Sept. 18, 1951 J. F. O'BRIEN ET AL 2,567,962

SWITCH UNIT

Filed Dec. 9, 1948 2 Sheets-Sheet 1

FIG. 1

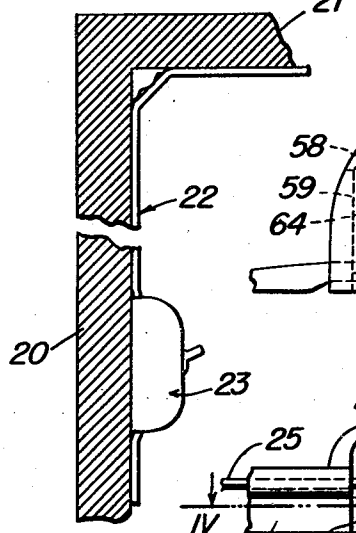


FIG. 2

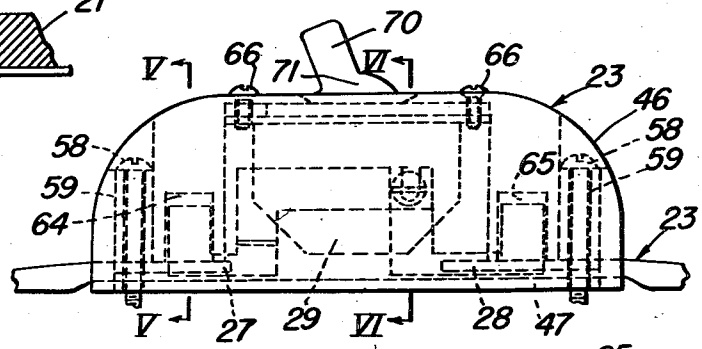


FIG. 3

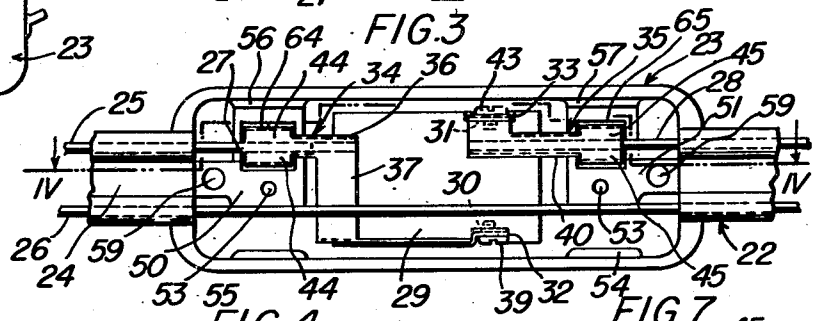


FIG. 4

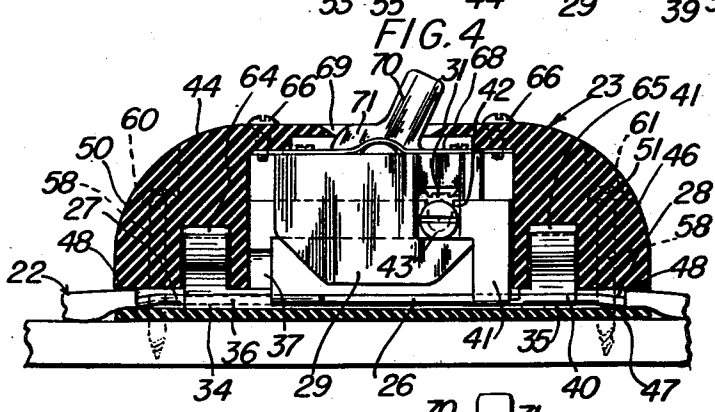


FIG. 5

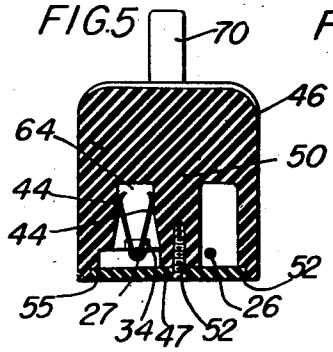


FIG. 6

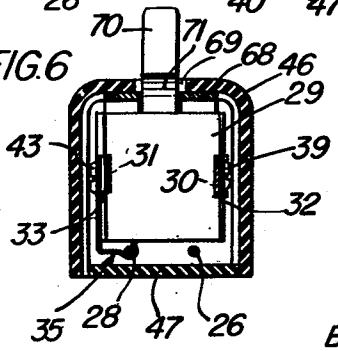


FIG. 7

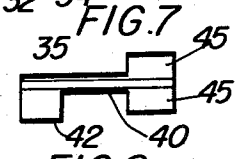


FIG. 8

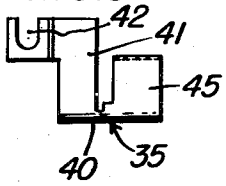
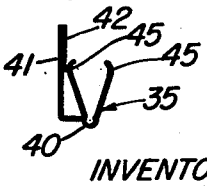


