Dec. 21, 1965 W. C. LINTON 3,225,164

FUSEHOLDERS FOR HOUSING KNIFE BLADE CARTRIDGE FUSES

Filed Nov. 27, 1964 3 Sheets-Sheet 1

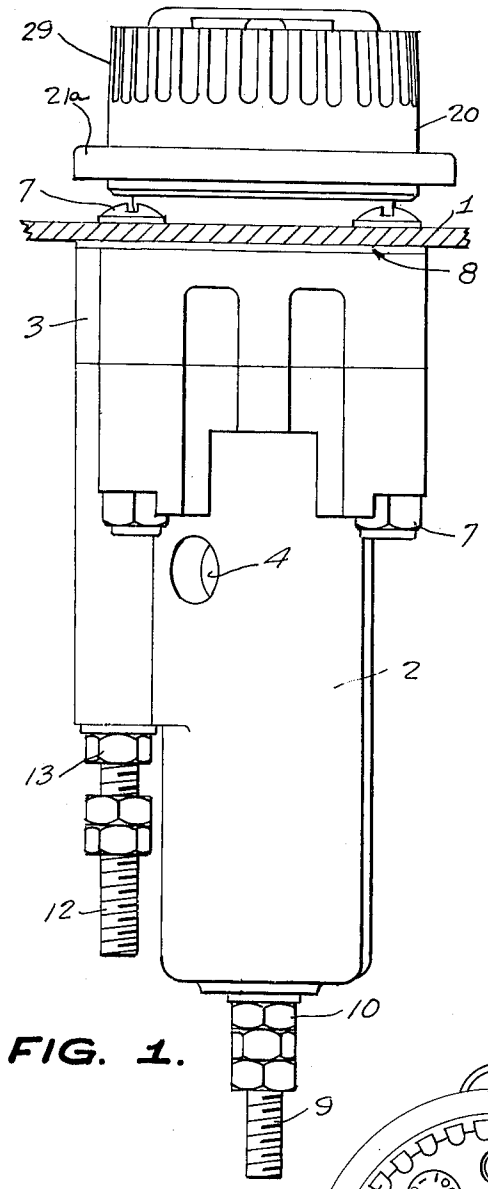


FIG. 1.

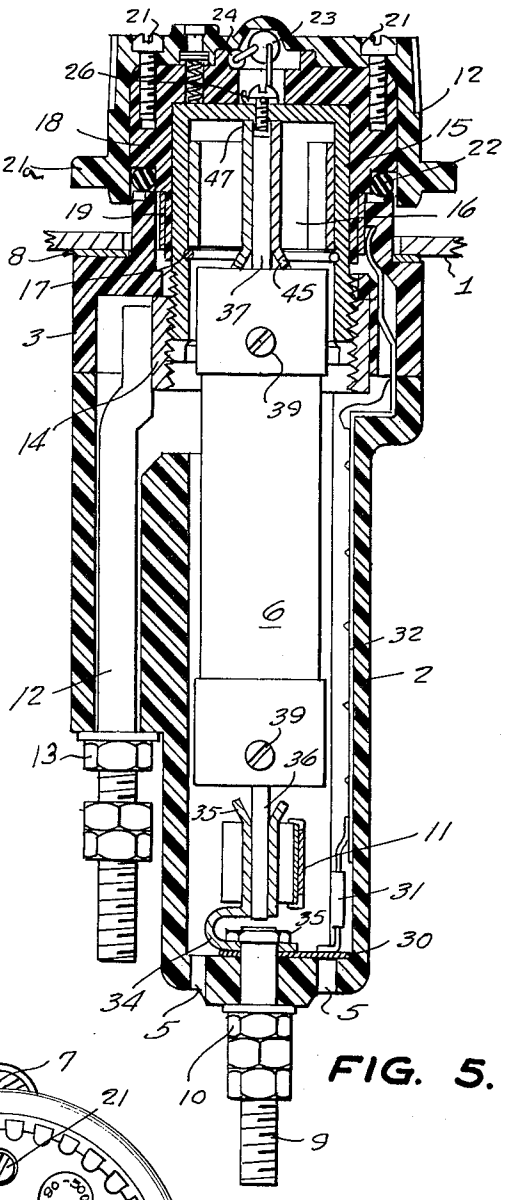


FIG. 5.

