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H. A. DOUGLAS

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ELECTRICAL CONTROL AND CONNECTION MEANS

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Fig. 1

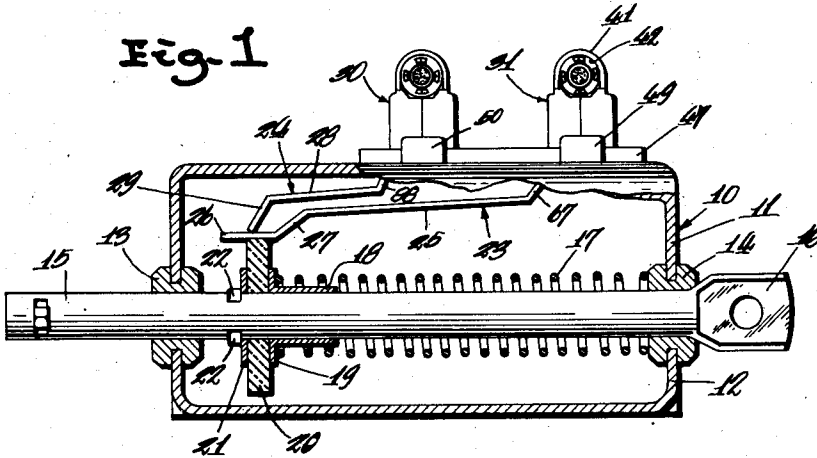


Fig. 2

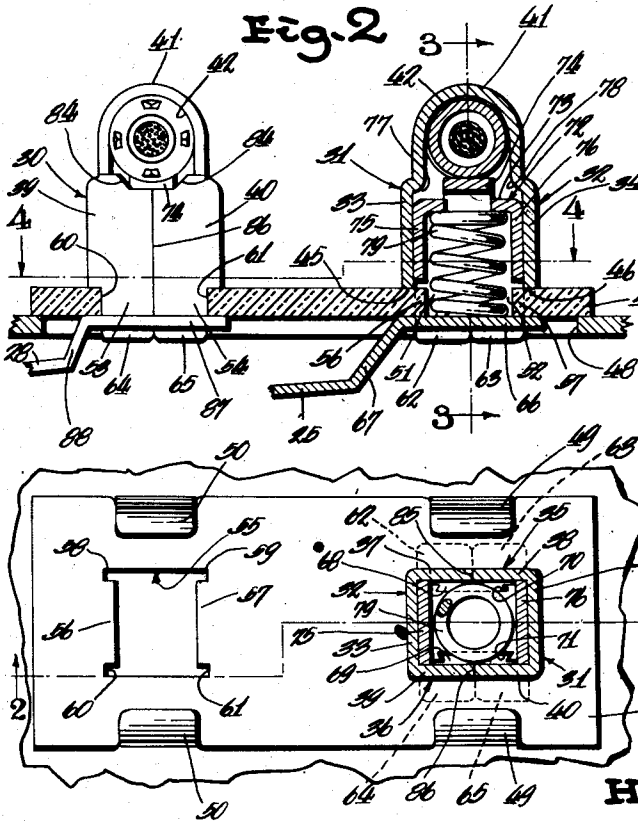


Fig. 3

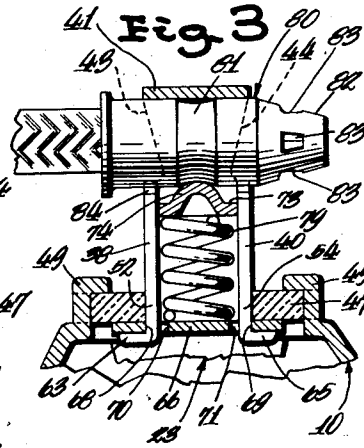
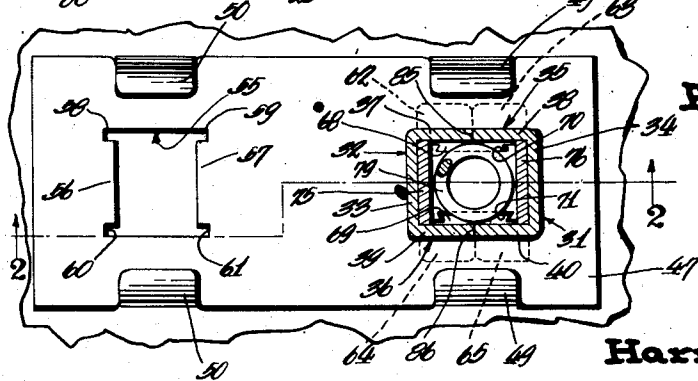


Fig. 4



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ELECTRICAL CONTROL AND CONNECTION MEANS

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9 Claims. (Cl. 200-163)

This invention relates to electrical control and connection means, and more particularly to electrical switches, and the principal object of my invention is to provide new and improved devices of this type. In the drawing accompanying this specification and forming a part of this application I have shown, for purposes of illustration, one form which my invention may assume. In this drawing:

Figure 1 is a longitudinal vertical sectional view, partly in elevation, of an electric switch embodying my invention,

Figure 2 is a fragmentary view, partly in section and partly in elevation, taken along the line 2-2 of Figure 4, a terminal omitted in Figure 4 being shown in elevation in Figure 2,

Figure 3 is a vertical sectional view taken along the line 3-3 of Figure 2, and

Figure 4 is a fragmentary view partly in plan, and partly in section, on the line 4-4 of Figure 2, one of the terminals being omitted.

