

[54] **MULTIPLE SWITCH ASSEMBLY WITH EXTERNAL SLIDE MEMBER ALLOWING ACTUATION OF ONLY ONE SWITCH AT A TIME**

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[52] U.S. Cl. .... **200/50 C, 200/DIG. 6**

[51] Int. Cl. .... **H01h 9/20**

[58] Field of Search .... **200/50 C, 5 E, DIG. 6, 200/42 T; 317/112, 119**

[56] **References Cited**

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[57] **ABSTRACT**

Disclosed is apparatus for selectively allowing the actuation of a predetermined number from a plurality of

electrical switching devices in an electrical system. Disclosed is an electrical system that requires, as an example, the selection of one of a plurality of power sources to a load. For overload protection, an electrical switch such as a circuit breaker is connected between each power source and load. The present invention cooperates with the circuit breakers to provide fail-safe protection by permitting one and only one circuit breaker, and thus power source, to be actuated at any one time. The apparatus comprises a slide member whose geometrical configuration allows it to be positioned over a circuit breaker only when the handle of the circuit breaker is in its OFF (unactuated) position. By utilizing a side-to-side configuration of circuit breakers, the slide members may be mounted on a pair of guide rods which extend longitudinally across all the circuit breakers in the system. The guide rods allow the slide members to be selectively positioned over those circuit breakers which are desired to remain in an unactuated position. By providing one less slide member than are provided electrical circuit breakers, only one of said circuit breakers will be left exposed to manual accessibility, thus allowing it to be manually switched to either of its two operating positions. Thus, the slide members of the present invention effectively combine the functions of power source selection and overload protection to make them mutually dependent.

