

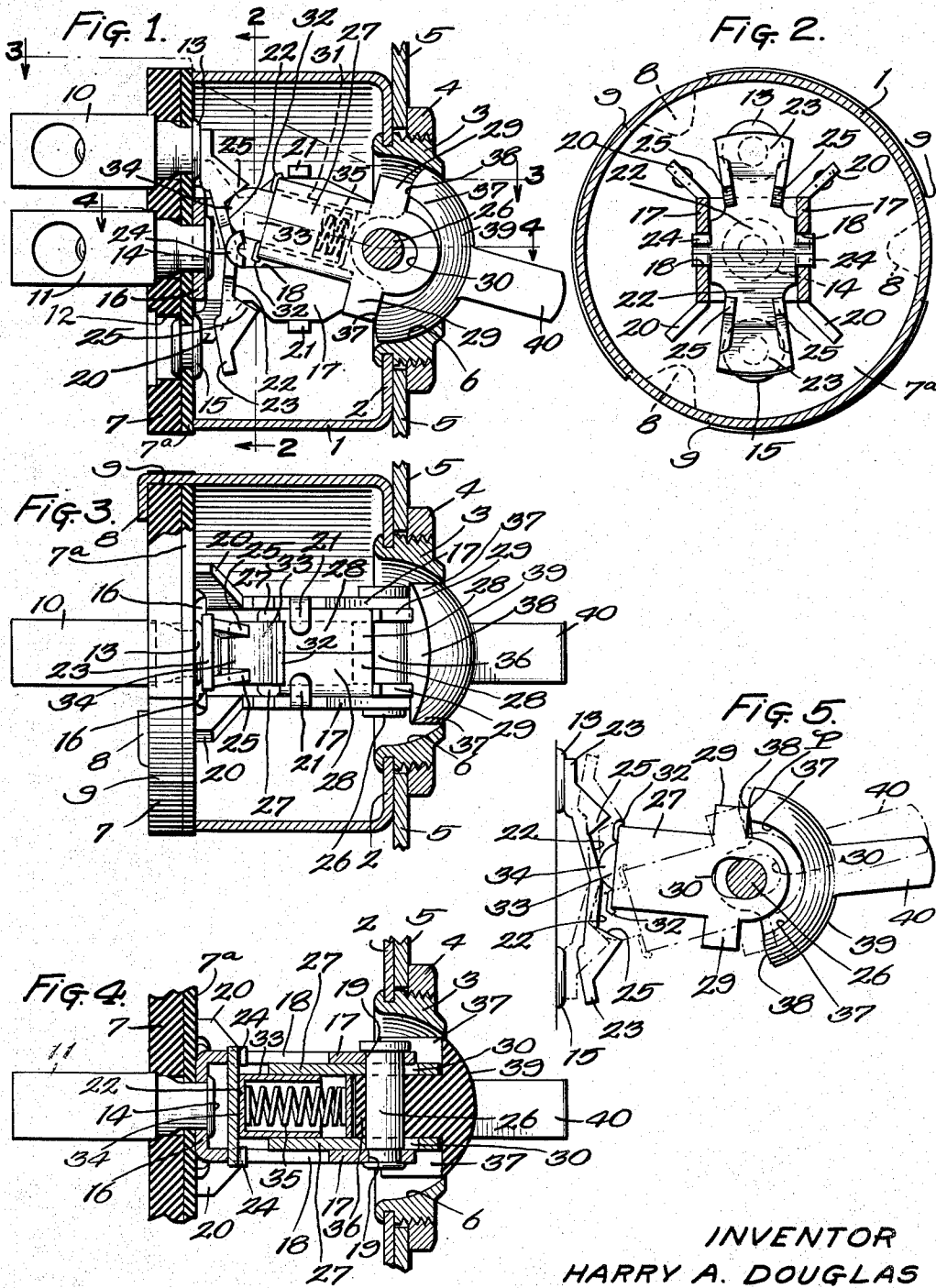
Oct. 5, 1937.

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2,095,174

ELECTRIC SWITCH

Original Filed May 31, 1934



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2,095,174

ELECTRIC SWITCH

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Application May 31, 1934, Serial No. 728,277
Renewed May 15, 1936

9 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 use may require.