FIG. 9



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SWITCH UNIT

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FIG. 13

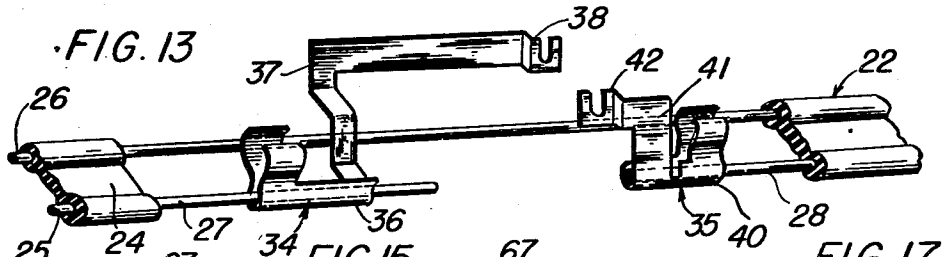


FIG. 15

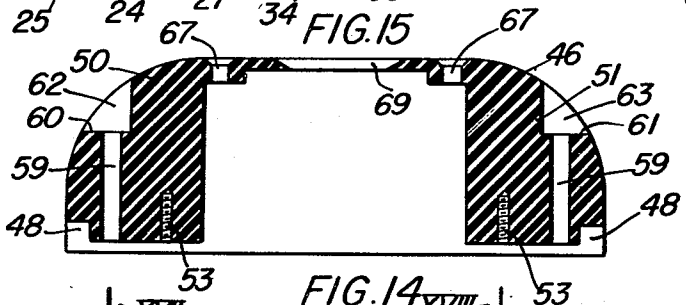


FIG. 17

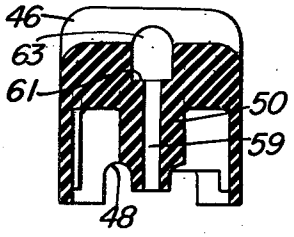


FIG. 14

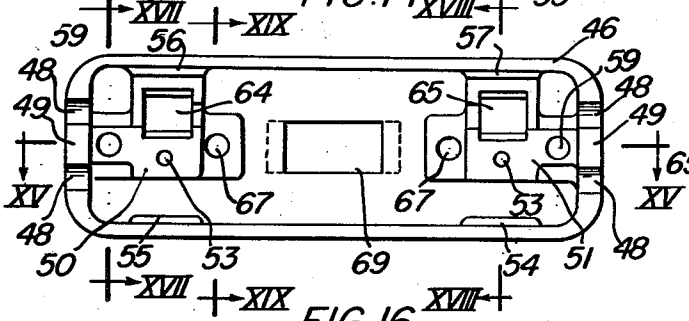


FIG. 18

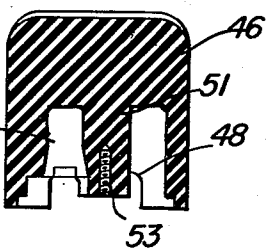


FIG. 16

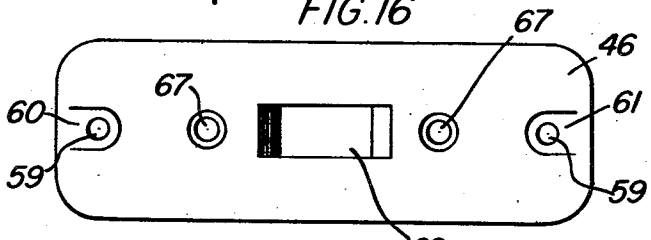


FIG. 19

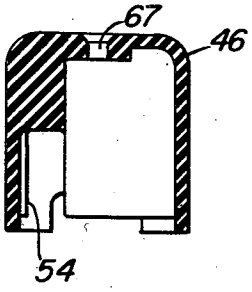


FIG. 10

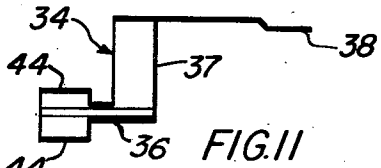


FIG. 11

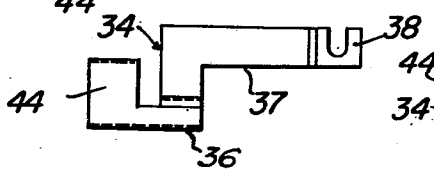
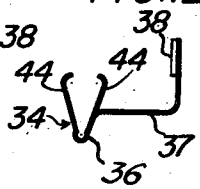


FIG. 12



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UNITED STATES PATENT OFFICE

2,567,962

SWITCH UNIT

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Application December 9, 1948, Serial No. 64,362

4 Claims. (Cl. 200—51)

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This invention relates to surface wiring, and more particularly to a switch for controlling a closed circuit including the conductors of an electrical conductor strip. The invention is especially useful in its application to temporary or semi-permanent lighting connections, to which use, however, it is not restricted.

Rearrangement of a room or shifting of interior walls or partitioning to alter the size or horizontal dimensions of a room, frequently requires relocation of electrical outlets in the room. To meet such requirements, surface wiring, in the form of a conductor strip, may be fastened in suitable position along a wall, or a ceiling, or both. Convenience outlets, lamp sockets and the like may then by suitably positioned along the conductor strip to provide the desired electrical connection points. Necessary individual switches may be associated with each unit connected to the strip, as a lamp immediately connected thereto, or a lamp or utility appliance connected thereto by a plug-in cord. However, it may be desirable to provide a master switch controlling the circuit in the conductors of the conductor strip itself, regardless of whether or not individual switches are associated with the connected units. Such master switch may serve to illuminate a series of un-switched lamps. It may also make possible individual illumination or actuation of a number of units energized by the conductor strip when the switch is closed, and the switch may be opened to disconnect all units simultaneously. Further, the switch may energize a unit connected to the strip at a point remote from the switch, as where the switch is positioned at the head of cellar stairs and the conductor strip extends from the switch to a cellar light.