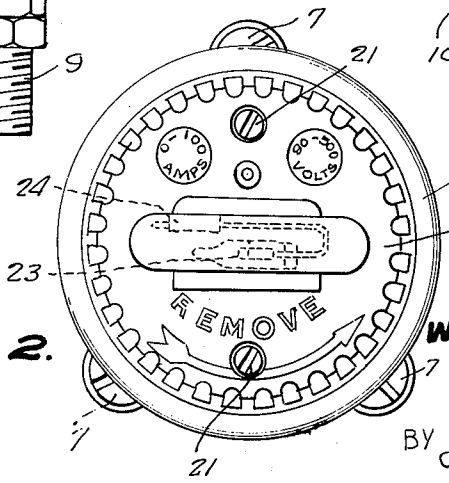


FIG. 2.

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FUSEHOLDERS FOR HOUSING KNIFE BLADE CARTRIDGE FUSES

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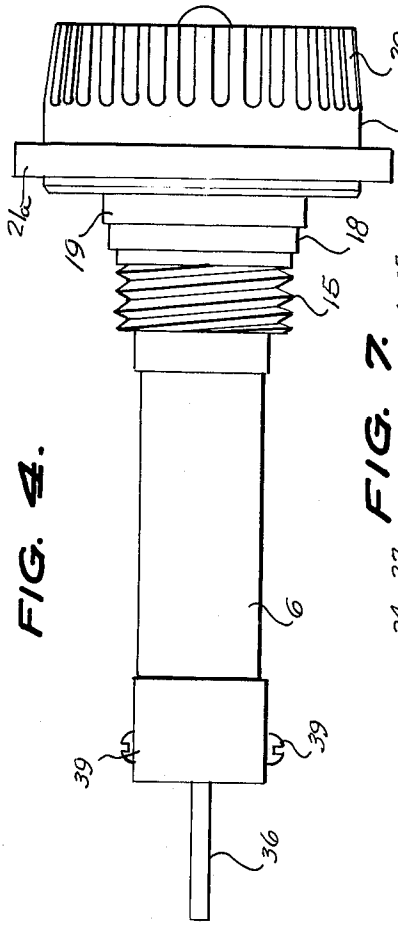


FIG. 4.

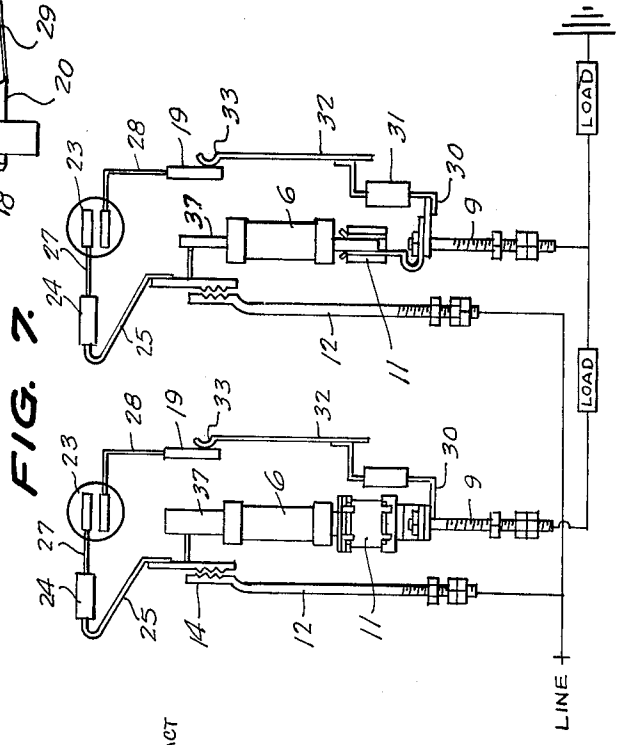


FIG. 7.

