

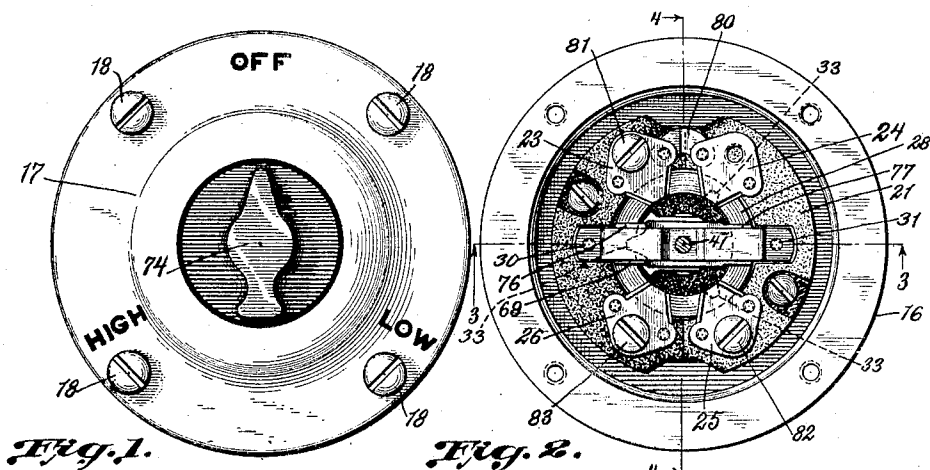
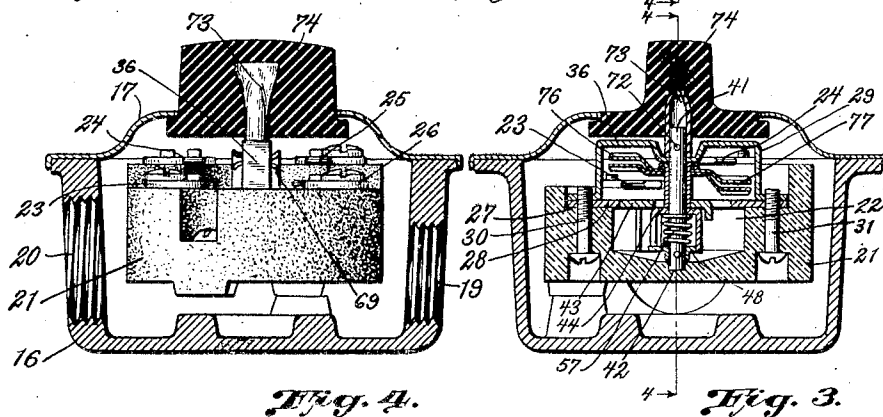
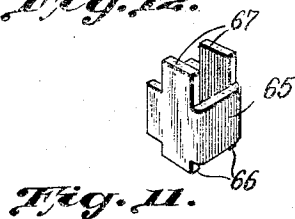
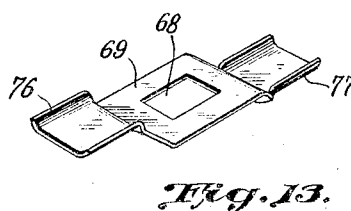
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Feb. 6, 1923.

1,444,055

R. B. BENJAMIN.
ELECTRIC SWITCH.
FILED AUG. 18, 1919.

2 SHEETS-SHEET 1



Inventor:

Reuben B. Benjamin

By
Jones, Addington, Ames & Seibold
Attorneys.

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2 SHEETS-SHEET 2

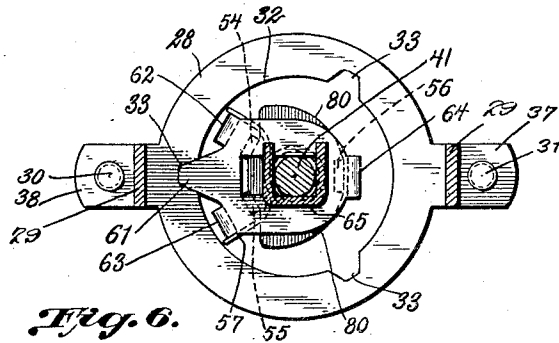


Fig. 6.