We have now found it possible to provide a simple, compact, sightly switch unit which may be easily and effectively connected to the conductor strip at any desired point thereon, and which is safe and completely insulated from its surroundings. Furthermore, a switch unit constructed according to the invention fully protects the circuit-making and -breaking elements, the bared portions of the strip conductors to which they are connected, and the electrical connectors between the strip conductors and the switch elements.

According to the invention, the switch is positioned within a housing of insulating material which completely encloses the switch and a section of the conductor strip to which the switch is connected. One conductor of the conductor strip is bared within the housing, a section of this bared

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conductor is cut away, and conductor-embracing clips are connected in spring engagement with the bared ends of the cut-away conductor and in novel fashion with opposite terminals of the switch. Thus the switch makes or breaks the circuit in the cut-away conductor.

One form of the invention is shown in the accompanying drawings, in which—

Fig. 1 illustrates a wall and a ceiling along both of which a continuous conductor strip extends, a switch unit constructed and arranged according to the invention being applied to the conductor strip upon the wall;

Fig. 2 is a longitudinal elevation of the switch unit illustrated in Fig. 1, the attached conductor strip being shown in broken elevation;

Fig. 3 is a view of the switch and conductor strip shown in Fig. 2 as seen from below with the bottom of the housing removed;

Fig. 4 is a longitudinal section taken on the line IV—IV of Fig. 3;

Fig. 5 is a cross section of the switch unit taken on the line V—V of Fig. 2;

Fig. 6 is a cross section of the switch unit taken on the line VI—VI of Fig. 2;

Fig. 7 is a plan view of one of the conductor-embracing clips of the switch unit;

Fig. 8 is a side elevation of the clip illustrated in Fig. 7;

Fig. 9 is an end elevation of the clip illustrated in Figs. 7 and 8;

Fig. 10 is a plan view of the other conductor-embracing clip of the switch unit;

Fig. 11 is a side elevation of the clip illustrated in Fig. 10;

Fig. 12 is an end elevation of the clip illustrated in Figs. 10 and 11;

Fig. 13 is a perspective view showing the conductor strip and the application thereto of the two conductor-embracing clips;

Fig. 14 illustrates the housing of the switch unit as seen from below with the switch, conductor strip and clips removed;

Fig. 15 is a mid-section taken on the line XV—XV of Fig. 14;

Fig. 16 is a top plan view of the housing illustrated in Figs. 14 and 15;

Fig. 17 is a cross section taken on the line XVII—XVII of Fig. 14;

Fig. 18 is a cross section taken on the line XVIII—XVIII of Fig. 14; and

Fig. 19 is a cross section taken on the line XIX—XIX of Fig. 14.

