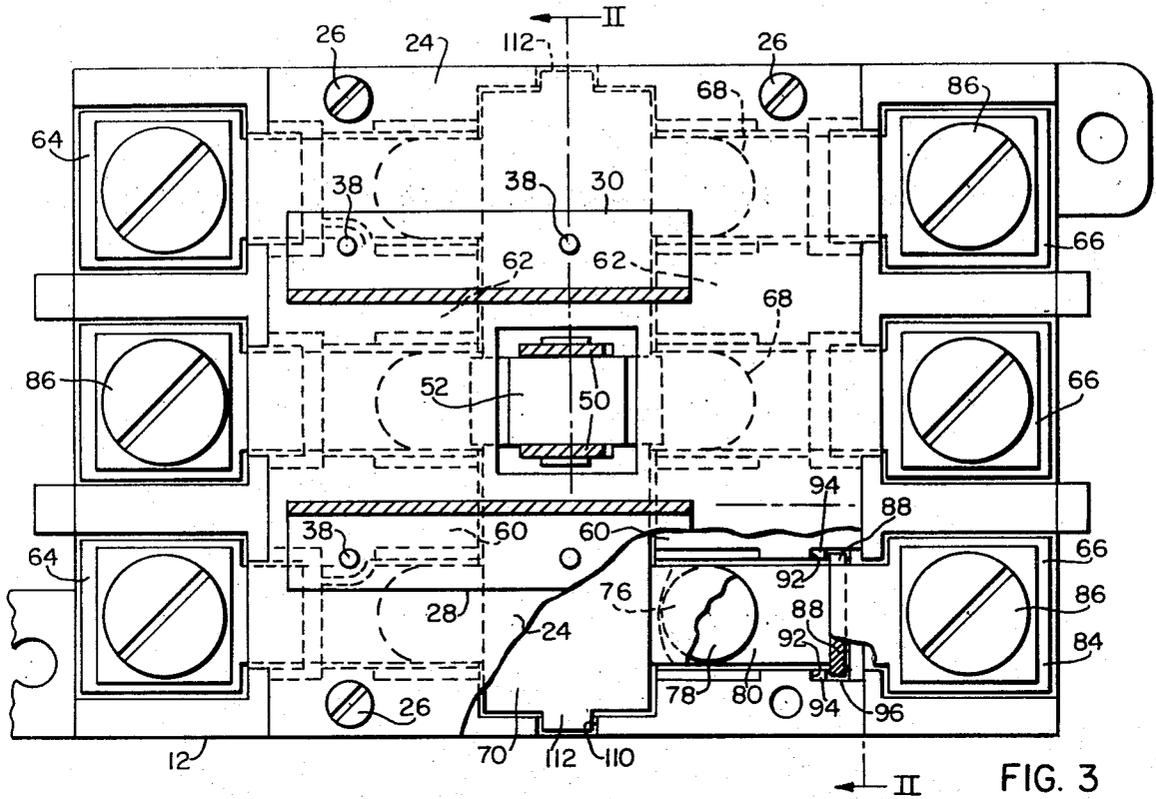
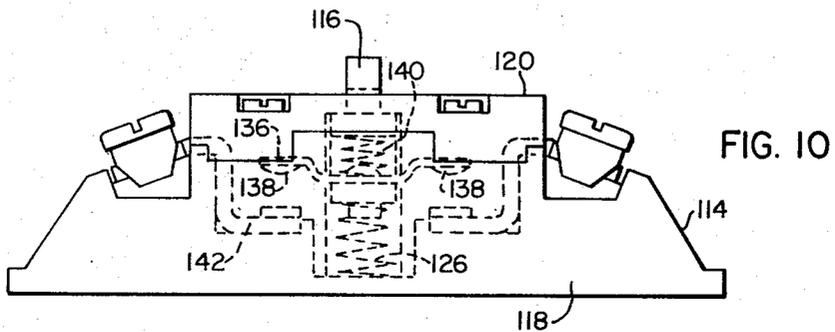
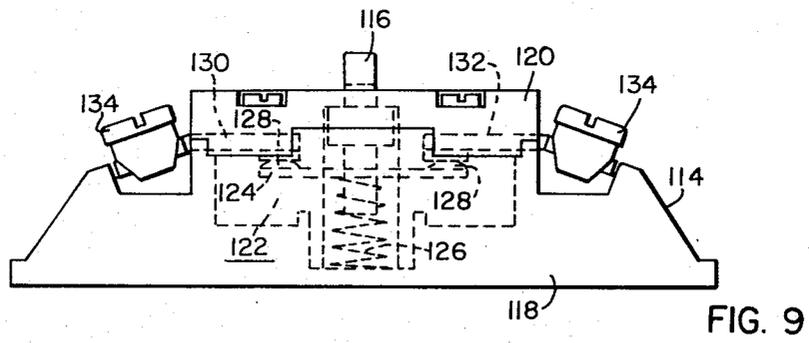
