Dec. 22, 1953 I. W. COX 2,663,770

ELECTRIC SNAP SWITCH

Filed Jan. 10, 1951

Fig. 1.

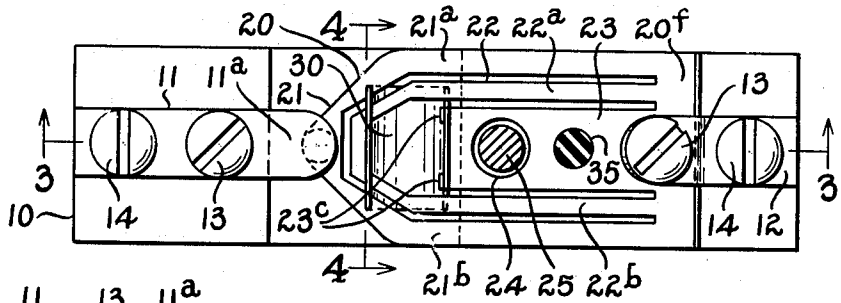


Fig. 2.

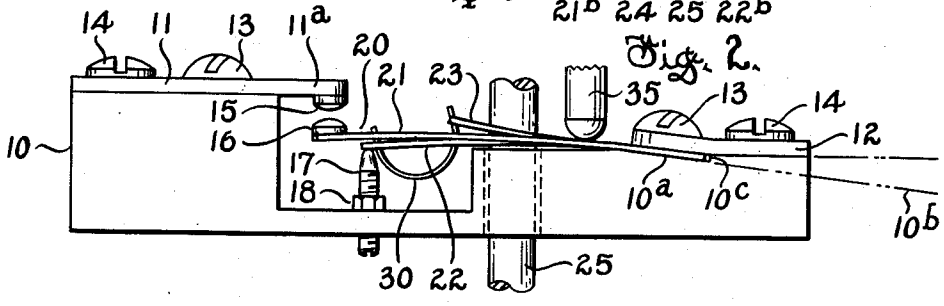


Fig. 3.

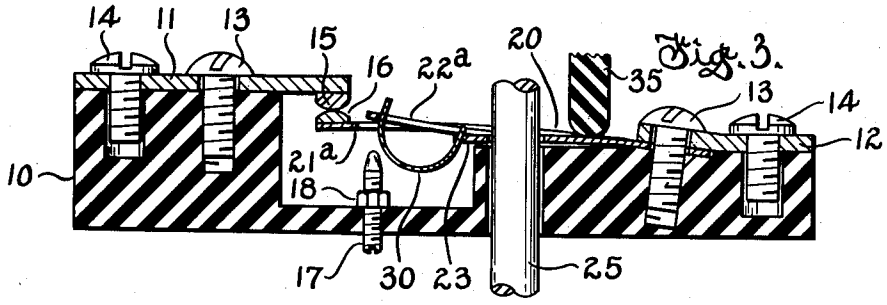


Fig. 4.

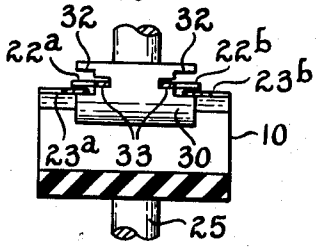


Fig. 5.

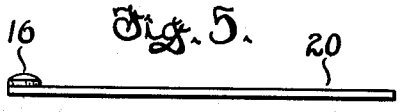
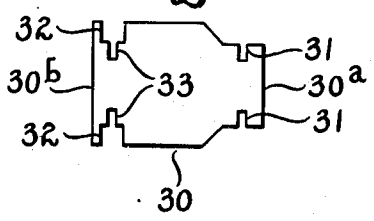


Fig. 6.



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ELECTRIC SNAP SWITCH

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3 Claims. (Cl. 200—67)

1

This invention relates to electric snap switches. More particularly, the invention relates to an improved actuating mechanism for single pole, single throw, snap switches.

An object of the invention is to produce a snap switch which is particularly suitable for energy differential control.

Another object is to provide for such switches an improved actuating mechanism which maintains a high degree of contact pressure until it is actually snapped to "off" position.

Another object is to produce a snap mechanism which can readily be mass produced from simple flat stampings.

A further object is to provide an improved stamped type snap mechanism, the stampings of which may be heat treated in flat stacks without necessity for special jigs.

Another object is to provide for assured uniform and easy assembly of functionally independent parts of a unitary structure to the extreme precision necessary for a predetermined narrow range of performance.

A further object is to provide a relatively thin snap switch of the impact break type which fits the needs of a particular control having a relatively large shaft which must pass through the center of the switch assembly.

