Oct. 5, 1937. H. A. DOUGLAS 2,095,175

ELECTRIC SWITCH CONSTRUCTION

Original Filed May 31, 1934

Fig. 1.

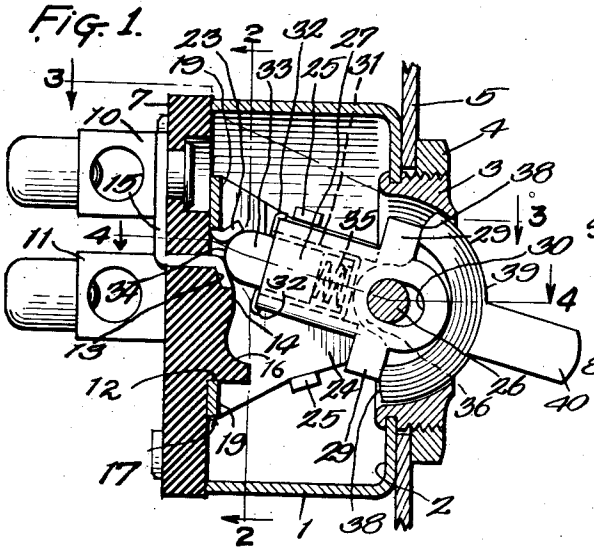


Fig. 2.

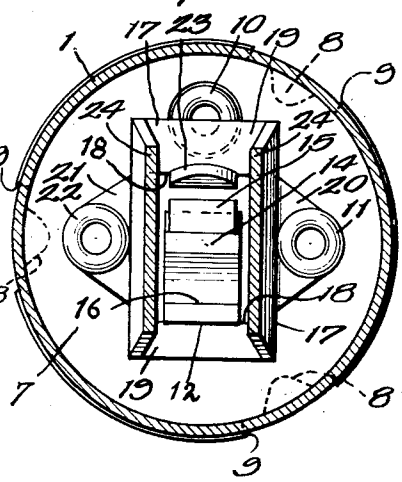


Fig. 3.

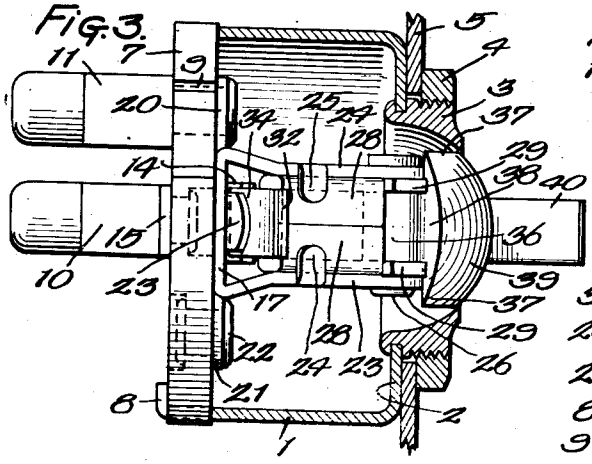


Fig. 4.

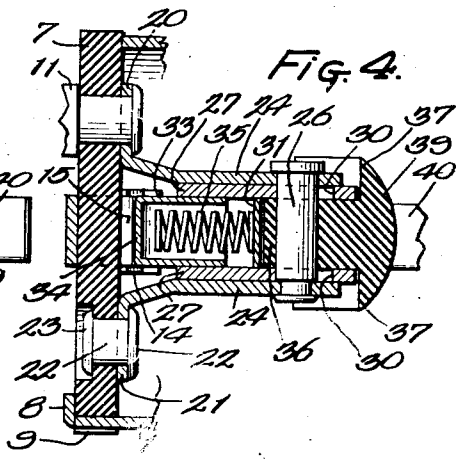


Fig. 5.

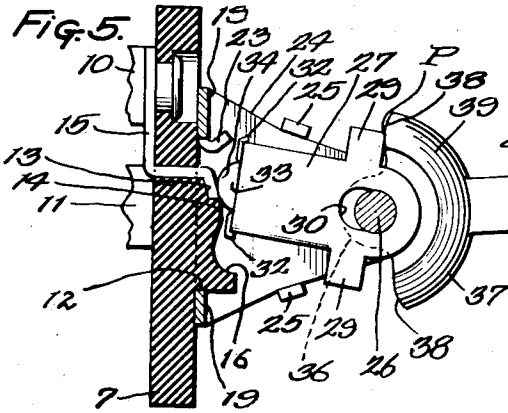
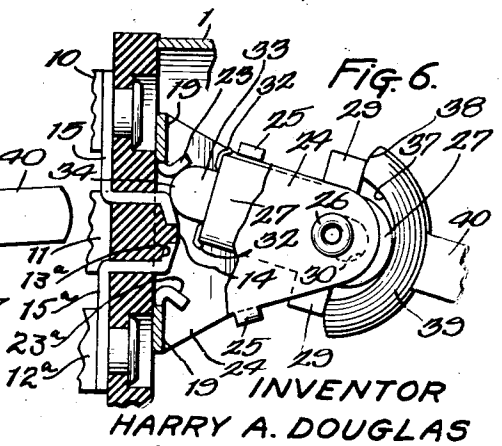


Fig. 6.