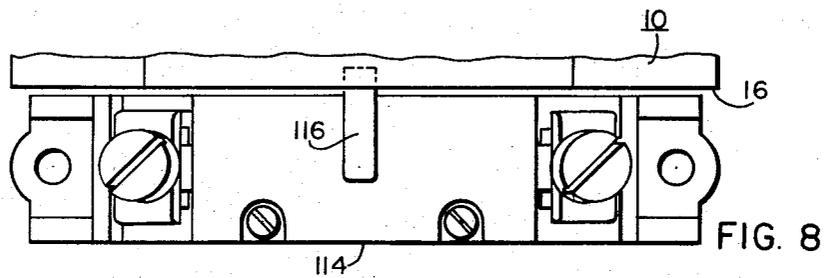
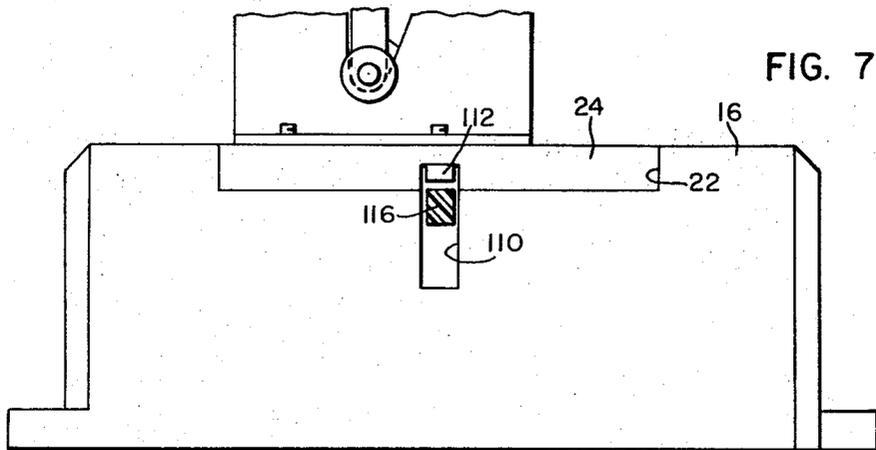


