Dec. 24, 1946. W. J. AITKEN 2,413,130

SNAP ACTION SWITCH

Filed March 1, 1945

Fig. 1

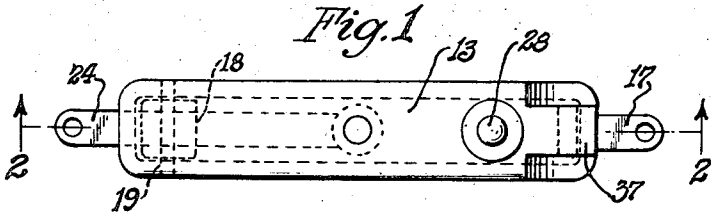


Fig. 2

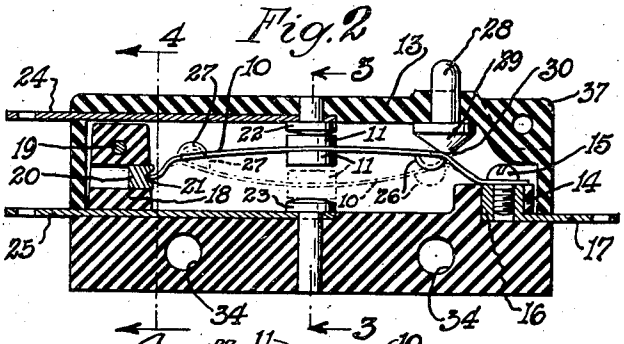


Fig. 3

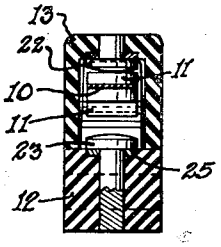


Fig. 2A

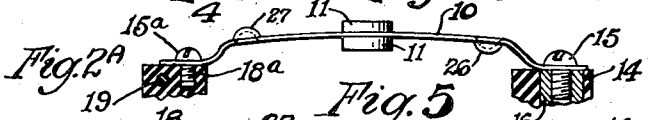


Fig. 4

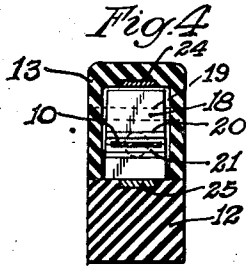


Fig. 5

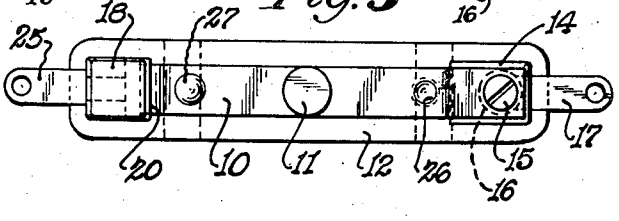


Fig. 6

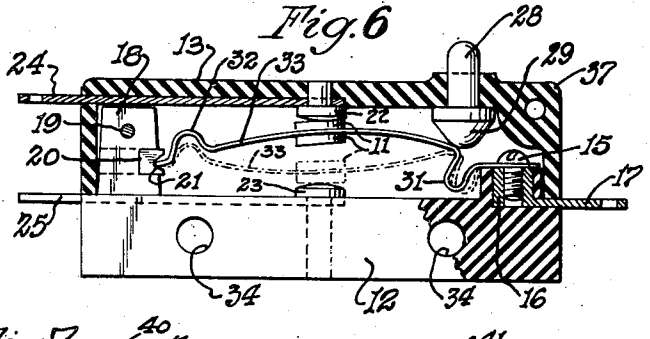


Fig. 7

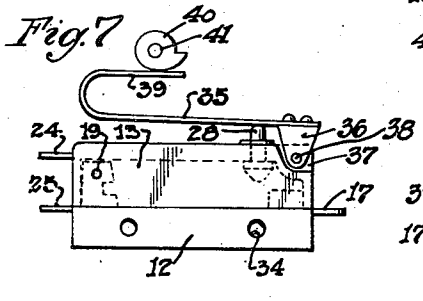
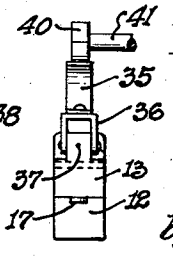


