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## SILENT SWITCH STRUCTURE

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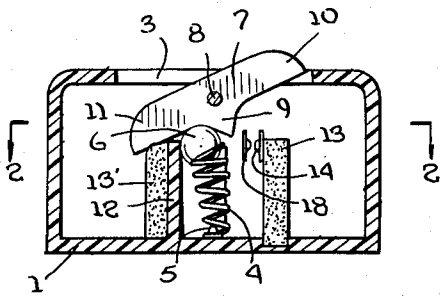


Fig. 1.

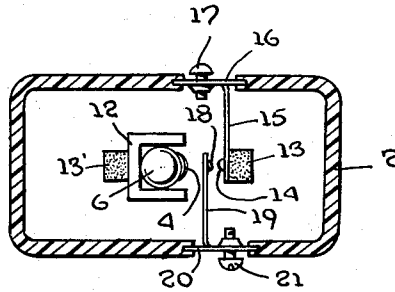


Fig. 2.

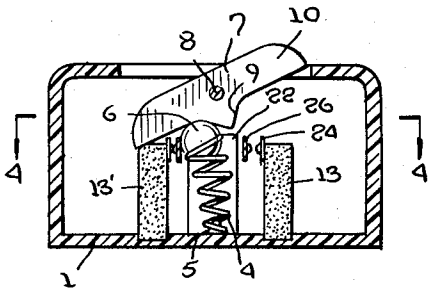


Fig. 3.

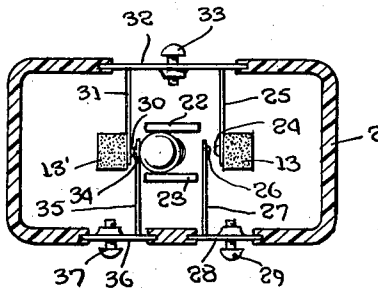


Fig. 4.

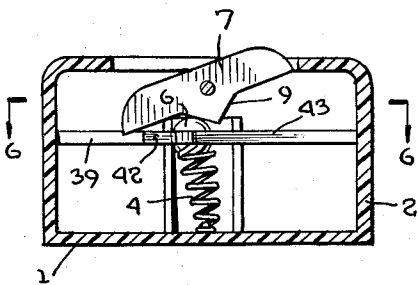


Fig. 5.

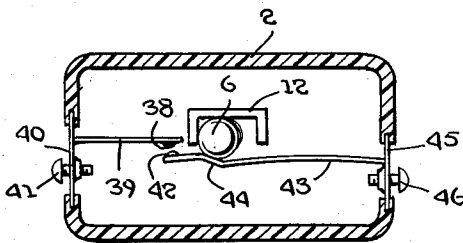


Fig. 6.

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## SILENT SWITCH STRUCTURE

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8 Claims. (Cl. 200—57)

The present invention is directed to electrical switches, more particularly to a type which is known as an alternating current switch, wherein a minimum of noise is produced when the switch is thrown. It is desirable that the contact points be rather close together and be closed quickly and opened quickly but somewhat more slowly. In other words, a quick "make" and a slower "break" is necessary.

Silent switches have been on the market for some time and are in current use. One such type is a mercury switch, which is satisfactory for the purpose but has some disadvantages in that they are subject to breakage since they embody a movable glass tube containing the mercury. Also the construction involves a number of parts and is relatively expensive. In another device of the same type wherein the action is mechanical, involving a spring contact member and a cam, the construction was unsatisfactory. The action of the cam was slow and the number of parts was relatively large. Also because of the relatively complicated structure, the switch was not entirely reliable.

The present invention is intended and adapted to overcome the difficulties and disadvantages inherent in prior devices of the type described, it being among the objects of the present invention to provide a silent switch having a short movement, a light action of the mechanism, in order to avoid any noise and provide a silent switch.

It is also among the objects of the present invention to provide a switch of the character described, having very few parts which are actuated by a throw lever simultaneously, actuating the switch mechanism.

