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SNAP ACTION SWITCH MECHANISM

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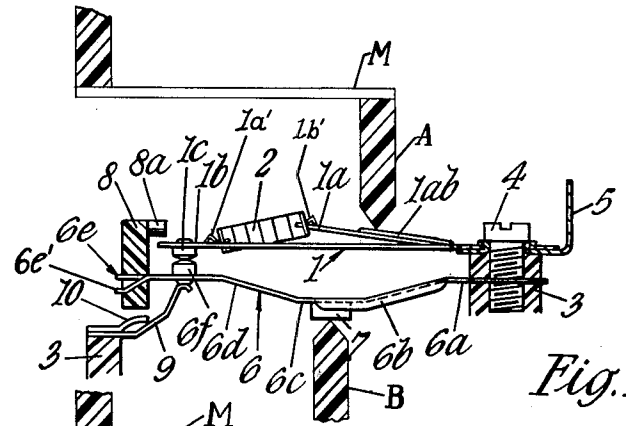

Fig. 1.

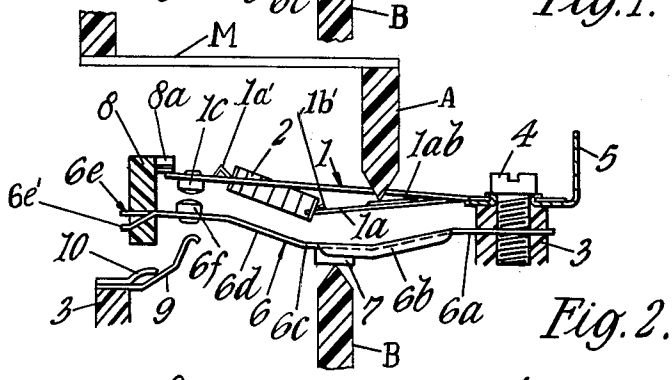

Fig. 2.

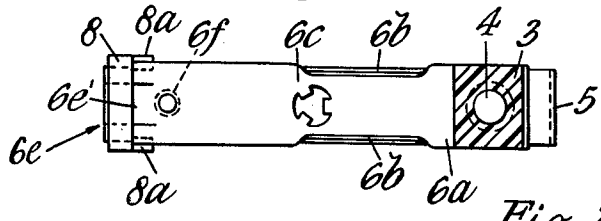

Fig. 3.

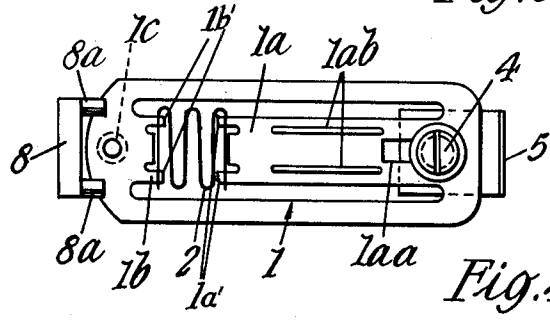

Fig. 4.

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SNAP ACTION SWITCH MECHANISM

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3 Claims. (Cl. 200—67)

This invention relates to electric switches and more especially, but not solely, for use in energy regulators.

The invention consists in an electric switch comprising a contact, toggle means for deflecting the contact, movable means comprising a second contact for co-operating with the first and a back stop to limit the movement of the first contact away from the second.

This arrangement has considerable flexibility. Thus, when the contacts are closed the position of adjustment of the movable means will determine the position in which an independent toggle switch actuator will snap the toggle means over to the other extreme position in which the contacts are open. Also the back stop will fix this other position.

By a more extensive movement of the movable means the toggle means can actually be switched to the contact open position independently of the position of the toggle switch actuator.

The back stop may be replaced if desired by a further contact.

The invention will be further described with reference to the accompanying drawings.

FIGURE 1 is a side elevation of a switch according to the invention in the "closed" position.

FIGURE 2 is a similar view showing the "open" position.

FIGURE 3 is an underneath view; and

FIGURE 4 is a plan view.

As shown, the switch comprises a toggle switch mechanism, the principal element of which is here shown as comprising a beryllium-copper alloy stamped strip 1, the shape of which is apparent from FIGURE 4. It is of generally rectangular shape with rounded corners at one end, the other end being an arc of a circle. The center part is cut away to form two tongues, a long one 1*a* projecting from the square end and a short one 1*b* projecting from the circular end.

The tongue 1*a* is formed with a window 1*aa* and two strengthening longitudinal pressed ribs 1*ab*.

The ends of both tongues are formed with transverse V-shaped stiffening and retaining lugs, 1*a'*; 1*b'* respectively, engaged in slots in, and thereby to support, a compression spring 2 pivotally therebetween and giving the self-restoring strip 1, snap-action operation in response to downward pressure on the member A, generally applied by means of a bimetallic strip M in the case of an energy regulator.

The circular end of strip 1 carries a contact 1*c* and the square end is secured to a base 3 by a screw 4 passing through an angular member 5 which constitutes a terminal.