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2,095,175

ELECTRIC SWITCH CONSTRUCTION

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Application May 31, 1934, Serial No. 728,278
Renewed May 15, 1936

6 Claims. (Cl. 200—68)

This invention relates to improvements in electric switches and more particularly to a snap action switch of the toggle 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 or 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 1.

Figure 5 is a detail view in elevation illustrating the position of the circuit making and breaking mechanism just before one circuit is broken.

Figure 6 is a detail view similar to Figure 5 partly in section and partly in elevation, with parts broken away, of a modified form adapting this construction to a two way switch and illustrating the position of the circuit making and breaking mechanism upon the closing of the circuit.

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 clamped relation upon the back of the support 5. The interior surface 6 of the sleeve 3 is of spherical formation for a purpose hereinafter described.

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 an integral rectangular projection of insulating material upon its inner surface having sides 12 parallel to the radii passing through the terminals 10 and 11 with the edge adjacent terminal 10 joined to an upwardly extending angular surface 13 terminating in a central transverse portion 14. An electric contact 15 in the form of a metallic strip is connected to the 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 upon the inner side of the disc 7 with the upper surface of the strip terminating flush with the flat top of the central transverse projection 14. 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 of the disc 7, providing end portions 19, one of which extends over the countersunk expanded end of the terminal 10 and having the sides of the base 17 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 from the contact 15 and the opposite end portion 19 is in engagement with the central projection of the disc 7. The spaced apart end portion 19 is provided upon its inner side with 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 insulating projection.

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 caused to oscillate by a manually operable oscillating operator.

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 surface 14 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 plates 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 surface 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 adapted to pass under the lower extremities of the actuator flanges 28 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 and operator 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 is caused to oscillate by the manual movement of an oscillating operator. The manually oscillated operator is formed of insulating material preferably a phenolic condensate such as "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 beyond the actuator plate 27 on each side of the pivot and each side of said portion is provided with an annular outstanding flange 37, the inner surface of which is concentric with the pivot pin 26 and of a radius sufficient to cause the flanges 37 to clear the top of the actuator plates 27 when the lower bearing surface thereof is in engagement with the lower side of the pivot pin 26. The lateral extensions of the member 36 and flanges 37 thereon are terminated on each side of the pivot 26 in surfaces 38 curving slightly upward with the surfaces 38 of the flanges 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 upper sides of the portion 36 and flanges 37 are of spherical formation following the surface of a sphere concentric with the longitudinal center of the pivot pin 26 and extending above the sleeve 3, as indicated at 39, which surface has a sliding contact with the inner surface 6 of the said sleeve. An operating handle 40 for manual operation is formed integral with the portion 36 and projects from the surface 39 centrally thereof perpendicular to the plane of the surfaces 38 thereof.

Figures 1 and 2 illustrate the normal positions of the various parts of the switch when the operating handle 40 has been depressed, 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 and the circuit is completed from terminal 11 to the terminal 10 through the bracket, the actuator and current continuing nose 34 to contact strip 15, but also is completed by the nose 34 acting as a current continuing bridge from the stop 23 of the bracket to the angular

surface of the contact strip 15 connected to the terminal 10.

When the handle 40 is manually raised or lifted, it imparts a rotative movement to the operator 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. As the rotative movement of the operator continues, it imparts a rotative movement to the actuator 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 5, 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 40 at the point of contact P between the oscillating operator end 38, and the actuator arm 29. During this movement, the point of the 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 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 this 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 14 and to quickly extend the nose 34 to engage the stop 16 on the other end of the insulating projection and thereby quickly oscillate the nose to break engagement with the contact terminal 10.

From the above, it is seen that as soon as the handle 40 has rotated the oscillating operator sufficiently to shift the actuator from its 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 thereby break the circuit from terminal 11 to terminal 10. Upon depression of the handle 40 from the upper lifted or rotated 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 6. In this form the central insulating projection carrying the contact strip 15 from the terminal 10 is provided with a complementary oppositely disposed surface 13a upon which is mounted a contact strip 15a mounted upon the disc 7 and connected to a third terminal 10a in the same manner as the strip 15. The additional terminal 10a 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 terminal 10a 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 15a and is provided with an upwardly extending stop 23a bent back at an angle similar to the corresponding stop 23.

In this form, when the current continuing nose 34 is oscillated by the handle 40 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 15a to complete the circuit to the terminal 10a and then slides over said contact strip until it engages the stop 23a upon the end portion 19 of the metallic bracket, whereby upon manual operation of the handle 40 the respective circuits from the terminal 11 to the terminals 10 and 10a are each closed and opened alternately.

