July 17, 1934. F. S. GREEN 1,966,716

CIRCUIT INTERRUPTING AND PROTECTING APPARATUS

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Fig. 1.

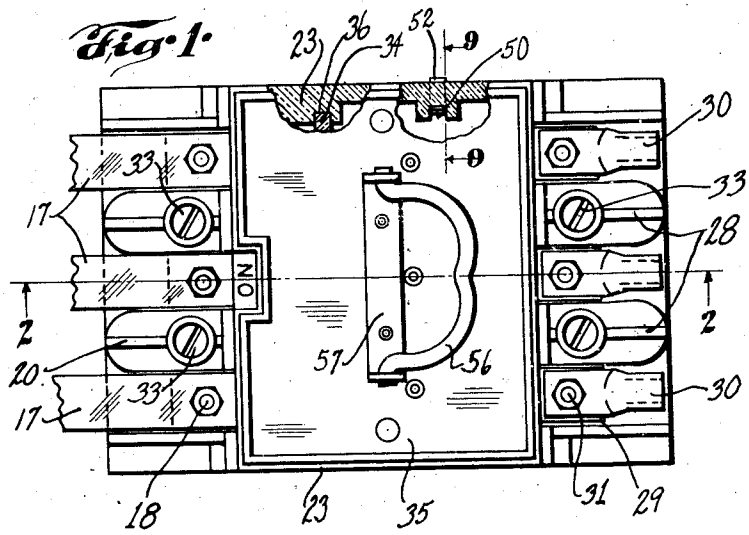


Fig. 9.

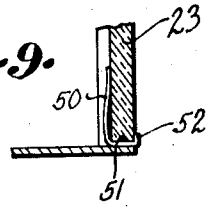


Fig. 2.

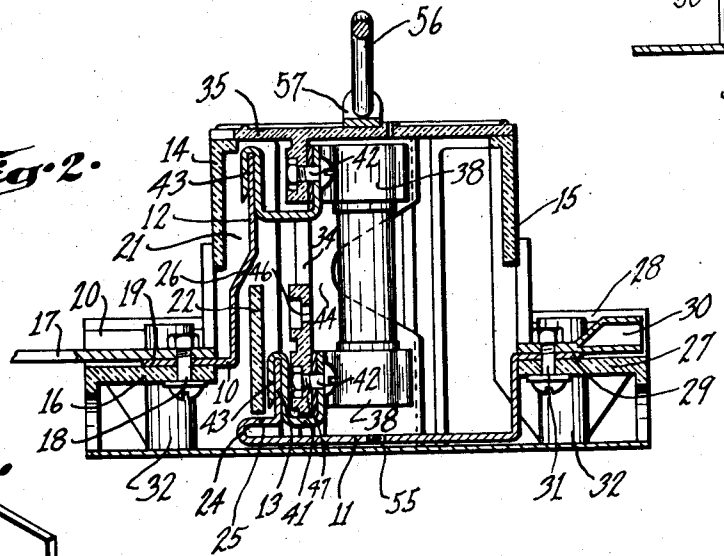
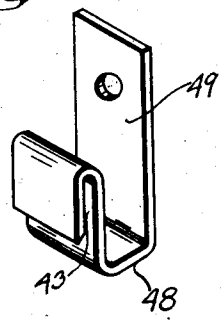


Fig. 10.



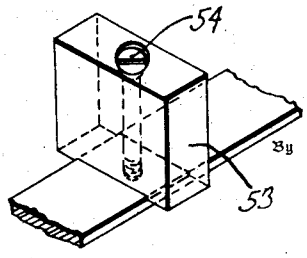


Fig. 11.

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CIRCUIT INTERRUPTING AND PROTECTING APPARATUS

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Fig. 3.

