Oct. 5, 1937. H. A. DOUGLAS 2,095,176

ELECTRIC SWITCH CONSTRUCTION

Original Filed May 31, 1934

Fig. 1.

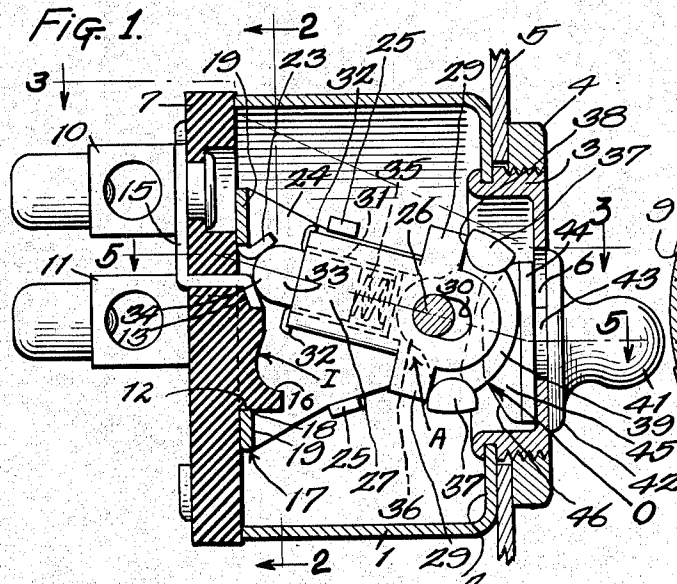


Fig. 2.

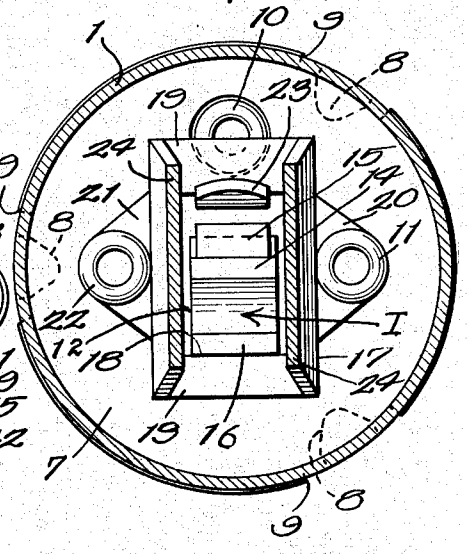


Fig. 3.

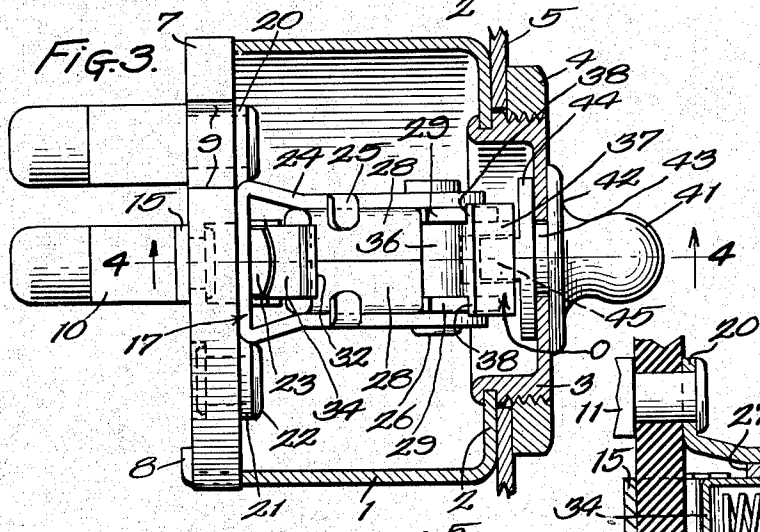


Fig. 5.