The drawings illustrate a wall 20 and an adjacent ceiling 21 along the inner surfaces of which

a conductor strip 22 is fixed to convey electrical energy to convenient points thereon. Upon the wall 20 and connected to the conductor strip 22, in a manner later to be described, is a switch unit 23 constructed and arranged according to the invention.

The conductor strip 22 is of well-known construction, comprising a strip of insulating material 24 in which spaced parallel conductors 25 and 26 are embedded. The conductor strip may be attached to the supporting surfaces by screws, nails, or the like (not shown) passing through the strip between its conductors and into the wall or ceiling.

In order to control a closed circuit including the conductors of the conductor strip 22, the insulating material 24 is removed from a portion of one of the conductors, here the conductor 25, and a section of the bared conductor is cut away to provide spaced-apart bared ends 27 and 28 thereof. A convenient switch is suitably connected between the bared ends 27 and 28 of the conductor 25 to control the circuit by "making" or "breaking" the connection between the bared ends. Although but one of the strip conductors need be bared for connection with the switch, it is preferable in practice to remove the insulating material from coextensive portions of both strip conductors. Such arrangement is illustrated in the drawings.

The switch here shown is a standard tumbler switch 29 of the insulation-enclosed type. Its internal construction forms no part of the present invention. As is well known, such switches have their contacts and movable parts substantially completely enclosed in insulating material through which their terminals or binding elements 30 and 31 extend into external recesses 32 and 33, respectively, on opposite sides of the switch.

The switch 29 is electrically connected across the bared ends 27 and 28 of the conductor 25 in novel fashion. Thus an electrical connector 34 is attached in spring engagement with the bared end 27 of the conductor 25, and a second electrical connector 35 is attached in like manner to the bared end 28 of the same conductor. By suitably binding the electrical connector 34 to one of the terminals (here the terminal 30) of the switch, and the other electrical connector 35 to the opposite terminal (here the terminal 31) it is possible to "make" and "break" the connection between the bared ends 27 and 28 by closing or opening the switch 29.

Each electrical connector comprises a resilient conductor-embracing clip of electrically conductive material and an attachment prong also of electrically conductive material for binding the connector to a switch terminal. The attachment prong is preferably integral with the conductor-embracing clip. Thus, the electrical connector 34 comprises a conductor-embracing clip 36 of spring metal which makes spring engagement with the bared end 27 of the conductor 25. An integral attachment prong 37 is formed on the clip 36 extending transversely and upwardly from the clip and longitudinally to a bent and slotted end 38 thereof positioned to meet the terminal 30 of the switch 29, to which it is attached by a binding screw 39. As best seen in Fig. 13, the attachment prong 37 is formed to clear the conductor 26 with ample margin to avoid all possibility of short circuit when the latter is bared. The second electrical connector 35 comprises a conductor-embracing clip 40 of spring metal

which makes spring engagement with the bared end 28 of the conductor 25. An integral attachment prong 41 is formed on the clip 40 extending upwardly from the clip and longitudinally to a bent and slotted end 42 thereof positioned to meet the terminal 31 of the switch 29 to which it is attached by a binding screw 43. In order to cause the conductor-embracing clips to hug the bared ends of the conductor more closely it is preferred to form pairs of unitary wings 44, 44 and 45, 45 on the respective clips 36 and 40. The wings 44, 44 and 45, 45 preferably extend upwardly from the respective clips toward the switch 29. By compressing the wings toward each other the clips to which they are attached bear more firmly upon the conductor ends.

From the foregoing, it will be evident that closing the switch 29 will close the circuit across the cut-away portion of the conductor 25, from the bared end 27 through the conductor-embracing clip 36, the attachment prong 37, the switch terminal 30, the switch 29, the switch terminal 31, the attachment prong 41, the conductor-embracing clip 40 to the bared end 28. Opening the switch 29 opens this circuit.