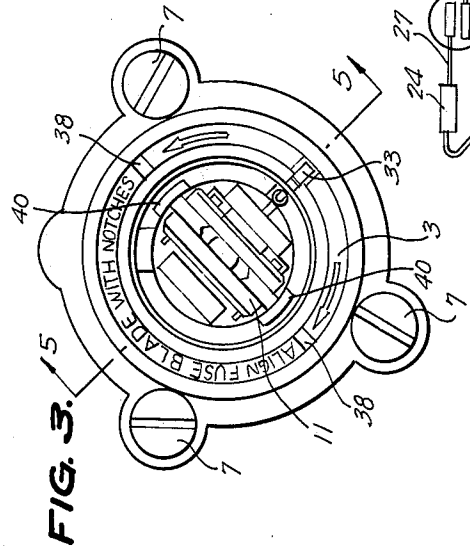


FIG. 3.

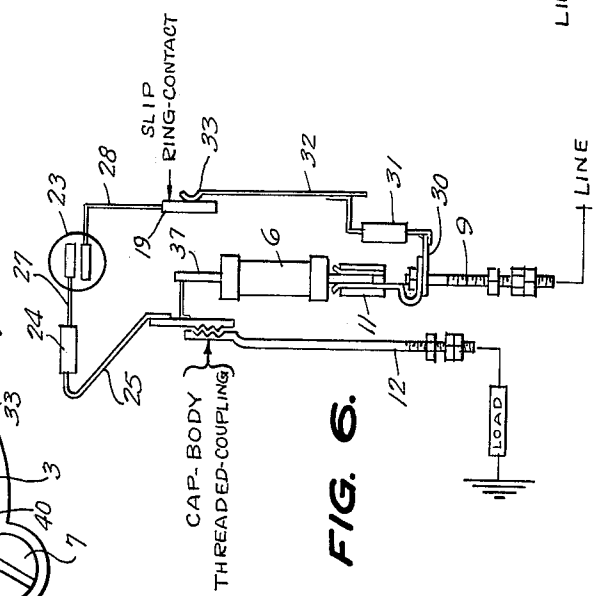


FIG. 6.

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FIG. 8.

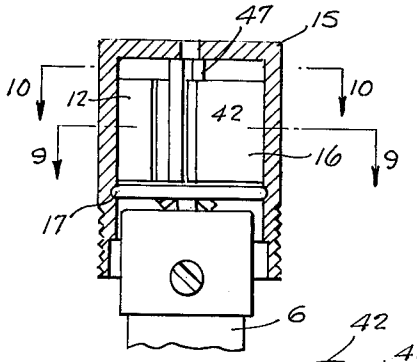
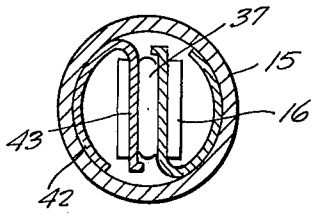


FIG. 9.



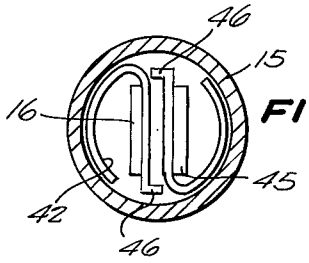


FIG. 10.

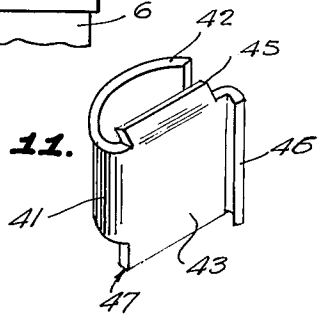


FIG. 11.

FIG. 13.

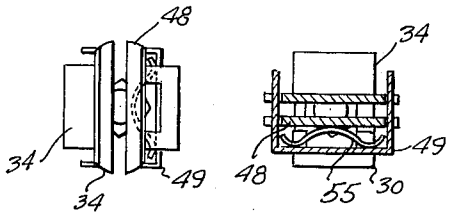


FIG. 15.

