Oct. 27, 1964 T. M. COLE 3,154,722

FUSIBLE CIRCUIT PROTECTIVE DEVICE

Filed Oct. 23, 1959 2 Sheets-Sheet 1

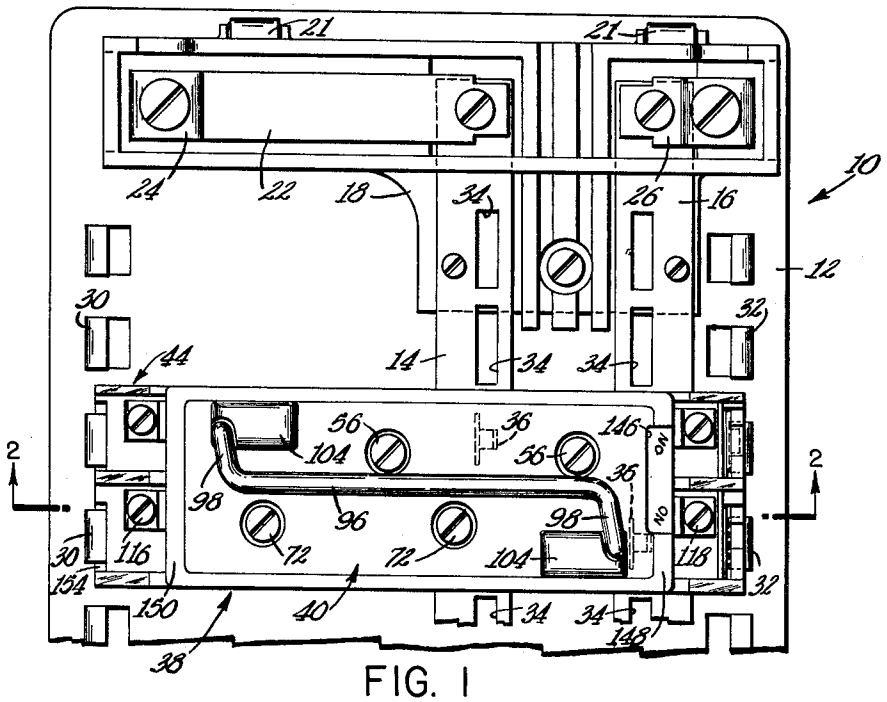


FIG. 1

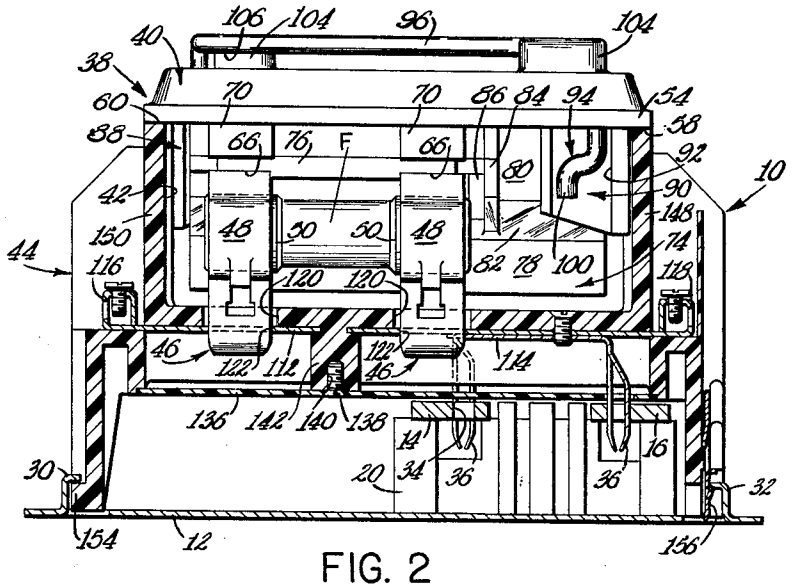


FIG. 2

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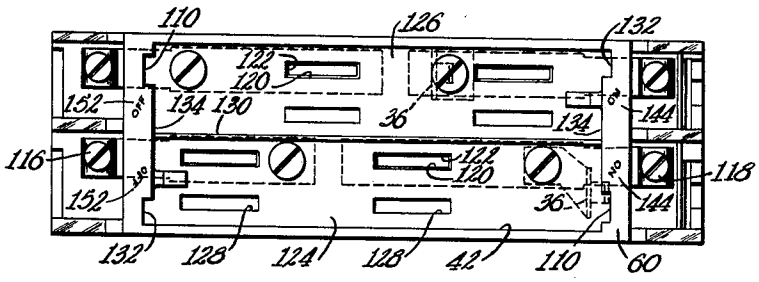


FIG. 3

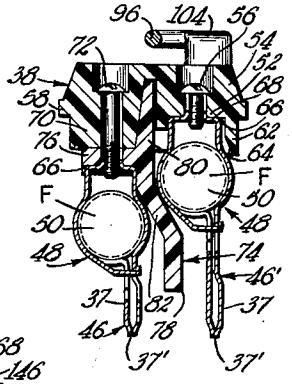


FIG. 5

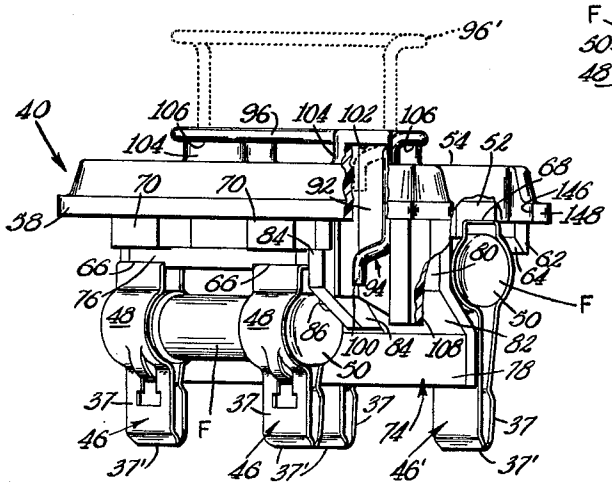


FIG. 4

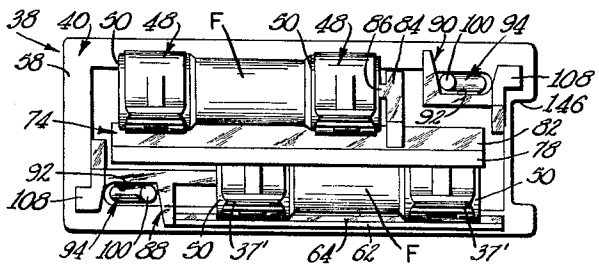


FIG. 6

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FUSIBLE CIRCUIT PROTECTIVE DEVICE

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6 Claims. (Cl. 317—114)

This invention relates generally to a circuit protective device and, more particularly, to so-called fusible pull-out switches. Such switches have a receptacle part and a companion pull-out unit that contains fuses and has plug-in blade contacts. The pull-out unit or head is receivable in the receptacle in either of two ways, one in which the blade contacts engage respective contacts in the receptacle, and another in which the blades enter inert parts of the receptacle. The switch may thus be "on" or "off" depending on how the pull-out unit is inserted.

Fusible pull-out switches are advantageously used in fusible panelboards or separately. In application Serial No. 801,349, filed March 23, 1959, by Thomas M. Cole, now Patent No. 3,093,773, a panelboard is disclosed having various interchangeable modular fusible plug-in devices, which remain in place after being installed. Such fusible devices include plug fuse receptacles and pull-out switches containing cartridge fuses. A pull-out switch of usual proportions occupies twice the modular space occupied by a plug-fuse unit. An object of the present invention resides in the provision of a pull-out switch whose width is greatly reduced so as to attain the same modular width as the plug-fuse unit in the aforementioned panelboard. More generally, an object of this invention resides in the provision of a pull-out switch of minimum width, and the invention relates to features of construction toward this end.

