Dec. 30, 1924. 1,521,432

J. F. CAVANAGH

ELECTRICAL SWITCH

Filed April 24, 1924

Fig. 1.

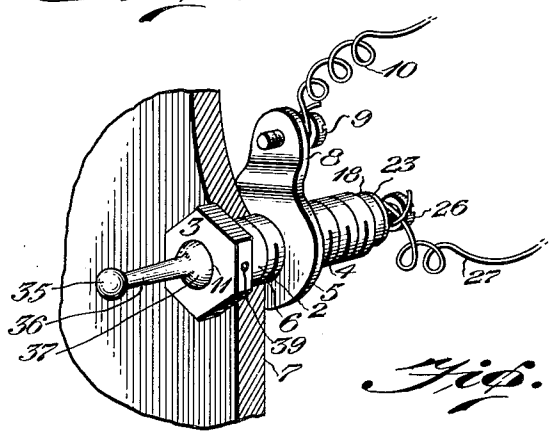


Fig. 5.

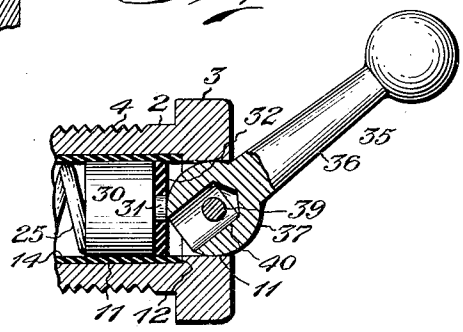
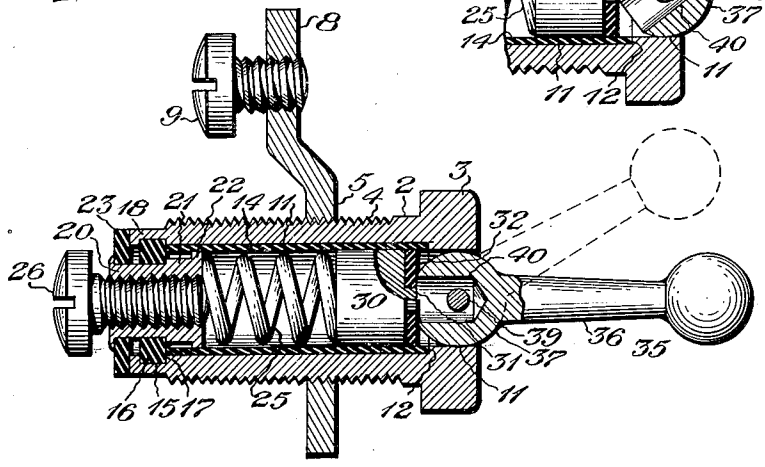


Fig. 2.



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JOHN F. CAVANAGH, OF PROVIDENCE, RHODE ISLAND.

ELECTRICAL SWITCH.

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To all whom it may concern:

Be it known that I, JOHN F. CAVANAGH, a citizen of the United States, residing at Providence, in the county of Providence, State of Rhode Island, have invented certain new and useful Improvements in Electrical Switches, of which the following is a specification.

This invention relates to electrical switches and consists in improvements in the construction and method of operation of the same.

A principal object of the improvement is to provide a simple, compact switch of the so-called "toggle" type adapted for various uses such as an ignition- or lighting-switch for automobiles or as a panel-switch for radio-apparatus.

Another object of the improvement is to provide a switch which may be attached to an instrument-board, panel or other support without requiring screws or bolts to hold it in place.

Another object of the improvement is to provide a switch having a minimum number of parts which may be produced at small cost and assembled with few operations so that the complete device is most economical to manufacture.

Another object of the improvement is to provide a switch in which the operating-mechanism is completely enclosed and the parts made proof against wear or deterioration, whereby to insure greater durability and also to render the switch less liable to derangement or getting out of order.

Further objects of the improvement are set forth in the following specification which describes a preferred embodiment of the invention as illustrated in the accompanying drawings. In the drawings:

Fig. 1 is a view of the switch in perspective showing it as attached to a panel;

Fig. 2 is an enlarged, longitudinal sectional view of the switch taken in the vertical plane of its axis; and

Fig. 3 is a similar fragmentary, sectional view illustrating the contacts of the switch in "closed" position.