A housing of insulating material is provided for enclosing the switch and for substantially completely enclosing a section of the conductor strip 22 including the bared portion of the strip conductor. This housing consists of an arched cover 46 and a substantially plane bottom 47 therefor. Together the cover 46 and the bottom 47 closely fit the insulation of the conductor strip on either side of the bared conductor parts. Thus, the cover 46 has pairs of end channels 48, 48 at each of its ends which closely embrace a good part of the insulating material immediately surrounding the strip conductors 25 and 26. See Figs. 3, 4 and 14. A tongue 49 formed at each end of the cover 46 between the end channels of each pair fits against the insulating material of the strip between its conductors and improves the enclosure of the strip 22 at the ends of the housing. See Fig. 14.

Within the arched cover 46, at either end thereof, central lugs 50 and 51 extend from the top of the arch to the level of the inner face of the bottom 47 when assembled with the cover. The width of the central lugs, here shown, is equal to the distance between the strip conductors; and when both conductors are bared they will lie along opposite faces of the lugs when held within the housing. Clearly the central lugs 50 and 51 may be otherwise formed to function appropriately in cases where both strip conductors are not bared. The outer ends of the lugs 50 and 51 are positioned within the arched cover adjacent the respective pairs of end channels 48, 48 and 48, 48 and the tongue 49 at either end of the cover. The lugs thus form abutments for the insulation remaining upon the conductor strip at either end of the bared conductors, and serve to hold the housing and the strip in fixed longitudinal relationship. See Figs. 3 and 4.

The plane bottom 47 of the housing is assembled with the arched cover 46 and fixed in place against the lower faces of the lugs 50 and 51 by screws 52, 52 which pass through the bottom and are tightened into threaded holes 53, 53 in the lugs. So positioned, the plane bottom closes the housing and bears upon the insulation of the conductor strip opposite each pair of end channels 48, 48. See Fig. 4. Additional side lugs 54, 55, 56 and 57 may project from the

inner wall of the arched cover to provide surfaces co-planar with those of the central lugs 50 and 51 against which the plane bottom rests. Thus additional support and steadiness may be given the bottom when in place.

The housing is fixed to the supporting surface by means of fixing screws 58, 58 which extend through long passages 59, 59 in the central lugs 50 and 51, through the plane bottom and into the structure forming the supporting surface. The heads of the fixing screws 58, 58 bear upon plane surfaces 60 and 61 provided by recesses 62 and 63 formed in the respective curved ends of the arched cover 46. By means of this contact, the fixing screws hold the housing firmly against the supporting surface.

Wing-compressing sockets 64 and 65 are formed in the arched cover 46 for accommodation of the unitary wings 44, 44, and 45, 45 of the respective electrical connectors 34 and 35. The wing-compressing sockets are tapered inwardly of the cover to force the pairs of wings together and draw the conductor-embracing clips more closely about the bared ends of the conductor 25 as the electrical connectors are moved into the arched cover 46.

The switch 29 is fixed in the arched cover 46 by means of positioning screws 66, 66 which extend through countersunk openings 67, 67 in the cover and coact with the conventional attachment plate 68 of the switch. The arched cover 46 has a switch operating opening 69 therein through which the handle 70 of the usual switch operating rocker 71 extends out of the housing when the switch 29 is in place therein. It is thus possible to operate the switch and to open and close the circuit including the conductors of the conductor strip 22 while the connections between the strip and the switch are substantially completely enclosed.

The switch unit is very simply assembled. First the insulation 24 is removed from a suitable length of one or both conductors and a section of one bared conductor is cut away. Next, the electrical connector is attached to a bared end of the conductor from which a section has been cut away; and the second electrical connector is attached to the other bared end of the same conductor. The conductor-embracing clips now embrace the separated bared ends of the conductor. The bent and slotted ends of the electrical connectors are next fixed to the opposite terminals of the switch 29 by the respective binding screws 39 and 43 of those terminals, thus fixing the switch to the conductor strip. The arched cover 46 of the housing is now placed over the switch and its connections in a position in which the pairs of unitary wings 44, 44 and 45, 45 will enter the wing-compressing sockets 64 and 65 in the cover, and the switch and its connections are moved into the cover as far as they will go with the switch handle 70 projecting through the switch operating opening 69 therein. The positioning screws 66, 66 are now thrust through the countersunk openings 67, 67 in the cover to engage the attachment plate 68 of the switch, and are turned therein until the attachment plate bears firmly upon the inside of the arched cover. Thereupon the plane bottom 47 of the housing is placed in position and is held firmly against the interior lugs of the arched cover by turning the screws 52 into the threaded holes 53 in the central lugs within the cover. Finally the fixing screws 58 are thrust through the long passages 59 in the cover and through the plane bottom, and are screwed into the structure which presents the supporting surface of the strip 22.