Fig. 8



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SNAP ACTION SWITCH

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Application March 1, 1945, Serial No. 580,358

8 Claims. (Cl. 200—67)

1

The present invention relates to light pressure switches of the type wherein a spring in the form of a leaf, plate or blade snaps in one direction when a plunger or button is depressed and snaps back again upon the release of the plunger; and it has for its object to simplify and improve the construction of such switches, increase the capacity thereof and, at the same time, bring about a very substantial reduction in size.

All of such prior switches with which I am familiar obtain very small gaps between contacts, when opened, sometimes as little as one thirty second of an inch. Furthermore, the contacts themselves are small. These characteristics sharply limit the usefulness of the switches to situations in which only small currents need be handled. Viewed in one of its aspects, an object of the present invention is to overcome this weakness.

The aforesaid prior switches are also unsatisfactory because they are too bulky; and, in another of its aspects, my invention may be said to have for an object to reduce the size to such an extent that two of my switches will occupy no more space than is needed for one of the old style.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but for a full understanding of the invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawing, wherein:

Figure 1 is a plan view of a switch embodying the said invention in a preferred form; Fig. 2 is a section taken on line 2—2 of Fig. 1; Figs. 3 and 4 are sections taken, respectively, on lines 3—3 and 4—4 of Fig. 2; Fig. 2A is a fragmentary elevational view illustrating an alternate method of supporting the movable switch member; Fig. 5 is a view, similar to Fig. 1, with the casing cover removed; Fig. 6 is a view similar to Fig. 2, but with a part of the base in section, illustrating a second form of movable switch element; Fig. 7 is a side view, on a smaller scale, showing a switch and an operating means therefor; and Fig. 8 is an end elevation of the devices appearing in Fig. 7.

Referring to Figs. 1 to 5, 10 is a movable switch member which constitutes the most important feature of the present invention. It consists simply of a long, narrow leaf spring, preferably made from beryllium copper. It is provided, about midway between its ends, with thick discs

2

11, one on each face, of pure silver. The spring overlies and extends lengthwise of the base member 12 of a long, narrow casing or housing of insulating material. Cooperating with the base is a cover 13 in the form of a deep, inverted pan. One end of the spring overlies a short post or upward projection 14 on end of the base, within the interior of the casing, and is rigidly secured and held by a screw 15 that passes through the spring and into a binding post 16 embedded in the part 14. A flat terminal 17 extends from the binding post out through the corresponding end of the casing. In the opposite end of the casing is a somewhat higher post or projection 18, rising from the base. A pin 19, passing through the long side walls of the cover and the post 18, serves to fasten base and cover together. In the side of the post 18 facing the post 14 is a block 20 of metal that contains a V-shaped notch or groove 21 extending across the width of the same. The free end of the spring is engaged in this notch or groove to provide a rocking connection between this post and the spring. The parts are so shaped and proportioned that the spring is normally bowed upwardly sufficiently to cause the upper contact disc to be pressed forcibly against the overlying cover. In the use of the device the curvature of the spring is reversed, as will hereinafter be described, until the contact disc on the under side is pressed forcibly against the base. The cover and the base are respectively provided with stationary contact pieces 22 and 23, one to be engaged by the upper contact disc on the spring in the normal positions of the parts, while the other is engaged by the lower contact disc when the direction of curvature of the spring is reversed. Terminal elements 24 and 25, similar to terminal 17, but longer, extend from the stationary contacts, 22 and 23, respectively, through the end of the casing opposite that at which the terminal 17 is located. Since the terminals are arranged one above the other the width of the device need not be increased to provide adequate spacing between them.