**11 Claims, 4 Drawing Figures**

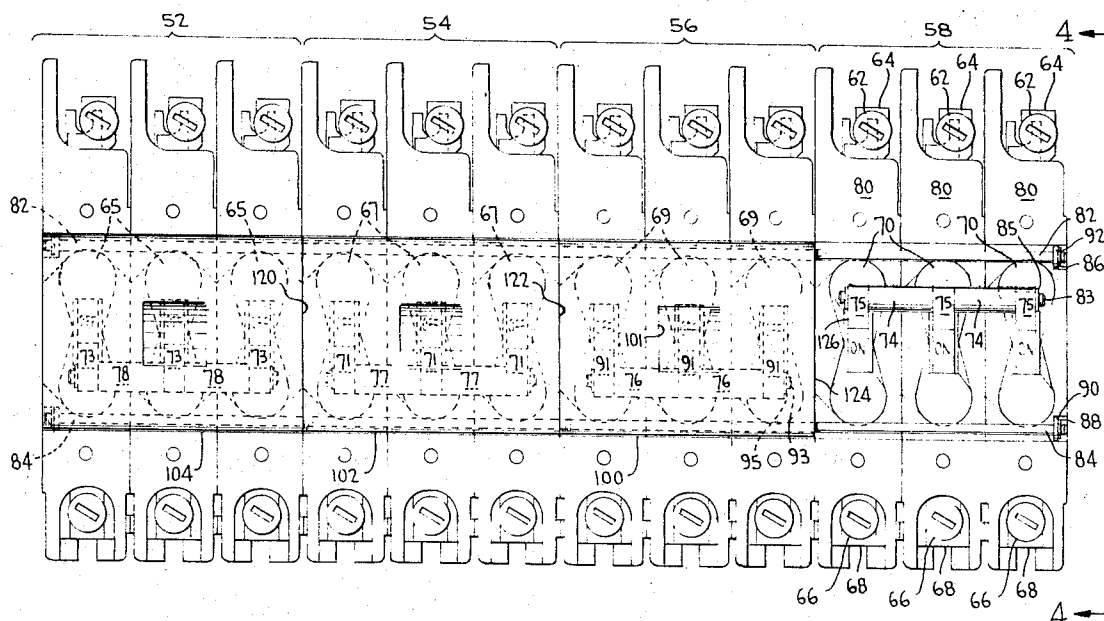


FIG. 1  
PRIOR ART

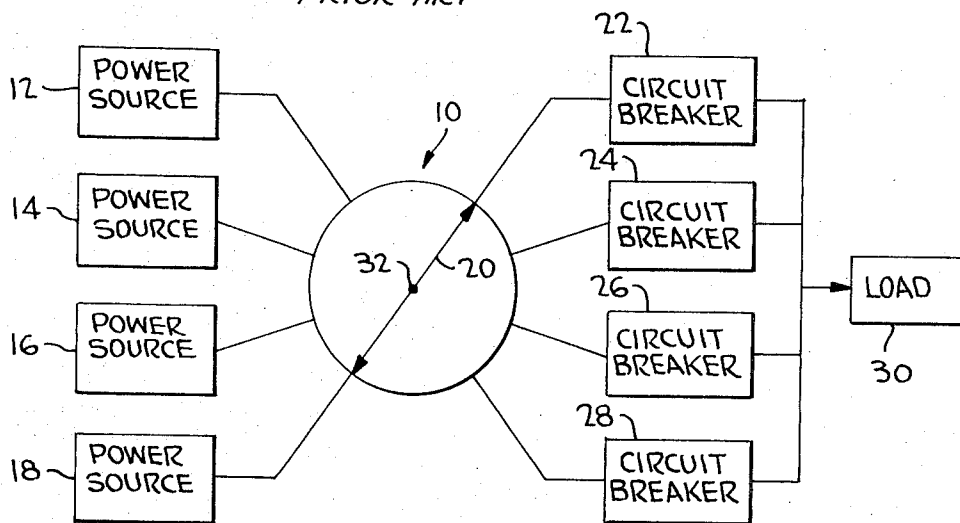
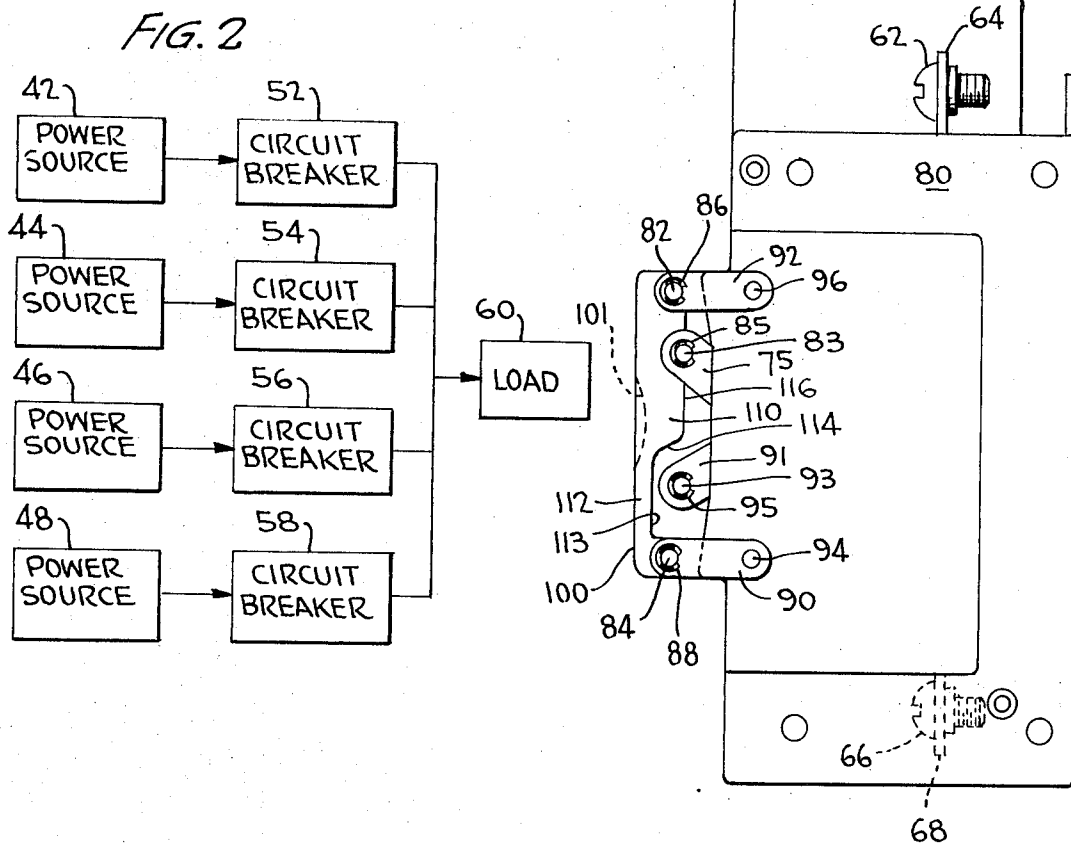


FIG. 4





# **MULTIPLE SWITCH ASSEMBLY WITH EXTERNAL SLIDE MEMBER ALLOWING ACTUATION OF ONLY ONE SWITCH AT A TIME**

The present invention is related to selector systems for electrical switches and, more particularly, to a combination safety cover and switch selector for an electrical circuit switching device that allows manual access to only a predetermined number of a plurality of such devices. Even more particularly, the present invention may be used to coordinate the operation of a plurality of circuit breaker devices, each having a manual operating handle moveable between an ON and OFF position, such that the movement of all but one of the circuit breaker handles is restricted so as to prevent overloading of the associated circuitry.