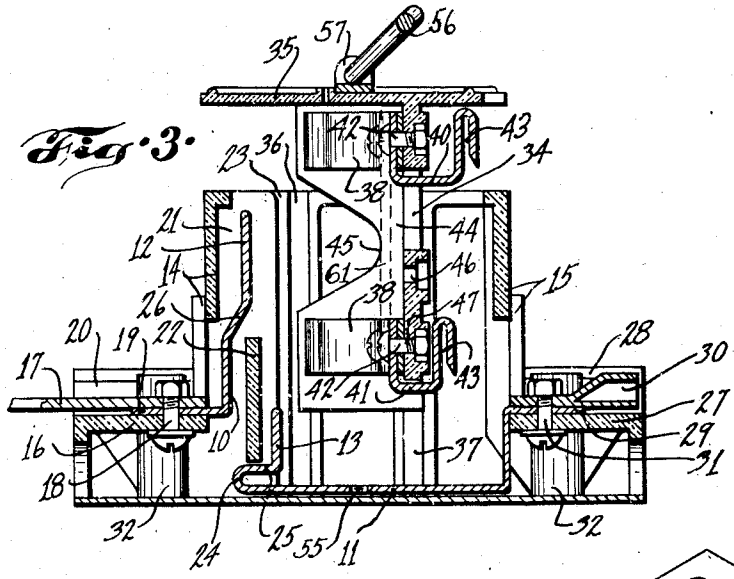


Fig. 4.

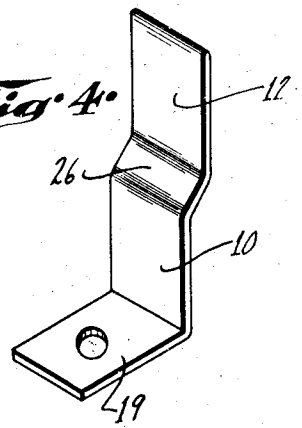


Fig. 5.

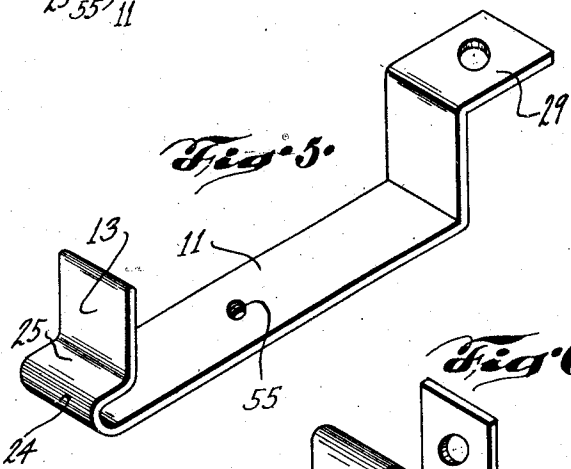


Fig. 6.

Fig. 12.

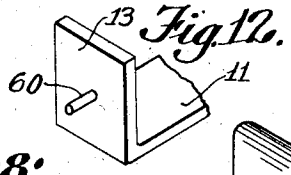
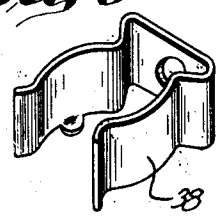


Fig. 8.



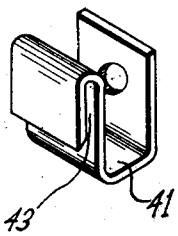


Fig. 7.

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Patented July 17, 1934 1,966,716

UNITED STATES PATENT OFFICE

1,966,716

CIRCUIT INTERRUPTING AND PROTECTING APPARATUS

Floyd S. Green, St. Louis, Mo., assignor to Frank Adam Electric Co., St. Louis, Mo., a corporation of Missouri

Application January 25, 1932, Serial No. 588,601

13 Claims. (Cl. 200—114)

My invention relates to circuit interrupting and protecting apparatus, and more particularly to an improved safety-type fuse switch.

An object of my invention is to provide a switch of the class described, which, by reason of a novel arrangement of parts, is unusually compact and requires but little mounting space, thereby adapting it for particular application in connection with switchboards and panelboards.

Another object of my invention is to provide an improved switch, characterized by a housing member arranged to receive a partition member which carries fuses and switch contact elements. The partition member is adapted for association with the housing in either of several variant positions, and switching is accomplished by removing the partition from the housing and replacing it therein, in a relatively reversed position.

A further object of my invention is to provide, in a switch of the type mentioned above, and wherein the partition member is removable and entirely separable from the housing, means whereby the switch contacts on the movable fuse carrier are constrained for rectilinear movement immediately prior to their engagement with the fixed contacts, enabling such engagement to be effected with directness and certainty.

Yet another object of my invention is to provide on the housing, or body portion of the switch, indicia of several switching conditions, for example, the words "on" and "off", and to provide a closure member, movable with the partition member, which is adapted to reveal only such indicia as evidences the true switching condition.

