

Nov. 13, 1923.

1,474,013

R. B. BENJAMIN

ELECTRIC SWITCH

Filed Sept. 13, 1918

2 Sheets-Sheet 1

Fig. 1.

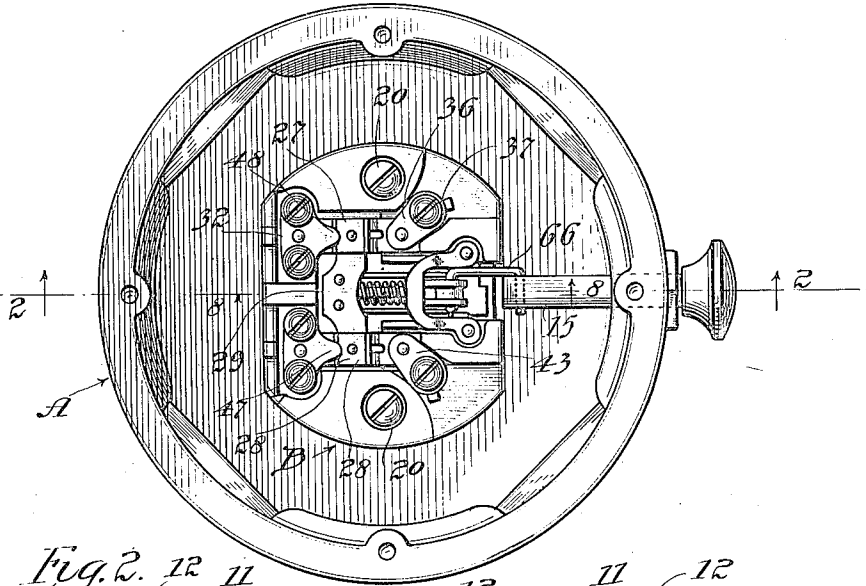


Fig. 2.

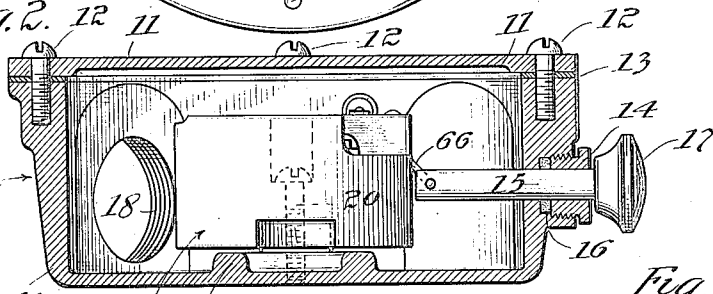


Fig. 5.

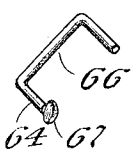


Fig. 4.

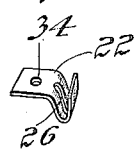


Fig. 3.

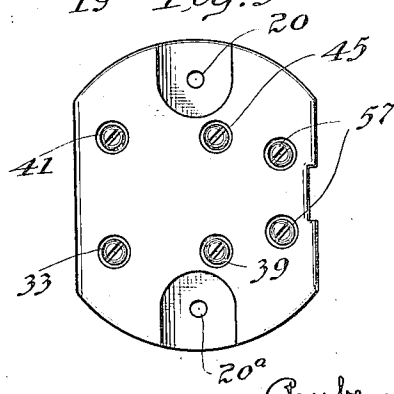
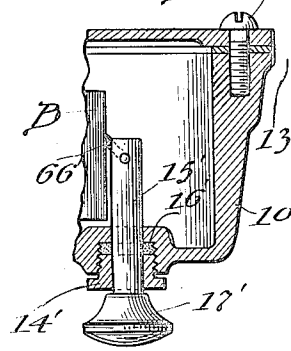


Fig. 6.



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2 Sheets-Sheet 2

Fig. 7.