FIG. I





CONTROL SWITCH ASSEMBLY**CROSS REFERENCE TO RELATED APPLICATION**

This invention is related to that disclosed in the application of Edward P. Richards and Stephen S. Dobrosielski, Ser. No. 404579, filed Oct. 9, 1973.

BACKGROUND OF THE INVENTION**1. Field of the Invention**

This invention relates to circuit breakers, and more particularly to a motor control switch comprising an insulating housing and cover therefore having interfitting parts.

2. Description of the Prior Art

From time to time it is necessary to modify the design and operation of circuit interrupters such as circuit breakers and switches for such purposes as increasing their rating and improving their operation in response to competitive devices. A concomitant consideration is the elimination of parts which result in lower cost. Associated with the foregoing is the normal use of non-operating parts such as fasteners including screws, bolts, rivets and the like, which constitute cost saving items where they can be eliminated without reducing the function or rating of the switch.

Heretofore it had been necessary to use fastening means such as rivets or screws for retaining a stationary contact in place because of its subjection to conditions such as vibrations and arcing which cause the contacts to become deformed or move out of the desired position during use.

SUMMARY OF THE INVENTION

In accordance with this invention, it has been found that foregoing problems may be overcome by providing a switch device including an electrically insulating housing having an access opening therein, a cover for the opening, a circuit breaker mechanism in the housing and comprising a plurality of sets of movable and stationary contacts, means on the cover and external of the housing for opening and closing the separable contacts, said means comprising a crossbar and a connecting element, the cover having an aperture therein and the connecting element being slidably disposed in the aperture means detachably interlocking the crossbar to the connecting element and comprising one member of an interlock on one of the crossbar and connecting element, the other member of the interlock being on the other of the crossbar and connecting element, the stationary contacts comprising a contact structure having a contact portion, an intermediate portion, and a terminal portion, the cover and housing having mutually interfitting portions for clampingly restraining the stationary contacts in place when the cover is in place on the housing, the stationary contacts being removable when the cover is detached, the cover and the housing forming an access opening through which the terminal portion extends, and the intersurface of the housing wall comprising surface means extending into the housing for guiding the stationary contact structure into position.

The advantage of the switch device of this invention is that by providing molded mortising in the housing and cover the stationary contacts are located and secured in place and restrained from movement to different levels which would cause nondescript separation of the contacts and thereby result in one or two contacts

drawing current at increased resistance to cause pitting and charring of the contact surfaces.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view partly in section, taken on the line I—I of FIG. 2, showing the switch device of this invention;

FIG. 2 is a vertical sectional view taken on the line II—II of FIG. 1;

FIG. 3 is a fragmentary horizontal sectional view taken on the line III—III of FIG. 2;

FIG. 4 is an isometric view of a stationary bar;

FIG. 5 is a side elevational view of a crossbar;

FIG. 6 is an end view of the cross bar;

FIG. 7 is a side elevational view taken on the line VII—VII;

FIG. 8 is a fragmentary plan view of an auxiliary switch adjacent to and operative by the switch device of FIG. 1;

FIG. 9 is a side elevational of an auxiliary switch of the normally closed type; and

FIG. 10 is a side elevational view of the auxiliary switch of the normally open type.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1 a manually operated switch is generally indicated at 10 and it comprises a base for electrically insulating housing 12 and a manually operated over-center toggle mechanism 14. The housing 12 is a box-like member having opposite side walls 16, opposite end walls 18, a bottom wall 20 and an access opening 22 in the top side of the housing. A cover 24 closes the opening 22 where it is secured in place by corner screws 26.

The toggle mechanism 14 is disposed externally of the housing 12 and includes a pair of upright support frames 28 and 30 (FIG. 2), an overcenter toggle structure generally indicated at 32, and a manual handle 34. Each frame 28, 30 comprises a base flange 36 which is secured to the cover 24 by suitable means such as spaced screws 38. Each frame 28, 30 comprises a V-shaped notch 40.

The overcenter toggle structure 32, being similar to the overcenter toggle structure, such as shown in U.S. Pat. No. 3,263,042, comprises an operating lever 42, a pair of toggle springs 44, a pair of closely spaced latch plates 46, upper toggle links 48, lower toggle links 50, and a connecting member 52. The lower end of the operating lever 42 is seated at the apex 54 of the notch 40. Movement of the handle 34 in the direction of the arrow 56 causes the operating parts 48-52 to move overcenter to the "off" position in which the connecting member 52 is retracted upwardly in an opening 58 in the cover 24. Thus, is the handle 34 may be moved from the "on" position to the "off" in a manner conventional to overcenter toggle mechanisms.

As shown in FIGS. 1 and 2 the housing 12 provides a chamber that is separated by a pair of partitions 60 and 62 which extend in pairs from opposite end walls 18 toward the center lateral axis of the housing. The partitions together with opposite sidewalls 16 provide separate compartments in which the stationary and movable contact structures are disposed in isolation from each other. The stationary contact structures 64 and 66 are disposed in each compartment and are operable with a movable contact structure 68. The movable

contact structure 68 formed the three separate poles of the switch 10 are all mounted on a crossbar 70, the upper end of which is provided with an interlocking member 72 which is seated in a corresponding notch 74 in the lower side of the connecting member 52. In order to expedite assembly and disassembly of the interlocking member 72 with the notch 74, the member has a suitable interfitting configuration such as a T-shape which corresponds to the shape of the notch. The crossbar 70 thus is readily inserted into position by laterally sliding the interlocking member 72 into the notch.