These and other objects and advantages will appear from the following detailed description, and from the accompanying drawings, which illustrate a single preferred embodiment of my invention.

Fig. 1 of the drawings is a plan view of my device, a portion of the closure member being broken away to illustrate certain features of the device; Fig. 2, a sectional elevation taken along the line 2—2 of Fig. 1, the partition member and associated elements being shown disposed in "switch closed" relation with the housing and stationary switch parts; Fig. 3, a sectional elevation, illustrates my device with the partition reversed relative to the showing in Fig. 2, and partway withdrawn from the enclosure. This figure shows the relation of the fuse carrier and enclosure when positioned for "switch open" condition. The figure also shows, in dotted lines, a modification in the structure; Figs. 4 and 5 are perspective views of the stationary switch contact elements; Figs. 6 and 7, perspective views of the removable fuse carrier switch contact elements, associated with the fuse clips, as shown in Fig. 8; Fig. 9 is a bottom sectional elevation, as taken along the line 9—9 in Fig. 1, through one of a pair of slots adapted to receive the fuse carrier partition member, in the "off" position, and showing secured therein a resilient retaining device for the fuse carrier; Fig. 10 is a perspective view of a modified form of removable fuse-carrier switch contact element associated with a fuse clip, which, when substituted for the corresponding contacts in Fig. 3, adapts the fuse carrier to fuses of small capacity; Fig. 11 is a perspective view of a safety block device employed in connection with the modified fuse-carrier switch contact element, for the purpose of preventing the insertion of a fuse carrier fitted with fuses of more than predetermined length, and intended capacity, and Fig. 12 is a fragmentary perspective view of a modified portion of one of the stationary switch contacts.

Referring now by numerals of reference to the drawings, that portion of my device which may be termed the housing or switch body, comprises a boxlike structure, preferably formed, as by molding, of an insulating material such as Bakelite, or the like. By shaping the switch body in suitable molds, the numerous partitions and insulating barriers, providing for compactness and safety, may be formed integrally with the housing. This construction reduces the cost of manufacture and greatly enhances the ruggedness and appearance of the device.

In the present embodiment, which is illustrative of a three-pole switch, conductor elements, or switch contacts, 10 and 11 (Figs. 4 and 5, respectively), formed preferably of strap copper, are disposed within, and fixedly secured to the housing. Each of the elements 10 and 11 is bent to provide contact portions 12 and 13, respectively, which project toward the front of the housing and have their contact areas disposed in spaced parallel planes, each at substantially a right angle to the front of the housing. The contacts 12 and 13 are arranged nearer the wall 14, of the housing, as distinguished from the opposite end wall, which is designated 15.

Considering now the conductor element 10, which may be termed the outer stationary

switch contact, this member is secured to a shelf or ledge 16, lying in a plane outwardly of, and parallel with the bottom of the housing and located externally of the housing proper. The outermost switch contact members 10 may be provided with terminal lugs for connection with line conductors, or may be connected as at the bent end portions 19, to bus bars, portions of which are indicated at 17. Connections may be made directly thereto, as by means of screws 18 or the equivalent, which extend through the ledge 16. Barriers 20, formed outwardly on the ledge 16, and barriers 21, extending inwardly from the end wall 14, and preferably the full depth of the housing, are disposed between adjacent conductor elements. These, and other insulating barriers and partitions to be hereinafter mentioned, enable conductor elements of opposite polarity to be relatively closely assembled to provide a compact structure, without danger from arcing or short-circuiting.

