

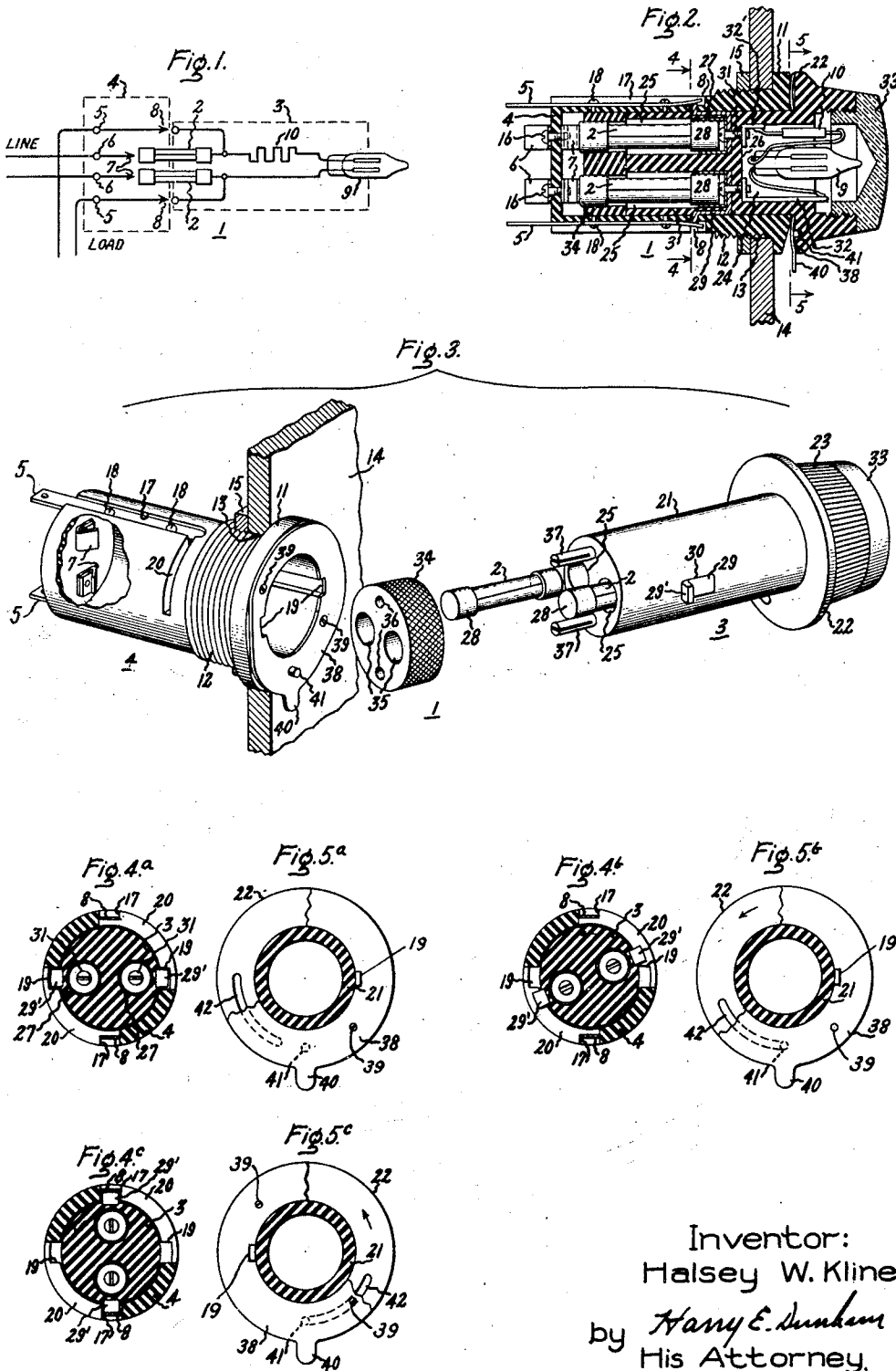
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FUSE AND SWITCH UNIT

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FUSE AND SWITCH UNIT

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My invention relates to a combined fuse and switch unit, and more particularly to a dead front fuse and switch unit which combines the functions of a fuse, switch and indicating means.

