

Nov. 15, 1966

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3,286,061

FUSE, SWITCH AND PILOT LIGHT UNITARY DEVICE

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3 Sheets-Sheet 1

Fig. 1

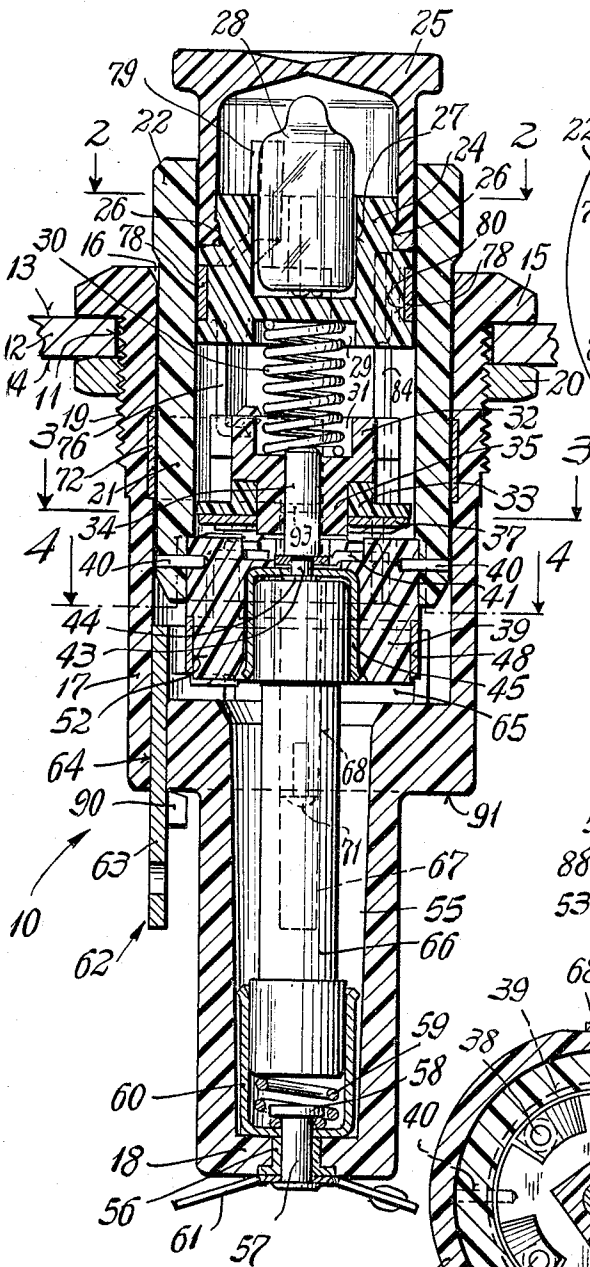


Fig. 2

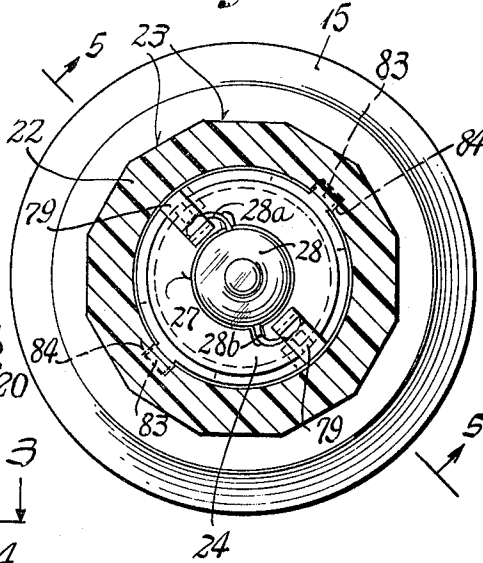


