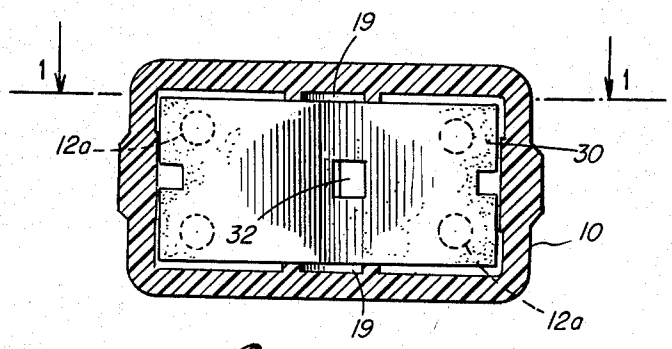
March 9, 1965 H. E. SCHLEICHER 3,172,972

SNAP-ACTION ELECTRICAL SWITCH WITH CONTACT DAMPENING MEANS

Filed May 2, 1963

FIG. 2



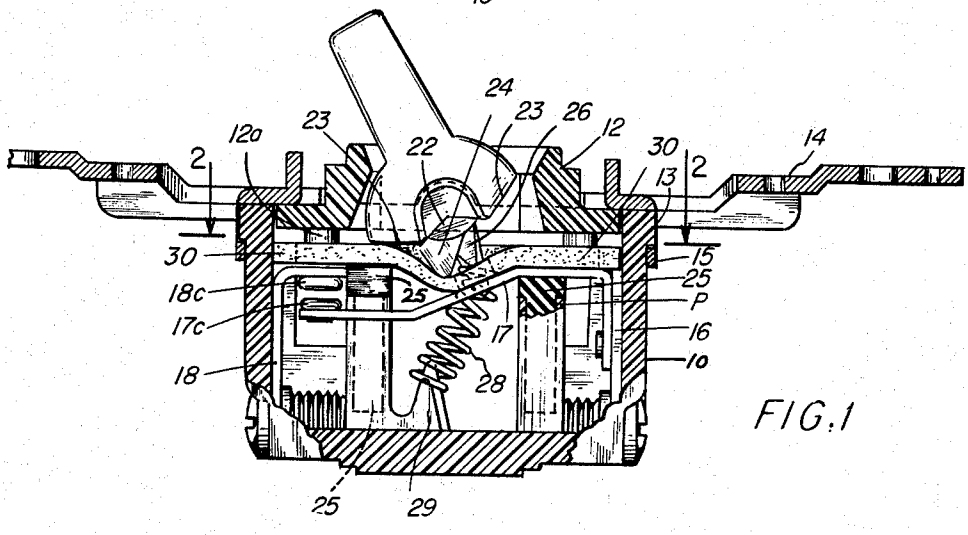
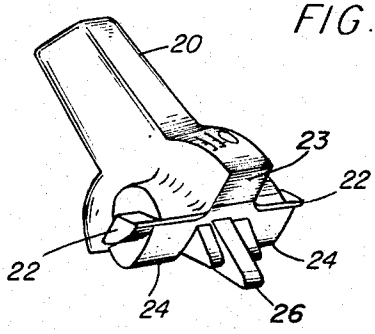




FIG. 1

FIG. 3




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United States Patent Office 3,172,972
Patented Mar. 9, 1965



3,172,972

# SNAP-ACTION ELECTRICAL SWITCH WITH CONTACT DAMPENING MEANS

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Filed May 2, 1963, Ser. No. 277,624
4 Claims. (Cl. 200—67)

This invention relates to lever-operated electric switches. More particularly, it relates to means to quiet the action of lever-operated electric switches.

Heretofore, switches have been designed to operate quietly without the usual loud click heard in the many old style lever-operated electric switches of the over-center spring action type. One example of such quiet action switch is found in Bentley Patent 2,725,438.

While the switch of the Bentley type provided a positive action and feel as the switch was operated and was quiet in operation as compared to old style over-center manually operated switches, they, nevertheless, did have a perceptable click on operation from one position to another which can be heard in silent rooms or rooms where there is a low level of noise. This click tends to increase as the switch grows older, particularly when the switch was mounted behind a wall plate of hard molded insulating material, such as are now in general use. The plates act like a sounding board to amplify the sound of the click incident to the operation of the switch.