Fuses are extensively used in protecting electric circuits of all sorts. In addition to the fuse for protecting electric circuits a switch is usually required for control purposes and also suitable indicating means for indicating either the condition of the fuse or the condition of the electric circuit controlled by the switch. Such apparatus is extensively used in connection with control panels for electrical equipment. In such applications it is always desirable to reduce the panel space requirement to a minimum and at the same time provide a dead front construction.

It is an object of my invention, therefore, to provide a new and improved combined fuse and switch unit which is attractive in appearance, requires much less panel space than similar apparatus used heretofore, which eliminates the requirement of a fuse block and furthermore provides a dead front construction.

It is another object of my invention to provide an indicating type combined fuse and switch unit which is relatively inexpensive.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawing in which Fig. 1 is a schematic diagram illustrating the electric circuit of the combined fuse and switch unit of my invention; Fig. 2 is a sectional view of the combined fuse and switch unit embodying my invention supported from a panel; Fig. 3 is an exploded perspective view of the combined fuse and switch unit of Fig. 2; Figs. 4a, 4b, and 4c are sectional views taken on line 4—4 of Fig. 2 with the fuses removed illustrating three different operating positions of the combined fuse and switch unit, and Figs. 5a, 5b, and 5c are sectional views taken on line 5—5 of Fig. 2 illustrating the operating positions corresponding to those shown by Figs. 4a, 4b, and 4c, respectively.

Referring to the schematic diagram of Fig. 1 in which the corresponding parts thereof are designated by the same reference numerals as in the other figures of the drawing, I have illustrated the electrical circuit of the combined fuse and switch unit generally indicated at 1 which

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includes a pair of conventional enclosed fuses 2 mounted in a removable fuse holder 3, schematically shown. Fuse holder 3 is adapted to fit into a socket or base schematically indicated at 4 which supports a pair of load terminals 5 and a pair of line terminals 6, to which external electrical connections can be made. The base or block 4 includes a pair of stationary contacts 7 and a pair of stationary contacts 8 at which the load and line circuits are made and broken upon operation of the switch of the combined fuse and switch unit of my invention. As shown, the contacts 7 are eccentrically positioned relatively to the longitudinal axis of the base 4. In order to indicate the operating condition of the combined fuse and switch unit of my invention an indicating circuit is connected across the load circuit and comprises a lamp schematically indicated at 9 serially connected with a resistor 10. The lamp and resistor 9 are mounted with the fuses 2 in fuse holder 3. My invention is particularly concerned with a new and improved fuse and switch unit which incorporates the electrical circuit schematically illustrated in Fig. 1.

The combined fuse and switch unit of my invention as shown in Figs. 2 and 3, comprises a block or base of insulating material 4 which is generally cylindrical in construction and of socket form open at one end to receive the fuse holder 3. Base 4 is preferably formed of molded, insulating material and is provided at the open end thereof with an enlarged circumferential flange 11 and a threaded portion 12 immediately adjacent the flange. The threaded portion 12 is smaller in diameter than the flange 11 but is larger in diameter than the remaining portion of insulating base or socket 4, whereby base 4 may be inserted through an opening 13 in a suitable panel 14. A suitable clamping nut 15 threaded to the threaded portion 12 of base 4 firmly clamps the panel 14 between flange 11 and nut 15 and consequently rigidly mounts the base 4 to the panel, as is clearly indicated in Figs. 2 and 3.

Line terminals 6 are mounted at the closed end of base 4 exteriorly thereof and are electrically connected to U-shaped resilient, stationary contacts 7 mounted within base 4 at the closed end thereof by means of suitable fastening means such as conducting screws 16 extending through the closed end of base 4. The load terminals 5 are illustrated as comprising strips of conducting material such as phosphor bronze or the like positioned within longitudinally extending shallow recesses 17 molded in the outside wall of base or socket 4 and the strips 5 positioned therein are

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fastened to base 4 by screws 18. One end of each load terminal 5 within recess 17 is designated as 8 and these portions 8 form the other set of stationary switch contacts referred to above and described in greater detail hereinafter. It will be observed that with the arrangement described thus far all electrical connections to the combined fuse and switch unit are made on one side of panel 14, permitting the other side exposed to the operator to have a dead front construction.