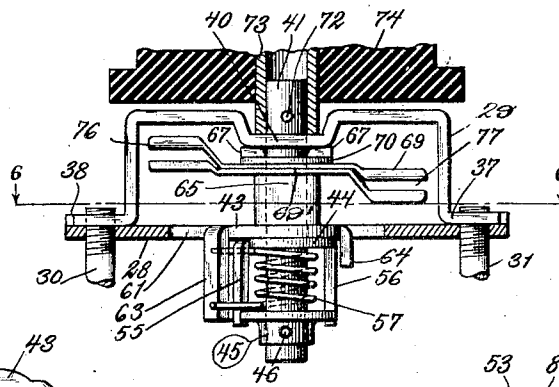


Fig. 5.

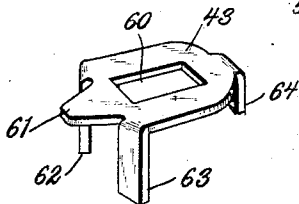


Fig. 8.

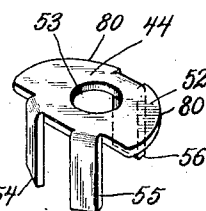


Fig. 9.

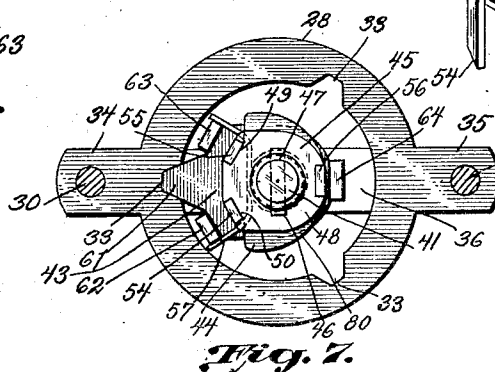


Fig. 7.

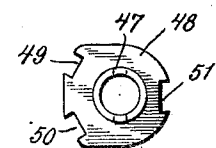


Fig. 10.

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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 August 18, 1919. Serial No. 318,102.

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.

This invention relates to electric switches and more particularly to electric snap switches which are operable in both directions and adapted to control a plurality of circuits.

One of the objects of this invention resides in the production of an improved snap switch which is both simple in construction and certain in its operation and which at the same time is operable in both directions to control a plurality of circuits.

Another object of the invention resides in the production of a switch in which a common means is utilized for controlling the operation of the switch contacts and the switch tripping mechanism.

A further object of the invention comprises the production of an improved switch tripping mechanism.

Other objects and features of the invention will become apparent from the following description, the accompanying drawings, and the appended claims.

For the purpose of description, an embodiment of the invention is illustrated in the accompanying drawings in which—

Fig. 1 is a plan view of the switch;

Fig. 2 is a plan view of the switch with the cover removed;

Fig. 3 is a vertical section through the switch mechanism on a plane represented by the line 3—3 in Fig. 2 looking in the direction of the arrows;

Fig. 4 is a view, partly in section, of the switch taken on the plane represented by the line 4—4 in Figs. 2 and 3 looking in the direction of the arrows;

Fig. 5 is an enlarged illustration, partly in section, showing the switch operating mechanism;

Fig. 6 is an illustration of a portion of the switch mechanism, the view being taken on the plane represented by the line 6—6 in Fig. 5, looking in the direction of the or-

Fig. 7 illustrates a bottom view of the mechanism shown in Fig. 5;

Figs. 8 and 9 are enlarged perspective views respectively of the catch plate and cam plate; and

Figs. 10, 11, 12, and 13 are enlarged perspective views of details of the switch operating mechanism.