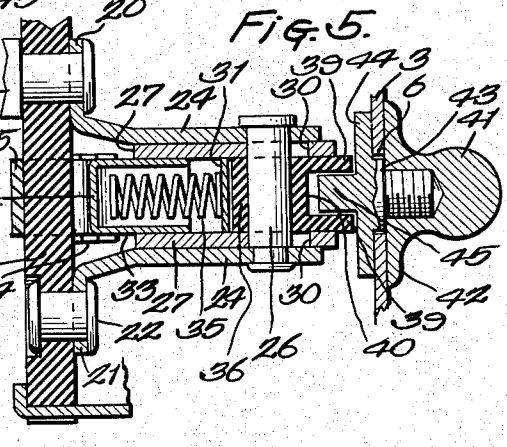
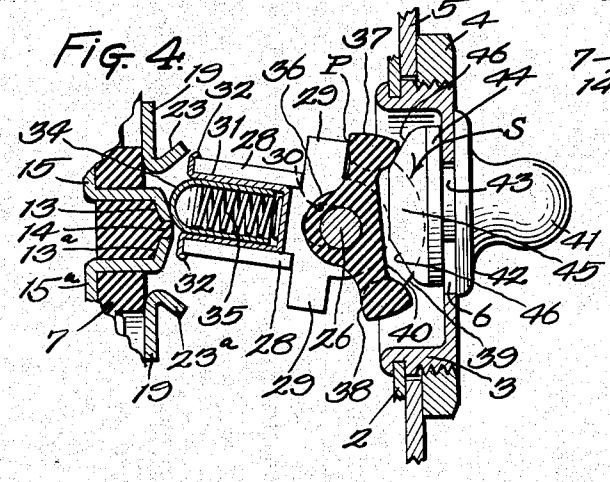


Fig. 4.



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ELECTRIC SWITCH CONSTRUCTION

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Application May 31, 1934, Serial No. 728,279
Renewed September 30, 1935

2 Claims. (Cl. 200—68)

This invention relates to improvements in electric switches and more particularly to a snap action switch of the slide operated type to quickly make and break a circuit therethrough.

It is an object of this invention to provide a switch of this type which is compact, simple in construction, readily assembled and easily attached to a support therefor, such as an escutcheon plate of a wall switch or an instrument board, as the case may be.

With these and other objects in view, reference is made to the accompanying sheet of drawings which illustrate a preferred embodiment of this invention with the understanding that minor detail changes may be made without departing from the scope thereof.

In the drawing—

Figure 1 is a view in central vertical section of an embodiment of this invention, with parts illustrated in elevation.

Figure 2 is a view in section taken on the line 2—2, Figure 1.

Figure 3 is a view in section taken on the line 3—3, Figure 1.

Figure 4 is a detail view in section taken on the line 4—4, Figure 3.

Figure 5 is a detail view in section taken on the line 5—5, Figure 1.

As illustrated in Figures 1, 2 and 3, the switching mechanism is enclosed in a cup-shaped metallic cylindrical casing 1, having the bottom or end closure 2 provided with a central circular opening for the reception of a shouldered metallic sleeve 3, the inner end of which is spun over or riveted upon the inner side of the closure 2 to secure the sleeve thereto, as shown. The outer exterior portion of the sleeve 3 is screw threaded for engaging a locking nut 4 when mounted upon a support 5 therefor, which may be the cover or escutcheon plate of a wall switch or the instrument board of an automotive vehicle, by passing the sleeve 3 through a circular opening provided in the support and applying the nut 4 on the exterior thereof to draw the closure 2 in a clamped relation upon the back of the support. The walls of the sleeve 3 are brought together on the outer side to form an elongated slot 6.

The open end of the casing 1 is closed by a contact carrying disc 7 of insulating material which is held securely in position by a plurality of spaced apart fingers 8, preferably three in number, forming integral extensions of the casing wall which are passed through corresponding notches 9 in the periphery of the disc 7 and then bent over the outer surface of the disc to hold the same firmly against the end of the casing wall. The contact carrying disc 7 mounts two electric terminals 10 and 11, preferably of the snap terminal type disclosed in this applicant's prior copending application, Serial No. 713,713, filed March 2, 1934, adapted to be electrically connected to electric conductors, not shown, upon the outer side of the disc 7. As shown each terminal includes a rectangular block having a cylindrical extension which extensions are preferably reduced in diameter, as shown. When this type terminal is employed, it is desirable to provide the carrier disc 7 with circular apertures through which the reduced extremities of the terminals are passed and the metal of the end is then expanded or riveted upon the interior of the disc 7 to hold the terminals in place. The terminals 10 and 11 are mounted on perpendicular radii of the disc 7 an equal distance from the center.