Fig. 4

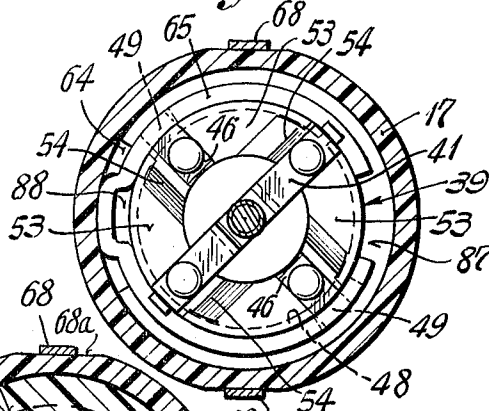
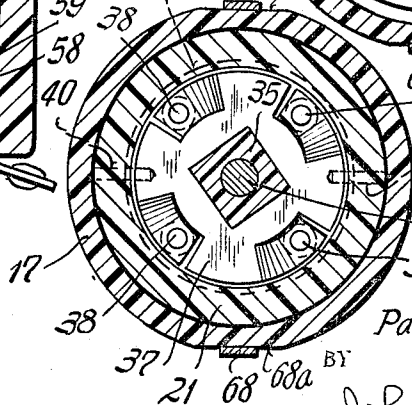


Fig. 3



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Fig. 5

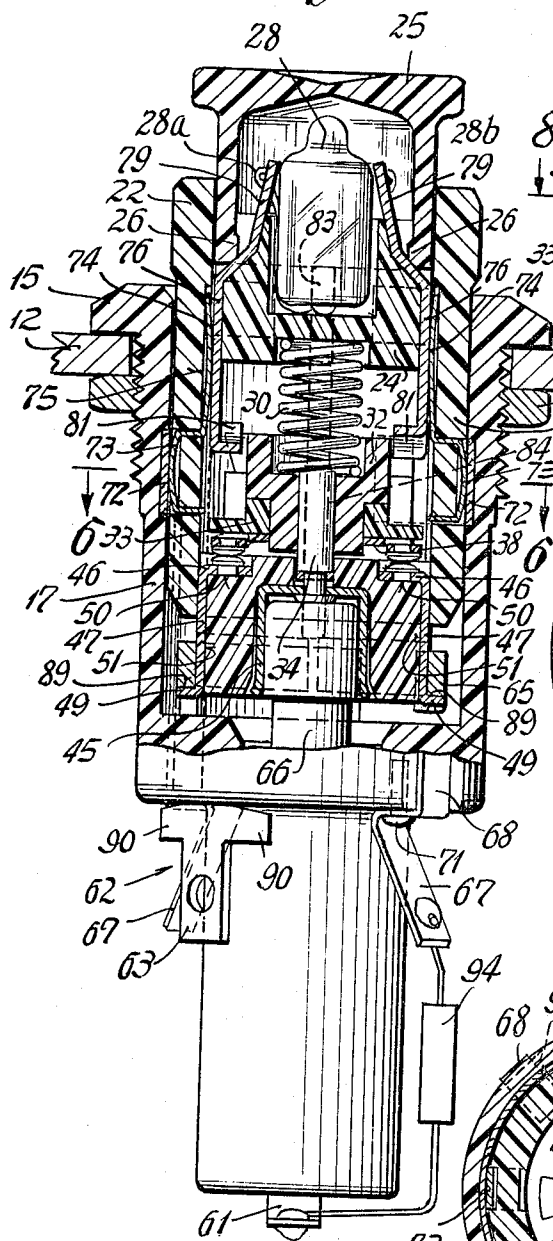


Fig. 7

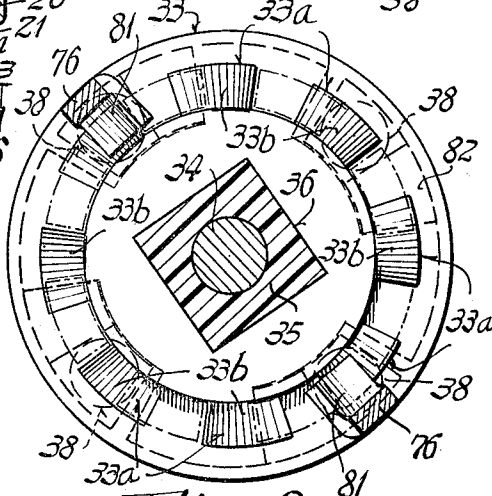
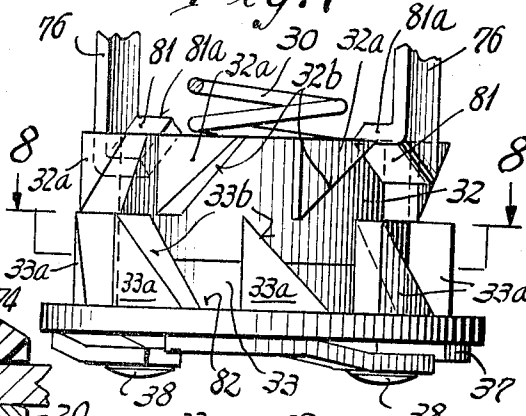