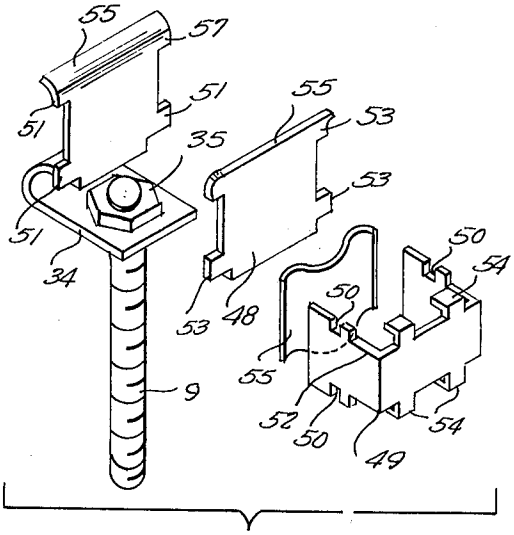


FIG. 16.

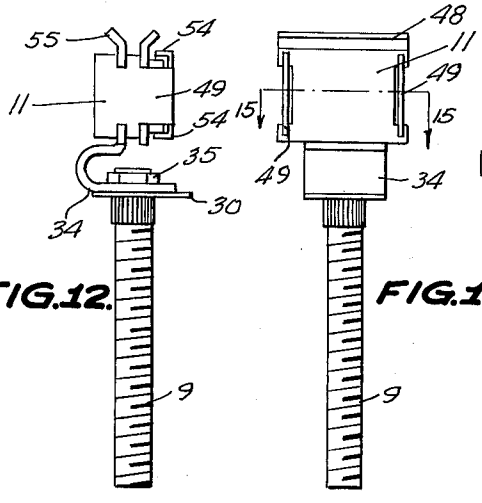


FIG. 12.

FIG. 14.

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3,225,164

FUSEHOLDERS FOR HOUSING KNIFE BLADE CARTRIDGE FUSES

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Filed Nov. 27, 1964, Ser. No. 414,056
8 Claims. (Cl. 200—121)

This application is a continuation in part of my pending application for patent filed November 29, 1962, Serial No. 240,974, now abandoned.

The invention relates to dead front fuseholders for housing standard knife blade type cartridge fuses and is an improvement over that type of fuseholder disclosed in my Patent No. 2,989,610 dated June 20, 1961, whereby they will meet the qualification requirements of the standard military specifications with respect to endurance, vibration and high impact shocks and still retain their dead front value.

Other objects of the invention will be in part obvious and as pointed out as the description continues.

In the accompanying drawings:

FIG. 1 is a side elevational view of the complete fuseholder as vertically suspended from a panel board.

FIG. 2 is a top plan view of the fuseholder.

FIG. 3 is a top plan view of the fuseholder body with the fuse removed therefrom.

FIG. 4 is a side elevational view of the cap removed from the fuseholder body with the fuse connected thereto.

FIG. 5 is a vertical sectional view of the complete fuseholder taken on the line 5—5 of FIG. 3 in the direction of the arrow points with the fuse housed therein.

FIG. 6 is a schematic diagram illustrating the electrical indicating circuit of a single fuseholder of my invention.

FIG. 7 is another schematic diagram illustrating two fuseholders when connected together in the same electrical circuit.

FIG. 8 is a vertical detail sectional view of the fuse socket having rotatably supported therein the sectional fuse clip and the latter being illustrated in side elevation.

FIG. 9 is a horizontal sectional view taken on the line 9—9 of FIG. 8 in the direction of the arrow points.

FIG. 10 is another horizontal sectional view taken on the line 10—10 of FIG. 8 in the direction of the arrow points illustrated in top plan view the position of the sectional fuse clip when the blade of the fuse has been removed therefrom.

FIG. 11 is an inverted perspective view of one section of this rotatable supported fuse clip.

FIG. 12 illustrates in side elevation the stationary fuse clip unit.

FIG. 13 is a top plan view of the same.

FIG. 14 is another side elevation of the same taken at right angles to FIG. 12.

FIG. 15 is a horizontal sectional view taken on the line 15—15 of FIG. 14 in the direction of the arrow points, and,

FIG. 16 is an explosive perspective view of the several parts of the stationary fuse clip.