Insulating base or socket 4 which is in the form of a cylindrical shell is provided with two longitudinally extending bayonet indentures 19 molded in the inside walls in diametrically opposed relationship, as is clearly shown in Fig. 3. Bayonet indentures 19 are so positioned relative to recesses 17 that a line interconnecting the centers of bayonet indentures 19 is at right angles to a line interconnecting the centers of the recesses 17. Base or socket 4 is also provided with two circumferential slots 20 each extending for about one quarter of the circumference of base or socket 4. Each circumferential slot extending through the walls of base or socket 4 interconnects one bayonet indenture 19 on the inside wall with a corresponding recess 17 on the outside wall as is clearly shown in Figs. 3 and 4.

The fuse holder 3 comprises a removable unit having a cylindrical body portion 21 adapted to fit within base or socket 4. Preferably removable unit or fuse holder 3 has an enlarged circumferential flange 22 adjacent one end which is adapted to cooperate with the flange 11 of the base 4 when in the circuit controlling position. This circumferential flange has a knurled portion 23 shaped so as to provide a manually actuable knob for controlling the combined fuse and switch unit. Like the base or socket 4, removable unit or fuse holder 3 is preferably formed of insulating material with an enlarged recess 24 molded in the knurled end of the fuse holder, and two fuse receiving recesses 25 molded in the other end thereof with a suitable wall 26 separating the fuse receiving recesses 25 from the recess 24. As shown, the axes of the fuse receiving recesses are eccentrically disposed relatively to the axis of rotation of the fuse holder 3. Mounted within each fuse receiving recess 25 is a cup-shaped spring contact 27 adapted to engage the ferrule 28 associated with one end of fuse 2. A pair of Z-shaped contacts 29 are mounted in recesses 30 formed in the outside wall of cylindrical body portion 21 of fuse holder 3. These recesses 30 are arranged diametrically opposite each other so that when the Z-shaped contacts 29 are positioned in the recess one end of the contact extends into the fuse receiving recess 25 through an opening provided therefor, while the other end 29' forms a bayonet type contact extending outwardly from the body portion 21 as clearly shown in Fig. 3, to be accommodated by the bayonet indentures 19 of the base 4. Except for the outwardly extending portions 29', the Z-shaped contact 29 is either flush with the cylindrical body portion 21 of fuse holder 3 or extends into the fuse receiving recess 25. Each of the cup-shaped spring contacts and associated Z-shaped contact is fastened to the wall 26 within fuse holder 3 by means of a conducting screw 31. Screws 31 are electrically connected to suitable conducting members 32 and 32' mounted within recess 24. Conducting members 32 and 32' have been illustrated in Fig. 2 as comprising angle-shaped members into which bolts or screws 31 are threaded. Indicating

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lamp 9 and serially arranged resistor 10 are mounted within recess 24 and electrically connected across angle members 32 and 32'. Preferably recess 24 is closed by a transparent plug 33 which may be held in position by any suitable means, such as for example the threaded arrangement shown. The transparent plug 33 is preferably shaped so as to have a desirable appearance with respect to completing the knob portion of the fuse holder or removable plug assembly 3.

Preferably the fuse receiving recesses 25 are shorter than the fuses 2 so that a considerable portion of each fuse extends beyond the recess 25 to permit ready removal thereof. In order to hold the fuses 2 in position within fuse receiving recesses 25 while the fuse holder 3 is removed or inserted with respect to socket or base 4, I provide a cylindrical fuse retaining disk 34 having a pair of openings 35 therein which closely fit the terminals 28 of the fuses 2. Disk 34 is also provided with a pair of openings 36 for engaging with pins 37 mounted in the end of the cylindrical body portion 21 of fuse holder 3. The pins 37 have split ends so as to provide a spring action for holding fuse retaining disk 34 in position. The circumference of disk 34 is preferably knurled to facilitate removal thereof when replacement of fuses 2 is desired.