As illustrated in the drawings, the switch is enclosed in a housing 16, preferably made of metal, fitted with a cap 17, secured to the housing base 16 by means of screws such as 18. The housing base 16 is preferably fitted with threaded apertures such as 19 and 20 adapted to receive conduits carrying the circuit conductors which it is desired to connect to the switch mechanism.

Mounted within the enclosure 16 is an insulating base 21 fitted with the central chamber or depression 22 in which the switch operating mechanism is positioned. The insulating base 21 also carries the stationary switch contacts 23, 24, 25, and 26. In the chamber 22 of the insulating base 21 is an annular ledge 27 on which is mounted a stop plate or ring 28 and an upwardly extending bracket 29, the stop ring 28 and the bracket 29 being held in place on the annular ledge 27 by means of the screws 30 and 31. The stop plate 28 is illustrated in detail in Figs. 6 and 7 and consists of a flat annular ring, the inner edge 32 of which is fitted with three substantially V shaped notches such as 33 angularly displaced at 120 degrees. Extending outwardly from the annular ring and diametrically opposed to one another are the arms 34 and 35 which serve as means for mounting the stop plate or ring on the ledge 27, through the agency of screws 30 and 31.

The screws 30 and 31 also secure the bracket 29 to the annular ledge, the feet 37 and 38 of the bracket being fitted with threaded apertures to receive the said screws, whereby said bracket is mounted on the annular ledge above the stop plate. The bracket 36 is fitted with a central aperture at 40 to receive the cylindrical spindle 41, the spindle 41 being rotatably mounted in the said aperture and in a bearing 42 positioned at the bottom of the chamber 22 in the insulating base 21.

Loosely mounted on the spindle 41 is the catch plate 43 and the cam plate 44. Rigidly secured to the spindle 41 is the notch plate

45, said plate being secured to the spindle in any suitable way, preferably by pinning it thereto by a pin such as 46. The notch plate is illustrated in detail in Fig. 10 and consists of an annular downwardly extending sleeve 47 and a flat plate 48 fitted with the notches 49, 50, and 51.

The cam plate 44, illustrated in detail in Fig. 9, comprises a flat plate surface 52 having a central aperture at 53, the plate 52 being fitted with the three downwardly extending arms 54, 55, and 56. The cam plate is mounted on the spindle above the notch plate 45, and is maintained in a separated position from the said notch plate by a spiral U spring 57, the spiral spring serving to maintain a separation between the notch plate 45 and the cam plate 44, such that the ends of the arms 54 to 56 inclusive of the cam plate will ride in the notches 49 to 51 inclusive and respectively of the notched plate. Loosely positioned on the spindle 41 and slidably mounted on the top surface of the plate 56 of the cam plate 44 is the catch plate 43. This catch plate is equipped with a central rectangular aperture 60 and with a forwardly extending substantially V shaped projection 61, the contour of which is substantially the same as the shape of the notches cut in the stop plate 28. The catch plate is also fitted with three downwardly extending arms 62, 63, and 64 respectively. The arms 62 and 63 serve respectively to receive the opposite ends of the spring 57, as clearly illustrated in Fig. 5, when the apparatus is assembled, the ends of the spring being positioned on the outer faces of these arms and also passing by the outer faces of the arms 54 and 55 respectively of the cam plate. The rectangular perforation 60 in the catch plate permits the catch plate to move freely and independently of the spindle 41 in a direction longitudinal to the length of said plate, and obviously likewise permits free movement of the spindle 41 without affecting the said plate. Due to the interlocking relationship of the arms 54, 55, and 56 of the cam plate with the notches 49 to 51 respectively in the notched plate 45, the cam plate will be rotated with the spindle 41.