Referring now more particularly to the drawings wherein I have illustrated the complete fuseholder embodying the present invention as suspended from a panel board 1 comprising a body consisting of two sections 2 and 3 connected together by means of screws (not shown) and each section being molded from suitable insulating materials. The section 2 of the body having ventilating openings 4 and 5 formed therein. The sections of the body provide an upper opened end cavity for receiving a standard knife blade type fuse 6. The fuseholder as illustrated herein is to accommodate a standard 61–100 ampere size fuse; but by slightly enlarging the fuse holder parts and maintaining the same general design, larger knife blade type fuses of 101 to 200 amperes may be housed therein. Attaching hardware 7 is employed for connecting the section of the body to the panel board 1. A rubber gasket 8 is received between the body and the panel board to render the fuseholder splash proof from behind the panel board.

The lower terminal comprising a stud bolt 9 is secured to the body 2 by means of a lock nut 10 and supports the permanent fuse clip 11. The side terminal comprises a bolt 12 secured to the body 2 by means of the lock nut 13. An internally threaded ring nut 14 is welded to the upper end of the bolt 12 and in threaded engagement therewith is a fuse socket 15. A rotatable fuse clip 16 is freely supported in the fuse socket 15 by means of a split locking ring 17.

The cover or knob for closing the upper opened end cavity of the body comprises a plug 18 molded from insulating materials with one end of the fuse socket 15 secured thereto. The depending flange of the plug 18 has a contact ring 19 connected thereto. A cap 20 molded from a translucent insulating material, preferably a polycarbonate resin, known commercially as Lexan, extends over the plug 18 and is secured to the latter by the self tapping screws 21. An O ring 22 is arranged between the cap and plug and when seated up the upper end of the section 3 of the body seals the opened end cavity of the latter. The cap has a recess for receiving the neon glow lamp 23 and resistor 24. One lead wire 25 of the resistor is contacted to the fuse socket 15 by means of the set screw 26 and its opposite lead wire 27 to the lamp 23 whereas the other lead wire 28 of the lamp is connected to the contact ring 19. The cap is provided with finger serrations 29 whereby one may better grip the same for turning the fuse socket 19 when inserting and withdrawing the fuse 6 within the cavity of the body. Also formed with this cap 20 is an annular barrier flange 21*a*.

A rectangular contact plate 30 is seated against rotation in the bottom of the cavity within the body and has connected thereto one lead wire from the resistor 31 whereas the opposite lead wire from this resistor is connected to the lower end of the contact blade 32 having a free end 33 contacting the ring 19. The lower end of the stationary section 34 of the fuse clip 11 is connected to the terminal bolt 9 by means of the nut 35 and solder extends over this unit so as to seal the fuse clip, plate 30 and bolt 9 together and thereby preventing the fuse clip from turning.

The lower blade 36 of the fuse 6 is retained in the stationary fuse clip 11 whereas the opposite blade 37 is retained in the freely rotating fuse clip 16. When inserting the fuse within the cavity of the body the blades thereof should be aligned with the notches 38 whereby the blade 36 will be directed to the stationary fuse clip 11. Many blade type fuses have rivet heads or screw heads 39 projecting from the ferrules of the fuse and to accommodate the same vertically align recesses 40 are provided in the base of the fuseholder.

The improved features of the present invention reside in the fuse clips, one of which is rotatably received within and in electrical contact with the fuse socket 15 and the other 11 permanently connected to the bottom terminal stud bolt 9 in order to maintain at all times a positive and continuous contact between the blade terminals of the fuse 6 and the terminals 9 and 12 when the fuseholder is subjected to undue vibrations and high impact shocks.