Fig. 8

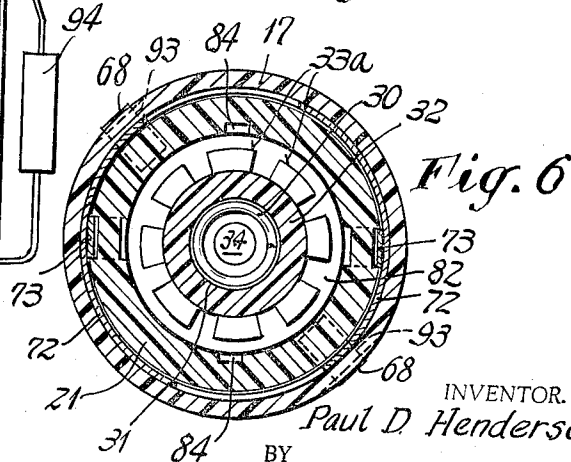


Fig. 6

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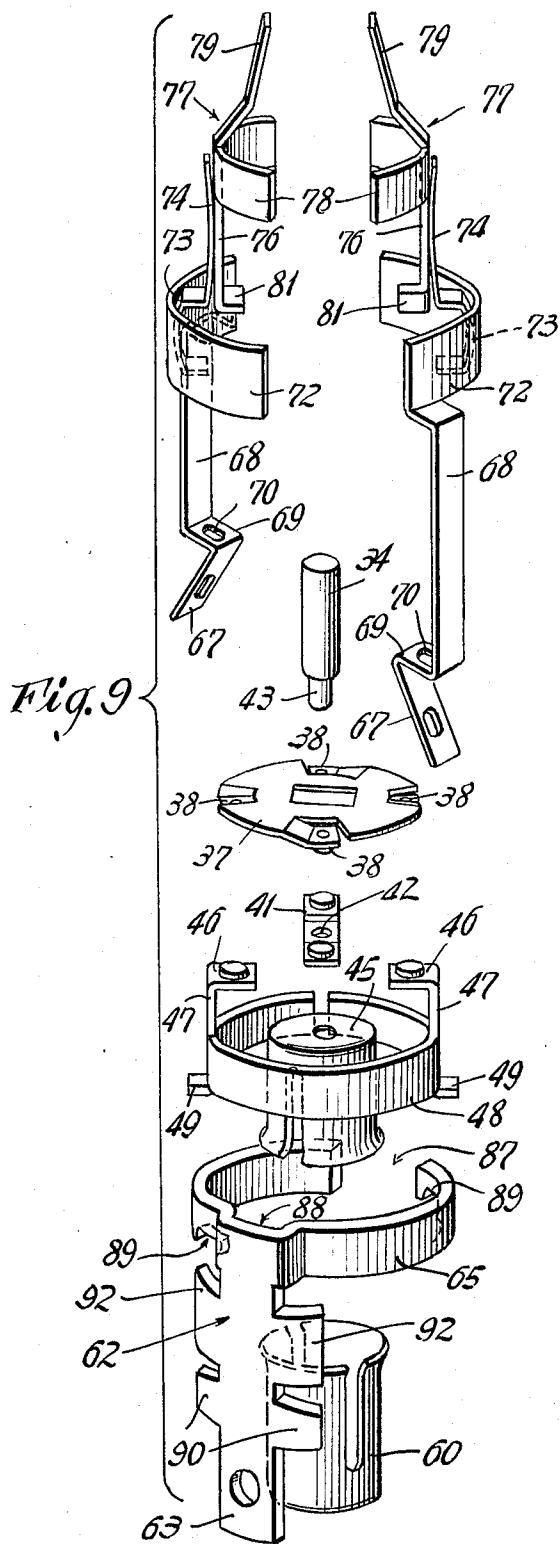
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3,286,061 FUSE, SWITCH AND PILOT LIGHT UNITARY DEVICE