Fitted in the rectangular opening 60 of the catch plate 43 is a sleeve 65 shown in detail in Fig. 11. This sleeve is positioned about the spindle 41, above the catch plate. The downwardly extending protrusion 66 of said sleeve fitting in the rectangular perforation in the catch plate, whereby said sleeve will partake of any rotation administered to the catch plate, but whereby nevertheless the catch plate will be adapted for relative longitudinal movement with respect to said sleeve. Extending from the upper end of the sleeve 65 are the protrusions 67, the said protrusions extending through rec-

tangular apertures such as 68, fitted in the middle portion of the movable contact blades 69. The movable contact blades 69 are rigidly secured to the sleeve 65 by means of a washer 70, shown in detail in Fig. 12, fitted with a central rectangular aperture 71 which fits over the protrusion 67 on the sleeve 65. When the movable contacts 69 are fitted over the protrusions or shoulders 67 on the sleeve 65 in the position illustrated in Figs. 3 and 5, the washer 70 is fitted in position over these protrusions 67, the protrusions thereafter being turned over to solidly retain all of this apparatus in its assembled position as there shown.

Connected to the spindle 41 by means of a pin, such as 72, or in any other desired manner, is a sleeve 73 in which is molded, or otherwise secured in any desired manner, an insulating turn button or knob 74.

Referring now to Figs. 3, 5, and 13, it will be observed that the movable contacts are so constructed that the contacting portions thereof attached to the central part 69' have one contacting portion 76 extending upwardly from the central portion 69' and the other, 77, extending downwardly from the central portion 69'. Because of the shape of the movable contacts, one of the movable contacts, in rotating about the spindle 41, will sweep around in one horizontal plane, and the other movable contact, for example 77, will sweep around in a horizontal plane below the first horizontal plane in which the contacts 76 are rotated.

The stationary contacts 23 and 26 are positioned in the chamber 22 of the insulating base 21 in a horizontal plane below the horizontal plane in which the contacts 24 and 25 are positioned. The horizontal plane in which the contacts 23 and 26 are positioned is in substantially the same horizontal plane as the horizontal plane in which the contacting portion 77 of the movable contact sweeps and the stationary contacts 24 and 25 are positioned in a horizontal plane, which is substantially the same as the horizontal plane in which the contacting surfaces 76 of the movable contacts sweep, as clearly indicated in Figs. 2 and 3.

Referring now to Fig. 2, it will be observed that the center line of the stationary contacts 23 and 24 are angularly displaced at 60 degrees, and in the like manner the center line of the stationary contacts 25 and 26 are angularly displaced from one another by an angle of 60 degrees. The movable contacts 69 in their neutral position have the center line of the contacting ends 76 thereof angularly displaced from the center line of the stationary contacts 23 and 26, each by an angle of 60 degrees, the center lines of the stationary contacts 26 and 23 being displaced from one another by an angle of 120 degrees. The center line of the contacting portion 77

of the movable contacts 69 is displaced from the center line of the stationary contacts 24 and 25, each by an angle of 60 degrees, and the center line of the stationary contacts 24 and 25 are displaced from one another by an angle of 120 degrees.

The V-shaped notches in the stop plate 28, as hereinbefore described, are angularly displaced by 120 degrees, and the stop plate is so positioned in the chamber 22 of the insulating base 21 that the V-shaped notches 33 will have their center line in alignment with the center lines respectively of the stationary contacts 24 and 25 and with the center line of the movable contacts 69, in the neutral position, at the contacting surface end 76 thereof. The position of these V shaped notches 33 is indicated in broken lines in Fig. 2.

The operation of the snap switch may now be briefly described as follows.

When the button or knob 74 is rotated it will carry with it the spindle 41 which in turn will rotate the notch plate 48, the notch plate, through the agency of the notches 49 to 51 thereof and the cooperating arms 54 to 56 inclusive of the cam plate 44 will in turn rotate the cam plate 44. The rotation of the cam plate 44 in either one direction or the other—depending upon the direction of the rotation of the button or knob 74—will carry with it one end of the spiral spring 57—depending upon the direction of rotation, because either the arms 55 or 54 of the cam plate in its rotation—depending upon the direction of rotation, will sweep against either one or the other end of said spring. The rotation of the cam plate will hence put the spiral spring 57 under tension. In the rotation of the cam plate either of the cam surfaces 80 thereof—depending upon the direction of rotation—will ride against the downwardly projecting arm 64 of the catch plate, and since the catch plate is loosely mounted on the top face of the cam plate, the said plate will be gradually retracted by the cam surface 80. When the cam plate has been rotated so that the high point of the cam surface rides over the downwardly extending arm 64, the catch plate 43 will be retracted sufficiently to withdraw the V shaped protrusion 61 thereof out of the V shaped notch 33 in the stop plate, and directly upon the withdrawal of the V shaped protrusion from the notch 33 the catch plate will be rotated with a snap movement due to the tensioning of the spring 57 until the protrusion 61 is snapped into the next V shaped notch 33 in the stop plate 28, 120 degrees removed from the notch 33 from which it was withdrawn. The rotation of the catch plate will carry with it the sleeve 65 and the movable contacts 69, whereas the spring will continue to turn the spindle and the apparatus attached thereto until all the