A feature of this novel pull-out switch is the staggered relationship of the plug-in blade contacts which offsets the cartridge fuses lengthwise in relation to each other. A further feature resides in the disposition of the cartridge fuses in different planes relative to the front face of the pull-out unit and thereby enabling effectively closer disposition, widthwise of the unit. A still further feature of the novel pull-out switch relates to novel mounting features of the handle of the pull-out unit, for movement between retracted and projected or hand gripping positions, and in the utilization of diagonally disposed recesses in the pull-out unit for the telescoping legs of the handle. This location of the handle recesses takes advantage of the spaces opposite the ends of the longitudinally staggered cartridge fuses.

The illustrative embodiment of the invention, which has been outlined above as incorporating certain novel features forming part of the invention, is more fully described in the remainder of this specification, from which further novel features and objects and advantages will become apparent. In the following description reference is made to the accompanying drawings forming part of this disclosure, in which drawings:

FIG. 1 is a fragmentary plan view of a panelboard with the illustrative novel fusible panelboard switch mounted thereon, a portion of the panelboard being left free of circuit protective devices for illustrative purposes;

FIG. 2 is a cross sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a plan view of the receptacle of the illustrative pull-out switch, with the pull-out fuse unit removed;

FIG. 4 is a side perspective view of the pull-out unit, the handle thereof being shown in solid lines in its normal retracted position and in dotted lines in position to be gripped for pulling the pull-out unit;

FIG. 5 is a cross-section of the pull-out unit taken along a broken offset plane transversely through respective end caps of the cartridge fuses and the corresponding contact blades; and

FIG. 6 is a bottom plan view of the pull-out unit in FIGS. 4 and 5.

Referring to the drawings, a panelboard 10 is shown having a sheet metal plate 12 bearing a pair of bus bars 14 and 16. The bus bars are spaced away from the base of plate 12 by insulating supports including the line barrier insulator 18 and a support insulator 20. The bus bars are screwed to the insulators and the insulators in turn are fastened to plate 12 by screws and by metal tongues 21. Bus bar 14 is connected to one line terminal bar 22 and to solderless connector 24 forming one line terminal while the second bus bar 16 is similarly connected to another line terminal 26. The line terminals 24 and 26 are adapted to receive line wires through suitable openings in the upstanding end walls of insulator 18.

Aligned rows of hooks 30 and 32 extend along the opposite edges of plate 12, said hooks being in the form of metal tongues that project integrally from plate 12. The bus bars contain a series of slots 34 which constitute formations for plug-in cooperation with the plug-in terminals 36 of the fusible circuit protective device 38 adapted for mounting on the panelboard. Each plug-in formation 36 is interposed between a confronting pair of transversely aligned hooks 30 and 32, the formations being spaced along lines parallel to the two rows of hooks 30 and 32. The bus terminals or formations 36 are asymmetrically located relative to the center line as described in detail in copending application Serial No. 801,349, filed March 23, 1959, said application being assigned to the assignee herein.

The exemplified circuit protective device 38 occupies the area of the panelboard allotted to two pairs of adjacent hooks 30, 32 and their companion formations 34 disposed therebetween. The device 38 is adapted for standardized modular applications, such as panelboard applications of the exemplified embodiment, and in such applications the overall width dimension of the unit must be accommodated in the alloted mounting region therefor. Device 38 is of a form designed for a pair of cartridge fuses F contained in a pull-out unit 40 (FIG. 4).

The pull-out unit 40 is received in a corresponding cavity 42 in the unitary base or receptacle part 44. The receptacle part and pull-out unit are each formed by molding a suitable insulation material, for example, "Bakelite." Mounted in the pull-out unit are two pairs of combined fuse holders and movable contacts 46 and 46' which may be of the type disclosed in Patent No. 2,617,847, issued on Nov. 11, 1952. The combined fuse holders and contacts 46, 46' are of identical construction except that the intermediate portion of contact 46' from which its plug-in portion or terminal 37 depends is longer than the corresponding intermediate portions of contact 46. The terminal ends 37' of both pairs of plug-in terminals 37 serve the same function and are disposed in a common plane for plug-in connection to the bus bars.