Referring to Figure 1, there is here shown an electric switch having a metallic casing 10 made in two halves 11, 12, bearings 13, 14 being held between the upper and lower halves of the end walls of the casing, in this instance by providing the bearing members 13, 14 with annular grooves in which the margins of semi-circular apertures in the respective halves of the end walls of the casing 10 are seated. The halves of the casing are held together in any suitable manner (not shown). Slidable through the bearings 13, 14 is a shaft or plunger 15 having a head 16 provided with an aperture serving to connect an operating means thereto. The plunger 15 is biased to the position shown in Figure 1 by means of a helical spring 17 surrounding the plunger, one end of the spring abutting the bearing 14 and the other end abutting a flange 19 on a sleeve 18, the sleeve 18 being slidable on the plunger 15. The flange 19 is pressed against an insulating disc 20 loosely mounted on the plunger 15, the insulating disc being in turn pressed against a washer 21 surrounding the plunger 15, and the washer being stopped by projections 22 formed on the plunger.

The disc 20 is adapted to operate a pair of relatively movable switch members 23, 24. In the illustrated construction the switch member 23 is formed of a piece of resilient sheet stock of suitable material, having a longitudinally extending portion 25 joined to an offset end portion 26 by a cam 27. The other switch member 24 has a longitudinally extending portion 28 provided with an end portion 29 bent out of line therewith toward the offset portion 26.

The switch members 23, 24 are electrically connected to and held by a pair of terminals 30, 31. The terminals 30, 31 are identical, so that a description of the terminal 31 will apply equally well to the terminal 30.

The terminal 31 has a tubular body portion 32, of oblong rectangular cross-section, having opposite walls 33, 34 and opposite walls 35, 36 extending at right angles to the walls 33, 34. The wall 35 is formed in two halves 37, 38 and the wall 36 is also formed in two halves 39, 40, the halves 37, 39 being integral with the wall 33 and the halves 38, 40 being integral with the wall 34. The walls 33, 34 are integrally joined by a U-shaped loop 41, providing an aperture 42, having an axis extending transversely to the longitudinal axis of the tubular body 32. The legs of the U-shaped loop 41 may have their edges 43, 44 tapered toward the junction between the legs and the walls 33, 34.

The lower ends 45, 46 of the walls 33, 34 are in abutment with an insulating base 47. The insulating base 47 is somewhat larger than the aperture 48 in the top of the casing 10, and may be fastened to the casing in any suitable manner, in this instance by striking up fingers 49, 50 on the casing and clinching them over the top of the insulating base 47.

While the walls 33, 34 abut the upper surface of the insulating base 47, the wall 35 is provided with extensions 51, 52 and the wall 36 is provided with extensions 53, 54, these extensions taking through an aperture 55 in the base 47. The form of the aperture 55 is clearly shown in Figure 4, in which the terminal 30 has been omitted for that purpose. The aperture 55 has a generally rectangular outline but on two opposite margins thereof is provided with projections 56, 57 extending into the aperture and, by reason of being of less width than the respective overall width of these opposite margins, forming notches 58, 59 in the upper corners of the aperture 55, as viewed in Figure 4, and notches 60, 61 in the lower corners. The distance between the seats of the notches 58, 59 is such as to snugly accommodate the combined width of the wall extensions 51, 52 and the distance between the seats of the notches 60, 61 is in like manner of such width as to snugly accommodate the combined width of the wall extensions 53, 54. It will therefore be evident that the projection 56 will be disposed between the opposite inside surfaces of the wall extensions 51, 53 while the projection 57 will be disposed between the opposite inside surfaces of the wall extensions 52, 54.

The wall extensions 51, 52 and 53, 54 are made long enough to serve as a means for not only fastening the terminal 31 to the insulating base 47 but also to serve as means for fastening the switch member 23, and as an electrical connection therefor. To this end the switch member 23 in the illustrated embodiment is provided with an offset part 66, joined to the longitudinal extending part 25 by an angle portion 67. The offset part 66 is adapted to lie flat against the underside of the base 47 and is provided with apertures 68, 69, each aperture being of a length sufficient to receive the wall extensions 51, 52 and the wall extensions 53, 54 respectively. The aperture 68 includes a dove-tail recess portion 70, of less length than the combined width of the wall extensions 51, 52, and in like manner the aperture 69 includes a dove-tail recess portion 71 of less length than the combined width of the wall extensions 53, 54. The dove-tail recesses 70, 71 extend toward each other from the nearest margins of the apertures 68, 69, as may be seen in Figure 4.