The described switch arrangement is simple, compact and sightly, and is effectively connected to the conductor strip at the desired point from which its insulating material has been removed. All of the connections are safely insulated from their surroundings; and the circuit making, circuit breaking, and bared elements of the apparatus are fully insulated and protected.

The particular form of the invention here described and illustrated in the accompanying drawings is presented merely as an example of how the invention may be applied. Furthermore, the phraseology and terminology employed herein is used for purposes of description and not of limitation. Other forms, embodiments and applications of the invention, coming within the proper scope of the appended claims, will readily suggest themselves to those skilled in the electrical art.

We claim:

1. A switch unit for controlling a closed circuit including the conductors of a conductor strip, said unit comprising: a housing of insulating material for substantially completely enclosing a section of the conductor strip; a tumbler switch of the insulation-enclosed type within said housing having binding elements on opposite sides thereof; an electrical connector within said housing for spring engagement with a bared end of one strip conductor from which a section has been cut away and fixed to one binding element of said switch; and a second electrical connector within said housing for spring engagement with the other end of the strip conductor from which the section has been cut away and fixed to the other binding element of said switch, said second electrical connector being turned transversely of the direction in which the strip conductors extend to cross the interior of said housing and reach the other binding element of said switch to which it is fixed; whereby said switch will control the closed circuit including the strip conductors and whereby all connections between the conductor strip and said switch will be protected by said housing.

2. A switch unit for controlling a closed circuit including the conductors of a conductor strip having a portion of its insulation removed and having one conductor bared and a section thereof cut away, said unit comprising: a housing of insulating material for substantially completely enclosing a section of the conductor strip including the bared portion of the strip conductor; a tumbler switch of the insulation-enclosed type within said housing having binding elements on opposite sides thereof; a conductor-embracing clip of electrically conductive material within said housing in spring engagement with a bared end of the strip conductor from which a section has been cut away; an integral attachment prong on said clip fixed to one binding element of said switch; a second conductor-embracing clip of electrically conductive material within said housing in spring engagement with the other end of the strip conductor from which a section has been cut away; and an integral attachment prong on said clip fixed to the other binding element of said switch, the integral attachment prong on said second conductor-embracing clip being turned transversely of the direction in which the strip conductors extend to cross the interior of said housing and reach the other binding element of said

switch to which it is fixed; whereby said switch will control the closed circuit including the strip conductors and whereby all connections between the conductor strip and said switch will be protected by said housing.

3. A switch unit for controlling a closed circuit including the conductors of a conductor strip, said unit comprising: a tumbler switch of the insulation-enclosed type, having binding elements on opposite sides thereof; a housing of insulating material comprising an arched cover into which said switch is screw-connected with its operating handle extending therefrom, and a bottom adapted to be fixed beneath its cover, the cover and the bottom of said housing when so fixed substantially surrounding a section of the conductor strip within said housing; and electrical connectors constructed and arranged for spring-engagement with the respective bared ends of a severed conductor within said housing and fixed to the respective binding elements of said switch.

4. A switch unit for controlling a closed circuit including the conductors of a conductor strip, said unit comprising: a tumbler switch of the insulation-enclosed type having binding elements on opposite sides thereof; a housing of insulating material comprising an arched cover into which said switch is screw-connected with its operating handle extending therefrom, and a plane bottom of insulating material adapted to be fixed beneath its cover, the cover and the bottom of said housing when so fixed substantially surrounding a section of the conductor strip within said housing; and resilient electrical connectors constructed and arranged for spring-engagement with the respective bared ends of a severed conductor within said housing and fixed to the respective binding elements of said switch; said electrical connectors having pairs of unitary wings thereon, and the cover of said housing having therein wing-compressing sockets for accommodation of the unitary wings to force the pairs of wings together and draw said electrical connectors more closely about the bared ends of the severed conductor.

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KENNETH E. VROOM.

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