Frequently it is necessary to interrelate the operation of a plurality of electrical switching devices, such that the condition of one of the electrical switching devices limits the permissible condition of another one or more of the electrical switching devices. As, for example, in the connection of a load to one of a plurality of power sources, only one of the power sources should be connected to the load at any one time. In the absence of control of power source selection, two or more power sources may be simultaneously connected to the load and damage the circuit. A prior art method of accomplishing such power source selection is by means of a rotary selector switch or similar device that connects one and only one power source to the load at any one time. In order to provide overload protection, each of the plurality of power source-to-load circuit connections must be provided with an electrical switching device such as a circuit breaker that automatically disconnects the source from the load upon the occurrence of an overload condition. Commonly associated with each circuit breaker is a handle that is manually moveable from an ON position to an OFF position, the ON position indicating a valid connection between its input and output, e.g., the selected power source and the load. If the selected circuit becomes overloaded for any reason, the circuit breaker handle automatically switches to the OFF position, thus disconnecting the power source from the load. When the malfunction that has caused the overload is corrected, the circuit breaker handle may be manually switched back to the ON position to reconnect the selected power source to the load. One disadvantage attendant to such rotary selector switch systems or the like is that the position of the selector switch is mutually exclusive of the positions of the circuit breaker handles associated with each power source circuit. This mutual exclusivity lends such a system to serious infirmities if the rotary selector switch proves to be electrically faulty. For example, if two adjacent circuit breaker handles are both in the ON position and, for one reason or another, a short circuit occurs within the rotary selector switch so as to simultaneously connect two power sources through the ON circuit breakers, serious damage may occur to the load and to the circuit breakers. Additionally, rotary selector switches are relatively expensive to manufacture, and must provide the highest degree of electrical integrity in order to ensure their safe operation in combination with a plurality of mutually exclusively actuated circuit breakers. It therefore would appear highly desirable if the mutual exclusivity of the power source could be made mutually dependent upon the position of the

circuit breaker handle. It also appears that it would be eminently desirable if the infirmities and high cost attendant to the use of rotary selector switches in systems of this type could be dispensed with.

It is therefore a primary object of the present invention to provide a system for selecting one of a plurality of power sources to be connected to a load through a circuit breaker wherein the power source selection and the circuit breaker switch position are mutually dependent.

Another object of the present invention is to eliminate the need in power source circuit selector systems of rotary selector switches or the like.

An additional object of the present invention is to provide in a system that has a plurality of power sources to be selectively connected to a singular load the fail-safe capability of selecting only a single power source while ensuring that all other power source circuit breakers are maintained in an OFF condition.

A still further object of the present invention is to provide in a multiple power source-circuit breaker selector system the safety feature of preventing manual access to those circuit breakers associated with the non-actuated power sources such that they may be accidentally actuated.

Another object of the present invention is to provide in a multiple power source-circuit breaker configuration apparatus for achieving the dual purposes of source selection and circuit breaker handle positioning in a simple, low cost and regged piece of hardware.

A still further object of the present invention is to provide in a power source selection-circuit breaker system a plurality of source selector-circuit breaker devices, each of said devices cooperable with a single circuit breaker and having no moving parts associated therewith.