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6 Claims. (Cl. 200-121)

The present invention relates to a unitary device that may be used with electrical equipment for performing the functions of providing an on-off switch for the equipment, an indication of the energization of the equipment and protection against excessive current flow.

In many kinds of electrical equipment that are enclosed in a container, the above three functions are generally performed by individual parts with each part only serving to perform its own function. If all of these functions are desired, then not only must each part accordingly be supplied and separately handled but also must be separately interconnected in the equipment. Moreover, in order to install the parts so as to have them accessible and/or visible, an opening for each must be provided in the container. The use of separate parts, separate opening and with each requiring to be individually installed has been found to be somewhat expensive thereby increasing the cost of the equipment.

It is accordingly an object of the present invention to provide as a single unit, a device which performs the functions of a pilot light, a switch and a fuse holder and which may be installed and connected in equipment as simply and easily as any part which performs just one of the functions.

Another object of the present invention is to provide a device which achieves the above-noted object and which has a visible pilot light, an accessible knob for operating the switch and accessibility of the fuse holder, all being from or on the exterior of the container.

A further object of the present invention is to provide a combined fuse holder, switch and pilot light which is relatively economical to manufacture, is exceedingly compact and may be easily and economically installed and/or replaced in electrical equipment.

In carrying out the present invention, there is provided a unitary device that includes a tubular housing which is secured in an opening in the container to have the entrance to the housing available from the exterior of the container. Releasably secured in the housing is a tubular holder that has at its forward end a pilot light and at its other or rearward end a fuse containing means while a switching mechanism is secured intermediate the holder. The pilot light has a lens or cover and is mounted on the forward end of the holder to be axially movable with respect to the holder with the cover that protects the pilot light also serving as the manually operable actuator for the switch. The cover may move in and out of the holder and to change from one condition of the switch to the other, both movements are required, the inward movement being supplied by the operator while the outward return movement is a spring urged movement.

It will be understood that with the structure of the device as set forth above, a fuse may be inspected and/or replaced by removing the holder from the housing without disturbing the switch and pilot light contained within the holder while the light may be replaced by simply removing its lens or cover without disturbing the switch or fuse. The switch mechanism by being contained within the holder obviates any possibility of interference therewith when either of the above operations are performed.

The electrical connections to the unitary device in-

clude a pair of terminals that are electrically connected together within the device so that the switch and fuse are placed in series with the two terminals. Accordingly both the switch and the fuse may individually control the current passing between the two terminals. The pilot light also has a pair of contacts which enable it to be either connected to indicate the condition, i.e., conducting or nonconducting, of the switch and fuse or to enable it to indicate the condition of a different circuit electrically remote from the switch and fuse. In the first connection the fuse and switch are electrically connected such that power flows to the light only when current is passing between the two terminals and thus the light is responsive to the condition of each while in the second connection it may be independent of the fuse and switch, depending upon the relationship between the different circuit to which the light is connected and the fuse and switch.

Other features and advantages will hereinafter appear.

In the drawing:

FIGURE 1 is an axial section of the unitary device of the present invention.

FIG. 2 is a radial section taken on the line 2-2 of FIG. 1.

FIG. 3 is a radial section taken on the line 3-3 of FIG. 1.

FIG. 4 is a radial section taken on the line 4-4 of FIG. 1.

FIG. 5 is a view, partly in axial section, of the unitary device with the sectional portion being taken at substantially a 45° angle with respect to the axial section shown in FIG. 1.

FIG. 6 is a radial section taken on the line 6-6 of FIG. 5.

FIG. 7 is a side view, somewhat enlarged, of the switch actuating mechanism.

