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ELECTRIC SWITCH

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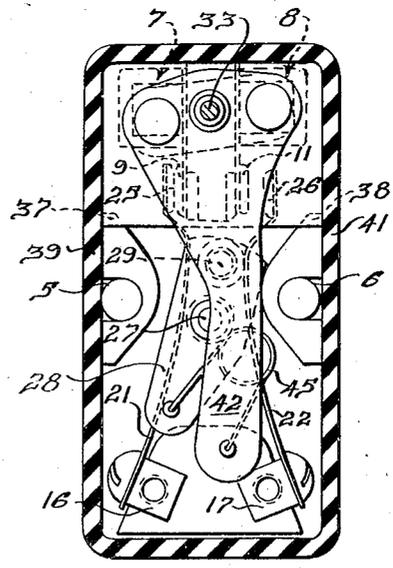
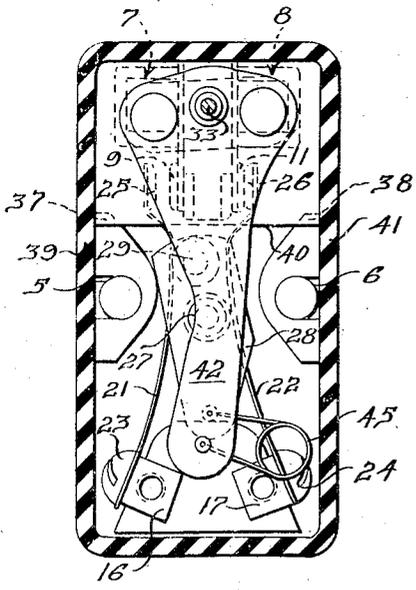
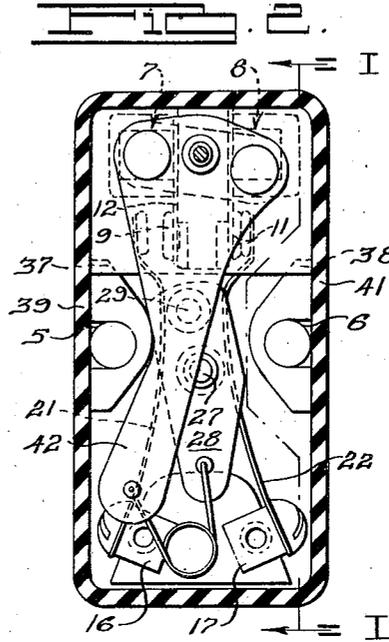
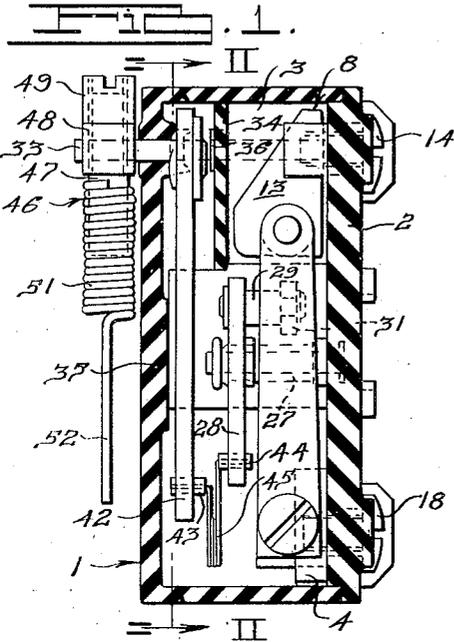


Fig. 3.

Fig. 4.

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## ELECTRIC SWITCH

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11 Claims. (Cl. 200-67)

This invention relates to circuit making and breaking devices and more particularly to electric snap switches of the type known as limit switches.

One object of the present invention is to provide an electric switch having improved means for effecting quick make and break of an electrical circuit.

Another object of the present invention is to provide in an electric snap switch means preventing the snap acting mechanism coming to rest in a dead center position.

Another object of the present invention is to provide an electric snap switch in which a contact carrying member is cooperative in moving the actuating spring through its dead center position.

Another object of the present invention is to provide a limit switch in which a substantial emergency overtravel of the operating arm is permitted.

Another object of the present invention is to provide an improved and economical form of electrical snap switch.

Other objects and features of the invention will be readily apparent to those skilled in the art from the following specification and appended drawing illustrating certain preferred embodiments of the invention in which:

Figure 1 is a vertical sectional view of the limit switch taken on the line I—I of Figure 2.

Figure 2 is a vertical sectional view taken on the line II—II of Figure 1, showing the parts in their first position of rest.