The fuse clip 16 comprises two identical sections 41 each made from a heavy sheet of resilient electrical con-

ducting material such as beryllium copper. To effect a better contact between the fuse socket **15** and fuse clip **16**, the latter is plated with gold and the fuse socket is silver plated as plating of the same metal on both often causes the fuse socket to adhere to the fuse clip and prevent the turning of the cap **20** when attempting to remove the latter from the body of the fuseholder. Each section **41** of the fuse clip has a semi-circular portion **42** of the same curvature as that of the inner wall of the fuse socket **15** and a flat diametrical section **43** of a width slightly less or equal to the width of the blade **37** of the fuse **6**. The height of end section **43** is greater than the length of the blade **37**. The lower edge of each section **43** has formed contiguous therewith flared extension **45** for permitting the easy insertion of the blade **37** between the sections **41** of the fuse clip when mounted within the fuse socket and each section **41** terminates in a right angle flange **46** which latter holds the sections **41** in spaced relation. When the assembled sections **41** of this fuse clip are inserted within the fuse socket and their upper ends **47** resting against the inner closed wall of the fuse socket a split locking ring **17** is inserted within the inner wall of the fuse socket in order to retain both sections of the fuse clip within the fuse socket and yet permit the free rotation of the fuse clip within the fuse socket. As the blade **37** of the fuse is inserted between the sections **41** of the fuse clip, the free semi-circular sections **42** are spring pressed against the inner wall of the fuse socket with a substantially large contact surface which will be maintained when the fuseholder is subjected to vigorous vibrations and extreme shocks which cannot be obtained with standard knife blade contacts similar to that indicated by the numeral **106** of my Patent No. 2,989,610.

The stationary section **34** and the movable section **48** of the fuse clip **11** are each made from a heavy sheet of resilient electrical conducting material such as beryllium copper. These sections are connected together by a U-shaped locking plate **49** formed from a sheet of resilient electrical conducting material such as beryllium copper. Formed in the upper and lower edges of the side walls of this locking plate adjacent to the free ends thereof are the aligning notches **50** which receive the lugs **51** formed with the stationary section **34** for connecting the spring pressed extremities of the locking plate to the stationary section. The medial portion of the locking plate is reduced in height as at **52** so as to accommodate the lugs **53** of the movable section **48** whereby the latter will be connected to the locking plate and have free sliding movement thereon. To limit this free sliding movement of the section **48**, the locking plate is provided with the lugs **54**. A leaf spring **55** is retained by the lugs **54** betweeen the movable section **48** and the locking plate. The upper extremities of the sections **34** and **48** are flared outwardly as at **59** to permit the ready insertion of the fuse blade **36** there between whereupon the leaf spring **55** will maintain a pressure contact upon the blade **36**.

The grip upon the fuse blade **37** by the upper fuse clip **16** is sufficient that when the cap **20** is removed from the body of the fuseholder the fuse will be carried therewith, to first permit the blade **36** to be released from the lower fuse clip **11** and the entire fuse then manually withdrawn from the body as is illustrated in FIG. 4 of the drawing. Thereafter the fuse **6** has to be manually withdrawn from the upper clip **16**.

The neon glow lamp **23** is an ideal visible indicator for electrical fuses as its current consumption is practically nil and not more than three milliamperes. The neon glow lamp requires an intial breakdown voltage of between 60 and 90 volts and a minimum extinguishing voltage of 50 volts. Due to the runaway characteristics of these lamps and to prevent instantaneous burnout a ballast resistor must be used in series therewith. In order to control the lamp current as applied to the present fuseholder capable of using fuses of between 80 and 500 volts, a single ballast resistor of 330,000 ohms should be used in series therewith as the lamp would then emit sufficient light for indicating purposes.

However, with the present invention I have found that two 180,000 ohm resistors must be used in series with the lamp and one connected to each lead wire of the lamp as has been best schematically illustrated in FIGS. 6 and 7 of the drawings.

As illustrated in FIG. 6 of the drawings, it will be noted that the fuse **6** is connected in series with the terminals **9** and **12** and the indicating circuit comprising the lamp **23** and two resistors **24** and **31** are also connected in series with the terminals **9** and **12**, but in parallel with the fuse so that when the fuse blows the lamp will glow. However, at times, it becomes desirable or necessary to reverse the flow of current especially when two or more fuseholders are connected to the electrical circuit as is schematically illustrated in FIG. 7 of the drawings.