Also secured to the base 3 to lie underneath strip 1 is a resilient strip 6 shown in FIGURES 1, 2 and 3. This comprises a hinge portion 6*a* adjacent the base 3 and forming a terminal, a stiffened portion 6*b* bent away from strip 1, a short central portion 6*c* parallel to strip 1 carrying an insulating button 7 which can be pressed in upwardly by a member B, a resilient portion 6*d* bent up towards strip 1 and an end portion 6*e* carrying a contact 6*f* and an insulating back stop 8.

A central tongue 6*e'* is formed in the end portion 6*e*

so that this end can be slipped through a slot in the backstop 8 and bent down to retain it (FIGS. 1 and 2).

The backstop extends to beyond the end of strip 1 and is provided with extensions 8*a* which limit the movement of strip 1 away from the contact 6*f*. Also attached to another portion of the base 3 is a resilient contact member constituted by a spring 9 and a cooperating backstop 10.

In operation, for a given position of the button 7, downward presure by any suitable operating member A when the switch is in position of FIGURE 1 bends the tongue 1*a* about the edge of member 5 giving an over-center snap action for the switch to pass to the position shown in FIGURE 2 opening the contacts 1*c* and 6*f*.

The position at which this switchover occurs will clearly depend on the position of button 7, which can be adjusted by any suitable means such as member B.

The restoration movement, when pressure by the operating member A is released, is against a relatively weaker resistance since the fulcrum position of strip 1 for upward movement gives a longer effective arm.

The difference in stiffness for upward and downward movemnets is used to assist in obtaining an acceptable ratio of opearting times for "closed" periods and for "open" periods.

Pressure on button 7 when the switch is in the closed position by any operating member indicated generally at B (FIGURE 1) will also operate the switch into the open position (FIGURE 2).

Thus, extreme positions of button 7 can give permanent "open" and permanent "closed" positions of the switch.

The shape and stiffening of parts 6*a* and 6*b* of spring 6 ensures that the adjustment of position of button 7 produces a reasonably linear positioning of contact 6*f*.

The resilient portion 6*d* improves the contact pressure at the moment of "make." Thus the pressure of the contacts 6*f* and 1*c* together causes the portion 6*d* to give way slightly and in doing so increases the angle at which the spring 2 lies. This increase of angle increases the component force from the spring 2 to force the contacts together.

At the same time a similar reaction exerts itself on the switch operating blade 1. The window 1*aa* in this operating blade lowers the stiffness rate of the blade. Thus the reaction from the compression spring lifts the operating blade 1 resulting in an increase in angle of the compression spring 2 in relation thereto immediately after the contacts have made circuit. The overall effect is to produce a high making pressure at the contacts, and reliable over center action.

The deflection of the resilient portion 6*d* of the flexible member carrying the contact 6*f* has another useful object: it produces a slight sliding motion between the contacts, and this is of great value in rubbing away surface contamination on the contacts.

A further feature is that whenever the button 7 is changed in position, and especially when switching from a controlling position to "open" and also from "open" to a controlling position, a considerable amount of sliding action takes place at the contacts, this sliding action being associated with the arcuate positioning movements of the contacts. This sliding action effectively reduces any slight surface roughness which may be building up, well before a tendency to weld at high points occurs.

A further useful feature of the method of adjustment shown is that for various operating positions the contacts touch at different positions on their surfaces. This assists in lengthening life by distributing the contact wear.

The circuit controlled by spring 9 is normally closed,

e.g. to operate a pilot light for all positions in which contacts 1*c* and 6*f* can be opened by downward pressure by suitable operating member A. When, however, button 7 rises to give the permanently "open" position spring 9 remains in the open position as shown in FIGURE 2.

We claim:

1. An electric switch comprising an insulating base, a first terminal member mounted on said base, a first resiliently flexible member mounted at one end on said base in electrical connection with said first terminal member, a first contact mounted on said first resiliently flexible member at its other end, a self-restoring snap-action mechanism mounted on said first resiliently flexible member for deflecting it, means for directly engaging and operating said snap-action mechanism whereby to deflect said first resiliently flexible member, a second terminal member mounted on said base so as to be insulated from said first resiliently flexible member, a second resiliently flexible member mounted on said base in electrical connection with said second terminal member, a second contact mounted on said second resiliently flexible member for engagement with said first contact when said first resiliently flexible member is in its undeflected position, said second resiliently flexible member comprising a flexible length carrying said second contact and a further stiffened length adjacent its mounted end, a backstop mounted on said second resiliently flexible member to limit the movement of said first contact away from said second contact and means operative adjacent the junction of said flexible and stiffened lengths by which said second resiliently flexible member may be actuated over a range of movement sufficient to operate said snap-action mechansim mounted on said first resiliently flexible member whereby to move said first resiliently flexible member into its deflected position.

2. An electric switch as claimed in claim 1 in which said second resiliently flexible member is of shallow V-shape, one arm of the V constituting said flexible length and the other arm constituting said stiffened length.

3. An electric switch as claimed in claim 1 comprising a resilient contact member mounted on said base for engagement with said second contact, a stop mounted on said base and limiting said movement of said resilient contact member whereby said resilient contact member engages said second contact on said second resiliently flexible member in its unactuated position but not in its actuated position.

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