Other objects and advantages will hereinafter appear in the accompanying description and drawing, in which

Figure 1 is a top plan view of a switch mechanism embodying the invention, the actuator and the aforementioned shaft being shown in section;

Fig. 2 is a side elevational view showing the switch in "off" position;

Fig. 3 is a longitudinal sectional view taken along the line 3—3 of Fig. 1 and showing the switch in "on" position;

Fig. 4 is a lateral sectional view taken on line 4—4 of Fig. 1 and shows certain details of the impact break mechanism;

Fig. 5 is a detail side elevational view of the actuating mechanism and illustrates the coplanar relation of its parts prior to the assembly therewith of the compression spring, and

Fig. 6 is a developed or extended view of the compression spring prior to its being shaped as shown in Figs. 2 and 3.

Referring to the drawing, it will be seen that the switch comprises an insulating base 10 at opposite upper ends of which are secured terminal members 11 and 12 by means of screws 13 having a threaded connection with said base.

2

Threadably connected to the outer ends of said terminal members are terminal screws 14 by means of which conducting wires may be connected to said switch. Affixed to the inner end 11a of contact member 11 is a stationary contact 15 which is positioned for engagement by movable contact 16. Also mounted on base 10 is an adjustable stop member 17 having a threaded connection with said base and being provided with a lock nut 18 by means of which the threaded member 17 may be maintained in a given position. The purpose of stop member 17 will be hereinafter explained.

As best shown in Figs. 1 and 5, the switch actuating mechanism is essentially comprised of a flat stamping 20 having a plurality of integrally attached reed-like members. Stamping 20 is preferably made from relatively thin spring conducting material, such as beryllium copper, by using stamps or dies. It is of substantially rectangular shape and certain portions thereof are removed during the forming process to provide a plurality of functionally independent, coplanar, flat reed-like members, each of which members has a distinct function as will hereinafter appear. The first of such members is a substantially U-shaped contactor arm 21 having leg portions 21a and 21b which are integrally joined to a base portion 20f of stamping 20. Affixed to the apex of said contactor arm is the movable contact element 16 which is moved into and out of engagement with the stationary contact 15 by means of said arm. Spaced inwardly from said contactor arm 21 is a second substantially U-shaped member 22 having leg portions 22a and 22b which also are integrally joined to base portion 20f. Member 22 functions as the flipper arm for the snap mechanism and it will be seen that it is adapted to pivot about substantially the same axis as contactor arm 21. The switch actuator is comprised of a tongue-like member 23 which also is integrally connected to base portion 20f and is centrally positioned between the flipper leg portions 22a and 22b with its free end extending toward the apex of the flipper member 22. The free end of actuator 23 is notched to provide projections 23c the purpose of which will hereinafter become apparent, and may also be provided with a relatively large aperture 24 through which may extend without interference a relatively large shaft 25 when the switch mechanism is used with certain controls.

The reed-like members, contactor arm, flipper and actuator, are so proportioned in length and

in width as to provide, when clamped at the proper common angle to the base 10, the desired values for the restoring force on the actuator and of residual contact pressure on the axially neutral contact carrier. Further, as best shown in Fig. 5, all of said reed-like members are normally coplanar. In consequence, after the stampings 20 are formed, they may be piled in flat stacks for heat treating without requiring special jigs or fixtures.

In Fig. 6 there is shown a developed view of a U-shaped spring compression member 30 which is adapted to effect an operating connection between the actuator 23 and the flipper 22 and also effect movement of contactor arm 21 with a snap action by imparting a hammer-blow thereto. Said spring member 30 may be made from any suitable flat sheet spring material. One end 30^a thereof is of reduced width so that it may move between flipper leg portions 22^a and 22^b free of interference therewith and is provided with oppositely disposed rectangular notches 31 which are adapted to receive the projections 23^c on actuator 23, as best shown in Fig. 1. The other end 30^b of said member is provided with a pair of relatively large rectangular notches 32, each of which has another smaller rectangular notch 33 extending inwardly therefrom. Thus, as best shown in Fig. 4, notches 32 are adapted to engage contactor leg portions 21^a and 21^b with lost motion, and the notches 33 are adapted to receive flipper leg portions 22^a and 22^b with a relatively close fit. Since Fig. 4 is a view showing the switch in contact engaging position, it will be seen that when the flipper arm 22 snaps downward and moves the end 30^b of spring member 30 downward with it the upper faces of the notches 32 will engage contactor arm 21 with a hammer-blow by reason of the initial rapid travel of said faces prior to engagement with said contactor arm.

For assembling stamping 20 and compression spring member 30 together, spring 30 is bent into substantially the U-shape shown in Figs. 2 and 3 and inserted between flipper arm 22 and actuator arm 23 with its notches in engagement with corresponding portions of said arms as hereinbefore described. Thus, as best shown in Fig. 1, it will be seen that as the spring 30 tends to open it places the flipper arm 22 in tension and the actuator arm 23 in compression. No longitudinal stress is placed in either direction on the contactor arm 21, it being flexed only upwardly or downwardly accordingly as it is engaged by the bottom or upper faces of notches 32. And as well known to those skilled in the art, flipper arm 22 will be moved upwardly or downwardly with a snap action accordingly as the actuator arm 23 is moved in one direction or the other. It should also be noted that the particular configuration of the stamping 20 permits the projection of shaft 25 through the approximate center of the switch mechanism without interference thereof. This is particularly advantageous in certain small control mechanisms where space is at a premium and repositioning of members such as control shafts would prove impractical or otherwise be undesirable.