Figure 3 is a view similar to Figure 2 but with the operating parts in an intermediate position.

Figure 4 is a view similar to Figure 2 but with the operating parts in their second position of rest.

The switch, according to the present invention, comprises a generally rectangular insulating enclosure 1 open at the bottom. A supporting plate 2 having raised formations 3 and 4 thereon is secured to the enclosure by eyelets 5 and 6 and seals off the opening therein. A pair of conductor members 7 and 8 having contact elements 9 and 11 disposed upon legs 12 and 13 thereof are mounted upon the plate 2 near the upper end thereof and on either side of the projecting formation 3 and with the contact elements 9 and 11 facing in opposite directions. Spun-over inserts carrying terminal studs 14 hold the members 7 and 8 in place upon the plate 2, the studs serving to secure the terminals of electrical lead wires to the switch. Disposed near the lower

extremity of the supporting plate 2 and closely fitted within notches provided on opposite sides of the raised formation 4 are a pair of generally rectangular cross threaded conductor members 16 and 17 held in place by spun-over insert portions into which terminal studs 18 are threaded. Elongated switch members 21 and 22, formed of a spring metal, are secured at one extremity to the conductor members 16 and 17 by studs 23 and 24 and carry contact elements 25 and 26 adjacent their free ends. The movable contacts 25 and 26 are continually biased for engagement with the stationary contacts 9 and 11 by the inherent resiliency of the spring members 21 and 22.

Pivotaly mounted upon a post 27 secured to the supporting plate 2 and located between the spring arms 21 and 22 is an actuating member 28. The member 28, at one end, carries a pin 29 on which is mounted the roller or striker 31, adapted to alternately engage with and move the spring arms 21 and 22 against the bias thereof upon oscillating movement of the member 28. The size of this roller 31 determines whether the contact action will be overlapping or non-overlapping. If the roller 31 is of a smaller diameter than the distance between the spring arms 21 and 22, as is the case here illustrated, one movable contact will close before the other opens, while if the diameter of the roller is greater than the distance between, both contacts will be opened at the mid-position of the roller.

A recess formed in the projecting formation 3 provides a bearing for an actuating shaft 33 which extends outwardly from the bearing through openings in an insulating piece 34 and in top wall 35 to the exterior of the switch. The insulating piece 34 is mounted in place by being press fitted upon a projection 36 provided by the formation 3 and has its lower edge 40 engaging ledges 37 and 38 formed on elevations 39 and 41 on the base 2. Thus, the insulating piece as disposed cooperates with the formation 3 to provide an arc chamber about the contacts. A lever 42 is rigidly secured to the portion of the actuating shaft 33 which is disposed between the insulating piece 34 and the interior face of the top wall 35 and is movable thereby. Short lengths of metal tubing 43 and 44 are press fitted into the lower extremities of pivotal member 28 and lever 42 and are adapted to receive the projecting ends of a torsional or overcenter spring 45, which has its central portion coiled. The manner of changing the direction of application of force of the spring 45 to effect snap movement of the actuating member 28 in opposite directions

to effect snap movements of the resilient contact arms will be hereinafter described.

To effect movement of the actuating shaft 33, an operating lever 46 is mounted upon the outer extremity thereof. The operating lever 46 comprises a drilled rod 47 and sleeve 48 thereon which receive the shaft 33 through the openings therein. A nut 49 threaded onto the end of the rod 47 clamps 48 against the shaft 33 to thereby maintain the rod 47 and shaft 33 in rigid assembly. To provide for a substantial overtravel of the operating lever 46, a helical spring 51 having a straight end arm 52 is screwed onto the lower end of the rod 47. Due to the normal rigidity of the spring 51 force may be applied to the straight end 52 of the wire to effect operation of the switch mechanism without causing the turns of the spring to buckle. The application of additional force on the end 52 of the spring will cause the spring to bend thereby providing for a substantial overtravel in either direction of movement.