In order to fasten the terminal 31 and the switch member 23 to the base 47 ends 62, 63 of the wall extensions 51, 52, and ends 64, 65 of the wall extensions 53, 54 are clinched over the offset portion 66 of the switch member 23.

Disposed within the tubular body 32 of the terminal 31 is a detent means 72, generally of U-shape and desirably formed of sheet metal. The bight 73 of the U-shaped detent means is generally flat but provided with a protuberance 74, having an approximately semi-cylindrical surface, struck up from the bight 73 at right angles to the axis of the aperture 42. The U-shaped detent means 72 has legs 75, 76 slidable on the inside surfaces of the walls 33, 34. Upward movement of the detent means 72, as viewed in Figures 2 and 3, is limited by shoulders 77, 78 extending inwardly at the upper ends of the walls 33, 34 at substantially the junction between these walls and the loop 41. The detent means 72 is biased upwardly by means of a spring 79, one end of which bears against the inside surface of the bight 73 and the other end of which bears against the offset part 66, of the switch member 23, between the apertures 68, 69. The protuberance 74 of the detent means is adapted to engage an annular furrow 81 in a cylindrical portion of an electrical conductor terminal 80 when the conductor terminal 80 is thrust into the aperture 42. The end 82 of the conductor terminal 80 is of frusto-conical form to serve as a cam surface operable to move the protuberance 74 downwardly against the bias of the spring 79 as the terminal 80 is thrust into the aperture 42, the protuberance thereafter snapping into the furrow 81. The terminal 80 may be fastened to the electrical conductor disposed therein by swedging as indicated by the swedge indentations 83.

The upper ends of the walls 35, 36 may have cut back margins 84 if necessary, to expose the protuberance 74 for cooperation with the conductor terminal 80.

The terminal 30 is adapted to be fastened and to fasten the switch member 24 to the base 47 in a manner already described in connection with the fastening of the switch member 23 by the terminal 31. To this end, the switch member 24 is provided with an offset part 87, similar to the offset part 66, of the switch member 23, the offset part 87 being joined to the longitudinal extending portion 28 by an angle portion 88.

It will be evident from the foregoing description that the terminals 30, 31 are desirably made of sheet metal, the walls 33, 34, 35, 36 being formed to the desired shape and the channel shaped halves of the body 32 being then bent toward each other until the longitudinal opposed edges of the wall halves 37, 38 and 39, 40 meet in lines of registry 85, 86 respectively, to form the tubular body 32. By so bending the halves of the body 32 toward each other, the loop 41 is formed. The detent means 72 may then be inserted in the tubular body 32, and the wall extensions 51, 52 and 53, 54 inserted through the aperture 55 in the base 47. Either before or after that is done the spring 79 is placed against the underside of the detent, and then the apertures 68, 69 in the offset part 66 of the switch member 23 are brought into registry with the wall extensions 51, 52 and 53, 54 respectively, and the ends 62, 63 and 64, 65 of these wall extensions clinched over the offset part 66. The terminal 30 may be assembled with the base 47 and switch member 24 in a similar manner.

The base 47 may then be assembled with the casing 10 by placing the base over the aperture 48 and clinching the fingers 49, 50 over the top of the base. The fingers 49 are desirably so positioned with respect to the terminal 31 that they engage the base in the longitudinal plane of the terminal including the aperture 42 so that bending of the base is minimized when a conductor terminal 80 is thrust into the aperture 42. The same applies in connection with the fingers 50 with respect to the terminal 30.

It will be evident that by moving the plunger 15 toward the right as viewed in Figure 1, against the bias of the spring 17, the insulating disc 20 will release the switch member 23, which, due to its resilience will bend downwardly, breaking contact between the ends 26, 29 of the switch members 23, 24. When the plunger 15 is permitted to move toward the left, after having broken the contact between the switch members 23, 24, the insulating disc 20 will engage the cam 27 to thereby return the end 26 into contact with the end 29. It of course will be obvious to those skilled in the art that the switch parts may be so arranged and constructed that the switch will be normally opened instead of normally closed, and that the switch members 24, 25 may be formed and operated in other ways than that illustrated.