The center of the contact carrying disc 7 is provided with a rectangular projection of insulating material I upon its inner surface having sides 12 parallel to the radii passing through the terminals 10 and 11 with the edges adjacent terminals joined to an upwardly extending angular surface 13 terminating in a central transverse flat portion 14. An electric contact 15 in the form of a metallic strip is connected to terminal 10, preferably by passing the reduced cylindrical portion thereof through an aperture provided therefor in the end of said strip, upon the outer side of the contact carrying disc. The other end of the strip is then passed through the disc 7 to embrace the adjacent side and angular surface 13 of the central projection I upon the inner side of the disc 7 with the upper surface of the strip terminating flush with the flat transverse top 14 of the central projection. The upper surface of the insulating projection leading from the flat top of the transverse portion 14 opposite the contact strip 15 is continued downwardly therefrom at an angle similar to that formed by the upper surface of said strip for a similar distance and then curved upwardly to form a stop 16, for a purpose hereinafter described. The expanded or riveted head of the terminal 10 is preferably received in a recess provided therefor upon the inner surface of the disc 7 to be wholly received below that surface, for a purpose hereinafter described.

The switching mechanism is carried upon a U-shaped metallic bracket having a rectangular base 17, with a central cut out portion 18 to receive the projection I upon the disc 7 providing

end portions 19 all of which extends over the countersunk expanded end of the terminal 10 and having the sides of the base provided with integral outstanding perforated ears 20 and 21. The reduced cylindrical portion of the terminal 11 is passed through the apertured ear 20 with the end expanded or riveted upon the upper surface thereof, while the other ear 21 is secured to the disc 7 by a rivet 22 passing through the ear and disc with the metal of the ends expanded or riveted thereon. The inner side of the end portion 19 of the base extending over the terminal 10 is spaced apart from the contact 15 and the opposite end portion 19 is in engagement with the central projection I of the disc 7. The spaced apart end portion 19 is provided upon its inner side with an integral upwardly extending stop 23 bent back at an angle and spaced apart from the contact 15 to form a stop complementary to the stop 16 of the projection I.

The ear bearing sides of the base are extended upward to form two similar arms 24 perpendicular to the base 17 and equally spaced from the axis of the casing 1 with each side of each arm provided midway its height with outstanding integral fingers 25. The switching device for alternately continuing the circuit from the terminal 11 to the contact 15 of the terminal 10 is mounted to oscillate upon a pivot 26 passing through apertures in the upper ends of the arms 24. The circuit making and breaking mechanism includes an oscillating actuator A caused to oscillate by a manually operable oscillating operator O.

The actuator is mounted upon a pivot pin 26 passed through apertures in the arms 24 of the supporting bracket and includes two similar metallic actuating plates 27, adapted to receive the pivot pin 26 and depend therefrom in sliding engagement with the respective arms 24 of the supporting bracket and terminating short of the high point of the carrier disc projection I with a portion of the opposite longitudinal sides struck up at right angles to the main body to form right angular flanges 28 extending upward from the bottom leaving oppositely disposed similar outstanding arms 29 extending from the body of the plate, the longitudinal edges of the flanges 28 are adapted to engage the similar edges of the corresponding flanges on the respective plates 27. The actuator plates 27 are mounted upon the pivot pin 26 in similar longitudinally elongated bearings 30 allowing a sliding longitudinal movement of the plate about the pin 26. The upper surfaces of the actuator arms 29 lie in the same plane which passes slightly below the axis of the pivot pin 26 when the upper end of the bearing 30 is in contact with the upper surfaces of the pin 26. A spring housing 31 in the form of an inverted U is mounted between the plates 27 and embraced by the flanges 28. The extremities of the sides of the housing are provided with transverse flanges 32 with the terminations thereof inclined upwardly to engage the outer sides of the oppositely disposed actuator flanges on each side of the housing and position the base, or top, of the housing at a distance below the lower end of the actuator bearing 30. The housing 31 receives in sliding engagement therewith a detent 33 in the form of a rectangular casing closed at the lower end in a rounded nose 34 and open at the other end to receive a coil spring 35 bearing against the interior of the nose and top of the housing. When the actuator A and operator O have been assembled upon the supporting bracket, the fingers 25 of the bracket arms 24 are bent toward each other, as shown in Figure 3 to prevent the nose 34, when mounted on the disc 7, from riding over either of the stops 16 or 23.