With these and other objects in view, reference is made to the accompanying sheet of drawings which illustrates 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 in full lines the position of the circuit making and breaking mechanism just before the circuit is broken and in dot and dash lines the position assumed by the said parts upon the breaking of said 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 escutcheon plate of a wall switch or the instrument board of an automobile 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 they approach their extremities. When this type terminal is employed, it is desirable to provide a rectangular depression in the outer surface of the carrier disc 7 with a central bore extending through the disc to receive the cylindrical portion and adjacent rectangular parts of each terminal to prevent rotative movement of the terminal and to interpose an additional similar disc 7a of insulating material between the disc 7 and end of the casing 1 which is provided with registering circular apertures concentric with the bores in the disc 7 through which the reduced extremities of the terminals pass and the metal of the end is then expanded or riveted upon the interior of the disc 7a to hold the terminals in place and provide electric contacts 13 and 14.

The terminal 11 is mounted upon the disc 7 axially of the casing 1 and is passed through the discs 7 and 7a and through the base 16 of a U-shaped metallic bracket and the expanded end 14 thereof not only forms an electrical contact therewith but also secures the bracket to the contact carrying disc. Opposite sides of the base 16 are continued upwardly to form similar parallel arms 17 each of which is provided with an elongated longitudinal central slot 18 and a circular aperture 19 thereabove to mount a pivot pin hereinafter described. It is preferable to extend each side of each arm 17 adjacent the base to form angular feet 20 to engage the inner surface of the carrier disc to impart rigidity to the bracket and also to provide midway on each side of each arm an outstanding integral finger 21, the purpose of which will hereinafter be described.

A metallic current continuing bridge is mounted between the arms 17 of the bracket for oscillation about an axis cutting the axis of the casing 1 and parallel to the inner surface of the carrier 7. The current continuing bridge is preferably

formed from a flat strip of metal centrally struck up to form oppositely disposed similar angular surfaces 22 departing downwardly from its transverse center line terminating in flat feet 23 lying in angular planes. The terminal 10 is mounted upon the disc 7 by passing through the discs 7 and 7a at a sufficient distance from the axis thereof that the expanded end forming the contact 13 may be engaged by one of feet 23 of the bridge to form an electric connection therewith. The contact carrying discs 7 and 7a are preferably provided with a similar contact receiving aperture 12 diametrically opposite and at an equal distance from the axis thereof as the terminal 10 and to mount a double headed rivet in the aperture of the disc 7a having the metal 15 expanded upon the interior thereof of the same dimensions as the contacts 13 and 14 which may be engaged by the opposite foot 23 of the bridge to form a stop therefor. The metal on each side of the transverse center line of the bridge is extended outwardly and the sides of the extensions curved upwardly on the arcs of similar circles having their respective centers lying in the transverse center line of the upper surface coinciding with the meeting edge of the angular surfaces 22 to form trunnions 24 whereby the axis of oscillation of the bridge coincides with the meeting edge of said angular surfaces. Each side of the body of the bridge including a portion of each contact foot 23 and the contiguous angular surface 22 is struck up at right angles to the plane of the feet with each portion adjacent to the axis of oscillation provided with a flat surface departing from the body at a similar obtuse angle to the contiguous angular surface 22 to form similar stops 25, the purpose of which will be hereinafter described.

The trunnions 24 are adapted to be mounted in circular or semi-circular bearings concentric therewith at the bottom of the slots 18 in the arms 17 to support the axis of oscillation of the bridge half way between and at right angles to the line through the centers of the contact 13 and stop 15 and a sufficient distance thereabove so that when the bridge is oscillated about its axis one of the feet 23 thereon will alternately make and break an electrical connection with the contact 13 of the terminal 10.

The circuit continuing bridge is caused to oscillate by the cooperation of an oscillating actuator in conjunction with a manually oscillated operator. The actuator is mounted upon a pivot pin 26 mounted in the apertures 19 in the arms 17 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 17 of the supporting bracket and terminating short of the high point of the current continuing bridge with a portion of the opposite longitudinal sides struck inwardly 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 lower 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 21 of the bracket arms 17 are bent toward each other, as shown in Figure 3, to prevent the nose 34 from riding over the stops 25 of the bridge.