The primary reason for employing the two resistors **31** and **24** is to first prevent the lamp from being destroyed when reversing the flow of current as disclosed in FIG. 7 and secondly to prevent a personal shock hazard when inserting a live fuse within the holder therefor. When replacing a fuse, a service man will at first insert the fuse blade **37** within the rotating clip **16** whereupon the fuse will be carried by and projected from the knob **20** as is illustrated in FIG. 4 of the drawings. The service man will then grip the knob **20** and align the blade **36** of the fuse with the notches **38** whereupon by pushing upon the knob the fuse blade **36** will enter the stationary fuse clip. By turning the knob **20** in the direction of the arrows as illustrated in FIG. 2, the fuse blade will be forced down into its final position within the stationary clip **11**. A service man with exceptionally large hands, when gripping the knob **20** his fingers may extend over the barrier flange **21***a* of the knob and the ends of his fingers touch the contact ring **19**. In this latter event, the blade **36** when first attempting to insert a live fuse within the body of the fuseholder, may touch the contact strip **33** and the service man acting as a ground would receive only less than three milliamperes which would be hardly noticeable much less cause a shock. By inserting the fuse further with the fuseholder the blade **36** may contact the ring nut **14** of the terminal **12** and by the service man's body acting as a ground he would still receive only about three milliamperes of current due to the location of the resistor **24**. Before the fuse blade **36** makes contact with the fuse clip **11**, the fingers of the service man previously touching the contact ring **19** will be forced from the latter by contacting the upper of section **3** of the body.

When the flow of current is reversed as illustrated in FIG. 7 of the drawings and should the resistor **24** be removed or be of insufficient series resistance and the body of the service man acting as a ground by touching the ring nut of the terminal **12**, the lamp **23** would be instantaneously destroyed when the current flow exceeds 78 volts and the time limit during this instantaneous burnout would permit any sufficient current to pass as to be of a non-catastrophic value.

During this instantaneous burnout the arc so created may at times weld the electrodes of its lamp together and the failure of a glow lamp when insufficient series resistance is incorporated to restrict the flow from a non-catastrophic value can sometimes be violent. Under the 500 volt condition it would be very probable that should some person touch the contact ring **19** and have a satisfactory ground, the time involved here could very well be sufficient to electrocute that person. By using the two 180K series resistors **24** and **32** as per the present invention, this will give sufficient resistance to limit the current below five milliamperes (Underwriter's regulations) in either direction preventing the failure of the lamp.

I claim:

1. The combination with a blade type fuse holder comprising a body molded from insulating materials having

an opened end cavity formed therein for receiving a fuse, contact terminals connected to said body and extending within the opened end cavity thereof, a stationary fuse clip connected to one of said terminals for contact with one blade of the fuse, a cap removably received to said body for closing the opened end cavity thereof, a fuse socket having an opened end cylindrical cavity therein, a rotatable fuse clip, a split ring connected to said fuse socket freely supporting said rotatable fuse clip within said fuse socket, said rotatable fuse clip consisting of two sections, a resiliently supported semi-circular contact connected to one end of each of said sections and having its opposite or free end extending therefrom, and a lug formed with the opposite end of each section of said rotatable clip retaining the latter in spaced relation with respect to one another whereby when the other blade of the fuse is inserted within the space between said sections said semi-circular contact thereof will be retained in electrical contact the said fuse socket.

2. A dead front fuseholder for indicating the blown condition of the fuse comprising a casing formed from electrical insulating materials and having an opened end cavity formed therein for receiving the fuse, a central contact terminal and a side contact terminal connected to and extending within the opened end cavity of said casing whereby the fuse may be connected in series therewith, a cap for closing the opened end cavity of said casing, a fuse socket connected to said cap and having an end extending therefrom, a threaded coupling for detachably connecting the extended end of said fuse socket to said side contact terminal whereby said cap may be removably connected to said casing, a slip ring contact connected to and extending from said cap, a resistor connecting said contact ring in series with the central contact terminal of the casing a glow lamp mounted within said cap and having one lead wire thereof connected in series with said contact ring, a second resistor connecting the other lead wire of the lamp in with said fuse socket whereby both resistors will be connected in series with said lamp and contact terminals of said casing, but in parallel with the fuse retained in said casing, for causing the lamp to glow upon the rupture of the fuse, both of said resistors having approximately the same ohmage value of resistance and an annular barrier flange formed with and extending from the lower end of said cap so as to prevent accidental personal contact with said slip ring contact when exposed during the gripping of said cap for inserting and withdrawing the fuse from the cavity with said casing.