The actuator A is caused to oscillate by the movement of an oscillating operator O. The oscillated operator is formed of insulating material preferably "Bakelite" and is provided with a depending perforated portion 36 slidably received between the actuator plates 27 to receive the pivot pin 26 and mount the operator for oscillation thereabout. The upper portions of the actuator plates 27 are cut on the arc of a circle concentric with the pivot pin 26 when the upper bearing surface thereof is in engagement with the upper side of said pin. The depending portion 36 of the operator is extended above the actuator plates 27 and on each side of the pivot. Each side of said portion is provided with a transverse lug 37. The lateral extensions of the member 36 and lugs 37 thereon are terminated on each side of the pivot 26 in stops having surfaces 38 curving slightly upward with the surfaces 38 of the lugs in contact with the actuator arms 29 when the lower end of the bearings 30 of the actuator are in engagement with the under side of the pivot pin 26. The top 39 of the portion 36 between the lugs 37 is formed on the arc of a circle concentric with the pivot pin 26 and is provided with a longitudinal central groove 40 extending between the lugs 37 with its bottom parallel to the surfaces 38.

A hand operated sliding operator S is mounted for back and forth motion in the slot 6 of the sleeve 3 and is provided with means to impart a back and forth movement to the oscillating operator about the pivot 26. The sliding operator S is preferably constructed to include an exterior knob 41 extended into an annular flange 42 at its bottom, of a sufficient diameter to cover the exterior of the slot 6 in all positions of the knob 41, and an interior operating member having a central cylindrical portion 43 passing through the slot 6 in screw-threaded engagement with the axis of the sliding knob 41 and provided with a flange 44 of greater width than the slot 6 formed to have a sliding engagement with the under side of the closure of the sleeve 3. Said operating member is also provided with a central longitudinal lug 45 received within the groove 40 of the oscillating operator O with its ends terminated in angular surfaces 46 adapted to alternately ride over the lugs 37 of the oscillating operator O, as the knob 41 is moved back and forth in the slot 6 and imparts a rotary movement to the oscillating operator.

Figures 1 and 3 illustrate the normal positions of the various parts of the switch when the operating knob 41 has been moved to the bottom of the slot 6, from which it is seen that the current continuing nose 34 of the detent 33 has engaged the contact strip 15 of the terminal 10 and is maintained in contact therewith by the tension of the spring 35 holding the nose 34 against the stop 23 of the base 17 of the bracket which spring has bodily moved the actuator to slide over the pivot pin 26 to bring the lower end of the bearing 30 in resilient engagement with the under side of said pivot pin and the actuator arms 29 have engaged both stop surfaces 38 of the oscillating manual operator O and the circuit is completed from terminal 11 to the terminal 10 not only through the bracket, as well as through the actuator A, and current continuing nose 34 to contact strip 15, but is also completed by the nose acting as a current continuing bridge from the stop 23

of the bracket to the angular surface of the contact stop 15 connected to the terminal 10.