Pursuant to the present invention, the fuses F are disposed in laterally staggered relation at spaced levels to hold the fuses in closely adjacent relation using a minimal space and thereby minimize the overall width dimension of the device 38. Each pair of longitudinally spaced and aligned fuse holders or clips 48 define receptacles to accommodate the cylindrical end contacts 50 of a companion cartridge fuse F. The pair of combined fuse holders and contacts 46' are mounted on integral support blocks 52 depending from the top wall 54 of unit 40 and are secured in position by screws 56. The unit 40 includes a peripheral flange 58 which seats against the top peripheral edge 60 of the receptacle part 44 as shown in FIG. 2. Depending from flange 58, at one side

of unit 40, is a guide strip 62 which cooperates with an adjacent side of edge 60 to help guide unit 40 in receptacle part 44. Guide strip 62 interfits in closely adjacent relation with fuse holders 48 of the combined holders and contacts 46' and to this end said strip is provided with a chamfered inner edge as indicated at 64. Combined members 46 and 46' have base parts 68 which interfit, and are secured, in companion recesses 66 of their mounts to prevent rotation of said members about the axes of their mounting screws.

The members 46 are mounted opposite to members 46' on integral support blocks 70 depending from the top wall 54 and said members are secured in position in recesses 66 by screws 72. The support blocks 70 are of greater depth or dimension than the support blocks 52. Secured to the support blocks 70 is an insulating barrier member 74 having a flange strip 76 which is secured between blocks 70 and base parts 68 of members 46 by screws 72. Thus the flange 76 serves to increase the mounting depth of members 46, the recesses 66 for members 46 being defined in said flange. The barrier 74 is interposed between the pairs of members 46 and 46' and is shaped to closely interfit therewith to minimize the overall width dimension of the device 38. More particularly, the barrier member 74 includes straight wall portions 78 and 80 which are laterally offset and interconnected by the inclined wall portion 82, this configuration approximately conforming to the inner configuration of the members 46, 46'. The barrier member 74 is preferably formed as an integral molding of a suitable insulating material such as "Bakelite." The barrier member 74 (FIG. 2) further includes a lateral projection or reinforcing rib 84 having a stop 86 which coacts with an adjacent end of a companion cartridge fuse to axially limit the movement thereof on installing the same in members 46 from a direction opposite to said stop.

At diagonally opposite corners of unit 40 in space provided by the laterally staggered mounting of the fuses, there is provided integral vertical channel members 88 and 90 depending from wall 54. The channel members 88, 90 define compartments 92 to receive the mounting end parts 94 of handle 96, the latter being formed by bending wire stock to the desired configuration. The handle 96 is telescopically mounted with respect to unit 40 and is movable between a retracted position as shown in FIGS. 1, 2 and 4 in solid lines and a projected handle gripping position shown in broken lines 96' in FIG. 4. In the normal plugged position of unit 40 the handle will be in the retracted position and the handle will be lifted to the projected position to facilitate the plug-in and removal of the unit with respect to the receptacle part 44. The handle 96 has end portions 98 which are bent in laterally opposite directions in the plane of the handle and the mounting end parts 94 depend from said portions 98. Parts 94 terminate in offset end parts 100 which coact with companion stop shoulders 102 defined by blocks 104 to limit the movement of the handle in a projected direction. It will be understood that the parts 94 ride in companion compartments 92 during handle movement and are housed therein in the normal retracted position of the handle. The blocks 104 are disposed at opposite corners of unit 40 and extend integrally up from the wall 54 above compartments 92. The blocks 104 have shoulders 106 for the seating thereon of handle portions 98 in the handle retracted position, and in said position the handle and block 104 are disposed at substantially the same level.

The channel members 88 and 90 at the outer sides thereof include guide ribs 108 which are receivable in a companion pair of diagonally disposed grooves 110 of unit 44. Ribs 108 and grooves 110 thus constitute means for guiding the plug-in unit into position in the receptacle part 44 with the terminals 37 in proper engagement therein.