In order to prevent the fuse holder 3 from being inadvertently withdrawn from base 4, I provide a locking arrangement comprising a spring washer 38 of the same size as circumferential flange 11 and with notched out portions to cooperate with bayonet indentures 19. Spring washer 38 is preferably fastened to circumferential flange 11 as is clearly indicated in Fig. 3 by screws 39. Spring washer 38 is also provided with a manually engageable tab 40 by means of which the washer may be flexed in a longitudinal direction with reference to base 4. A suitable pin 41 extending outwardly from spring washer 38 is adapted to engage with a circumferential recess 42 formed in flange 22 of fuse holder 3. This circumferential recess is slightly less than 90 degrees of the circumference of flange 22 and limits the maximum rotation of fuse holder 3 relative to base 4 while pin 41 extends into recess 42.

When the fuse holder 3 is completely assembled with the fuses 2 and fuse retaining disk 34 in position, it may be inserted in base 4, if the extensions 29' of Z-shaped contacts 29 are inserted within bayonet indentures 19, as is shown in Fig. 4a. As soon as the fuse holder 3 has been inserted sufficiently for the portions 29' of Z-shaped contacts 29 to engage circumferential slots 20, rotation of the fuse holder 3 may take place. If the fuse holder is rotated counter-clockwise from the positions shown in Figs. 4a and 5a to the positions shown in Figs. 4b and 5b, the pin 41 will enter recess 42 and thereafter the fuse holder 3 can no longer be moved to the position indicated in Figs. 4a and 5a unless the tab 40 of spring washer 38 is depressed to remove pin 41 from circumferential recess or groove 42. When the fuse holder 3 is in the position indicated in Figs. 4b and 5b the contacts 7 within base 4 are out of engagement with the cooperating ferrules 28 of fuses 2 and likewise the contacts 29' are out of engagement with the contacts 8 so that in effect there are two breaks in series in each circuit. If the fuse holder 3 is now rotated in a counter-clockwise direction from the position indicated in Fig. 4b to the position indicated in Figs. 2 and 4c the circuit is completed both

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at the contacts 7 and at the contacts 8. The contacts 29' engage the contacts 8 and cause a deflection thereof to insure good contacting relationship as is clearly shown in Fig. 2 of the drawings.

Figs. 4b and 5b, therefore disclose the assembled open position of the combined fuse and switch unit of my invention, while 4c and 5c show the closed position of the combined fuse and switch of my invention. Figs. 4a and 5a show the position of the parts while the fuse holder 3 is being inserted in base 4.

In view of the detailed description included above the operation of the combined fuse and switch of my invention will be obvious to those skilled in the art.

Although I have disclosed the indicator circuit including the lamp 9 as connected in parallel with the load circuit so that the lamp is energized when the load circuit is energized, it will be obvious to those skilled in the art that various modifications of this indicating circuit may be utilized.

While I have shown and described certain particular embodiments of my invention, I do not desire my invention to be limited to the construction shown and described for it will be, of course, obvious that changes may be made without departing from my invention. I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A combined switch and fuse unit adapted to be mounted on a panel comprising an insulating base having a recess formed therein, means for fastening said base to a panel, a plurality of contacts associated with said base at least one of which is mounted in a shallow recess in the outside wall of said base, a fuse holder adapted to be mounted in said recess, a fuse in said fuse holder, a plurality of contacts associated with said fuse holder and adapted to engage with said plurality of contacts associated with said base, means including one of said contacts on said fuse holder for determining the relative positions of said base and fuse holder when said fuse holder is inserted into the recess in said base, means for permitting rotation of said fuse holder relative to said base only when said fuse holder has been inserted into said recess a predetermined distance, means for rotating said fuse holder to produce engagement and disengagement of said plurality of contacts associated with said base with said plurality of contacts associated with said fuse holder, and latching means for latching said fuse holder to said base while still permitting relative rotation of said fuse holder and said base.