When the knob 41 is manually raised or lifted, it imparts a rotative movement to the operator O by engagement of the angular surface 46 with the lug 37 and through contact of the engaged stop 38 with the adjacent actuator arm 29 to first bodily move the actuator in the direction of the engaged stop 23 of the base 17 until the upper end of the bearing 30 engages the upper side of the pin 26, placing the detent spring 35 under greater tension than normal. Then as the rotative movement of the operator continues, it imparts a rotative movement to the actuator A about its upper bearing on the pivot 26 causing the detent nose 34 to travel over the upwardly inclined surface of the contact 15 towards its high point, as shown in Figure 4, holding the contact with the terminal 10 closed under a slightly increasing tension of the spring 35 as the nose approaches the high point of the contact 15. During the rotative movement, the pivot pin 26 acts as the fulcrum of a bell crank lever with power being applied upon one arm by the operator handle S at the point of contact P between the oscillating operator end 38, and the actuator arm 29. During this movement, the point of contact P moves in the direction of the angular surface of the contact 15 so that as the line from the point P to the engaging point of the nose 34 approaches a right angle to the angular surfaces of the contact 15, the friction of the nose thereagainst is minimized. The movement of the nose 34 toward the high point of the carrier projection I increases the tension of the spring 35 so that just before the nose reaches the high point, the spring 35 bodily moves the actuator away from the contact 15 to bring the lower end of its bearing 30 into engagement with the under side of the pin 26 with the nose 34 still held in contact with the strip 15, and during the movement causes the actuator to rotate about the point P as a pivot. In other words, during the application of power at P, the bell crank lever rotates about the pivot 26 as a fulcrum, but as the nose 34 approaches the high point of the projection, power is applied at the lower end of the other arm of the bell crank lever causing it to rotate about the point P as a fulcrum, the elongated bearing 30 allowing sliding movement of the actuator about the fixed pivot 26. The movement imparted to the actuator 27 by the stored up power in the spring 35 causes the nose 34 to snap over the high point of the projection I and to quickly extend the nose 34 to engage the stop 16 on the other end of the insulated projection and thereby quickly oscillate the nose to break engagement with the contact of terminal 10.

From the above, it is seen that as soon as the knob 41 has rotated the oscillating operator O sufficiently to shift the actuator A from the normal pivot 26 to its eccentric pivot P, the spring 35 automatically completes the oscillation to snap the nose 34 out of engagement with the contact strip 15 and break the circuit from the terminal 11 to the terminal 10. Upon downward movement of the knob 41 from the upper position, the action above described is reversed and the parts returned to the position shown in Figure 1.

This invention also contemplates its application to a two circuit switch, as shown in Figure 4. In this form the central insulating projection I carrying the contact strip 15 from the terminal 10 is provided with a complementary oppositely disposed surface 13*a* upon which is mounted a contact strip 15*a*, mounted upon the disc 7 and connected to a third terminal (not shown) in the same manner as the strip 15. The additional terminal is mounted upon a diameter of the disc passing through the center of the contact 10 and at a similar distance from the center thereof with the riveted head of the said terminal lying under the adjacent end portion 19 of the base 17 of the metallic actuator carrying bracket. The inner side of that end portion 19 is spaced apart from the adjacent contact strip 15*a* and is provided with an upwardly extending stop 23*a* bent back at an angle similar to the corresponding stop 23.

In this form, when the current continuing nose 34 is oscillated to break the circuit to the terminal 10 just as soon as it is snapped over the flat insulating surface 14, it immediately engages the contact strip 15*a* to complete the circuit to the additional terminal, and then slides over said contact strip until it engages the stop 23*a* upon the end portion 19 of the metallic bracket, whereby upon manual depression of the button 4 the respective circuits from the terminal 11 to the other terminals are each closed and opened alternately.

As shown and described, the parts of this improved switching mechanism, excepting the oscillating operator O and the contact carrying disc, are all adapted to be formed of metal stampings, or machined parts, to be easily and quickly assembled. The operating parts are dependable as the spring 35 for imparting the snap movement is fully protected and the other parts are so constructed that the switch may be operated thousands of times without any of the parts deteriorating or getting out of order.

Certain features, common to the present application and to applicant's Patent 2,044,065, June 16, 1936, are claimed in the aforesaid patent.

What I claim is:

1. An electric switch, comprising: a casing having an end wall at one end and being open at the other end; cam means disposed in said casing and carried by said end wall; operating means, having a portion disposed on the outside of said end wall, constructed and arranged to operate said cam means; said operating means and said end wall being relatively so constructed and arranged that said cam means is reciprocable in the general plane of said end wall; a base; switch mechanism mounted on said base; said switch mechanism including an operator swingable in a predetermined plane with respect to said base; and said cam means and said operator being so constructed and arranged that when said base is assembled with said open end of said casing, said operator and said cam means may be brought in operative relation so that reciprocation of said cam means swings said operator in said predetermined plane.

2. An electric switch, comprising: a base; switch mechanism mounted on said base; said switch mechanism including an operator swingable in a predetermined plane; cam means constructed and arranged to swing said operator by reciprocation of said cam means; means mounting said cam means for rotation about an axis in said plane; and said cam means and said operator being relatively so constructed and arranged that said cam means is constrained for reciprocatory movement in said plane.

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