Briefly, in accordance with the attainment of the above-mentioned objects, our invention comprises an extremely simple device that provides mutual dependence between power source selection and circuit breaker switch position, which device may be easily incorporated into the mounting structures of existing circuit breaker systems. In accordance with the particular use set forth, a plurality of the devices are provided that are one less in number than the number of power source-circuit breaker combinations desired to be selectively actuated. In a preferred configuration, the circuit breakers are positioned in a side-by-side abutting relationship. Each of the selector devices is adapted to be slideably positioned over a single circuit breaker. Each device, which may be called a slide member, is formed in such a shape that it may only be positioned over a handle of a circuit breaker that is in the OFF position. Guiding means are provided along the abutting circuit breaker housings along which the plurality of slide members may be selectively positioned over the desired circuit breakers to provide the power source selection capability. The form of a slide member that prevents its placement over a circuit breaker whose handle is in the ON position provides the system with source selection-circuit breaker handle position interdependence. In accordance with a preferred embodiment, one less slide member is provided than there are circuit breakers to be controlled. The slide members are selectively positioned over those circuit breakers whose handles are in the OFF position, thereby designating those power sources that are not desired to be

connected to the load. There remains without any slide member over it a single circuit breaker from the plurality whose handle may be moved to the ON position to connect its power source to the load without any fear of having any of the other power sources coincidentally connected. The covering structure of the slide member also provides an additional degree of safety in preventing the circuit breaker handle over which it is positioned from being accidentally moved to the ON position. In order to selectively change the power source connected to the load, the exposed circuit breaker handle must first be switched to the OFF position and the slide members rearranged to provide manual access to the desired circuitbreaker and, thus, its associated power source.

These and other objects and advantages of the present invention will become more apparent upon reference to the following specification, appended claims and drawings wherein:

FIG. 1 is a schematic illustration in block diagram form of a prior art power source selection system utilizing a rotary selector switch;

FIG. 2 is a schematic illustration in block diagram form of a preferred embodiment of a power source circuit selection system in accordance with the present invention;

FIG. 3 is a plan view of a preferred embodiment of several circuit breaker assemblies in combination with the slide members of the present invention; and

FIG. 4 is a side view of the circuit breaker assembly in combination with a slide member of the present invention taken along line 4—4 of FIG. 3.

Referring now to the drawings, FIG. 1 represents in block diagram form a system typical of prior power source selection systems. Rotary selector switch 10 is shown positioned between a plurality of power sources 12, 14, 16 and 18 and a plurality of electrical circuit breakers 22, 24, 26 and 28. Within rotary selector switch 10 is diagrammatically illustrated an electrical conductor 20 that is rotatable about axis 32 so as to effectuate the connection between a single power source and a single circuit breaker. For example, as illustrated in FIG. 1, electrical conductor 20 is shown positioned to connect power source 18 to circuit breaker 22. In the three other positions of conductor 20, power source 16 is connected to circuit breaker 24, power source 14 is connected to circuit breaker 26, and power source 12 is connected to circuit breaker 28. The circuit breakers 22, 24, 26 and 28 are each typically provided with an external manually operated handle that permits actuation of the circuit breaker in either of two states, usually referred to as the OFF and ON positions. When the handle is in the ON position, the circuit breaker completes the electrical connection between its input and output, whereas when the handle is in the OFF position, the circuit breaker ensures that an open circuit exists between its input and output, thereby preventing the passage of current through it. As seen in FIG. 1, the output of circuit breakers 22, 24, 26 and 28 are all connected in parallel to load 30. In the configuration shown, if the manually operated handle of circuit breaker 22 were moved to the ON position, power from power source 18 would be provided to load 30 via electrical conductor 20 of rotary selector switch 10 and circuit breaker 22. With electrical conductor 20 in the position shown, and absent any electrical infirmities in switch 10, none of the other power

sources 12, 14 or 16 are electrically connected to load 30. This is true irrespective of the positions of the manually operated handles on circuit breakers 24, 26 and 28. However, say, for example, that it is desired to connect power source 12 to load 30 without connecting power sources 14 and 16 to it. Electrical conductor 20 has to be rotated through the positions connecting power sources 16 and 14 to circuit breakers 24 and 26, respectively, prior to reaching the desired position of connecting power source 12 to circuit breaker 28. It is noted that if the manually operated handles of circuit breakers 24 and 26 were for some reason in their ON positions, power would be delivered to load 30 from power sources 16 and 14 as electrical conductor 20 were rotated to connect power source 12. This could lead to undesired surges of energy from sources 16 and 14 being introduced into the system to damage load 30 and the circuit breakers. Additionally, any electrical infirmity that renders a short circuit in selector switch 10 so as to allow power from two sources to be delivered to load 30 could cause serious damage. It is clearly seen that the positioning of electrical conductor 20 of switch 10 is mutually exclusive of the positioning of the manually actuated handles on circuit breakers 22, 24, 26 and 28. Although it is quite obvious that some electrical circuit could be devised to make the two positionings interdependent, such device would undoubtedly be costly and subject to the same electrical infirmities present in selector switch 10, while adding additional complications to the system shown.