FIG. 8 is a section taken on the line 8-8 of FIG. 7.

FIG. 9 is a perspective view, somewhat exploded, showing the disposition of the electrical conducting parts of the unitary device of the present invention.

Referring to the drawing, the unitary device is generally indicated by the reference numeral 10 and is shown secured in an aperture 11 formed in a plate 12 which may be a side of a container of electrical equipment with the surface 13 being the exterior of the container and the surface 14 the inner. The unitary device is secured in the aperture 11 by a flange 15 formed adjacent an entrance 16 of a tubular housing 17 having a closed inner end 18. The housing 17 is preferably formed of plastic to have the axial section shown and includes exterior threads 19 which threadingly engage a lock nut 20. The nut 20 cooperates with the flange 15 to engage and clamp opposite sides of the plate 12 therebetween.

Releasably secured in the housing 17 is a holder 21 that is tubular and cylindrical in shape and has at its outer end a thickened portion 22 formed with equally flat surfaces 23 with the diameter of the portion 22 being larger than the entrance 16 of the housing to project outwardly therefrom. The holder 21 is also preferably molded of plastic material with its outer diameter being such as to provide a snug fit with the inner diameter of the housing 17. Contained within a holder is a plunger 24 releasably connected to a cup-shaped lens or cover 25 as by cooperating latching flanges 26.

The plunger 24 has its outer surface formed to provide a bore 27 in which an electric bulb 28 is partially positioned while its inner surface includes a recess 29 into which one end of a spring 30 projects to abut against the bottom of the recess. The other end of the spring 30 is seated in a recess 31 formed in an upper cam part 32 that is integrally associated with a lower cam part 33. A

pivot pin 34 supports for rotational movement the two cam parts and the cam parts are caused to move together by the upper cam part having a rectangular portion 35 that fits with a rectangular cutout 36 formed in the lower cam portion.

A contact ring 37 bears against the lower surface of the lower cam part 33, for movement therewith as by it also having a rectangular cutout into which the rectangular portion 35 extends and by being rotationally mounted on the pin 34. The ring is formed of electrically conducting resilient material, such as a copper alloy and carries a plurality of contacts 38 preferably four in number that are equally spaced about the ring. The contacts are spaced downwardly below the plane of the ring by the portions of the ring carrying the contacts being deformed downwardly as shown in FIG. 7. It will be appreciated that the contacts are all electrically connected together through the material of the ring.

The contacts of the ring ride on the upper surface of a contact support 39 that is secured as by pins 40 to the holder 21. The upper surface of the contact support facing the contact spring has four contacts mounted thereon. Two of the contacts are carried on opposite ends of a contact strap 41 to be electrically connected together with the strap 41 having an aperture 42 through which the reduced end portion 43 of the pivot pin 34 passes. The terminus of the reduced end portion 43 of the pin is headed over as at 44 to secure a fuse clip 45 to the contact support 39 and to the contact strap 41 with the strap 41 also being electrically connected to the clip 45 through the pin.

The other pair of contacts on the contact support 39, as shown in FIG. 9, are mounted on inwardly bent end portions 46 of a pair of arms 47 that extend outwardly from a substantially annular member 48. Extending outwardly from the inner edge of the annular member 48 are oppositely disposed catches 49.

As shown in FIG. 5, the upper surface of contact support 39 includes oppositely disposed depressions 50 for receiving the portions 46, axially extending grooves 51 for receiving the arms and a reduced diameter portion 52 in which the member 48 is positioned. Additionally, the upper surface of the contact support includes between the contacts supported by the contact strap 41 and the portions 44, flat portions 53 (FIG. 4) that extend from adjacent each contact for approximately two-thirds of the way to the next contact with the remaining one-third including an upwardly extending ledge 54. Thus as the contact ring is rotated, it will have its contacts moved outwardly or away from the contact support 39 by the ledges and then as the contacts become aligned with the contacts supported by the contact support 39, the former snaps onto the latter to provide snap action switching.