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 plates 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 the flanges 37 thereon are terminated on each side of the pivot 26 in surfaces 38 curving slightly upward 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, as shown in Figure 1. 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, 3 and 4 illustrate the normal position of the various parts of the switch when the operating handle 40 has been depressed, from which it is seen that the foot 23 of the circuit continuing bridge has engaged the contact 13 of the terminal 10, and is maintained in contact therewith by the tension of the spring 35 holding the nose 34 of the detent 33 in engagement with the stop 25 adjacent the closed contact which spring has bodily moved the actuator 27 to slide over the pivot pin 26 to bring the lower end of its bearing 30 in resilient engagement with the

under side of said pivot pin and the actuator arms 29 have contacted both stop surfaces 38 of the oscillating manual operator, and the circuit is completed from terminal 11 through the bracket, bridge trunnions and bridge and contact 13 to the terminal 10.

When the handle 40 is manually lifted it imparts a rotative motion to the operator about the pivot 26 and through contact of the engaged stop 38 with the adjacent actuator arm 29 bodily moves the actuator in the direction of the engaged stop 25 of the bridge until the upper end of the elongated 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 22 of the bridge towards its high point, as shown in full lines 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 bridge. During this 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 contact P moves in the direction of the angular surface 22 of the bridge so that as the line from point P to the engaging point of the nose 34 approaches a right angle to the surface 22, the friction of the nose thereagainst is minimized. The movement of the nose 34 toward the high point of the bridge increases the tension of the spring 35 so that just before the nose reaches the high point, the spring 35 bodily moves the actuator upwardly to bring the lower end of its elongated bearing 30 into engagement with the under side of the pin 26, 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 bridge, power is applied by the spring 35 at the lower end of the other arm of the bell crank lever causing it to rotate about point P as a fulcrum, the elongated bearing 30 allowing the actuator to slide upwardly about the fixed pivot 26. The movement imparted to the actuator 27 by the spring 35 causes the nose 34 to snap over the high point of the bridge and the spring 35 then quickly extends the nose 34 to engage the stop 25 on the other end of the bridge and thereby quickly oscillates the bridge to the other end of its travel as limited by the stop 15 and at the same time makes a quick break of the engagement with the contact 13 of the 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 stored up power in the spring 35 automatically completes the oscillation to snap the electric contacts out of engagement. Upon depression of the handle 40 from the upper lifted and rotated position just described, the action above described is reversed and the parts returned to the position shown in Figure 1 to complete the circuit.

From the illustrations upon the drawing and the construction and operation of the parts above described, it is obvious that this switching mech-

anism is readily adapted to a two circuit system by substituting a terminal similar to terminal 10 for the rivet stop 15 upon the contact carrier disc 7 whereby circuits from the terminal 11 will be closed and opened alternately to the terminal 10 and the terminal of contact 15. Such a construction may be advantageously employed where it is desirable, as in a lighting system, to energize alternately distinct sets of lamps.

As shown and described the parts of this improved switching mechanism excepting the manual operator and contact carrying discs 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.

I claim:

1. An electric switch including, a casing, a contact carrier mounted thereon, switching mechanism mounted on the carrier within the casing including a plurality of spaced apart contacts, a current continuing bridge pivotally mounted for oscillation and adapted to make and break alternately a circuit from one contact to another, an actuator mounted for oscillation about a pivot having a sliding engagement over its pivot in one direction and a sliding engagement with the bridge in another direction, an oscillating operator therefor pivotally mounted upon the actuator pivot and having a handle extending through the casing to oscillate the operator to directly engage and rotate the actuator about its pivot to slide the actuator over the bridge, and means to shift the axis of rotation of the actuator from its normal pivot to a pivotal point eccentric thereto at its engagement with the operator to bodily slide the actuator over its normal pivot and thereafter impart a snap movement to the bridge about its pivot to make or break an electric circuit there-through.

2. The structure of claim 1, wherein said last named means includes the provision of oppositely extending arms upon the actuator for engagement with the operator and resilient means carried upon the actuator to maintain its sliding engagement with the bridge and to impart its bodily movement over its pivot.

3. The structure of claim 1 wherein the actuator includes an elongated rectangular body having a longitudinally elongated bearing therein allowing a bodily movement of the actuator about its pivot, a reciprocable spring pressed detent mounted therein adapted to travel over the bridge, and the bridge provided with similar angular surfaces departing from its axis of oscillation adapted to be traveled over by the nose of the detent when the actuator is moved about its pivot and normally maintaining the lower end of the actuator bearing in engagement with the under side of the actuator pivot pin.