FIG. 2 illustrates a multiple power source and circuit breaker circuit arrangement that may be utilized in accordance with the present invention. Power sources 42, 44, 46 and 48 are shown connected to circuit breakers 52, 54, 56 and 58, respectively, all of which are connected in parallel to load 60. It is immediately apparent from comparing FIGS. 1 and 2 that the system depicted in FIG. 2 has eliminated the need for rotary selector switch 10 of FIG. 1. The structure of the present invention that replaces the function of rotary selector switch 10 is illustrated in subsequent figures, but the principle of operation can be understood with the aid of FIG. 2. Basically, the present invention provides slides selectively positionable over circuit breakers 52, 54, 56 and 58 that will maintain their manually operable handles in their OFF positions. The slides provided (not shown in this figure) are one less in number than the number of circuit breakers in the system. Thus, taking the four-member circuit breaker system of FIG. 2 as an example, three slides are provided, one associated with each of the three circuit breakers that is desired to be maintained in the OFF and therefore unactuated position. The slides, explained more fully hereinbelow, also provides the additional feature of only being positionable over a circuit breaker whose handle is in the OFF position. This feature ensures that if three such slides are provided in the system of FIG. 2, then at least three circuit breaker handles will remain securably in their OFF position, whereas only one circuit breaker handle will be manually accessible to allow switching from the ON to the OFF position, or vice-versa. For example, in the system of FIG. 2, if it is desired to interconnect power source 48 through circuit breaker 48 to load 60, three of the aforementioned selector slides can be positioned over circuit breakers 52, 54 and 56 only when the associated handles of said circuit breakers were in their OFF positions. The handle of circuit

breaker 58 remains freely accessible to manual actuation from its ON to its OFF position, or vice-versa.

Referring now to FIG. 3, a preferred embodiment of the essential combination of the present invention is illustrated in which reference numerals 52, 54, 56 and 58 represent multipole circuit breakers taken from the electrical configuration shown in FIG. 2. For simplicity and ease of explanation, no connections to or from the three pole circuit breakers 52, 54, 56 and 58 have been illustrated, although it is understood that input and output connections may be made as shown in FIG. 2. Circuit breaker 58 of FIG. 3 can accommodate a three-wire system, each wire connected to a circuit breaker case 80 via terminal screws 62 and flanges 64. Screws 62 and flanges 64 may be used, for example, to receive a three-element power wire from three-phase power source 48 of FIG. 2. Terminal screw connectors 66 cooperate with flanges 68 to provide a terminal for a three-element wire connection that leads, for example, to load 60. The connections are set forth in the manner described merely for simplicity, as is well understood that in the ordinary a-c circuit breaker use, a greater or lesser number of circuit breaker poles may be provided as desired.

Circuit breaker 58 of FIG. 3 is seen to consist of three individual poles 70 with handles 75 connected by a link 74. Handles 75 are selectively moveable together to OFF and ON positions, and are illustrated in circuit breaker 58 to be in their ON positions. It is seen that by virtue of link 74, handles 75 coact to move together such that their operation may, in effect, be considered as one switch for three-phase circuits. This coaction of two or three or more individual poles within separate modules or cases is very common, and it is understood that the circuit breaker 58 is depicted as having three separate pole cases only for the purposes of illustration. It will be well appreciated that the device of the present invention can be adapted to circuit breaker poles that have a common case, or a combination of individual and common cases for the poles. Circuit breakers 52, 54 and 56 are also shown as three-pole devices, all shown for purposes of illustration in their OFF positions. For example, circuit breaker 56 comprises three poles 69 with handles 91 connected via link 76. Handles 91 are shown in their OFF positions. Similarly, circuit breaker 54 comprises three individual poles 67 with handles 71 connected via link 77. Handles 71 are shown in their OFF positions. Also, circuit breaker 52 comprises three individual poles 65 with handles 73 connected via link 78. Handles 73 are in their OFF positions. It is seen that link 74 of handles 75 is secured at its end 83 by means of a self-locking piece such as spring clip 85. Similarly, link 76 is held in position through handles 91 by means of its protruding end 93 and spring clip 95. Links 77 and 78 are similarly held in position within the respective handles of the individual circuit breaker poles 67 and 65, respectively. For the sake of conciseness, the securing means are labeled in the drawing at only one end of links 74 and 76, but it is understood that the other ends are similarly secured.