The switch contacts 10 and 11 are separated by a partition 22 disposed crosswise between opposite side walls 23 of the housing. This partion, by preference, dwoes not extend clear to the bottom of the housing, a space being reserved for a folded extremity 24 of the inner switch contact 11. By the provision of the fold, or reverse bend 24, in the element 11, the contact portion 13 thereof, terminating at a right angle from the upper fold 25, is adapted for resilient endwise movement. However, as best illustrated in Fig. 3, the contact portion 13 of the inner switch contact element 11 is partially restrained, in its outward resilient movement, by the relatively close proximity of the inner end of the partition member 22, to the fold surface 25. This feature of construction has a definite advantage in the operation of the device, as will presently appear. A certain resilience is provided in the outer switch contact 10 by forming that element with a bend 26 which laterally offsets the contact portion 12. As will hereinafter more clearly appear, the portions 12 and 13 are adapted to be engaged by complementary contact element, which are secured to a movable fuse carrying frame, the switch-closing engagement of the contacts being effected upon sliding movement of the carrier, endwise relative to the contacts 10 and 11. Obviously, upon engagement or disengagement of the contact members, stresses are set up, the tendency of which is to cause a loosening of the members from their securements. This undesirable result is nullified by the cushioning effect produced by the endwise resilience of the contact members. It is readily observed that, in connection with the inner switch contact member 11, the screw 31 is the only principal means of securing the switch contact element to the housing ledge 27. This securement alone, may not be fully sufficient to prevent the contact member from bending, and eventually breaking, under the stresses of repeated removals of the fuse carrier, from its "on" position in the housing. In order to obviate this difficulty, the partition member 22 is provided and positioned so that its inner end lies adjacent the fold surface 25 of the switch contact 11. Therefore, when the fuse carrier is removed from switch closed or "on" position in the housing, the outward movement of the switch contact will be limited by the abutment of the partition end with the fold surface 25. The partition 22 thus acts, not only as an insulating barrier between the inner and outer switch contacts 10 and 11, but as an additional and necessary securement for retaining the switch contact 11 in place. This expedient results in a saving in cost of manufacture, as it eliminates another screw for securing the folded end of the switch contact to the housing. A modified arrangement, Fig. 12, for attaining the same result, consists in eliminating the folded extremity 24, retaining only a right angle bend for the contact surface portion 13, and attaching to the lower portion of the surface 13, a pin or stud 60, adapted to abut the inner end of the partition member 22.

As appears from Fig. 1, the housing is substantially symmetrical in plan, a ledge 27 and barriers 28 projecting from the end 15, in a manner corresponding to the ledge 16 and barriers 20, extending outwardly from the end wall 14. The inner switch contact 11 is bent to provide a terminal portion 29, which is secured with a terminal lug 30, to the ledge 27, as by a screw 31, or the equivalent.

For mounting the housing, spacer blocks 32, preferably molded integrally with the ledges 16 and 27, are provided, and are apertured to accommodate screws 33 which extend therethrough for engagement with a panel mounting back or other support.

As was previously mentioned, a partition member such as 34, is arranged for endwise sliding movement, into and out of the housing. The partition, like the housing, is preferably constructed of moulded insulating material, and has associated at a right angle therewith, a closure member 35. The partition 34 is adapted to be positioned within and between either one of two pair of guide-ways, or grooves 36 and 37, disposed in opposite side walls 23 of the housing. In either position, it is seen that the partition serves substantially to divide the space within the housing, into two compartments. As will be hereinafter explained, switching may be accomplished by sliding the fuse carrier out of the housing, turning it 180 degrees about an axis at a right angle to the closure member, and replacing it in the housing; the partition thereby being removed from one set of grooves, and repositioned in the other set or pair. According to preference, the housing is intended, primarily, for vertical mounting in either of several positions and the present description is predicated upon such a mounting. However, the device may be utilized with its base in a horizontal plane, if desired. With the housing secured so that its base lies in a vertical plane, it is seen that the movement of the fuse carrier, when inserted in the housing or removed therefrom, will always be in a horizontal direction.

By the arrangement of fuse clips 38, as appears in Figs. 2 and 3, it is seen that fuses are adapted to be removed from, and positioned in the housing by endwise movement relative thereto. These fuse clips, with fuse contact members 40 and 41, are secured to the partition 34, as by means of screws 42. As best appears in Fig. 2, end portions of the members 40 and 41 are preferably folded to provide contact seats 43, adapted for the reception of stationary switch contact portions 12 and 13, these contact seats being preferably located on the side of the partition 34 opposite to the fuse clips.

As previously mentioned, the contact portions 12 and 13 are disposed out of alignment. The

contact receiving seats 43 of the fuse-carrier switch contacts are likewise misaligned to register with the portions 12 and 13. The registration and engagement of the recited parts, however, is possible only when the partition is disposed within the housing guideways 36. In the alternate position, (the partition being located in guideways 37, as appears in Fig. 3), the switch contacts 40 and 41 are always disposed remotely from the switch contact members 10 and 11, whereby the device is in "switch open" position.

Barriers 44, extending between the fuse clips, are provided with suitable finger openings 45 facilitating removal and replacement of fuses.