4. An electric switch including, a cup shaped casing, a contact carrier mounted upon the open end thereof, a switching mechanism mounted on the contact carrier including a plurality of spaced apart contacts, a metallic bracket electrically connected to one of said contacts, a current continuing bridge mounted for oscillation adapted alternately to establish circuits through the bracket to the other contacts, an actuator mounted for oscillation about a pivot upon the bracket above the bridge, a manually operable

oscillator of insulating material mounted upon the bracket having means to directly engage and oscillate the actuator, said actuator having a sliding engagement over its pivot in one direction and sliding engagement with the bridge in another direction, means maintaining the actuator in engagement with its pivot and with said bridge, said oscillator having a handle extending through the casing to oscillate the operator to directly engage and rotate the actuator about its pivot to slide over the bridge, and means to shift the axis of rotation of the actuator from its normal pivot to a pivotal point eccentric thereto when engaged by the operator to bodily slide the actuator over its normal pivot and thereafter to impart a snap movement to the bridge about its pivot to make or break a circuit therethrough.

5. An electric switch including, a cup-shaped casing having a central opening in the end closure, a contact carrier mounted on the open end thereof, a switching mechanism mounted upon the said carrier including a plurality of electric terminals, a U-shaped metallic bracket secured to one terminal, a current continuing bridge mounted for oscillation between the arms of said bracket and adapted alternately to make and break contact with another terminal an actuator for oscillating the bridge 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, and means upon the operator to directly engage and oscillate the actuator upon back and forth movement of the handle to oscillate the bridge.

6. The structure of claim 5 wherein each side of each actuator plate is provided with an outstanding arm and wherein each side of the operator above the actuator arms is extended beyond the actuator plates and said extensions provided with means when the operator is moved back and forth to engage the opposite actuator arms to oscillate the actuator, and wherein said last named means includes an annular flange on each side of the operator and a curved annular flange overhanging the said bracket on the other sides.

7. An electric switch, comprising: a pivot; a first member constructed and arranged to swing about said pivot from one limiting position to another limiting position; an operating handle member pivotally mounted on said pivot and having portions in direct engagement with said first member, so constructed and arranged that said handle, through the intermediation of said portions, is adapted to directly engage and positively move said first member out of either of its limiting positions; snap action means, including a single spring, so constructed and arranged that when said handle is moved a predetermined

amount said first member is automatically moved with a snap action; said snap action means being also so constructed and arranged that said single spring serves to normally maintain said first member in direct engagement with both of said handle portions when said first member is in either of its limiting positions thereby to definitely position said handle with respect to said first member.

8. An electric switch, comprising: actuated means constructed and arranged to swing from one limiting position to another limiting position through a central position; a pivoted operating handle member, having portions in direct engagement with said actuated means, so constructed and arranged that said handle member, through the intermediation of said portions, is adapted to directly engage and move said actuated means when said actuated means is in either of its limiting positions; energy storage means; auxiliary means, cooperating with said energy storage means, so constructed and arranged that when said handle is moved to move said actuated means, energy is first stored in said energy storing means and then, before said actuated means reaches said central position, the stored energy is released to throw said actuated means past said central position; said energy storing means being also so constructed and arranged that, in cooperation with said actuated means and said auxiliary means, it serves to normally maintain said actuated means in direct engagement with both of said handle portions when said actuated means is in either of its limiting positions thereby to definitely position said handle with respect to said actuated means.

9. An electric switch, comprising: a pivot; a first member constructed and arranged to swing about said pivot from one limiting position to another limiting position; a handle member; an operating member connected to and operable in unison with said handle member and pivotally mounted on said pivot and having portions in direct engagement with said first member, so constructed and arranged that said handle member, through the intermediation of said portions, is adapted to positively move said first member out of either of its limiting positions; snap action means, including a single spring, so constructed and arranged that when said handle member is moved from a normal position a predetermined amount in a direction to move said first member out of one of its limiting positions said first member is automatically moved with a snap action; said snap action means being also so constructed and arranged that said single spring serves to normally maintain said first member in positive engagement with both of said portions when said first member is in either of its limiting positions thereby to definitely position said handle member with respect to said first member.

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