The power source selector and fail-safe circuit breaker handle positioning means mentioned above are seen in FIG. 3 to consist of slide members 100, 102, and 104 which are shown positioned over circuit breaker poles 69, 67 and 65, respectively. Slide members 100, 102 and 104 are freely moveable along a pair

of rods 82 and 84 shown positioned essentially parallel to one another in raised relation to poles 65, 67, 69 and 70 and extending longitudinally across the entire bank of circuit breakers. For clarity, the abutting edges of slide members 100 and 102 are labeled 122, while 120 represents the abutting edges between slide members 102 and 104. It is seen that slide members 100, 102 and 104 are positioned only over those switch handles 91, 71 and 73, respectively, that are in their OFF positions. The configuration of the slide members which impose this restraint can more clearly be evidenced with reference to FIG. 4 which shows a side view taken along line 4-4 of FIG. 3.

FIG. 4 shows slide member 100 positioned on rods 82 and 84. The ends of rods 82 and 84 are secured to supporting links 92 and 90 by means of spring clips 86 and 88, respectively. Links 92 and 90 position rods 82 and 84 in raised parallel relation to case 80 of the circuit breaker devices and are secured to case 80 at points 96 and 94. Slide member 100 comprises two principal portions, an abutment portion 110 having inner edges 114 and 116, and an indented portion 112 having an inner edge 113. It is seen from FIG. 4 that by virtue of the thickness of abutment portion 110 and the thinness of indented portion 112 that slide member 100 can only be positioned over a circuit breaker switch whose handle is in the OFF position, as indicated by handle 91 of circuit breaker 56. Edge 114 of abutment portion 110 effectively prevents the accidental switching of handle 91 to the ON position. Handle 75 of circuit breaker 58 can be in its ON position as shown, inasmuch as it is not covered by any slide member (see FIG. 3) and therefore is manually accessible, permitting movement to either its ON or OFF positions. Slide member 100 may also be provided with indent means 101 on its outer surface which provides ease of manual manipulation back and forth along guide rods 82 and 84.

It is seen that by virtue of the foregoing description, the slide members, if provided one less in number than the number of circuit breakers sought to be selectively actuated, provide power source selector means and fail-safe circuit breaker handle positioning means by which only one of the circuit breakers in the assembly may be manually adjusted at any one time. If it is desired, for example, to select power source 46 of FIG. 2 to be connected to load 60 via circuit breaker 56, it is necessary, as seen in FIG. 3, to first manually move handles 75 to their OFF positions. If this is not done, it will be impossible to position slide member 100 over circuit breaker poles 70 inasmuch as the abutment portion 110 of the edge 124 of slide member 100 will come in contact with edge 126 of handles 75 so as to prevent slide member 100 from being moved to cover poles 70. Thus, in the configuration shown in FIG. 3, if handles 75 remain in their ON positions, no other circuit breaker may be actuated. On the other hand, if handles 75 are moved to their OFF positions, similar to those positions depicted by handles 73, 71 and 91, then slide member 100 may be moved along guide rods 82 and 84 to be positioned over poles 70. This movement will be allowed by virtue of the indent portion 112 of slide member 100. Edge 113 of indent portion 112 is pre-determinately located at a sufficient distance away from poles 70 so as to allow easy passage of slide member 100 over handles 75 when they are in their OFF positions. Connecting edge 114 of abutment portion 110 is

located such that no intermediate position of the switch handles will allow passage of the slide member other than their full OFF positions. When slide member 100 covers poles 70, poles 69 will be exposed to manual access and may be actuated to their ON positions by means of handles 91 to complete the desired circuit connection from power source 46 to load 60. It should also be observed that by virtue of the cover design of the slide members, accidental actuation of OFF position pole switches is effectively prevented since they are closed to manual access, in addition to the safety provided by the abutment portion 110.