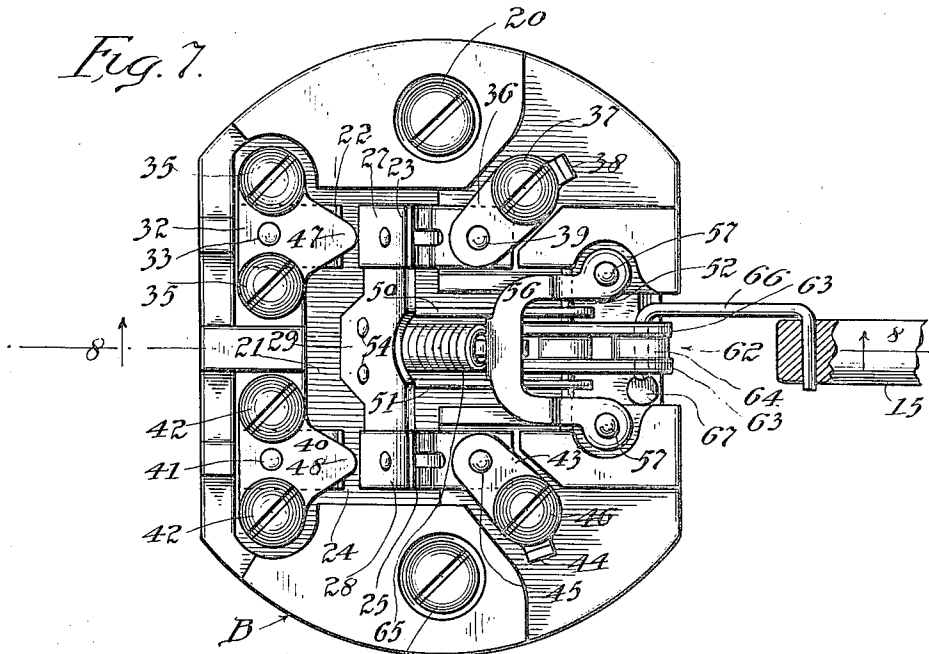


Fig. 8.

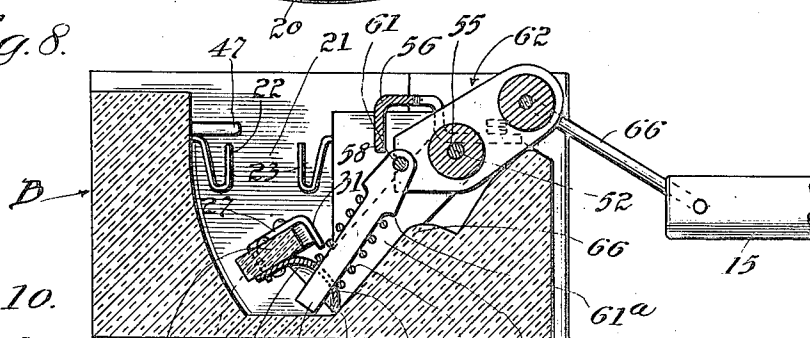


Fig. 10.

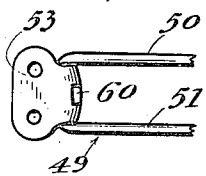
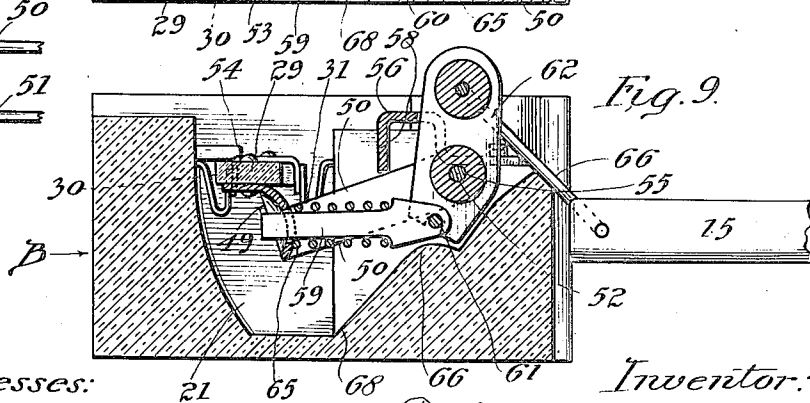


Fig. 9.



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UNITED STATES PATENT OFFICE.

REUBEN B. BENJAMIN, OF CHICAGO, ILLINOIS, ASSIGNOR TO BENJAMIN ELECTRIC MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

ELECTRIC SWITCH.

Application filed September 13, 1918. Serial No. 253,882.