In quiet action switches of the type disclosed in the above-mentioned Bentley patent of either the single-throw or double-throw type, there was a tendency of the movable contact to chatter or rebound when engaging the fixed contact due to the inherent springiness of the flexible movable contact arm in connection with the over-center spring. This was even more pronounced when rubber bumpers were used as stops for the operating lever.

The over-center spring is a necessary and desired element because (*a*) of the desire of the user to "feel" a positive change from one position to another, and (*b*) of the need to hold the manual operating lever in its two opposite positions after it has been moved from one position to the other.

Thus, an object of the invention is to reduce to a minimum or practically inaudible level the noise incident to operation of lever-operated electric switches of the over-center spring type and particularly of the type which are designed for normally quieter action.

Another object is to provide means to quiet the action of lever-operated electric switches of the over-center spring type and to dampen the action of the same so as to overcome the tendency to chatter or rebound as the switch lever stops in moving to its opposite positions and as the movable contact comes into engagement with the fixed contacts, thus to prolong the life of the switch contacts and reduce the noise incident to switch operation.

Other objects and advantages of the invention will appear as it is described in connection with the accompanying drawing.

In the drawing:

FIG. 1 is a longitudinal elevational section view of a switch embodying the invention with the section taken along line 1—1 of FIG. 2.

FIG. 2 is a plan view of a switch embodying the invention with the top or cover of the switch housing removed.

FIG. 3 is a detail view of the handle used in the switch of FIG. 1.

Referring to the drawing, the operating parts of the switch are housed within a hollow casing made preferably of molded insulation material with a cup-shaped base section 10 open at the top and a cover 12 fitting within the casing walls at the top edges thereof in usual fashion. At



opposite ends of the casing, metal terminal plates 16 and 18 are mounted in conventional fashion, as by sliding inwardly into slots at the ends of the casing. Attached to the plate 16 is the short leg of an L-shaped movable contact member 17 having a contact button 17*c* of silver or other good highly conductive contact material on its opposite or free end.

The movable contact member 17 is preferably a thin strip of flexible resilient electrically conductive metal bent into L-shape.

The movable contact button 17*c* may engage and disengage a fixed contact button 18*c* of similar material to the movable contact button, but mounted on the upper surface of an in-turned upper end of the terminal plate 18.

The movable contact member 17 is biased by inherent springiness or resilience to a "closed" position in which the button 17*c* engages the button 18*c*.

To move the movable contact member 17, a switch operating lever 20 of molded insulating material has trunnions 22 thereon by which the lever is pivotally mounted in seats 19 in the upper edge of the base 10. To operate the movable contact member, a cam finger or extension 24 extends inwardly into the base 10 to press the movable contact member down and cause it to disengage the fixed contact in the position shown in FIG. 1. There may be two such fingers adjacent opposite trunnions 22, if the invention is applied to a switch having two movable contact members on opposite sides of the casing, such as a two-pole, a three or four-way switch.

When the switch is in the position shown in FIG. 1, the cam finger 24 presses down the movable contact member 17 and holds the contact button 17*c* from engaging the fixed contact button 18*c*.

On moving the lever 20 clockwise from the position of FIG. 1, the cam finger 24 will rotate clockwise and allow the movable contact member 17 to move its button 17*c* into engagement with the fixed contact button 18*c*.

To hold the lever 17 either in "on" position or in its opposite "off" position, an over-center coiled compression spring 28 has one end seated on a spring-holding stud 29 molded in the bottom of the base 10 while its other end engages a spring-operating finger 26 molded on the lever 20 and extending centrally thereof between the movable contact operating cams 24.

In order to reduce the noise of operation of the lever from one position to the other, rubber bumpers 25 may be provided within the casing at opposite ends to act as stops for the shoulders 23 formed on the lever 20. These shoulders lie on opposite sides of the pivotal axis of the lever; and upon abutting the bumpers, the bumpers absorb the sound of the lever coming to rest in its opposite positions. However, the bumpers are resilient and, hence, tend to rebound. Since the movable contact arm 17, when in direct engagement with the cam 24 in previous switches tended to follow every movement of the cam, there was a pronounced tendency of the switch parts to rebound when the rubber bumpers were used. This caused noise, but at a lower lever than when the lever shoulders struck solid stops on the casing.