The operation of the device will now be described. Assuming the parts to be as shown in Figure 2, an application of force upon the arm 52 will effect counterclockwise movement of the actuating shaft 33 to rotate the lever 42 secured thereto in the same direction. Rotation of the lever 42 will move the torsional spring 45 towards its dead center position. It is to be particularly noticed that the trip point of the switch is reached before the spring 45 reaches its dead center position as is illustrated in Figure 3. For when the parts reach the position here illustrated, the bias of the spring arm 21 acting upon the roller 31 is greater than the force being exerted by the spring 45 upon the actuating member 28, since the force exerted by the spring 45 decreases as it approaches dead center position, and this bias will be effective to begin a movement of the actuating arm 28 in a clockwise direction. This movement of the member 28 is sufficient to carry the end of spring 45 secured thereto through the spring's dead center position and thereby results in a reversal of the direction of the force of the spring, which force will act upon the actuating member 28 to greatly accelerate the further movement thereof and the roller 31 carried thereon will strike the opposite spring arm 22 with a hammer blow to effect a snap movement of the movable contact 26 away from the stationary contact 11. Spring arm 21 being freed from restraint by the roller 31 will carry the contact 25 thereon into engagement with stationary contact 9. Movement of the operating lever 36 in a reverse direction will effect a reverse movement of the parts to return the movable contacts to the positions occupied in Figure 2. It is readily apparent that with the construction described it is impossible to get the switch into a dead center position for the resilient contact arms apply their force automatically and independently of the operating lever 46 to carry the spring 45 through its dead center.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto, as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What is claimed is:

1. In an electric switch, an insulating base, a stationary contact on said base, a movable contact, an elongated resilient contact arm having

one end fixedly secured to said base and carrying said movable contact adjacent its free end and normally biasing it into engagement with said stationary contact, a movable member mounted on said base and movable to effect movement of said contact arm against its bias to contacts disengaged position, an overcenter spring for actuating said movable member, and means including said resilient contact arm operable to change the direction of the line of force of said overcenter spring to effect snap movement of said movable member and permit said contact arm to move to contacts engaged position with a snap movement.

2. In an electric switch, an insulating base, a stationary contact on said base, a contact arm mounted on said base, a contact element carried by said contact arm for cooperation with said stationary contact for making and breaking an electrical circuit therethrough, a movable member mounted on said base and engageable with said contact arm for movement thereof to contacts disengaged position, an overcenter spring operable upon said movable member, means effecting movement of said overcenter spring towards a dead center position, and a resilient member exerting its bias to move said overcenter spring through said dead center position whereby the overcenter spring effects snap movement of said movable member into engagement with said contact arm for snap movement thereof to perform the switching operation.

3. In an electric switch, an insulating base, a stationary contact on said base, a movable contact, an elongated resilient contact arm having one end thereof fixedly mounted on said base and carrying said movable contact adjacent its free end normally biasing it into engagement with said stationary contact, a pivotal member mounted on said base and engageable with said contact arm for movement thereof, a rotatable member, an overcenter spring interconnecting said pivotal member and rotatable member, said rotatable member being operable to move said overcenter spring toward its dead center position, and a resilient member exerting its bias to move said overcenter spring through said dead center position whereby said overcenter spring effects snap movement of said pivotal member into engagement with said contact arm for snap movement thereof to perform the switching operation.

4. In an electric switch, an insulating base, stationary contacts on said base, a pair of spaced resilient arms, each having an end fixedly secured to said base, and each carrying a contact element adjacent to the free ends thereof, and normally biasing said contact elements into engagement with said stationary contacts, an oscillating member mounted on said base and adapted to alternately move said resilient switch arms and against the bias thereof to contacts disengaged position, overcenter spring means operable to effect snap movement of said oscillating member to move said switch arms with a snap, and means including a resilient switch arm movable from its contacts disengaged position for moving said overcenter spring means through its dead center position.

5. In an electric switch, an insulating base, a pair of spaced resilient contact arms, each having an end thereof fixedly mounted on said base, and carrying opposed contact elements adjacent to their free ends, stationary contacts disposed on said base for cooperating with said contact elements for making and breaking a

circuit therethrough, an oscillating member mounted on said base and alternately engageable with said contact arms for movement thereof in opposite directions, a rotatable member, an operating spring interconnecting said oscillating member and said rotatable member, and means including said resilient contact arms and said rotatable member for moving the line of force of said overcenter spring from one side of the pivot of said oscillating member to the other to effect snap movement of said oscillating member and of said contact arm.

6. In an electric switch, an insulating base, stationary contacts on said base, a pair of spaced resilient arms, each having an end fixedly secured to said base, a contact element supported on each of said arms, and biased thereby for engagement with said stationary contacts, a pivotal member mounted on said base and adapted to alternately engage with and move said resilient arms against the bias thereof to contacts disengaged position, a rotatable member, an overcenter spring interconnecting said pivotal and said rotatable member, said rotatable member being operable to move said overcenter spring toward dead center position and said resilient arms when engaged by said pivotal member being adapted to exert their bias to effect movement of said overcenter spring through said dead center position to effect snap movement of the pivotal member out of engagement with the said engaged resilient arm and into engagement with the other of said resilient arms for snap movement thereof to disengaged position.