apparatus secured to the spindle assumes its normal position, as illustrated in Figs. 2 and 5 in front of the notch 33 to which the catch plate has been advanced.

From the foregoing description it will be evident that the single spiral spring 57 functions to control the movement of the cam and catch plates and also the movable contacts 69. The entire operation of the switch is controlled by the single spring which is placed in tension upon the turning of the operating button or knob. With each turn of the operating button or knob the movable contacts 69 will be rotated through an angle of 120 degrees, as hereinbefore described. In this rotation the contacting surfaces 76 and 77 of the movable contacts 69 will sweep into contact with some of the stationary contacts and either over or under other of the stationary contacts. Thus, in rotating the switch from the neutral position illustrated in the drawings in a clock-wise direction to the first notch, the contacting surface 76 of the movable contacts 69, because of their elevated position, will sweep over the contacts 23, but will contact with the stationary contacts 24, which are positioned in the same horizontal plane as the contacting surfaces 76 of the movable contacts 69, the other contacting surface 77 of the movable contact 69 being positioned in the lower horizontal plane will sweep under the stationary contact 25, which is positioned in the higher horizontal plane, but will contact with the stationary contact 26 positioned in the lower horizontal plane. When the switch has been moved to this position, it will be observed that a circuit has been established from the stationary contact 24 through the movable contacts 69 to the stationary contact 26.

Now if the switch is again rotated in a clock-wise direction, the movable contact 69 will be rotated through 120 degrees to the next V-shaped notch in the stop plate. In this rotation the contacting surface 77 will sweep into connection with the contact 23, both of which are positioned in the lower horizontal plane, and the contact surface 76 of the movable contact plate 69 will sweep into contact with the stationary contact 25, both of the two latter contacts being positioned in the upper horizontal plane. Upon the next rotation of the movable contacts in a clock-wise direction, the movable contact plates 69 will move back into the neutral position in which they are illustrated in Fig. 2. In this movement to the neutral position, the contacting surface 76, being positioned in the upper horizontal plane, will sweep over the stationary contact plane 26 positioned in the lower horizontal plane and the conducting surface 77 being positioned in the lower horizontal plane will sweep under the stationary contact 24 which is positioned in the higher horizontal plane.

In a like manner, when the switch is rotated in a counter clock-wise direction the rotating contact blade 69 will always move through an arc of 120 degrees and in each such movement the contacting surfaces 76 and 77 will each actually make contact with but one stationary contact. The switch is consequently arranged for rotation in either direction into three positions; the neutral position—in which the circuits through the switch are open,—and two positions in which the rotating contact blades 69 operate to close a circuit between two stationary contacts. In rotating through the three positions, the contacting surfaces of the rotating blade 69 each sweep past four contacts, but each actually makes contact with but two of said contacts for each complete revolution.