As shown and described the parts of this improved switching mechanism, excepting the manual operator and the contact carrying disc are all adapted to be formed of metal stampings 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 including a casing, a contact carrier mounted thereon, and switching mechanism mounted on the carrier within the casing including a plurality of spaced apart electric terminals mounted on the carrier, said carrier provided with an axial projection of insulating material having spaced apart oppositely disposed angular surfaces extending downwardly from the top thereof, contact strips having one end inset upon an angular surface with its upper surface terminating flush with the top of the projection and having its other end connected to one of the terminals, a metallic bracket in electrical engagement with another terminal surrounding said projection and spaced apart from said contacts with upstanding arms on each side of said projection, a circuit continuing bridge having a back and forth movement over the angular surfaces of said contacts, stops to limit said travel after making or breaking the circuit from one terminal to the other, said bridge carried in an actuator mounted for oscillation about a pivot mounted on said bracket arms, a manually operable oscillating operator mounted on the actuator pivot having means to engage and oscillate the actuator, said actuator having a sliding engagement with its pivot and sliding engagement with the bridge, means maintaining the actuator in engagement with its pivot and with said bridge in engagement with a contact, means extending through the casing to oscillate the operator to engage and slide the actuator bodily over its pivot and then rotate the actuator to travel in sliding engagement with the bridge, and means to shift

the axis of rotation of the actuator from its normal pivot to a pivotal point eccentric thereto and thereafter snap the bridge to make or break the circuit.

2. An electrical switch including a cup shaped casing, a contact carrier mounted upon the open end thereof, and switching mechanism mounted upon the carrier within the casing including a central projection of insulating material upon the carrier having spaced apart oppositely disposed angular surfaces extending downwardly from the top thereof, a plurality of spaced apart electric terminals mounted upon the carrier, a contact strip inset in an angular surface of the projection terminating at the top thereof and connected at the other end to one of the terminals, a metallic bracket surrounding the carrier projection, spaced apart from the contact on said projection and connected to another terminal, said bracket having upstanding arms on each side of said projection, a circuit continuing bridge adapted to wipe over said angular contact and surface of the carrier projection to close and open a circuit from the bracket terminal to the other terminal, an actuator resiliently carrying the bridge for oscillating the bridge over said projection including spaced apart plates mounted for oscillation upon a pivot between the arms of said bracket, a manually operable operator mounted upon the actuator pivot between the actuator plates and having a handle extending through the end closure of the casing, and means upon the operator to engage and oscillate the actuator upon back and forth movement of the handle to oscillate the bridge.

3. The structure of claim 1 wherein the said actuator has a sliding engagement with its pivot and sliding engagement with the bridge with means maintaining the actuator in engagement with its pivot and with said bridge in engagement with said projection, said handle extending through the casing adapted to oscillate the operator to engage and move the actuator over its pivot and rotate the actuator causing the bridge to travel in sliding engagement over the angular contact on the projection, and means to shift the axis of rotation of the actuator from its normal pivot to a pivotal point eccentric thereto and thereafter snap the bridge to break or make a circuit therethrough.

4. The structure of claim 2 wherein the bracket is provided with a stop to limit the travel of the bridge and maintain its engagement with a contact when so limited by a stop, and wherein the said projection is provided with a stop to limit the travel of the bridge in the opposite direction and maintain it out of engagement with a contact when so limited by the projection stop.

5. An electric switch, comprising: a movable contact constructed and arranged to move from one limiting position to another limiting position through a central position; a stationary member having a surface slidably engaged by said movable contact; a stationary contact fixedly mounted on said stationary member and having a surface forming part of said stationary member surface, that portion of said stationary member surface engaged by said movable contact when in its central position being of insulating material, said movable contact engaging said stationary contact when in one of said limiting positions; snap action means, for slidably moving said movable contact away from said one of its limiting positions; said snap action means including energy storing means and being so constructed and arranged that energy is first stored in said energy storing means and then, before said movable contact reaches said central position the stored energy is released to snap said movable contact off of said stationary contact onto said insulating portion.

6. An electric switch, comprising: a movable contact having a limiting position; a stationary member having a surface slidably engaged by said movable contact, said surface being inclined into the path of movement of said movable contact when said contact moves in a direction away from said limiting position; a stationary contact fixedly mounted on said member and having a surface forming part of said inclined surface, the continuing portion of said inclined surface being of insulating material, said movable contact engaging said stationary contact when in said limiting position; snap action means, for slidably moving said movable contact from said position up said inclined surface, so constructed and arranged that before said movable contact reaches the upper end of said stationary contact said movable contact is caused to automatically snap off of said stationary contact onto said insulating portion of said inclined surface.

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