7. In an electric switch, an insulating base, stationary contacts thereon, a pair of spaced elongated resilient switch arms each having an end mounted on said insulating base, and each carrying a contact element adjacent their free ends and normally biasing said contact elements for engagement with said stationary contacts, an oscillating member mounted on said insulating base intermediate said spaced resilient contact arms and adapted to alternately strike said resilient contact arms with a hammer blow for movement thereof to contacts disengaged position, a rotatable member, an overcenter spring interconnecting said oscillating member and said rotatable member, and means including said rotatable member for moving said overcenter spring toward dead center position, said resilient arms when engaged by said oscillating member being adapted to exert their bias thereon to effect movement thereof to carry said overcenter spring through its dead center position to effect snap movement of the oscillating member out of engagement with the engaged resilient switch arm and into engagement with the other resilient arm for snap movement thereof to disengaged position.

8. In an electric switch, an insulating enclosure, a pair of spaced resilient contact arms therein, each having an end thereof fixedly mounted on the base of said enclosure, movable contact surfaces provided on said contact arms at the free ends and opposed to one another, stationary contacts mounted on said base and between said contact arms, for cooperation with said movable contact surfaces for making and breaking an electrical circuit, an oscillating member mounted on said base and adjacent said resilient contact arms and being alternately engageable with said contact arms for movement thereof in opposite directions, a rotatable mem-

ber carried within said enclosure, an operating spring interconnecting said oscillating member and said rotatable member, and means including said rotatable member to move the point of connection of said spring to said rotatable member from one side of the point of connection of the spring to the oscillatable member to the other side thereof to effect a snap movement of the oscillatable member to strike and move a resilient contact arm, said point of connection of the spring to the oscillatable member moving in a direction opposite to the direction of movement of said first point of connection.

9. In an electric switch, an insulating enclosure, a pair of spaced resilient contact arms, each having an end thereof fixedly mounted on the base of said enclosure and each having a movable contact surface provided adjacent its free end, said contact surfaces facing in opposite directions, stationary contacts mounted on said base and between said contact arms and adapted to be engaged and disengaged by said movable contacts, said resilient contact arms continually biasing said movable contacts for movement into engagement with said stationary contacts, a support member carried by said base and between said resilient contact arms, an oscillating member pivotally mounted intermediate its ends on said support member and being movable to alternately move said resilient contact arms, a second support member mounted within said enclosure and spaced from said first support member, a rotatable member pivotally mounted at one end on said second support member, an overcenter spring having the ends thereof secured to said oscillatable member and said rotatable member and at extremities thereof adjacent to one another, and means including said rotatable member to effect movement of the points of connection of the ends of said overcenter spring in opposite directions and past one another to effect a snap movement of said oscillating member and of said resilient contact arms alternately engageable thereby.

10. In an electric switch, an insulating enclosure, a pair of spaced resilient contact arms therein, each having an end thereof fixedly mounted on the base of said enclosure, movable contact surfaces provided on said contact arms at the free ends and opposed to one another, stationary contacts mounted on said base and between contact arms, for cooperation with said movable contact surfaces for making and breaking an electrical circuit, an operating member, a movable striker member supported on said base and independently of said operating member, and between said resilient contact arms, overcenter spring means operatively interconnecting said operating member and said movable striker member, said operating member being movable to move said overcenter spring means to effect snap movements of said striker member to alternately move said resilient contact member, the size of said striker member relative to the distance between said spaced resilient arms determining whether the contact action is overlapping or non-overlapping.

11. In an electric switch, an insulating enclosure, a pair of spaced resilient contact arms, each having an end thereof fixedly mounted on the base of said enclosure and each having a movable contact surface provided adjacent its free end, said contact surfaces facing in opposite directions, stationary contacts mounted on said base and between said contact arms and

adapted to be engaged and disengaged by said movable contacts, said resilient contact arms continually biasing said movable contacts for movement into engagement with said stationary contacts, a support member carried by said base and between said resilient contact arms, a movable striker member pivotally mounted on said support member and being actuatable to alternately move said resilient contact arms to disengaged position, the size of said contact arms relative to the distance between said contact arms determining whether both of said contact arms will simultaneously occupy circuit making

positions or whether one of said contact arms will move to circuit breaking position before the other of said contact arms effects a circuit making position, an actuating member supported within said enclosure and separately from said striker member, means effecting an operative interconnection between said striker member and said actuating member, said means comprising an overcenter spring whereby snap movement of said striker member occurs upon movement of said actuating member to effect snap movement of said contact arms.

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