Opposite end portions of the movable contact structure 68 are provided with similar movable contacts 76 which in the contact close position engage similar stationary contacts 78 which are mounted on similar stationary contact structures 64 and 66. The contact structures 64 and 66 are Z-shaped members having contact portions 80, intermediate portion 82, and terminal portions 84. The portions 80 support the stationary contacts 78 and portions 84 support terminal screws 86. As shown more particularly in FIG. 4, the intermediate portion 82 of each stationary contact structure 64 and 66 includes a pair of oppositely disposed projections or ears 88 having upper surfaces 90.

One of the features of this invention is the provision of a switch device having means for securing the stationary contact structures in place in a readily detachable manner and without the use of fastening means such as rivets, and the ears 88 cooperate with corresponding surfaces of the housing 12 for this purpose. As shown more particularly in FIGS. 1, 2, and 3, the intersurface of the walls 16 as well as the outer opposite surfaces of the space partitions 60 and 62 are provided with oppositely disposed corresponding guide surfaces 92 extending downwardly from the top side of the housing to a lower end where a downwardly inclined surface 94 is disposed. The inclined surface 94 extends between the guide surface 92 and a space for clearance 96 which is slightly greater than the thickness of the ears 88. The space 96 is disposed between the lower end of the guide surface 92 and the inner surface of the end wall 18. When the movable contact structure 64 or 66 is dropped into the position shown in FIG. 1, the ears 88 are guided by oppositely disposed pairs of guide surfaces 92 and inclined surfaces 94 into the space 96. Holes 98 are provided in the end walls 18 to receive the lower end portions of the terminal screws 86. Thus, the contact portions 80 of the stationary contact structures 64 and 66 are disposed on the upper surface of the bottom wall 20.

After the stationary contact structures 64 and 66 are inserted, the cover 24 is placed in the access opening 22. The cover 24 includes one projection 100 for each compartment occupied by a stationary contact structures 64 or 66. Each projection is a channel shape member having similar end flanges 102 and an intermediate portion 104. When assembled, each projection 100 is seated in a corresponding chamber extending across the chamber with edge portions opposite the flanges 102 disposed against the guide surfaces 92 with the flanges 102 extending on opposite sides of the upper portion of the portions 82 of the stationary contact structures. The lower end surface of each flange 102 is disposed on the top surface 90 of a corresponding ear 88, thereby retaining the ears 88 snugly in place within the space 96. In addition, each projec-

tion 100 includes an enlarged portion 106 extending between each pair of partitions, or partition and outside wall, and having a lower end surface 108 in abutment with the terminal portion 84, thereby adding to the retention forces holding the stationary contact structures in place and preventing their dislocation due to vibrations and the like.

The switch 10 may be provided with additional contacts to activate or deactivate associated pilot circuits remote from the switch. Where the switch 10 is used for making and breaking power circuits, such as a motor (not shown), additional contacts may be added in order to activate or deactivate additional circuits including such devices as annunciator boards, indicating lights, alarm circuits, and the like. As shown in FIG. 7 each side (only one of which is shown in the drawing) is provided with vertical slot 110 which extends downwardly from the access opening 22 and in which projections 112 (FIGS. 5 and 6) are disposed. Manifestly, each time the switch 10 is operated the crossbar 70 moves up and down, the projections 112 move up and down in the slots 110. As shown in FIG. 8 an auxiliary switch 114 is mounted adjacent to the side 16 of the switch 10 and is provided with a plunger 116 which extends into the slot 110 and is actuated by the projection 112. As shown more particularly in FIG. 9, the auxiliary switch 114 comprises a housing 118, a cover 120, and an operating mechanism 122 within the housing. The particular switch 114 shown in FIG. 9 is a normally closed switch in which a movable contact structure 124 is biased upwardly by a spring 126 so that movable contacts 128 engage stationary contacts on stationary structures 130 and 132. Similar terminals 134 are provided at opposite ends of the structures 130 and 132.

Another embodiment of the switch 114 is shown in FIG. 10 and is a normally open switch with parts corresponding to the switch of FIG. 9 identified with similar reference numbers. In FIG. 10 switch 114 includes a movable contact structure 136 having contacts 138 at opposite ends thereof and having a spring 140 for holding the contact in an upper most position on the plunger 116 and remote from the stationary contact structures 142. Thus, when the plunger 116 upper most in the slot 110 (FIG. 7) the switch 114 in FIG. 10 is open and the switch in FIG. 9 is closed. It is understood that one auxiliary switch 114 may be provided on each side of the switch 10.