Referring to the drawings, the present improved switch comprises essentially a main casing consisting in a tubular barrel or sleeve 2 adapted for insertion through an opening in a panel, board or other support and having exterior means for clamping it thereto. As herein illustrated the barrel or sleeve 2 is provided at one end with a head or flange 3, preferably constructed in the form of a hexagonal nut, and with exterior screw-threads 4 on its body for engagement with a clamping plate or washer 5. Referring to Fig. 1, the barrel or sleeve 2 is inserted through a suitable hole 6 drilled in the panel 7 or other support with its head 3 abutting the face thereof. The plate or washer 5 is then screwed onto the barrel or sleeve 2, and by turning the latter by means of its nut or head 3 the clamping-washer 5 will be bound tightly against the rear of the panel to fasten the switch securely thereto. The washer or plate 5 may be provided with an offset arm or lug 8 having a threaded hole for receiving a binding-screw 9, to which is attached one of the terminal wires 10 of the circuit in which the switch is used.

The barrel 2 is preferably of cylindrical shape with a longitudinal bore 11 extending throughout its length and reduced slightly in diameter at its outer end to form an interior shoulder 12. A relatively thin sleeve 14 of insulating-material, such as a rolled strip of fiber or the like, is inserted in the bore 11 with its forward end abutting the shoulder 12 as shown in Fig. 2.

At the rearward end of the barrel 2 the bore 11 is slightly enlarged to adapt it to receive a fiber washer 16 which abuts a shoulder 17 formed by the enlarged counterbore 15. The outer circumference of the barrel 2 is turned down or reduced in diameter at this end to form a relatively thin neck 18, which is "spun" or flanged inwardly to overlap the rim of the washer 16 to hold it in position at the end of the barrel abutting the shoulder 17 in the bore 15.

A metal plug 20 projecting through the hole in the fiber washer 16 is formed with an enlarged head 21 received within the main bore 11 of the barrel 2. Preferably, the head 21 is of less diameter than the interior of the insulating-sleeve 14 and is formed at its end with a peripheral flange or fin 22. The flange 22 at the inner end of the plug 20 fills the space within the interior of the insulating-sleeve 14 and serves as a rest or abutment for the end of a helical spring 25 arranged therein for a purpose as later explained.

The outer reduced end of the plug 20 projects through a hole in a second insulating-washer 23 with its end spun over the edge

thereof to hold the washer in place against the inturned portion of the neck 18 at the end of the barrel 2. Through this simple construction the metal plug 20 is fastened firmly in place at the end of the bore 11 of the barrel 2 and effectually insulated therefrom to adapt it to form one terminal of the circuit in which the switch is used. A binding-screw 26 is threaded into a tapped hole in the plug 20 to provide a means for attaching a wire 27 or other conductor thereto as shown in Fig. 1.

At the opposite or outer end of the barrel 2 is a metal plug or plunger 30 fitted to slide freely within the bore of the sleeve 14, and insulated thereby from the metal of the barrel. The plunger 30 is formed at its outer end with an axially-projecting stud or teat 31 which serves as a contact-point for the switch-arm or lever 35. Surrounding the contact-stud 31 is a flat washer 32 of fiber or other suitable insulating-material which entirely covers the outer end of the plunger 30 with the exception of the end of the contact-stud.

The switch-lever 35 may be of any suitable form and, as herein shown, consists of a tapered rod or arm 36 having an integral ball at either end. The ball 37 at the butt end of the arm 36 is of a diameter to adapt it to fit the reduced outer end of the bore 11 in the barrel 2 to allow it to turn freely therein. A cross-pin 39 driven through suitable holes in the sides of the enlarged head or nut 3 on the barrel 2 passes through an axial hole in the ball 37 to hold the latter in place in the bore 11, while also serving as a pivot for the lever 35 to adapt the latter to rock vertically up and down or back and forth horizontally in accordance with the positioning of the switch. The ball 37 is truncated and recessed by drilling it with a hole 40 of sufficient diameter to adapt it to surround the contact-projection or stud 31 at the end of the plunger 30 without contact therewith when the lever 35 is alined with the axis of the barrel 2 as illustrated by full lines in Fig. 2. The drilling or recessing of the enlarged butt end or ball 37 of the lever 35 with the opening 40 provides a relatively flat rim or seat on this side of the ball which, when the plunger 30 is urged outwardly by its spring 25, bears against the face of the insulating-washer 32 and tends to hold the switch-lever in perpendicular relation. With the lever 35 in this position the switch is "open," the butt end or ball 37 of the lever being insulated from the plunger 30 by the washer 32 and the contact-stud 31 being clear of the rim of the opening 40 in the ball. When the lever 35 is rocked on its pivot 39 to tilt it into inclined position, as illustrated in Fig. 3, the recess 40 will be displaced to one side and the solid portion of the ball 37 will be carried into engagement with the stud 31 to close the contacts of the switch in the manner as hereinafter more fully explained, the method of operation of the complete device being as follows:

With the switch installed in the manner as previously described one conductor or wire 10 of the electrical circuit is fastened to the binding-screw 9 and is thus electrically connected to the switch-lever 35 through the washer 5 and barrel 2. The opposite wire 27 of the circuit is connected to the plug 20 by means of the binding-screw 26, the plug being insulated from the barrel 2 by the fiber lining-sleeve 14 and washers 16 and 23, but electrically connected to the plunger 30 through the helical spring 25. In this way the lever 35 forms one terminal of the circuit and the plunger 30 the other terminal, the ball 37 on the lever and the stud 31 on the plunger providing the contact-points for closing the circuit. If desired the switch lever 35 may be enameled or otherwise covered with insulation, or the finger portion of the lever may be constructed of fiber, bakelite, vulcanized rubber or the like with a metal ball-end attached thereto.

With the lever 35 in the position illustrated in Fig. 2, the opening or bore 40 in the butt end of the lever prevents its contact with the stud 31 on the plunger 30 as before explained, and the pressure of the plunger normally maintains the lever in this relation with the switch open. To close the switch a slight pressure is exerted on the lever 35 to rock it on its pivot 39, the plunger 30 being thereby forced back slightly to compress the spring 25 and the solid portion of the ball 37 being thus brought into contact with the stud 31 as shown in Fig. 3. The lever 35 will then be held in this position by the frictional pressure of the plunger on the side of the ball 37 under the action of the spring 25 until it is thrown back into open position again. With the switch closed the current flows from the wire 10 through the washer 5, barrel 2 and lever 35, and thence through plunger 30, spring 25, plug 20 to the wire 27 constituting the opposite lead of the circuit. The switch-lever or handle 35 snaps back and forth to open and close the contacts under a light pressure, while being frictionally maintained in "on" and "off" position against accidental movement.

It will be observed that my improvement provides a particularly simple, compact and efficient electrical switch having its operating-mechanism entirely enclosed and made proof against deterioration from wear or getting out of order through derangement of its parts. The peculiar construction of the contact-elements of the switch provides for a "wiping" engagement therebetween,

thereby insuring a positive electrical connection and also tending to maintain the contacts clean and bright. The elements of the switch are few in number and adapted for economical production and assembling with very little labor, whereby the complete device may be manufactured at a relatively low cost. In addition, the switch is attractive in appearance and capable of being applied to a panel or other support by simply inserting its barrel or casing through an opening therein, without requiring screws, bolts or other separate fastening-means for holding it in place.

While I have herein shown and described a preferred form of the device as illustrative of the improvement, it is to be understood that various modifications may be made in the structure and arrangement of its parts without departing from the spirit or scope of the invention.

Therefore, without limiting myself in this respect, I claim:

1. An electrical switch comprising a casing, a yieldable contact-element in said casing having its contact face protected by insulating-material with the exception of a relatively small area thereon, and a lever having a recessed portion bearing against the insulated face of the contact-element with its recess adapted to surround the contact area thereof to prevent electrical connection therebetween, said lever adapted to be moved into position to displace its recess to engage its solid portion with the exposed area of the contact-element.

2. An electrical switch comprising a yieldable contact-member having a bearing face with a contact-projection thereon, a covering of insulating-material on the face of the contact-member surrounding the contact-projection, and a lever having a recessed portion adapted to bear against the insulated face of the contact-member with the contact-projection enclosed within the recess to prevent electrical connection therebetween, said lever adapted to be shifted in position to displace its recess and wipe its solid portion across the contact-projection to close the circuit through the switch.

3. In an electrical switch, the combination of a yieldable contact-element having a relatively flat face with a contact-projection thereon, a covering of insulating-material overlying the face of the contact-element surrounding the contact-projection, and a lever having a truncated enlargement at its end against which the contact-element bears with a recess therein for receiving the contact-projection without contact therewith, its recess whereby its solid portion will make said lever adapted to be shifted to displace contact with the contact-projection to close the circuit through the switch.

4. In an electrical switch, the combination of a contact-element having a bearing-face provided with a central contact area surrounded by insulating-material, a switch-lever having an enlarged recessed end adapted to bear against the contact-element with the contact area thereof enclosed within its recess to prevent electrical contact between said element and the lever, and resilient means for urging the contact-element against the end of the lever to normally hold the latter in certain relation therewith while permitting said lever to be rocked to displace its recess whereby its solid portion will make contact with the exposed area of the contact-element.