The fuse carrier, as herein described, is shown with the fuse clips arranged and adapted for the reception of a fuse having a long tube or cartridge, such as employed, for example, with a 60 amp. fuse. However, the partition 34 is provided with additional apertures 46, similar to the apertures 47, and positioned somewhat outwardly thereof, for adapting the carrier to fuses having shorter cartridges, such, for example, as usually provided on fuses of 30 amp. rating. The change is made by removing the fuse contact 41, and the fuse clip 38, attached thereto, and substituting a fuse contact 48 of the same form, but having a longer shank portion 49 for securing it to the partition 34, together with a fuse clip 38, by a screw 42, through the aperture 46. This provision enables the molded parts of the fuse carrier to be employed selectively with fuses of a variety of sizes.

As will be seen from the general arrangement of the fuse switching device, the fuse switch may be converted into a safety type line switch, of unfused type, by a simple modification in the fuse carrier, involving only the removal of the fuse clips 38, and substituting a connector, or bus bar 61 therefor, shown in dotted line, Fig. 3, the bar preferably having the same cross sectional shape and area. With the above alterations made, the operation of the line switch is the same as that described when the device is employed as a fused switch.

As an expedient for indicating switching conditions, opposite front surfaces of the housing are provided with suitable indicia. For example, on the outer surface of the wall 14 appears the word "on", and similarly disposed on the opposite surface, as on the edge of wall 15, is the word "off". The housing closure member 35 is recessed to expose one such indicia, but at the same time conceals the other, when in either closed position relative to the housing.

With the fuse carrier inserted in the housing in the "on" position, the frictional engagement of the contact members 40, 12 and 41, 13, maintains the carrier securely in place, whereas, in the "off" position, the fuse carrier is kept in position in the housing, partly by the frictional engagement of the ends of the partition 34 with the sides of the grooves 37, disposed in opposite side walls 23 of the housing. As this frictional contact, alone, may not be sufficient to hold the carrier in place, a spring holder 50 is provided in the bottom of one of the grooves 37, and held in place by bending one of its end portions, to pass through a slot 51, cut in the side wall 23, and having formed on the end thereof, a retaining flange 52. This spring serves frictionally to engage the end surface of the partition 34, and effectively holds the fuse carriers in place, when in switch-open position.

When the fuse switch is employed in a circuit wherein the normal current flow is less than 30 amps., the fuse carrier is arranged and adapted for the insertion of the relatively short 30 amp., fuses. As it is well understood that, if a fuse carrier, adapted for and carrying 60 amp. fuses, is inserted in a housing adapted for only 30 amp. fuses, damage would probably result, following an overload, to the circuit and apparatus connected therein. To prevent such an accidental insertion of a carrier containing fuses of other than intended capacity, an insulator block 53 of bakelite, fiber, or other insulating material, is secured to each inner switch contact 11 by a screw 54 in the threaded aperture 55, the screw head being sufficiently counter sunk in the block to insure against possible electrical contact through the screw. These blocks are so positioned as to be directly under the lower end of the fuse and fuse clip, when the carrier is inserted in the "on" position. It is then impossible to insert in the housing, a fuse carrier containing fuses of more than the predetermined length, and intended capacity.

For manipulating the fuse carrier, there is provided a handle 56, preferably secured in hinged relation with the closure member, as through a handle bracket or trunnion member 57.

From the foregoing description it may be observed that the partition member 34, after it has been placed in the grooves or guideways 36, must be moved into the housing a considerable distance before engagement of the contact elements will be effected. The guideways preclude any tendency toward lateral displacement of the movable switch contacts immediately prior to engagement, so that the switch closing action may, therefore, be accomplished with directness and certainty.

By reason of the preferred relative disposition of barriers, contacts and fuse parts, a compact device is produced which is entirely safe in operation, and which requires comparatively little mounting space. I fully realize that the structural arrangement of parts may be altered, and certain of the parts omitted or modified, without departing from the spirit and full intended scope of my invention as defined by the appended claims.

I claim:

1. In a switch structure, a housing, a removable partition dividing the housing into two compartments, contacts carried by the housing and partition, and means formed by the housing and partition to provide two spaced paths of movement of the partition within the housing, corresponding respectively to open and closed switch positions.

2. In a switch assembly including a housing, stationary contacts in said housing, a closure member including a bracket, separable from the housing, contacts on one side of said bracket, and a removable bus bar on the reverse side of the bracket connecting said contacts, said closure adapted to be disposed on said housing, in one position to effect mutual engagement of said contacts, and in another relatively reverse position, to prevent switch closing engagement of said contacts.