To all whom it may concern:

Be it known that I, REUBEN B. BENJAMIN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Electric Switches, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

The present invention relates to electric switches of the snap action type and includes (1) novel mechanism for applying the actuating force through an enclosing weather-proof casing, (2) a novel arrangement of the switch contacts and binding terminals, (3) the provision of means for applying a prying action to the movable contact before subjecting it to the snap action, (4) the use of binding terminals which serve as stops for the movable switch element, and (5) certain details of construction and arrangements of of parts which will be more readily understood upon referring to the following detailed description taken in connection with the accompanying drawing which illustrates the preferred embodiment of my invention.

Referring to the drawing,

Fig. 1 is a plan view of a switch and enclosing casing constructed in accordance with my invention, the cover of the casing being removed to show the switch within;

Fig. 2 is a vertical section taken on a plane indicated by line 2—2 of Fig. 1, the switch supports and other parts being shown in full.

Fig. 3 is a bottom plan view of an insulating block which forms the support for the switch parts;

Fig. 4 is a perspective view of one of the fixed switch contacts;

Fig. 5 is a perspective view of the link which connects the manual operating member with an actuating member of the switch actuating mechanism;

Fig. 6 is a partial sectional view similar to a portion of Fig. 2 illustrating a modification in which the manual operating member is in a different location;

Fig. 7 is a plan view of the insulating support and the switch parts mounted upon it;

Fig. 8 is a central vertical section of the same, taken on a plane indicated by line 8—8 of Fig. 7, showing the parts in the open position of the switch;

Fig. 9 is a similar view showing the parts in the closed position of the switch; and

Fig. 10 is a detail view of a portion of the movable contact member. Throughout these views like characters refer to like parts.

Referring to the drawing in detail, "A" designates the enclosing casing of the switch, which may be a junction box, outlet box, or other enclosing instrumentality. The particular form of casing shown includes the cup-shaped portion 10 which is closed by a lid or cover 11 in the form shown. These portions are circular and the cover 11 is secured to the cup 10 by a plurality of screws 12 which pass through openings in the cover into engagement with threaded openings tapped into the cup 10. A gasket 13 of rubber or other suitable water-proof material is interposed between cup 10 and the lid or cover 11. In the form of the invention illustrated in Fig. 2, the gland 14 is provided at one point in the periphery of the cup for the passage of the operating member 15 which is capable of a sliding to and fro movement while the interior of the casing is kept dry by reason of the presence of the packing 16 of the gland 14. The button or head 17 on the member 15 enables it to be grasped between the thumb and finger to be pulled outward or pushed inward. In the modified form, shown in Fig. 6, the same parts are present but pass through the bottom of the cup 10, as illustrated. In this view the parts are designated by the same reference characters, primed. The cup portion 10 of the casing A is provided with a threaded opening 18 for the purpose of connecting a conduit to it.

The various switch parts are mounted upon a support or base B which is located within the casing and rests upon the annular rib 19 formed upon the bottom of the cup. The support or base B is composed of any suitable insulating material, preferably a durable insulating compound. It is secured in the cup 10 of the casing by means of two securing screws 20 which extend through openings 20^a in support B into threaded engagement with openings in the portion 10 of the casing. Obviously, the support B might be secured in any other suitable way. The support B is provided with a central recess 21 in which the switch parts are located. These switch parts include four relatively fixed contacts 22, 23, 110

24 and 25 which have the shape illustrated in Fig. 4 where the contact 22 is shown. These contacts are bent downward and back upon themselves so as to make the yielding contact surface substantially vertical, as the parts are viewed in the drawing. Each of these yielding brush contacts is provided with a slot, such as the slot 26 of the contact 22, which weakens its resistance and causes it to yield more readily to the pressure of the movable contact which engages it. The arrangement is such that contacts 22 and 23 may be electrically connected through the agency of bridging contact 27, and contacts 24 and 25 may be similarly connected through the agency of bridging contact 28. These bridging contacts are secured to an elongated cross-head 29, of insulating material. As this cross-head moves upward, the bridging contacts 27 and 28 are forced between the fixed contacts with a wedging action which provides a good electrical connection. To further increase the efficiency of the electrical connection, the bridge contacts 27 and 28 are bent down on opposite sides of the insulating cross-head 29, as indicated in the case of contact 27 by the portions 30 and 31, shown more particularly in Figs. 8 and 9.