It is therefore seen by the foregoing examples and description, that the power source selection, overload protection, and power switching may all be achieved by use of the slide members of the present invention, each of which preferably consists of a singular molded member having the necessary dimensions for the particular circuit breakers under consideration. It is well understood that a multiplicity of circuit breakers, greater in number than four, may be easily accommodated by the device of the present invention. Also, while the present invention has been described in terms of connecting one and only one power source to a load, it is understood that the number of circuit breakers to which it is desired to have manual access may be easily adjusted by judicious selection of the number of slide members. It is therefore seen that the device of the present invention is not limited in scope to the practical applications set forth hereinabove and that many other instances arise that require circuit breaker protection and/or selection and thus may find the present invention highly useful.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In combination with a plurality of electrical circuit breakers each having a manually operable handle movable in a first direction between first and second operative positions, apparatus for preventing manual access to all but a selected handle comprising a plurality of cover plates adapted to be positioned over said handles, said cover plates being one less in number than said circuit breakers, the cross section of each said plate including an indented portion located so as to permit said plate to be positioned over a handle only when said handle is in said first operative position, each said cover plate being slideably positionable along a second direction generally transverse to said first direction, said cross section of each said plate further comprising an abutment portion located so as to prevent said slide plate from being positioned over a circuit breaker when its handle is in said second operative position, said first and second operative positions corresponding to circuit breaker OFF and ON positions, respectively, and means for guiding said cover plates along said second direction, said guiding means comprising a pair of parallel rods securably mounted to said circuit breakers in parallel relation to said second di-

rection and a plurality of flanges that maintain said rods in raised relation to said circuit breakers.

2. In combination with at least first and second electrical switching devices, each including a housing having a front surface and a manual operating handle outwardly extending therefrom, said manual operating handle movable in a first direction between first and second operative positions; a handle interlock selectively positionable over one of said switching devices, said handle interlock comprising a slide member, means for guiding said slide member in a second direction generally transverse to said first direction, said slide member having no moving parts and including abutment means for preventing movement of said operating handle of the switching device over which it is positioned from said first operating position to said second operating position.

3. The combination of claim 2 wherein said slide member comprises an outer surface oriented in a plane generally parallel to said front surface of said switching device and an inner surface in raised opposing relation to said front surface of said switching device, said inner surface having said abutment means formed as an integral part thereof.

4. The combination of claim 3 wherein said inner surface comprises first, second and third sections, said first and second sections being essentially parallel to said outer surface of said slide member, said first section being closer to said outer surface of said slide member than said second section, said third section connecting said first section to said second section so as to form an abutment edge which comprises part of said abutment means, said third and first sections forming an indent portion that essentially allows said slide member to be positioned over said switching device only when said handle of said switching device is in said first operative position.

5. The combination of claim 4 wherein said electrical switching devices are circuit breakers and said first and second operative positions correspond to circuit breaker OFF and ON positions, respectively.

6. A plurality of switch selector devices for preventing manual access to a plurality of electrical circuit breaker handles, the number of circuit breaker handles being one greater than the number of switch selector devices so that only one of said circuit breaker handles is exposed to manual manipulation, each of said circuit breaker handles movable in a first direction between first and second operative positions, said plurality of switch selector devices being selectively positionable over a like number of said circuit breaker handles via guide means, said guide means being adapted to guide said selector devices in a second direction generally transverse to said first direction, each of said selector devices having a cross section such that it may be slidably moved only over a handle which is in said first operative position.

7. The invention according to claim 6 wherein said handles are coupled to circuit breakers and said first and second operative positions correspond to circuit breaker OFF and ON positions, respectively, whereby said plurality of circuit breakers and said plurality of selector devices coact so as to allow only one circuit breaker to be in said ON position at any one time.

8. The invention according to claim 7 wherein each of said switch selector devices has no moving parts, being a single integrally molded piece.

9

9. The invention according to claim 8 wherein said cross section of each of said selector devices comprises an abutment portion and an indent portion, said abutment portion of such width so as to prevent lateral passage of said selector device over a circuit breaker whose handle is in said ON position, said indent portion of such width so as to allow lateral passage of said interlock device over a circuit breaker whose handle is in said OFF position.

10

10. The invention according to claim 9 wherein said guide means comprises a pair of parallel rods securably mounted to said circuit breakers in parallel relation to said second direction.

11. The invention according to claim 10 wherein said guide means further comprises a plurality of flanges that maintain said rods in raised relation to said circuit breakers.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,801,758 Dated April 2, 1974

Inventor(s) J. Richard Shand and Lyal N. Merriken

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 24, "may be" should read --may not be--.

Signed and sealed this 10th day of September 1974.

(SEAL)  
Attest:

McCOY M. GIBSON, JR.  
Attesting Officer

C. MARSHALL DANN  
Commissioner of Patents

UNITED STATES PATENT OFFICE  
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