5. In an electrical switch, the combination of a tubular barrel, a contact-plunger slidable in said barrel and formed with a restricted contact area surrounded by insulating-material, a lever having a truncated recessed end adapted to bear against the insulating-material on the contact-plunger with its recess surrounding the contact area thereof, and a spring in the barrel acting against the contact-plunger to cause the latter to frictionally engage the truncated end of the lever to maintain the latter in position with the contact points disengaged while allowing the lever to be shifted to displace the recess to bring its solid portion into engagement with the contact area of the plunger.

6. In an electrical switch, the combination of a tubular barrel, a lever pivoted in the opening at one end of the barrel and provided with a truncated end having a recess therein, a metal plunger slidable in the barrel and formed with a contact-stud projecting from its outer end, an insulating washer overlying the end of the plunger surrounding the contact-stud, and a spring in the barrel acting against the plunger to urge the latter forward with its washer bearing against the rim of the recess in the truncated end of the lever while permitting the lever to be rocked to engage its solid portion with the contact-stud on the plunger.

7. In an electrical switch, the combination of a barrel having an axial bore, a lining of insultating-material in said bore, a lever pivoted in the bore at the outer end of the barrel and provided with a truncated ball-end having a circular opening therein, a plunger slidable in the bore of the barrel and provided with a contact-projection on its outer end of a diameter less than the diameter of the opening in the lever, a washer of insulating-material overlying the end of the plunger surrounding its contact-stud to adapt it to bear against the rim of the opening in the ball of the lever, a spring in the bore of the barrel acting to press the plunger against the end of the lever, and means for connecting the lever and contact-plunger to the opposite ends of an electrical circuit.

8. In an electrical switch, the combination of a tubular barrel having an axial bore, a lining of insulating-material in said bore, a plug at one end of the bore insulated from the barrel and forming one terminal of the electrical circuit, a plunger at the opposite end of the bore having a central contact-projection, a washer of insulating-material overlying the end of the plunger surrounding the contact-projection, and a lever pivoted at the end of the bore in the barrel and provided with a spherical enlargement formed with a recess having its rim adapted to bear against the washer on the plunger, and a spring for pressing the plunger against the recessed end of the lever to maintain the latter in axial alinement with the plunger while adapting it to be rocked to wipe the solid portion of its spherical end across the contact-projection on the plunger.

9. In an electrical switch, the combination of a tubular barrel having screw-threads on its exterior and an enlarged head at one end, a washer adapted to screw on to the barrel to secure it in position projecting through a panel with its head abutting the face thereof, a plunger slidable in the bore of the barrel and formed with a central contact-projection, a washer of insulating-material overlying the end of the plunger surrounding its contact-projection, a lever pivoted at the end of the barrel and provided with a spherical enlargement at its end having a recess therein forming a truncated portion adapted to bear against the washer on the end of the plunger, and a spring in the bore of the barrel for pressing the plunger against the truncated end of the lever to normally hold the latter in axial alinement with the plunger while permitting it to be swung into position to bring the solid portion of its end into engagement with the contact projection.

10. In an electrical switch, the combination of a tubular barrel having a head at one end and screw-threads on its exterior, a washer adapted to be screwed on to the barrel to secure the latter in an opening in a panel or other support with its head abutting the face thereof, a binding-screw in said washer for attaching an electrical conductor, a plug held in the bore of the barrel and insulated therefrom, a binding-screw in said plug for attaching opposite conductor, a plunger slidable in the opposite end of the barrel and provided with a contact-projection at its center, said plunger insulated from the barrel and having its forward end covered with insulating-material surrounding the contact-projection, a lever pivoted at the end of the barrel and provided with a truncated spherical enlargement adapted to bear against the insulated end of the plunger and formed with a recess surrounding the contact-stud, and a spring acting between the plug and the plunger to urge the latter outwardly to cause it to bear against the spherical end of the lever to frictionally hold it in adjusted relation while allowing it to be rocked into "on" and "off" position.

11. In an electrical switch, the combination of a tubular barrel, a lining of insulating-material in the bore of the barrel, a metal plug at one end of the bore, an insulating-washer surrounding the plug and secured in the end of the bore of the barrel to hold the plug in place, a lever pivoted at the opposite end of the bore of the barrel and provided with a truncated spherical end having a circular recess, a plunger slidable in the bore of the barrel and formed with a stud projecting from its end within the confines of the recess in the lever, a washer of insulating-material overlying the end of the plunger surrounding the contact-stud to normally prevent contact between the lever and the plunger, and a spring in the bore of the barrel acting on the plunger to press it against the truncated spherical end of the lever.

In testimony whereof I affix my signature.

JOHN F. CAVANAGH.