What is claimed is:

1. A switch device comprising an electrically insulating housing having housing walls forming a chamber, a cover detachably mounted on the housing, at least one set of contacts within the housing and comprising stationary contacts and movable contacts movable between open and closed positions with the stationary contacts, means for moving the movable contacts, the stationary contacts for each set of contacts comprising contact structure having a contact portion, an intermediate portion, and a terminal portion, the cover and housing having mutually interfitting portions for clampingly retaining the stationary contacts in place within the chamber when the cover is in place on the housing, the stationary contacts being removable from the chamber when the cover is detached, the cover and housing forming an access opening through which the terminal portion extends, the mutually interfitting portions comprise a projection on the cover extending in the direction of insertion of the cover onto the housing,

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and the projection being in surface-to-surface contact with the intermediate portion of the stationary contacts.

2. The switch device of claim 1 in which the intermediate portion is disposed in a plane that is substantially parallel to the direction of insertion of the cover, the intermediate portion comprising surface means facing the direction of insertion of the cover, and the projection having corresponding surfaces abutable with the surface means when the cover is in place.

3. The switch device of claim 2 in which the surface means of the intermediate portion comprising a shoulder extending from opposite edges thereof, the projection comprising a pair of flanges that are disposed on opposite edges of the intermediate portion, and each flange having an end surface abutting the corresponding shoulder for securing the stationary contacts in place.

4. The switch device of claim 3 in which the inner surface of the housing wall comprises an internal surface facing said intermediate portion, and the projection being disposed between the inturned surface and the intermediate portion.

5. A switch device comprising an electrically insulating housing having housing walls forming a chamber, a cover detachably mounted on the top surface of the housing, at least one set of contacts within the housing and comprising a stationary contact structure and a movable contact movable between open and closed positions with the stationary contact structure, the stationary contact structure comprising a contact portion, an intermediate portion, and a terminal portion, and the inner surface of the housing wall comprising surface means extending into the chamber for guiding the stationary contact structure into position within the chamber, the surface means comprising a vertically extending surface having a lower end portion inclined at an angle toward the inserted position of the stationary contact structure.

6. The switch device of claim 5 in which the cover comprises a projection depending from the undersurface thereof and the projection being disposed snugly between the vertically extending surface of the housing and the intermediate portion of the stationary contact structure.

7. A switch device comprising a circuit breaker including an insulating housing having an access opening

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therein, a cover for the opening, a circuit breaker mechanism within the housing and comprising a plurality of sets of movable and stationary contacts, means on the cover for opening and closing the separable contacts, said means comprising a crossbar and a connecting element, the cover having an aperture therein and the connecting element being slidably mounted in the aperture, means detachably interlocking the crossbar to the connecting element and comprising one member of an interlock on one of the crossbar and connecting element, and the other member of an interlock being on the other of the crossbar and connecting element.

8. The switch device of claim 7 in which the interlocking members are detachably engaged by moving the members laterally of the direction of travel of the contacts.

9. The switch device of claim 8 in which one of the interlocking members is a slot in the connecting element connecting element and the other of the interlocking members is a projection on the crossbar.

10. A switch device comprising a circuit breaker including an insulating housing having an access opening therein, a cover for the opening, a circuit breaker mechanism within the housing and comprising a plurality of sets of movable and stationary contacts, means on the cover for opening and closing the separable contacts, said means comprising a crossbar and a connecting element, the cover having an aperture therein and the connecting element being slidably mounted in the aperture, the crossbar being attached to the connecting element and having a projection extending from one end thereof, the housing having a slot extending in the direction of movement of the crossbar, the projection on the crossbar extending into the slot, and auxiliary switch mounted adjacent the insulating housing and comprising movable and stationary contacts therein, the movable contacts being operatively connected to a plunger, the plunger extending into the slot in the housing, and being movable by the projection on the crossbar when the crossbar is actuated.

11. The switch device of claim 10 in which the auxiliary switch is a normally open switch.

12. The switch device of claim 10 in which the auxiliary switch is a normally closed switch.

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