It is further among the objects of the present invention to provide a switch which is positive in its action and which provides a quick make and break and in which it is impossible to hang up the switch. Because of the very slight and short movement of the throw lever, very little effort is expended in actuating this switch. This permits the design of a throw lever that actually need only be touched with a finger.

It is still further among the objects of the present invention to provide a simple switch mechanism with which a double pole or three way switch can be constructed with the addition of a few parts.

In the accompanying drawing constituting a part hereof and in which like reference characters indicate like parts, Fig. 1 is a vertical cross-sectional view of a silent switch made in accordance with the present invention;

Fig. 2 is a top plan view thereof, with the upper part of the casing and mechanism removed for clearness;

Figs. 3 and 4 are, respectively, a vertical cross-sectional view and a plan view similar to Figs. 1 and 2, illustrating a three-way switch made in accordance with the present invention, and

Figs. 5 and 6 are views similar to Figs. 1 and 2, respectively, showing a further modified form of the invention, wherein a sliding or wiping action is provided for the operation thereof.

With reference to Figs. 1 and 2, the casing of the switch

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consists of a base 1 having upstanding sides 2 and a cover having an opening 3 therein. The casing is shown diagrammatically as a single unit but in actual use any number of desired parts may be used.

A coil spring 4 has its lower end fitted over a projection 5 on base 1 so as to be loosely held thereon. The coils of the spring are of minimum diameter at the base and of maximum diameter at the upper free end thereof. A ball 6 seats in the uppermost coil of spring 4. Lever 7 pivoted in the sides of the casing by pin 8 has a downward V-shaped cam 9 which contacts ball 6. Lever 7 has a pair of wings or handles 10 and 11 adapted to be operated by the fingers.

An insulating member 12 surrounds spring 4 on three sides to protect the switch against short circuits and retain the ball and spring. A bumper 13 of rubber or other suitable material has resting against the same a fixed contact 14 having a connector 15 attached to terminal 16, which is provided with a screw 17 for holding the end of a wire. Cooperating contact 18 has a conductor 19 attached to terminal 20 having a screw 21 therein for the attachment of a wire.

In the operation thereof when the circuit is open, the parts are in the position shown in Fig. 1 with ball 6 wedged in the angle between the left hand side of cam 9, handle 11 and spring 4. When handle 10 is pressed down, ball 6 rides up on cam 9 to the point thereof and then rapidly slides over to the right hand side of said cam, bearing against contact 18 and snapping it into closed position. The ball thereby becomes wedged between cam 9, spring 4 and contact 18.

When the circuit is to be broken, handle 9 is moved downwardly whereby ball 6 rides up on the right hand side of cam 9 under an increasing tension by reason of compression of spring 4. This causes increased tension between contacts 14 and 18, making certain that the circuit remains closed. Then as ball 6 passes the point of cam 9, it suddenly snaps to the left and contact 18 quickly opens due to the resiliency of conductor 19.

In the modification of Figs. 3 and 4, the same principle is applied to a three pole switch. Ball 6 and spring 4 are protected by insulating members 22 and 23 on opposite sides thereof. There is provided a bumper 13 against which lays fixed contact 24 from which conductor 25 is connected to terminal 32. Movable contact 26 adjacent to fixed contact 24 has a conductor 27 attached to terminal 28 having a screw 29 for holding a wire.

On the opposite side of this pair of contacts, with said ball and spring being between them, is a second pair of contacts. Against bumper 13' there lays contact 30 having connector 31 therefrom attached to terminal 32 which has a screw 33 for holding the wire. Cooperating movable contact 34 has conductor 35 attached to terminal 36 having a screw 37 for the reception of a wire.

In the operation of the switch when the parts are in the position shown in Fig. 4, contacts 30 and 34 are closed and contacts 24 and 26 are open. When handle 10 is flipped down, ball 6 moves to the right and closes contacts 24 and 26 while opening contacts 30 and 34. In this case also the action is extremely rapid and a firm contact is maintained between the closed contact members until the instant when the opposite set of contacts are firmly closed. At the same time the action is silent. In addition, the tensions inherent in the switch are quite light.