The housing 17 includes a reduced diameter hollow portion 55 with its closed end 18 having a metal eyelet 56 positioned thereon. A rivet 57 passes through the eyelet and has a head 58 that forces one end of a spring 59 against a fuse clip 60. Also clamped by the rivet 57 against the eyelet and exterior of the closed end 18 is a terminal 61. By riveting or otherwise spinning over the end of the rivet the terminal 61, the fuse clip 60 and the spring 59 are held mechanically in place and electrically connected together.

As shown in FIG. 9 wherein the electrical parts are perspective shown there is provided for connection to the switch and fuse, a terminal 62 having an exterior portion 63 that projects through a slot 64 (FIG. 1) formed in the housing. The terminal 62 further includes an annular portion 65 that circumscribes the substantially annular member 48 to be in electrical engagement therewith but enable rotary movement of the member 48 with respect to the annular portion 65. Thus current may pass from the terminal portion 63 to the annular portion 65 and thence to the terminals supported by the inwardly bent portions 46.

The contact ring 37 is formed with four contacts 38, as above noted, with the ring being made of electrically conducting material and in one position thereof when the contacts 38 are engaging the contacts on the portions 46, the other contacts of the ring 37 are engageable with the two contacts supported by the contact strap 41. The contact strap 41 is electrically connected to the pivot pin 34 and also to the fuse clip 45. With a fuse 66 of the cylindrical type shown positioned in the clip 45 and also in the clip 59, current may thus be conducted therebetween and to the rivet 57 to the other terminal 61.

Also projecting from the housing on the exterior thereof are oppositely disposed ends 67 of conducting strips 68 having a bent portion 69 formed with an aperture 70 through which a drive nail 71 passes to secure the strip to the housing. The strip extends along flat surfaces 68a formed on the exterior of the housing. The forward end of the contact strip 68 includes an arcuate portion 72 which is engageable with an arched portion 73 of a connector 74 that is contained within slots 75 formed in the holder. The ends of the connector 74 slidably engage axially extending sides 76 of a conductor 77 that include an arcuate portion 78 and a bulb supporting portion 79. The bulb is preferably of the type having two leads 28a and 28b with each of the leads being connected to the portion 79 of each of the conductors 77. The arcuate portions 78 are positioned in grooves 80 formed in the plunger 24 for movement therewith.

The inner ends of the side portions 76 terminate in inwardly bent cam drivers 81. The cam drivers move with the plunger 24 and thus an operator by pushing on to depress the lens 25 moves the plunger 24 and conductor 77 inwardly causing axial movement of the cam drivers 81 while the spring 30 upon release of pressure by the operator forces the plunger outwardly. The reciprocating movement of the cam drivers 81 as shown in FIG. 7 is utilized to rotate for both movements the contact ring one-eighth of a turn. Thus the upper cam part 32 is provided with a plurality of triangular ledges 32a with each ledge having a sloping camming surface 32b while the lower cam part 33 is similarly provided with triangular ledges 33a with each having a sloping camming surface 33b.

During the initial inward movement of the cam drivers, when the lens is depressed, the cam drivers engage radially opposite surfaces 33b and continued inward movement of the cam drivers causes the lower cam part to be rotated one-sixteenth of a revolution clockwise until the cam drivers abut a radial surface 82 formed on the lower cam part. Upon release of the lens by the operator, the spring 30 moves the cam drivers 81 upwardly in FIG. 5 and the edge 81a of each engages a camming surface 32b on the upper cam part and causes another one-sixteenth clockwise revolution of the cam parts and contact ring 39.

As the contact ring 39 requires one-quarter of a revolution from one position of closure to the next, it will be appreciated that each position of return of the plunger thus can shift the contact ring from an off position to an on position and then to an off. At the off position of the contact ring, it will be understood that the contacts 38 of the ring 37 rest on the flat parts 53, thereby removing all connection between the ring contacts 38 and the contacts supported by the contact support 39. Naturally if desired different numbers of contact positions may be used provided that the camming surfaces are changed.

The plunger 24 includes, as shown in FIG. 2, oppositely disposed tongues 83 which ride in grooves 84 formed on the interior surface of the holder and as the grooves do not extend throughout the holder, the outward movement of the plunger is accordingly limited.