The terminals 37 extend as resilient blades into tight engagement in slots 122 in conductors 112 and 114 of the unitary base 44 in the plugged-in position of unit 40. Conductors 112 and 114 extend to terminals 116 and 118, respectively at the opposite ends of the device. Conductor 114 additionally has a plug-in terminal 36, extending downwardly therefrom, terminals 118 and 36 having "solid" electrical interconnections, whereas these two terminals extend to terminal 116 only through the fuse supported between the companion pair of members 46. The terminals 37 of unit 40 penetrate through slots 120 in the receptacle part and enter into aligned slots 122 in conductors 112 and 114. The receptacle part has substantially duplicate sections 124 and 126 to receive the pairs of members 46 and 46', respectively, it being understood that the slots 122 are disposed to register with companion blades of members 46 or 46'. Accordingly the slots 122 in one section 124 are staggered with respect to the slots 122 in the other section 126, the slots in each section being longitudinally aligned. The terminal 36 in section 124 is laterally offset from its companion conductor 114 as shown in FIG. 3 in order to provide for the requisite lateral spacing between the terminals 36 for plug-in connection in the bus terminals 34.

The terminals 37 of unit 40 serve as a means for disconnecting the circuit extending between terminal 116 at one side of the fuse and terminals 118 and 36 at the other side of the fuse. The unit 40 is reversible end-to-end so that terminals 37 can enter "dead" or dummy passages 128 laterally adjacent to slots 120 in the receptacle unit 44. Thus the unit 40 accomplishes the basic functions of providing circuit protection and of interrupting the circuit, as may be required for two circuits. The receptacle or base part includes a medially disposed longitudinally extending partition 130 dividing the two sections 124 and 126. The receptacle part also includes vertical guiding slots and ribs 132 and 134, respectively which cooperate with companion structure of the unit 40 on plug-in. The bottom of the receptacle unit 44 is closed by a closure plate 136 which is secured in position by screw 138 extending into a tapped aperture 140 in post 142 (FIG. 2).

In the circuit "on" position of the unit 40, the legends "on" 144 embossed at one end of the receptacle unit are revealed through the cutout 146 in one end wall 148 of unit 40, the opposite end wall 150 of unit 40 concealing the "off" legends 152 embossed at the opposite end of the receptacle unit. In the circuit "off" position of unit 40, the "on" legends 144 are concealed and the "off" legends 152 are revealed, the terminals 37 engaging in dummy passages 128 in this circuit condition.

The device 38 is mounted to the panelboards 12 by the engagement of foot 154 which underlies one of the hooks 30 and by the downwardly projecting spring clip 156 that is in locking engagement with a corresponding positioned hook 32, as described in detail in the aforereferred to copending application. The device 38 may be mounted on the panelboard with terminals 36 engaging the bus bars, or in reverse configurations in which said terminals are out of engagement with the bus bars as also described in said copending application. In the commercial form of the embodiment device 38 is adapted for mounting 30 ampere cartridge fuses.

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

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

1. A fusible circuit protective device, comprising an elongated receptacle part, and a fuse pull-out unit receivable in said receptacle part for providing a fused circuit through the device, said unit having an insulating body with a handle at the front thereof and having two pairs of combined fuse clips and rearward extending plug-in contacts secured to the rear of said body, the fuse clips

being formed to encircle the cylindrical end contacts of a pair of companion cartridge fuses, each pair of combined plug-in contacts and fuse clips for a companion fuse being longitudinally spaced and aligned, the spacing between the fuse clips of one of said pairs being equal to the spacing between the fuse clips of the other of said pairs, a relatively thin insulating barrier extending in longitudinal and front-to-rear directions between said pairs of aligned combined plug-in contacts and fuse clips, the pairs of aligned plug-in contacts and fuse clips being disposed in staggered relation to receive a pair of cartridge fuses in said pull-out unit in closely adjacent relation, a combined plug-in contact and fuse clip of each pair being disposed at a point between but laterally offset from the combined plug-in contacts and fuse clips of the other pair.