Bumpers 25 may be elongated rectangular pieces of rubber or other elastic material which may be slid downwardly into the open top pockets or recesses P which extend up centrally at the top end of the base 10 from the floor thereof. The bumpers may have heads overlying the top edges of the pockets P.

For the fourfold purpose of (*a*) dampening vibrations of the movable contact member 17 as its button strikes the fixed contact button 18*c* and (*b*) muffling the sound of the switch action and (*c*) quieting the action of the movable contact button as it engages the fixed contact button and (*d*) quieting the action of the lever 20 as it stops in one position or the other, a felt pad or membrane

30 is provided and placed between the movable contact member 17 and the lever 20.

The membrane is rectangular in shape like the interior outline of the base cavity and of approximately the same size and contour so as to fit within the base at its top. The membrane 30 has a central aperture 32 through which the spring-operating finger 26 extends to engage the upper end of the spring 28. The membrane lies between the other parts of the inner end of the lever 20 and all interior parts of the switch mechanism.

Four circular button-like nubs 12*a* extend inwardly from the underside of the cover 12 at the four corners of the cover at four positions over the fixed contact and the anchored end of the movable contact member. When there are pairs of fixed and movable contacts on each side of the casing, these nubs press on the membrane clamping it at four points between the cover and contacts.

As the lever 20 is moved from the position shown in FIG. 1 to the opposite position and back, the contact-operating cam 24 slides over the felt membrane with minimum friction because the lever is made of smooth surfaced molded plastic material and slides easily over the felt membrane.

When there is only one pair of fixed and movable contacts, the nubs 12*a* at opposite ends of the cover press on the membrane at opposite ends holding it on that side when the cam 24 acts on the movable contact member. When there is no movable contact on the opposite side, there is no stress on the membrane by the cam 24 on that side.

Another advantage of the membrane is that the fiber gasket which conventionally was used between the mounting plate or bridge 14 and the cover 12 to keep dust out of the casing and arc flashes from the mounting plate or bridge is no longer necessary, as the felt membrane performs those functions too. It has been found the felt has less tendency to burn than the fibre.

Thus, the felt membrane performs the above-mentioned rebound, dampening, noise-reducing, noise-muffling and arc-quenching functions, considerably improving the operation of the switch over those heretofore known.

Any material can be used for the membrane which possesses the properties of absorption of sound, absorption and dampening of inertial force and high resistance to burning by an electric arc, and is tough and wear resistant under the continuous rubbing and friction of the operating lever. Although the operating lever and its end 26 are molded and smooth, the end must be pointed to give the usual and desired over-center action in combintion with the over-center spring 28 and toggle point 26. Woven wool felt is preferred, but pressed wool is also satisfactory and has proved sufficiently wear-resistant under test conditions. These are preferred over cotton which chars and burns more readily.



Many modifications within the scope of the invention will occur to those skilled in the art. Therefore, the invention is not limited to the specific form and configuration illustrated.

What is claimed is:

1. In an electric switch, a hollow casing housing the switch parts, a movable contact, another contact engageable and disengageable by said movable contact as the latter moves between two at-rest positions, a resilient arm on which said movable contact is mounted biasing said movable contact toward engagement with said other contact, a movable-contact-operating lever having a cam surface thereon for separating said movable contact from said other contact, spring means acting on said lever to bias it in two at-rest positions, said movable contact and resilient arm tending to chatter when moved into engagement with said other contact, a flexible member extending entirely across said casing and from end to end and having an aperture therethrough for said lever to engage said spring means, said flexible member being located between said cam surface and said resilient contact-carrying arm, said flexible member being formed of a damping material which is highly resistant to burning by contact arcing, and being of sufficient thicknes to overcome the tendency of said movable contact and arm to chatter, said damping member also deadening the sound of switch opening and closing movement.

2. An electric switch as claimed in claim 1 having stops at opposite ends of the casing for said switch lever which tend to make said lever and movable contacts rebound, said flexible member extending between said stops and said lever absorbing the inertia of the switch parts and while simultaneously performing said dampening and noise deadening actions.

3. An electric switch as claimed in claim 2 in which said flexible member is a felt pad.

4. An electric switch as claimed in claim 1 in which said flexible member is a felt pad.


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