Each of the fixed contacts rests against a flat face upon the support B, and a terminal plate bears directly against the upper face of the contact. Thus in the case of contact 22, we find the contact in engagement with the terminal plate 32. The screw 33, extending through an opening in the support B and through an opening 34 in contact 22, passes into engagement with a threaded opening in plate 32, and when screwed home securely holds the contact 22 and plate 32 in position upon the support while at the same time, bringing the two into good electrical engagement. The plate 32 is provided with a plurality of binding screws 35 which engage threaded openings in the plate 32 and pass down into suitable openings in the support B. The purpose of these screws is, of course, to secure the conductors in place and to put them in good electrical connection with the terminal plate. In the case of contact 23, the terminal plate 36 is somewhat differently shaped as it is provided with but a single binding screw 37. This plate is also provided with an upturned lip 38 for convenience in holding the wire or other conductor in position when screwing down the screw 37. In this instance, the screw 39, serves to mechanically secure the parts together, and at the same time, provides good electrical engagement between the contact 23 and the terminal plate 36. The fixed contact 24 has a terminal plate 40, holding screw 41 and binding screws 42, which are the same in construction and arrangement

as the corresponding parts associated with contacts 32. Likewise, contact 35 has a terminal plate 43, lip 44, holding screw 45, and binding screw 46, which are similar in arrangement and construction to the corresponding parts associated with contact 23. Plates 32 and 40 have over-hanging portions 47 and 48 respectively which serve as stops to limit the upward or closing movement of the movable bridging contacts 27 and 28, as the latter are carried upward by cross-head 29.

The movable contact-carrying element of the switch includes not only the insulating cross-head 29, but also a U-shaped member 49, whose arms 50 and 51 are mounted on the transverse pivot pin 52 on which the contact-carrying element oscillates. The portion of the member 49 that is adjacent to the cross-head 29 is shaped as illustrated more particularly in Figs. 9 and 10. This portion, designated 53, is provided with suitable openings through which it is riveted to the cross-head 29 by rivets 54. The pivot pin 52 rests in depressions 55 formed in the support B. An irregular frame 56 secured to the support B by screws 57, extends over the pivot pin 52 so as to hold it securely in place and the central portion of the frame 56 extends downward to form a stop 58 for an intermediate spring carrying member 59, which is guided at one end through a slot 60 in the portion 53 of the member 49 and is pivoted at 61 to an actuating member 62, which likewise oscillates on the pivot pin 52. The actuating member 62 is made up of parallel pieces 63, of insulating material suitably spaced at one end by an insulating washer 64 and at the other end by the head of the intermediate member 59. It will be noted that pivot 61 which connects the members 59 and 62 is eccentric to the pivot 52. These portions cooperate with the coiled compression spring 65 to give the movable element of the switch a snap action. The spring 65 preferably encloses the shank of the intermediate member 59 and abuts at one end against a shoulder 61^a formed on said member and at the other end against the portion 53 of the member 49 forming part of the movable contact carrying member of the switch. As previously indicated, the stop 58 is positioned so as to engage the intermediate member 59 at a certain point in the latter's movement. Likewise, a nub or projection 66 upon the support B engages the opposite side of said intermediate member at another point in the latter's movement. These stops 58 and 66 engage the member 59, one in its movement in one direction and the other in its movement in the opposite direction, just before the snap action of the switch takes place. Thus if the portions be considered as viewed in Fig. 8, if the actuating member 62 be moved by the

link 66 toward the left, then the intermediate member will be forced through opening 60 and the spring 50 will become slightly compressed. This action will ordinarily continue until the pivot 61 has passed an imaginary plane through pivot 52 and the center of the slot 60. When said critical point has been reached the spring will suddenly expand and cause the movable element of the switch to fly upward with a snap movement. In the present case, however, the member 59 engages the stop 66 before the pivot 61 reaches this imaginary plane. As soon as said engagement with stop 66 takes place, the further movement of member 62 in the same direction causes the intermediate member 59 to act as a lever upon the stop 66 as a fulcrum, thereby forcing the lower end of the member 59, and consequently the movable contact carrying member, upward. This will continue until the pivot 61 passes the imaginary plane and then the snap action, resulting from the release of the compressed spring, will follow. Thus the movement of the actuating member 62 results in producing two actions, first, a prying action and second, a snap action, the one following the other in the order named. In the same way a movement of actuating member 62 to the right, as the parts are viewed in Fig. 9, will cause a compression of the spring 50, then an engagement of member 59 with stop 58, thereby producing a prying action, and finally the passage of the pivot 61 beyond the critical point, thereby producing the snap action. It will be clear that this prying action takes place upon the movement of the movable switch element in either direction. Obviously, the action might be limited to the movement of the movable switch element in one direction only. The advantage of this prying action is to effectively separate the contacts. It is of particular value where the switch has been left standing for a long time with the parts in one position, in which case the contacts might corrode and thus cause the switch to stick. The prying action enables extra force to be applied to pry the contacts loose before the spring is acted upon to bring about the desired snap action.