It will be appreciated that the parts including the plunger, spring, cam parts, contact ring and contact support may be placed in the housing during manufacture with the terminal manufacturing operation consisting of inserting the pins 40. Thus the parts within the interior

of the holder are locked to the holder but yet the plunger may reciprocate within the holder to rotate the contact ring 37.

The holder is releasably secured within the housing by the catches 49 passing through opening 87 (FIG. 9) formed in the annular part 65 and on oppositely disposed groove 88 also formed therein. Thus upon movement of the holder inwardly the two catches 49 pass into and beyond the opening 87 and groove 88 and if the holder is then rotated for approximately one-quarter of a turn, the edges of the catches will seat in recesses 89 of the annular portion and retain the holder in the housing.

If it is desired to inspect or replace the fuse 66, the holder is rotated until the catches 49 align with the opening 87 and groove 88 freeing the holder to enable axial outward movement thereof. The outward movement is aided by the urging of spring 58 which also urges the fuse from the clip 60 to maintain the fuse in the clip 46 such that as the holder is withdrawn from the housing, the fuse remains in the clip 46 to be withdrawn therewith.

It will according be appreciated that the spring 58 not only serves to assure ejection of the fuse from the housing but also serves to accommodate variations in the length of different fuses. The spring 58 also produces an outward urging on the holder when it is in the housing which maintains the catches 49 in the recesses 89 thus restraining unwanted rotative movement and possible unlocking of the holder. The spring 58 is stronger than the spring 30 and movement of the plunger initially compresses the spring 30 but the spring 58 also serves as a resilient abutment so that additional movement of the plunger is absorbed by the spring 58 as the plunger then forces the holder to move inwardly with it.

Since terminal 62 by means of the annular portion 65 holds the holder in the housing it is preferred that the terminal 66 thereof be provided with a pair of tabs 90 which may be bent over to abut a radial flat 91 formed on the housing and thus more positively mechanically secure the terminal to the housing. Additionally, extensions 92 may be provided on the terminal 62 and fitted in the slot 64 on the housing to also aid in positioning and securing the terminal 62 to the housing.

The bulb, as above described, is connected to the ends 79 through the parts 76, 74 and 68 to enable electrical connection to be made to the bulb through the ends 67 of the contact strips 68 that project through apertures 93 formed in the housing. If it is desired to have the bulb be energized whenever the switch and fuse conduct current between the terminal 63 and the terminal 60, one end 67 may be connected to the terminal 60 and the other end to the other side of the power line (not shown). If the power in the line has the same voltage as the bulb then a direct connection may be made. However, if the power controlled is greater than the capacity of the bulb then a resistor 94 may be connected in series with the bulb to decrease the voltage across the bulb. Such a resistor has been found useful if the bulb is of the neon type. If desired, however, the two terminals 67 may be connected to a different circuit which may be, though preferably is, but not necessarily, controlled by the switch of the present invention.

It will be understood when the holder is removed from the housing, that the only energized part of the device 10 is the terminal 62. As it is located remotely from the entrance of the housing, the possibility of accidental contact therewith from the exterior of the plate 12 is exceedingly minute.

The parts heretofore mentioned as conducting electricity are made of metal while the other parts unless otherwise noted are preferably formed of plastic material that is molded to have the shapes shown in the drawing.

It will accordingly be appreciated that there has been disclosed a unitary device that may be incorporated into electrical equipment and easily and quickly connected to perform the functions of providing an on-off switch for