Since in switches of the type under consideration the movable member must remain in or move into what may be termed its normal working position, except while held in its other working position by an external force, means must be provided in the instant case to bring this about, insure proper pressure between cooperating contacts in each of the two working positions, and achieve a very rapid or snap movement after the spring has been initially flexed and also after it has been released. I have found that this may

be accomplished by providing the spring with a small downward bulge 26 near its fixed end and a similar, upward bulge 27 near the other end. These bulges may be made in various ways. Thus, in the arrangement shown, little hemispherical cups or protrusions, smaller in diameter than the width of the spring, are fashioned by deforming or extruding the metal of the spring to protrude in relatively opposite directions at the proper points. The spring is moved out of its normal position, that indicated in full lines in Fig. 2, through pressure on a little plunger 28 passing straight down through the top wall of the cover of the casing and provided with an insulated head 29 that engages the top side of the spring adjacent to the bulge 26. The head is preferably cone-shaped to enable it to exert a wiping action against the slightly arcuate shoulder 30 formed in the spring at protrusion 26, while the spring is bowed upwardly. Upon depressing the plunger, the spring is initially flexed and then rapidly snaps down into the broken line position where it remains until the plunger is released. As soon as the plunger is released the spring quickly snaps back into its normal position.

While I prefer to leave the left hand end of the spring free to rock instead of bending, when the spring snaps down, both ends may be held fast. Thus in Fig. 2A, instead of the high post rising from the left hand end of the base in the other form, there is a low post, 16a; the spring overlying this post as well as post 14, and being secured thereto by a screw 15a.

It will be seen that there is a large gap at the open side of the switch in whichever position it may be. Thus, in a device wherein the casing has an outside length of a little less than two inches and a width of three eighths of an inch, the gap is at least five thirty-seconds of an inch. This, coupled with the fact that the actual contacts may be quite large and heavy, makes it possible to handle much heavier currents than is true with the old switches. Also, because all of the contacts have their centers in the same longitudinal vertical plane, instead of in a transverse plane, the switch need be only one half as wide as one in which the stationary contacts must be spaced apart across the width of the device for cooperation with one end of a spring member. It therefore follows that two of my switches may be placed side by side in the same space as is required for one of the old switches; and, furthermore, that one of my switches will satisfactorily carry fifteen amperes as against ten amperes for the latter.

In the device shown in Fig. 6 the parts are the same as those in Fig. 2, except that the bulges 31 and 32 in the spring 33 result from bending the spring along lines extending transversely thereof to form U-shaped loops.

When a number of the switch devices are to be grouped together, they may be placed side by side and secured by fastenings passing through holes 34 in the base member; these holes also being adapted to receive fastenings or supporting means in mounting individual devices.

In Figs. 7 and 8 I have illustrated a suitable operating means for the switch. This consists of a spring lever 35 having at one end a jaw 36 which embraces an ear 37 at the end of the cover at which the plunger is located. A pin 38 joins the jaw to the ear and forms a spindle about which the lever may rock. The free end of the lever may be bent back, hair pin fashion, as at 39, to avoid making the overall length of the device too great. The lever overlies the plunger 28, so that when it is swung down it depresses the plunger and throws the switch from the full line position to the broken line position. The lever may be actuated by a cam 40 on a rotating shaft 41; the cam being above and resting on the turned back section of the lever.

While I have illustrated and described with particularity only the preferred form of my invention, including a slight modification in the spring member of the switch, I do not desire to be limited to the exact structural details thus illustrated and described; but intend to cover all forms and arrangements and means for supporting the ends of said spring member which come within the definitions of my invention constituting the appended claims.