From the foregoing it will be apparent to those skilled in the art that the illustrated embodiment of my invention provides a new and improved electrical control and connection means, which may be embodied in an electric switch, readily and conveniently constructed and assembled, and accordingly, accomplishes at least the principal object of my invention. On the other hand, it also will be obvious to those skilled in the art that the illustrated embodiment of my invention may be variously changed and modified, or features thereof, singly or collectively, embodied in other combinations than those illustrated, without departing from the spirit of my invention, or sacrificing all of the advantages thereof, and that accordingly, the disclosure herein is illustrative only, and my invention is not limited thereto. Moreover, it is to be understood that the term conductor terminal, includes the bare end of a conductor, or a separate part secured thereto.

I claim:

1. An electric switch, comprising: an insulating base having an aperture; relatively movable switch members; terminal means having an open ended tubular portion extending into said aperture, said terminal means having a transverse aperture for receiving an electrical conductor terminal; detent means, disposed within said tubular portion, for cooperation with said transverse aperture and the terminal; resilient means, disposed within said tubular portion for biasing said detent means into cooperating position; one of said switch members having a portion engaging said resilient means and extending over said open end of said tubular portion; and means for causing relative movement of said switch members.

2. An electric switch, comprising: an insulating base having an aperture; switch members; an electrical conductor terminal receiving means providing an aperture, having a portion extending through said base aperture and cooperating with one of said switch members for fastening said switch member and receiving means to said base; detent means cooperable with said receiving means aperture to hold a plug conductor terminal in position; and spring means interposed between said detent means and said fastened switch member for biasing said detent means to operative position.

3. In combination: a tubular body, the defining surface adjacent one end being partially interrupted to provide shoulder means and tongue means; a support, having slot means for receiving said tongue means, and having also an aperture communicating with said slot means; said shoulder means abutting one surface of said support, and the extremity of said tongue means being formed to overlie the opposite surface of said support, said support aperture being positioned to provide access to the interior of said body from said opposite surface.

4. In combination: a tubular body, the defining surface adjacent one end being partially interrupted to provide shoulder means and spaced tongue means; a support, having spaced slots respectively receiving said tongue means, and having also an aperture disposed intermediate said slots; said shoulder means abutting one surface of said support, and the extremities of said spaced tongue means being formed to overlie the opposite surface of said support, said support aperture being positioned to provide access to the interior of said body from said opposite surface.

5. In combination: a tubular body, the defining surface adjacent one end being partially interrupted to provide shoulder means and tongue means; a support, having slot means for receiving said tongue means, and having also an aperture communicating with said slot means; said tongue means extending through said slot means and said shoulder means abutting one surface of said support, said support aperture being positioned to provide access to the interior of said body from said opposite surface; and plate means overlying the opposite surface of said support, and closing off access to the interior of said body, said plate means being apertured to pass only said tongue means, and said tongue means being bent to overlie the outside surface of said plate means.

6. In combination: a tubular body, the defining surface adjacent one end being partially interrupted to provide shoulder means and tongue means, said body having an aperture spaced from said one end for receiving a conductor terminal; a support, having slot means for receiving said tongue means, and having also an aperture communicating with said slot means; said tongue means extending through said slot means and said shoulder means abutting one surface of said support, said support aperture being positioned to provide access to the interior of said body from said opposite surface; plate means overlying the opposite surface of said support, and closing off access to the interior of said body, said plate means being apertured to pass only said tongue means, and said tongue means being bent to overlie the outside surface of said plate means; and biasing means, within said body, having one end extending through said support aperture and bearing against the adjacent surface of said plate means, and its other end in position to yieldably engage a conductor terminal disposed in said receiving aperture.

7. An electrical switch, comprising: an insulating base having an aperture; switch members, at least one of which is movable relative to the other; terminal means having an open ended tubular portion extending into said aperture, said terminal means having a transverse aperture for receiving an electrical conductor terminal; detent means, disposed within said tubular portion, for cooperation with said transverse aperture and the terminal; resilient means, disposed within said tubular portion for biasing said detent means into cooperating position; one of said switch members having a portion engaging said resilient means and extending over said open end of said tubular portion; and means for moving said movable switch member into engagement with the other switch member.

8. An electrical switch, comprising: an insulating base having an aperture; switch members, at least one of which is flexible; an electrical conductor terminal receiving means providing an aperture, having a portion extending through said base aperture and cooperating with the flexible switch member for fastening said switch member and receiving means to said base; detent means cooperable with said receiving means aperture to hold a conductor terminal in position; and spring means interposed between said detent means and said fastened switch member for biasing said detent means to operative position.

9. An electrical switch including in combination: a housing; contact means and a body respectively secured to said housing in spaced apart relation, said body having a transverse terminal receiving aperture at one extremity, resilient contact means carried by said body adjacent its other extremity, means including resilient means operatively related to said body engaging said resilient contact means and functioning to retain a terminal placed in said receiving aperture, and means for moving said resilient contact means into engagement with said first mentioned contact means.

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