The upper face of base 10 is provided with an inclined portion 10^a the plane of which lies along the line 10^b (Fig. 2), said portion terminating at its lower end with an integral abutment 10^c. The portion 20^f of stamping 20 is clamped against said inclined portion 10^a by means of terminal member 12 the inner end 12^a of which

is similarly inclined. The angle of inclination for base portion 10^a is so selected that the movable contact 16 is normally biased toward the stationary contact 15 with at least the minimum contact pressure desired. Thus it will be seen that stamping 20 is readily and accurately positionable upon the base 10 and that both residual contact pressure and contact restoring force are provided in a simple and certain manner. To obtain the desired amount of arc-gap, stop member 17 is rotated to move upwardly or downwardly to decrease or increase the gap obtained when flipper member 22 abuts said stop member.

The operation of the improved switch will now be described. In Fig. 2 the switch is shown in its normally open position with the flipper arm 22 abutting against stop member 17 and the switch operating plunger 35 in its upper or "off" position. The contact arm 21 is held in its down position by engagement therewith of the upper faces of notches 32 in spring 30. However, as the plunger 35 is caused to move downwardly it effects depression of flipper arm 22 and consequent compression of spring 30. Finally, in a manner well known to those skilled in the art, when the actuator 23 and the end 30^a of spring 30 move over center, the flipper arm 22, spring end 30^b and contact arm 21 will move upward with a snap movement to the position shown in Fig. 3.

To return the switch to "off" position the above operation is reversed. As plunger 35 is caused to move upwardly it permits movement of actuator 23 under its bias to its upward position, and again, as the members pass over center, flipper arm 22 moves in the opposite direction with a snap movement. However, it is to be noticed that the switch operation is somewhat different when moving from closed to open position. Because of the upward bias of member 20, as the flipper arm 22 and spring 30 approach their center position, at which point there is little or no upward pressure exerted upon contact arm 21 by spring 30, good contact pressure is assured until such time as the contacts are moved apart with a hammer-blow induced by the lost motion connection between members 22 and 30. As before mentioned, this latter feature is of particular utility when the plunger 35 is actuated by a creeping or slowly moving force, in which instance the switch mechanism would be held at or near center position for relatively long periods of time. And as will readily appear to those skilled in the art, a switch made in accordance with the instant invention provides such feature in an improved, simple and economical manner.

I claim:

1. In a single pole, single throw, snap switch, in combination, a unitary stamping comprising three functionally independent, normally coplanar, flat reed-like members, the inner of which members functions as actuator and compression member, the middle of which members functions as the flipper and tension member, and the outer of which members functions as the independently movable contact carrier, all of said members being so proportioned in width and length as to provide when clamped at the proper common angle the desired values for the restoring force on the actuator and for the residual contact pressure on the movable contact carrier; a U-shaped spring member held in compression between said actuator and flipper mem-

bers, said spring member having lost motion means and affording impact movement only of the movable contact carrier when said switch is moved to circuit interrupting position; and means providing for the intersection of the plane of said stamping at a point in the stationary contact structure of said switch sufficiently far above its contact surface to assure the desired residual contact pressure.

2. A single pole, single throw, snap switch comprising, in combination, an insulating base having an upper face of which a portion is inclined away from horizontal; a stationary contact member mounted on said base at a point laterally displaced from said inclined portion; a snap mechanism comprised of a unitary stamping having three functionally independent, normally coplanar, flat reed-like members which are integrally connected to a base portion of said stamping and adapted to pivot about substantially the same axis; a movable contact carried by the outermost of said reed-like members; and a combined terminal and clamping member mounted on said base adjacent said inclined portion, said stamping base portion being clamped between said clamping member and the inclined portion of said insulating base with said movable contact positioned for normal engagement with said stationary contact whereby the desired residual contact pressure is provided.

3. In a switch mechanism, in combination, a unitary stamping, said stamping comprising an outer U-shaped contact carrier, an inner elongated actuator member, and an intermediate U-shaped flipper arm, said members being normally coplanar and functionally independent of each other and pivoted for individual movement about substantially the same axis; a stationary contact positioned for engagement by said contact carrier; and means for mounting said stamping and said stationary contact, said means including means providing for the intersection of the plane of said stamping at a point in the stationary contact structure sufficiently far above its contact surface to assure the desired residual contact pressure and to provide the desired restoring force for said actuator.

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