2. A fusible circuit protective device, comprising an elongated receptacle part, and a fuse pull-out unit adapted for plug-in reception in said receptacle part, said unit having provision for mounting a pair of cartridge fuses in longitudinally staggered relation at spaced levels whereby the width of said receptacle part and pull-out unit is minimized consistent with the accommodation of a pair of cartridge fuses by said pull-out unit, said provision comprising two pairs of longitudinally spaced combined plug-in contacts and fuse clips, each pair including aligned fuse clips adapted to accommodate the cylindrical end contacts of a companion fuse and one combined fuse clip and plug-in contact of each pair being disposed at a point between but laterally offset from the combined contacts and fuse clips of the other pair.

3. A fuse pull-out unit adapted for plug-in reception in a companion receptacle part, a handle at the front of said unit and provision for mounting a pair of cartridge fuses in longitudinally staggered relation at spaced levels whereby the width of said receptacle part and pull-out unit is minimized consistent with the accommodation of a pair of cartridge fuses by said pull-out unit, said provision for each fuse including a longitudinally spaced and aligned pair of contact devices, each said device having a fuse-embracing contact portion and a rearward extending plug-in terminal portion, the pairs of fuse-embracing portions of the pairs of combined contact devices being disposed at spaced levels and said combined contact devices being longitudinally staggered with one combined contact device of each pair being disposed at a point between but laterally offset from the combined contact devices of the other pair.

4. A fuse pull-out unit receivable in a companion receptacle part, said unit having a body of insulation, two pairs of combined contacts and fuse clips mounted on said body portion, said fuse clips being formed to accommodate the cylindrical end contacts of companion cartridge fuses, each pair of fuse clips for a companion fuse being longitudinally spaced and aligned, a relatively wide and thin insulating barrier extending from said body in longitudinal and front-to-rear directions between said pairs of aligned fuse clips, the pairs of aligned fuse clips being staggered longitudinally to receive a pair of cartridge fuses in said pull-out unit in closely adjacent relation, one

combined contact and fuse clip of each pair being disposed at a point between but laterally offset from the combined contacts and fuse clips of the other pair, the pairs of plug-in contacts being aligned in pairs and staggered longitudinally and terminating in free ends in a common plane and being of differential overall length, said pairs of fuse clips being differently spaced from said plane.

5. A fusible circuit protective device, comprising an elongated receptacle part, and a fuse pull-out unit receivable in said receptacle part for providing a fused circuit through the device, said unit having two pairs of combined plug-in contacts and fuse clips to accommodate the cylindrical end contacts of a pair of companion cartridge fuses, each pair of fuse clips to accommodate a companion fuse being longitudinally spaced and aligned, a relatively large and thin insulating barrier between each pair of aligned fuse clips, the pairs of aligned fuse clips being disposed in longitudinally staggered relation to receive a pair of cartridge fuses in said pull-out unit in closely adjacent relation, a handle mounted at the top of said unit and having rearward legs movable between retracted and projected positions, a pair of compartments at opposite sides of said barrier to receive said handle legs in said handle retracted position, said compartments being longitudinally spaced from said pairs of aligned fuse clips, respectively, in the spaces provided by said relative staggering thereof in said longitudinal direction.

6. A fusible circuit protective device, comprising an elongated receptacle part of molded insulation, and a fuse pull-out unit reversibly receivable in said receptacle part for selectively breaking the circuit through the device or for providing a fused circuit therethrough, said unit having two pairs of contacts formed to provide receptacles to accommodate the cylindrical end contacts of a pair of companion cartridge fuses, each pair of receptacles to accommodate a companion fuse being longitudinally spaced and aligned and said pairs being laterally staggered and differentially spaced from the top of said pull-out unit to receive a pair of cartridge fuses therein in closely adjacent relation, said unit having at the top thereof a handle movable between retracted and projected positions, the ends of said handle having mounting parts interengageable with companion stops of said unit to prevent disengagement of said handle from said unit, a pair of compartments to receive said handle mounting parts in said retracted position, said compartments being longitudinally spaced from said pairs of aligned receptacles in the space provided by said longitudinal staggering thereof.

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