In the specific embodiment of the switch illustrated in the drawings, the contacts 23 and 24 are interconnected by a conducting plate 80, thereby making the contacts 23 and 24 electrically common and consequently these two contacts are equipped with but one contact terminal screw 81, which is adapted to receive the common wire for the two circuits, the other leads of which are connected respectively by the terminal screws 82 and 83 to the contacts 25 and 26 respectively. Obviously the switch could readily be arranged by those skilled in the art for various different kinds of electrical switching operations in which the conducting bar 80 would be omitted and in which one lead of the two circuits controlled by the switch would not be common. Likewise, many other variations could be readily incorporated in the switch structure and the essential novel features and advantages of this invention still be maintained, in which a single spring is used to control and actually move the rotating contacts and in which the stationary and rotating contacts are disposed in an insulating base for the control of a plurality of circuits by a switch which may be operated in either direction.

It will be obvious, therefore, that the invention is not limited to the specific embodiment thereof illustrated and described, but is capable of many variations and other adaptations within the spirit and scope of the invention, as set forth in the following claims.

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

1. In a device of the character described, in combination, an insulating base, stationary contacts mounted on said base, said contacts being positioned in two different parallel planes, a rotatable spindle, rotatable contact plates loosely mounted on said spindle, the contacting surfaces at either end of the said plates being positioned one in the

plane of one of the said stationary contacts, and the other in the plane of the other of said stationary contacts, a switch operating element rigidly secured to said rotatable spindle, and means comprising a single resilient member co-operating with said operating element and said spindle operable to control and actuate the rotatable contacts into any one of a plurality of positions and into cooperation with the stationary contacts to control a plurality of circuits.

2. In a device of the character described, in combination, an insulating base, stationary contacts mounted on said base, a rotatable spindle, rotatable contacts loosely mounted on said spindle, a stop plate mounted on said insulating base fitted with notches, a switch operating plate rigidly secured to said spindle fitted with suitable notches, a cam plate loosely mounted on said spindle carrying depending lugs which cooperate with the notches in the aforesaid switch operating plate to actuate said cam plate when said spindle is turned, a catch plate fitted with a protrusion to cooperate with the notches in the stop plate, said catch plate being provided with depending lugs, and means comprising a spring cooperating with the depending lugs on said catch and cam plates, whereby said catch and cam plates will cooperate with said stop plate to control the movement and actually move the rotatable contacts through a certain defined arc for each operation of the switch.

3. In a device of the character described, in combination, an insulating base carrying stationary contacts, a rotatable spindle, rotatable contacts loosely mounted on said spindle, catch and cam plates, each fitted with a plurality of depending lugs, and a spring cooperating with the depending lugs of said plates to control the operation of said rotatable contacts for cooperation with said stationary contacts.

4. In a device of the character described, in combination, an insulating base, two pairs of contacts positioned thereon, the contacts of each pair being angularly displaced at 60 degrees, movable contact blades adapted to cooperate with said stationary contacts, and means for rotating and controlling the movement of said rotatable contacts, whereby they will move through an angular displacement of 120 degrees in each movement, the rotatable and stationary contacts being so disposed in different planes that said rotatable contacts will connect with but two of said contacts in each movement thereof.

5. In a device of the character described, in combination, an insulating base, a rotatable contact blade having contacting surfaces at each end thereof, stationary contacts mounted on said base angularly displaced from either side of the said contacting surfaces of the said blade by 60 degrees, and

means operable to rotate said contact blade through arcs of 120 degrees, the contacting surfaces of said blades and the stationary contacts being so positioned with respect to
5 each other that the contacting surfaces at each end of the said blades will make contact with but one of said stationary contacts during each movement thereof.

6. In a device of the character described,
10 in combination, an insulating base, a rotatable contact blade having contacting surfaces at each end thereof, stationary contacts mounted on said base angularly displaced from the said contacting surfaces by 60 de-
15 grees, the stationary contacts being dis-

placed from one another at the sides non-adjacent to the contacting surfaces of the contact blade by angles of 60 degrees, and means operable to rotate said contact blade through arcs of 120 degrees, the contacting
20 said contacts in each movement thereof. contacts being so positioned with respect to each other that the contacting surfaces at each end of the said blades will make contact with but one of said stationary contacts dur-
25 ing each successive movement thereof.

In witness whereof, I have hereunto subscribed my name.

REUBEN B. BENJAMIN.