3. A switch structure including a housing, a removable partition forming a pair of compartments in said housing, fixed contacts in one of said compartments, movable contacts carried by said partition, and means for selectively positioning the partition in said housing, in one location between said fixed and movable con-

tacts, and in another position beyond both the fixed and movable contacts.

4. A switch assembly including a housing, a closure member therefor separable from said housing, a bracket projecting from said closure member, stationary and movable switch contacts secured respectively to said housing and bracket, spaced guideways in the housing, said bracket being adapted to be obversely disposed in one of said guideways for mutual engagement of the contact members, and reversely disposed in another of said guideways to effect a closure of the housing without mutual engagement of said contacts.

5. A switch assembly including a housing, a closure member therefor, separable from said housing, stationary contacts in said housing, movable contacts, a bracket on said closure member for supporting the movable contacts, said bracket affording sliding engagement with said housing and adapted for obverse positioning therein to effect relative engagement of the contacts, and adapted for reverse positioning therein to effect a closure of the housing, with the normally coacting contacts disengaged, and flexible means operative only upon the reverse positioning of said bracket to retain the bracket in assembly in the housing, in switch-open position.

6. A switch assembly including a housing, a closure member therefor, a partition member extending substantially at a right angle from the closure member, fixed contacts in said housing, movable contacts secured on one side of the partition, said partition being adapted for disposal in said housing, between said fixed and movable contacts for "switch-open" position, and adapted to be removed and replaced in a reverse position to effect engagement of said fixed and movable contacts, whereby to close the switch.

7. In a switch assembly, a housing, a removable invertable drawerlike structure adapted for guided sliding movement relative to said housing, and including a housing closure member and an endwise movable member at substantially a right angle to the closure, stationary contact elements in said housing, contacts carried by and disposed parallel to said endwise movable member, said last named contacts being adapted selectively to engage, and avoid, said stationary contact elements upon movement of said closure into and out of closing position, responsively to the upright and inverted relation of the drawer structure to the housing.

8. In a safety-type fuse switch, an open end housing, a removable partition dividing the housing into two compartments, said partition being provided with a housing closure member, contacts carried by the housing and partition, means formed by the housing and partition to provide two spaced paths of movement of the partition within the housing, corresponding respectively to open and closed switch positions, and relatively spaced indicia of switching conditions on said housing, said closure member being constructed to render only one such indicia visible when said closure member is positioned on said housing.

9. In a switch assembly, a housing member, stationary contacts therein, a switching member removably disposed within the housing, movable contacts carried by the switching member, and means distinct from said contacts for yieldingly and frictionally retaining the switching member in switch-open position within the housing.

10. In a switch assembly, a housing, resiliently mounted, stationary contacts in said housing, a switching member removably disposed in said housing, complementary contacts carried by said member, securing means within the housing for said stationary contacts, and means associated with the stationary contacts and housing, providing an abutment for limiting the resilient movement of said stationary contacts during switching action, said abutment being spaced from the contact-securing means.

11. In a switch assembly, a housing, resiliently secured stationary contacts in said housing, a switching member, complementary contacts on the switching member, the member and its contacts being removably disposed in said housing, a barrier within the housing between certain of said contacts and means associated with the stationary contacts and said barrier for limiting the resilient movement of the stationary contacts, during switching action, said means being spaced from the points of securement of the stationary contacts.

12. In a fuse switch assembly, a housing, contacts therein, a fuse carrier removably disposed in the housing, complementary contacts on the fuse carrier, fuse clips on the carrier, means on the carrier for selectively spacing said fuse clips whereby to adapt the carrier for the reception of fuses of different dimensions and means adapted, upon the selection of a particular spacing of said fuse clips, to prevent the insertion of a fuse of a size or rating other than that provided for by said spacing.

13. In a fuse switch assembly, a housing, contacts therein, a fuse carrier removably disposed in the housing, complementary contacts on the fuse carrier, fuse clips on the carrier, means on the carrier for selectively spacing said fuse clips whereby to adapt the carrier for the reception of fuse cartridges of different rating, and a blocking element detachably secured within the housing, and adapted, upon such securement, to prevent the insertion of fuse cartridges in excess of a predetermined rating.

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