the equipment, a fuse container for the equipment and a pilot or indicator light to indicate the condition of energization of the equipment or of a selected part thereof. In performing each of these functions, the actuator for the switch and the pilot light are both accessible and visible on the exterior of the container. In addition, the fuse may also be inspected or replaced from the exterior of the container.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. A fuse, switch and pilot light unitary device comprising a substantially hollow housing having an open entrance, means for mounting the housing on a plate with the entrance being accessible from the exterior of the plate, a tubular holder releasably secured in the housing, said holder having a fuse containing means cooperable with a fuse containing means carried by the housing for supporting a fuse therein, switch means positioned within the holder and movable between an off and an on position, said switch means including a contact means mounted for rotation in the holder, means electrically connecting the switch means to the fuse containing means of the holder, a plunger mounted for reciprocating movement in the holder adjacent the entrance of the housing, switch actuation means carried by the inner end of the plunger and operable upon a reciprocating movement of the plunger to change the position of the switch means, a terminal connected to the switch and a terminal connected to the fuse containing means carried by the housing, an electric bulb secured in the housing and terminal means connected to the bulb for providing energization thereof and in which the contact means of the switch has a plurality of angular on positions alternating with a plurality of angular off positions and the plunger for each reciprocating movement moves the contact from one angular position to the next angular position.

2. A fuse, switch and pilot light unitary device comprising a substantially hollow housing having an open entrance, means for mounting the housing on a plate with the entrance being accessible from the exterior of the plate, a tubular holder releasably secured in the housing, said holder having a fuse containing means cooperable with a fuse containing means carried by the housing for supporting a fuse therein, switch means positioned within the holder and movable between an off and an on position, said switch means including a contact means mounted for rotation in the holder, means electrically connecting the switch means to the fuse containing means of the holder, a plunger mounted for reciprocating movement in the holder adjacent the entrance of the housing, switch actuation means carried by the inner end of the plunger and operable upon a reciprocating movement of the plunger to change the position of the switch means, a terminal connected to the switch and a terminal connected to the fuse containing means carried by the housing, an electric bulb secured in the housing and terminal means connected to the bulb for providing energization thereof and in which the contact means of the switch is rotatively connected to two cam parts, said plunger includes a cam driver, said cam driver being operative in one direction of movement to engage one of the cam parts and provide a rotative movement of the cam part in one rotative direction and engageable with the other cam part in the reverse direction of movement to provide a rotative movement of the other cam part in the same rotative direction.

3. The invention as defined in claim 2 in which the contact means of the switch has a plurality of angular on positions alternating with a plurality of angular off positions, and in which the movement of the one cam part produces a rotative movement of the contact means which is half the distance from one angular position to the next and the movement of the other cam part produces a rota-

tive movement of the contact means which is the other half of the distance from one angular position to the next.

4. A fuse, switch and pilot light unitary device comprising a substantially hollow housing having an open entrance, means for mounting the housing on a plate with the entrance being accessible from the exterior of the plate, a tubular holder releasably secured in the housing, said holder having a fuse containing means cooperable with a fuse containing means carried by the housing for supporting a fuse therein, switch means positioned within the holder and movable between an off and an on position, said switch means including a contact ring mounted for rotation in the holder and having a plurality of angularly spaced contacts electrically connected together, a stationary contact support facing said contact ring, a contact strap mounted on said support and having a pair of oppositely disposed contacts electrically connected together, a conductor formed to provide another pair of oppositely disposed contacts mounted on said contact support with said another pair of contacts being electrically connected together, said contact ring in the on position of the switch means engaging at least one contact of each pair of contacts, means electrically connecting the strap to the fuse containing means of the holder, a plunger mounted for reciprocating movement in the holder adjacent the entrance of the housing, switch actuation means carried by the inner end of the plunger and operable upon a reciprocating movement of the plunger to change the angular position of the contact ring, a terminal connected to the conductor and a terminal connected to the fuse containing means carried by the housing, an electric bulb secured in the housing and terminal means connected to the bulb for providing energization thereof.

5. The invention as defined in claim 4 in which the

contact ring rotates in only one direction and is formed of resilient material, the surface of the contact support facing the contact ring includes a ledge for each contact on the contact support with each ledge extending nearer the contact ring than its adjacent contact, each of said ledges being positioned to engage the contact ring prior to the engagement of the contact ring and the contacts on the contact support to thereby provide a snap action between the contacts and contact ring when the switch means achieves the on position.

6. The invention as defined in claim 4 in which the contact support includes flat areas on the surface facing the contact ring, said flat areas angularly alternating with the contacts carried by the contact support, and said contacts of the contact ring engaging said flat areas in the off position of the switch means.

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