2. A combined switch and fuse unit comprising an insulating base having a recess formed therein, a plurality of contacts associated with said base, a fuse holder adapted to be mounted in said recess, a fuse in said fuse holder, a plurality of contacts associated with said fuse holder and adapted to engage with said plurality of contacts associated with said base, means including one of said contacts on said fuse holder for determining the relative positions of said base and fuse holder when said fuse holder is inserted into the recess in said base, means for permitting rotation of said fuse holder relative to said base only when said fuse holder has been inserted into said recess a predetermined distance, means for rotating said fuse holder to produce engagement

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and disengagement of said plurality of contacts associated with said base with said plurality of contacts associated with said fuse holder, and latching means comprising an annular washer for latching said fuse holder to said base while still permitting relative rotation.

3. A combined switch and fuse unit comprising an insulating base having a recess formed therein, a plurality of contacts associated with said base, a fuse holder adapted to be mounted in said recess, a fuse in said fuse holder, a plurality of contacts associated with said fuse holder and adapted to engage with said plurality of contacts associated with said base, means including said contacts on said fuse holder and a plurality of longitudinally extending slots in the recess of said base for determining the relative positions of said base and fuse holder when said fuse holder is inserted into the recess in said base, means for permitting rotation of said fuse holder relative to said base only when said fuse holder has been inserted into said recess a predetermined distance, and means for rotating said fuse holder to produce engagement and disengagement of said plurality of contacts associated with said base with said plurality of contacts associated with said fuse holder.

4. A combined switch and fuse unit comprising an insulating base having a recess formed therein, a plurality of contacts associated with said base, a fuse holder adapted to be mounted in said recess, a fuse in said fuse holder, a plurality of contacts associated with said fuse holder and adapted to engage with said plurality of contacts associated with said base, means including one of said contacts on said fuse holder for determining the relative positions of said base and fuse holder when said fuse holder is inserted into the recess in said base, means for permitting rotation of said fuse holder relative to said base only when said fuse holder has been inserted into said recess a predetermined distance, means for rotating said fuse holder to produce engagement and disengagement of said plurality of contacts associated with said base with said plurality of contacts associated with said fuse holder, and means including a spring washer associated with said base for latching said fuse holder to said base, while still permitting limited rotational movement of said fuse holder.

5. A combined switch and fuse unit comprising an insulating base having a recess formed therein, a plurality of contacts associated with said base, a fuse holder adapted to be longitudinally inserted in said recess, a fuse in said fuse holder, means including a removable disk for retaining said fuse in said fuse holder, a plurality of contacts associated with said fuse holder and adapted to engage with said plurality of contacts associated with said base, means including one of said contacts on said fuse holder for determining the relative positions of said base and fuse holder when said fuse holder is inserted into the recess in said base, means for permitting rotation of said fuse holder relative to said base only when said fuse holder has been inserted in said recess a predetermined distance, and means for rotating said fuse holder relative to said base to produce engagement and disengagement of said plurality of contacts associated with said base with said plurality of contacts associated with said fuse holder.

6. A combined switch and fuse unit of the type adapted to be mounted on a panel comprising an insulating base having a recess formed therein,

means for fastening said base to a panel, a plurality of contacts associated with said base, a fuse holder adapted to be mounted in said recess, a fuse in said fuse holder, a plurality of contacts associated with said fuse holder and fuse adapted to electrically engage with said plurality of contacts associated with said base, means including one of said contacts on said fuse holder and an indenture in said base for determining the relative positions of said base and fuse holder when the fuse holder is inserted into the recess in said base, a circumferential slot in said base extending through the walls thereof and connected to said indenture into which said one contact may move to permit rotation of said fuse holder when said fuse holder has been inserted in said recess a predetermined distance, and means for rotating said fuse holder to produce engagement and disengagement of said plurality of contacts associated with said base and with said fuse holder.

7. A combined switch and fuse unit of the type adapted to be mounted on a panel comprising an insulating base having a recess formed therein, means for fastening said base to a panel, a longitudinally extending shallow recess in the outside wall of said base, a plurality of contacts associated with said base one of which is mounted in said shallow recess, a fuse holder adapted to be mounted in said recess, a fuse in said fuse holder, a plurality of contacts associated with said fuse holder and fuse adapted to electrically engage with said plurality of contacts associated with said base, means including one of said contacts on said fuse holder and an indenture in said base for determining the relative positions of said base and fuse holder when the fuse holder is inserted into the recess in said base, a circumferential slot in said base connected to said indenture into which said one contact may move to permit rotation of said fuse holder when said fuse holder has been inserted in said recess a predetermined distance, said circumferential slot also being connected to said shallow recess means for rotating said fuse holder to produce engagement and disengagement of said plurality of contacts associated with said base and with said fuse holder, and latching means for latching said fuse holder to said base while still permitting relative rotation therebetween.