I claim:

1. In a switch, a single elongated narrow leaf spring rigidly held at one end, a stationary support for the other end of the spring at such a distance from the fixed end that the spring normally bows upwardly, said support leaving the spring free to rock up and down on the support about the adjacent end edge of the spring, a stationary contact positioned above the spring at about the middle and normally pressing against and stressing it, the spring having near each end thereof an integral protrusion of transverse width less than the width of the spring, the protrusion near the fixed end of the spring being downward and the other being upward, a plunger above the spring in position adapted to exert pressure thereon beside the downward protrusion to slightly flex the spring and thereby cause it to quickly reverse its curvature, and a second stationary contact below and normally remote from the middle of the spring adapted to be engaged by the spring when the plunger is depressed and the curvature of the spring is reversed.

2. In a switch, a long narrow base having upward projections near its ends, a long narrow leaf spring overlying said base and fixed at one end to the top of one of said projections, the second projection having in the side facing the first projection a transverse notch positioned a substantial distance above the base, the free end of the spring being seated in said notch to hold the spring in an upwardly bowed condition and enable it to rock about the end edge that is seated in the notch, a cover forming with the base a casing for the spring, a stationary contact mounted on the inner side of the cover above the middle of the spring and normally pressing against and stressing the spring, the spring having near its ends hemispheric protrusions extending at least part way across the width thereof, the protrusion near the fixed end of the spring being downward and the other protrusion being upward, and a plunger reciprocable through the cover disposed above the spring and positioned to exert a downward pressure on the spring near the downward protrusion when the plunger is depressed, thereby causing the spring first to flex and then quickly reverse its curvature, together with a second stationary contact on top of the base below the middle of the spring adapted for engagement by the spring when the plunger is depressed and the curvature of the spring reversed.

3. A movable member for a snap switch consisting of a single elongated narrow leaf spring normally disposed in upwardly bowed position and having near each end a single protrusion

one of which is disposed upward and the other downward, and contact pieces fixed to opposite faces of the spring about midway between its ends.

4. In a switch, a casing including a comparatively narrow but elongated base and a cover therefor, a movable switch member within the casing extending longitudinally thereof and comprising an elongated narrow leaf spring, stationary means supporting the ends of the spring on said base and holding the spring in an upwardly bowed condition, the spring having near one end thereof a single upwardly disposed protrusion and near the other end thereof a single downwardly disposed protrusion, stationary contacts in the casing, an upper one of said contacts being secured to the underside of said cover and a lower one of said contacts being secured to said base and both of said contacts being vertically aligned at about the middle of the spring, said spring carrying contact means at about its middle portion so arranged that said contact means normally presses against the upper one of said stationary contacts, and an actuator adapted to be pressed downwardly to engage the spring near the downwardly disposed protrusion whereby the spring is initially flexed and caused to quickly snap away from the upper one of said stationary contacts and thereby reverse its curvature so as to engage the lower one of said stationary contacts when the actuator is moved down, said spring being adapted to quickly snap upwardly into normal engagement with the upper one of said stationary contacts when the actuator is released.

5. In a switch as set forth in claim 4, wherein said protrusions are rigid cup-shaped extrusions of the material of the spring and of transverse width less than the width of the spring.

6. A switch as set forth in claim 4 and wherein there are three vertically plane-aligned terminals one of which is secured to the base and connected to a fixed end of the spring, another of said terminals being secured to the stationary contact on the base and the other one of said terminals being secured to the stationary contact on the cover, said terminals extending longitudinally of the cover and base.

7. A switch as set forth in claim 4 wherein there are three laterally extending terminals one of which is secured to the base and connected to a fixed end of the spring, another of said terminals being secured to the stationary contact on the base and the other one of said terminals being secured to the stationary contact on the cover, said terminals extending outwardly of the casing and beyond the outer sides of the cover therefor.

8. A movable member for a snap switch consisting of a single elongated relatively narrow leaf spring normally disposed in bowed position having near each end thereof a single deformation in the body of the spring, said deformations constituting transverse stiffeners in the spring body in the form of protrusions projecting from the spring body in relatively opposite directions, and at least one circuit making and breaking contact piece carried by the spring at about midway its ends.

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