The link 66 which connects the manually operated member 15 with the actuating member 62 may be of any suitable construction. In the present instance, it is a simple wire bent into angular formation near its ends and the end near the member 62 is flattened out to form a head 67 as illustrated. This link may be connected to the member 15 which moves in a direction parallel to the cover 11, or, as in the construction illustrated in Fig. 61, it may be connected to a member which moves in a direction at right angles to the cover. It will be seen that the upward throw of the cross-head 29 is limited

by stops 47 and 48 upon the terminal plates 32 and 40 respectively. The throw in the opposite direction may be limited by a portion of the wall of the recess 21, as for example the portion indicated in 68 in Figs. 8 and 9. The provision of a plurality of binding screws for each of the binding plates 32 and 40 increases the uses to which the switch may be put.

With the leading in wires attached to binding screws 37 and 46 two branch circuits controlled by the same switch may be secured by attaching two leading out wires to each of the plates 32 and 40. By attaching the leading in wires to the plates 32 and 40 and one pair of leading out wires to binding screws 37 and 46 a switch-controlled circuit is obtained and also provision for leading out from the same device a branch circuit which is not switch controlled at this point.

Although I have shown a specific embodiment of my invention, yet it will be understood that many alterations may be made in the details of construction without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an electric switch, the combination with a pivoted contact carrying member, of a concentrically pivoted actuating member having a to and fro movement, an intermediate member having pivotal connection with said actuating member and sliding connection with said contact carrying member, said pivotal connection with said actuating member being eccentric to the pivotal connection of said actuating member, a compression spring acting between said intermediate member and contact carrying member, and stops for engaging said intermediate member as said actuating member nears the limit of its movement in each direction whereby said intermediate member acts as a lever on each stop as a fulcrum to shift said contact carrying member from its limiting position.

2. In an electric switch, the combination of an oscillating contact-carrying member, a pivotally supported oscillating actuating member, an intermediate member having a sliding connection with said contact carrying member and a pivotal connection with said actuating member eccentric to the axis of the pivotal support of said actuating member, a spring acting between said members to give a snap action when a critical point is reached in their movement, and stops for engaging said intermediate member prior to reaching said critical point whereby said contact-carrying member is subjected to a prying action prior to the beginning of the snap action movement.

3. An electric switch comprising a support, fixed and movable contacts mounted on said support, an actuating member for said movable contact, a pivot for said member resting in depressions in said support, means for accumulating energy resulting from the movement of said actuating member and suddenly releasing the accumulated energy to give said movable contact a snap movement, and a frame secured to said support having its extremities overlying said depressions to hold the pivot in place and having its intermediate portion positioned so as to engage said means to bring about a prying action on said movable contact prior to the beginning of said snap action.

4. An electric switch comprising a support, fixed and movable contacts mounted on said support, an actuating member, means for transmitting energy from said member to said movable contact, a pivot for said member resting in depressions in said support, and a frame overlying said pivot in said depressions and serving as a stop for said transmitting means.

5. A switch construction comprising a switch blade oscillatable back and forth, a contact co-operating therewith, an actuating member shiftable back and forth, transmission means between said actuating member and switch blade, comprising a spring shiftable back and forth past the dead center, a spring shifting link and an abutment for exerting pressure on said link to positively actuate said switch blade.

6. A switch construction comprising a switch blade oscillatable back and forth, a contact co-operating therewith, an actuating member shiftable back and forth, transmission means between said actuating member and switch blade, comprising a spring shiftable back and forth past the dead center, a spring shifting link and an abutment for exerting pressure on said link to positively free said switch blade from engagement with said contact.

In witness whereof, I have hereunto subscribed my name.

REUBEN B. BENJAMIN.