In the embodiment shown in Figs. 5 and 6, there is a fixed contact 38 having a conductor 39 attached to terminal 40 having a screw 41 therein for a wire. Cooperating contact 42 is attached to a spring member 43, the tension of which tends to keep contacts 38 and 42 closed. Spring 43 acts as a conductor and is attached to terminal 45 having screw 46 therein.

In the operation of the switch, when the parts are in the position shown, the circuit is broken with ball 6 being on the left hand end of angular portion 44 and being wedged in position as described above. When lever 7 is flipped in the opposite direction, ball 6 rides down on angular member 44, releasing contact 42, whereby spring action of conductor 43 allows it to make firm contact with the fixed contact 38.

There are a number of advantages inherent in the present construction. Because of the very light movement of the lever, very little effort is required to actuate the switch. Therefore, a light touch with a finger is sufficient to make or break the circuit but still the switch is held firmly in its "on" and "off" positions. There is strong wedging and locking of the ball against the lever so that the contact is formed in all the positions of the switch. The snap action of the ball gives a quick and positive make and break, thus minimizing arcing.

Various changes in the details of construction may be made within the principles herein set forth and the invention is not to be limited except by the character of the claims appended hereto.

I claim:

1. An electrical switch comprising a base, a coil spring mounted on said base and extending therefrom, said spring being free to move in substantially all directions, a ball on the free end of said spring, a lever pivoted on said base in substantially axial alinement with the axis of said spring and adjacent to the free end thereof, said lever having a central, V-shaped depending extension contacting said ball, a handle on said lever for manually rocking the same, a first contact on said base, a movable contact on said base and in close proximity to said fixed contact, said ball being adjacent to said movable contact, said ball being external to the circuit of said contacts, whereby when said lever is rocked in one direction said ball is wedged against said movable contact and said lever to close said contact and when said lever is rocked in the opposite direction said ball releases said movable contact to open a gap between said contacts.

2. An electrical switch according to claim 1 in which there is a resilient stop against which said handle is adapted to come in contact in its operative position.

3. An electrical switch according to claim 1 in which said spring has its lower end mounted over a projection on said base.

4. An electrical switch according to claim 1 in which the coils of said spring are of progressively larger diameters from the base to the free end of said spring.

5. An electrical switch according to claim 1 in which said ball rests partly within the end coil of said spring.

6. An electrical switch according to claim 1 in which an insulating wall on said base at least partly surrounds said spring.

7. An electrical switch comprising a base, a coil spring mounted on said base and extending therefrom, said spring being free to move in substantially all directions, a ball on the free end of said spring, a lever pivoted on said base in substantially axial alinement with the axis of said spring and adjacent to the free end thereof, said lever having a central, V-shaped depending extension contacting said ball, a handle on said lever for manually rocking the same, a pair of first contacts on said base and on opposite sides of said ball, a pair of movable contacts on said base in close proximity to said first contacts and said ball, said ball being external to the circuit of said contacts, whereby when said lever is rocked in one direction said ball is wedged against one of said movable contacts and said lever and when said lever is rocked in the opposite direction said ball releases said movable contact and wedges against the opposite movable contact.

8. An electrical switch comprising a base, a coil spring mounted on said base and extending therefrom, said spring being free to move in substantially all directions, a ball on the free end of said spring, a lever pivoted on said base in substantially axial alinement with the axis of said spring and adjacent to the free end thereof, said lever having a central, V-shaped depending extension contacting said ball, a handle on said lever for manually rocking the same, a first contact on said base, a movable contact on said base and in close proximity to said first contact, said ball being adjacent to said movable contact, and adapted to move longitudinally relative thereto, said ball being external to the circuit of said contacts, an offset on said movable contact against which said ball is adapted to slide to move said movable contact away from said first contact, and spring means on said movable contact biasing the same toward said first contact to close the gap therebetween.

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