8. A combined switch and fuse unit of the type adapted to be mounted on a panel comprising an insulating base having a recess formed therein, means for fastening said base to a panel, a plurality of contacts associated with said base, a fuse holder adapted to be mounted in said recess, a fuse in said fuse holder, a plurality of contacts associated with said fuse holder and fuse adapted to electrically engage with said plurality of contacts associated with said base, means including one of said contacts on said fuse holder and a bayonet indenture in said base for determining the relative positions of said base and fuse holder when the fuse holder is inserted into the recess in said base, a circumferential slot in said base connected to said indenture into which said one contact may move to permit rotation of said fuse holder when said fuse holder has been inserted in said recess a predetermined distance, means for rotating said fuse holder to produce engagement and disengagement of said plurality of contacts associated with said base and with said fuse holder, and additional means including a circumferential slot in said fuse holder for limiting the rotation of said fuse holder relative to said base.

9. A combined switch and fuse unit comprising an insulating base having a recess formed therein, a plurality of contacts associated with said base, a fuse holder adapted to be mounted in said recess, a fuse in said fuse holder, means including an insulating disk for holding said fuse in said fuse holder, a plurality of contacts associated with said fuse holder and fuse adapted to electrically engage with said plurality of contacts associated with said base, means including one of said contacts associated with said fuse holder for determining the relative positions of said base and fuse holder when the fuse holder is inserted into the recess in said base, means for permitting rotation of said fuse holder when said fuse holder has been inserted in said recess a predetermined distance, means for rotating said fuse holder to produce engagement and disengagement of said plurality of contacts associated with said base and with said fuse holder, and latching means latching said fuse holder to said base without interfering with limited rotational movement of said fuse holder relative to said base.

10. A combined switch and fuse unit comprising an insulating base having a recess formed therein, a plurality of contacts associated with said base, at least one of said contacts being eccentrically positioned therein, a fuse holder adapted to be mounted for translatory and rotary movement in said recess, a standard cartridge fuse positioned in said fuse holder with the longitudinal axis of the fuse eccentrically disposed relatively to the axis of rotation of the fuse holder, a plurality of contacts associated with said fuse holder and fuse adapted to engage with said plurality of contacts associated with said base with one end of said fuse in engagement with said eccentrically positioned base contact, means including one of said contacts associated with said fuse holder for determining the relative positions of said base and fuse holder when the fuse holder is inserted into the recess in said base, means for permitting rotation of said fuse holder when said fuse holder has been inserted in said recess a predetermined distance, and means for rotating said fuse holder to produce engagement and disengagement of said plurality of contacts associated with said base and with said fuse holder.

11. In combination, an insulating base member having a plurality of contacts associated therewith, a control member adapted to be removably mounted in said base member and rotatable relative thereto to make and break an electric circuit at said plurality of contacts, means for limiting the relative rotation of said members comprising a circumferential groove associated with one of said members and a pin fastened to the other of said members, and manual means for moving said pin out of said groove.

12. In combination, an insulating base member having a plurality of contacts associated therewith, a control member adapted to be removably mounted in said base member and rotatable relative thereto to make and break an electric circuit at said plurality of contacts, means for limiting the relative rotation of said members comprising a circumferential groove associated with one of said members and a spring biased pin fastened to the other of said members and biased so as to extend into said groove, and means for moving said pin out of said groove to permit withdrawal of said control member from said base member.

13. In combination, an insulating base member

having a plurality of contacts associated therewith, a control member adapted to be removably mounted in said base member and rotatable relative thereto to make and break an electric circuit at said plurality of contacts, means for limiting the relative rotation of said members comprising a circumferential groove in said control member and a spring biased pin associated with said base member, and manual means for moving said pin out of said groove to permit withdrawal of said control member from said base member.

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