3. A blade type fuse clip comprising two separable and unconnected sections, a fuse socket having an opened end recess formed therein for receiving the section of said fuse clip, each section being formed from a single flat sheet of electrical conducting material into a rectangular flat portion, a rib formed with one side of the flat portion of each section for retaining the latter in spaced relation to one another, a semi-circular contact formed with and resiliently suspended from the opposite side of the flat portion of each section, an outwardly flared portion formed with and extending from the lower end of the flat portion of each section for directing to and the insertion of a blade of the fuse within the space between said sections whereby the latter will be forced into electrical contact with said fuse socket and means for freely supporting the sections of said fuse clip within the opened end recess of said fuse socket.

4. The combination with a fuse socket having a cylindrical open end cavity formed therein for receiving one end of a blade type fuse, a sectional fuse clip, a split ring connected to the fuse socket freely supporting said fuse clip within the cavity thereof, a flat portion formed with each section, a rib formed with each section for retaining the latter in spaced relation with respect to one another thereby forming a space therebetween for receiving a blade of the fuse and a resiliently supported contact formed with and extending from each section whereby when a blade of the fuse is inserted within the space between said section said semi-circular contacts of the latter will be retained in contact with the cylindrical inner wall of the fuse socket.

5. A blade type fuse clip comprising a resiliently supported stationary section, a U-shaped connector formed from a flat sheet of resilient electrical conduction material, the free ends of said connector having a notch formed in the upper and lower ends thereof for receiving and connecting said stationary section to said connector, a movable section mounted upon and connected to said U-shaped connector, a leaf spring, lugs formed with said U-shaped connector supporting said leaf spring between said connector and said movable section whereby the latter will be spring pressed against the stationary section and an outwardly flared portion formed with the upper end of each section whereby the blade of the fuse may be directed to and inserted between said section of the fuse clip.

6. An electrical indicating circuit for a fuse having opposite end terminals connected in series with the contact terminals thereof, said indicating circuit being connected in series with the contact terminals, but in parallel with the end terminals of the fuse, a neon glow lamp having two lead wires extending therefrom, a resistor connecting one lead wire of said lamp to one of the contact terminals, another resistor connecting the other lead wire of said lamp to the other contact terminal and said lamp and resistors being connected in series and included in the indicating circuit whereby the current may be permitted to flow in reverse directions to said contact terminals and indicating circuit and yet cause said to flow upon the rupture of the fuse.

7. The combination with a fuse socket having a cylindrical opened end recess formed therein for receiving one end of a knife blade type cartridge fuse, a sectional fuse clip mounted within the recess of said fuse socket, a split-locking ring connected to the fuse socket freely supporting said fuse clip within the cavity thereof, each section of said clip being formed from a single sheet of electrical conducting material having a flat portion, a semi-circular portion formed with an extending from one end of said flat portion, the outer wall of said semi-circular portion being in direct contact with the inner wall formed by the cylindrical opened end recess of said fuse socket, a right angular flange formed with the opposite end of said flat portion whereby a space is provided between the flat portions of the opposed sections of the fuse clip and each portion having flared extensions formed therewith to facilitate the entrance of a blade of the fuse into the space between the flat portions of the fuse clip.

8. A fuse clip for knife blade type cartridge fuse comprising a terminal stud bolt, a stationary section connected to and supported by said stud bolt, a movable section, a clip embracing and connecting said sections together, a leaf spring supported by said clip and in direct contact with said movable section, means for retaining said sections apart for forming a space therebetween, and a flared portion formed with each section to facilitate the entrance of a blade of the fuse within the space provided between the sections of the fuse clip.

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