April 18, 1961 C. H. MILLERWISE 2,980,774

SNAP SWITCH

Filed March 14, 1958 2 Sheets-Sheet 1

FIG. 1

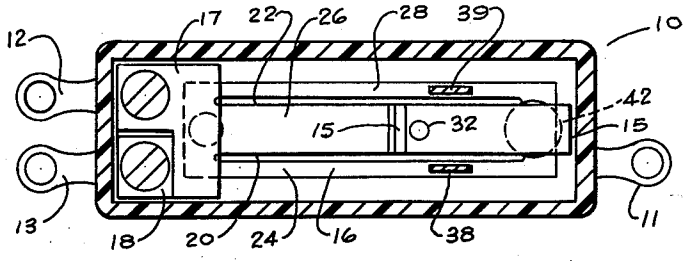



FIG. 2

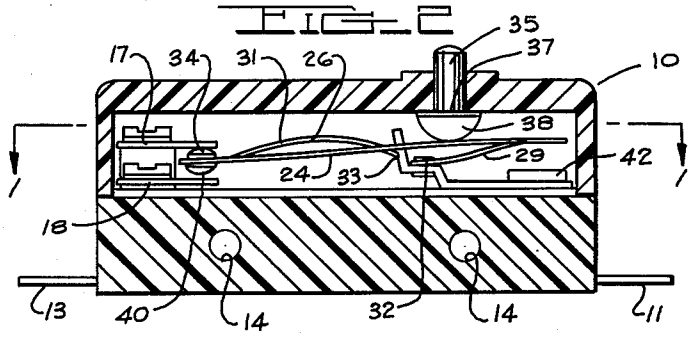
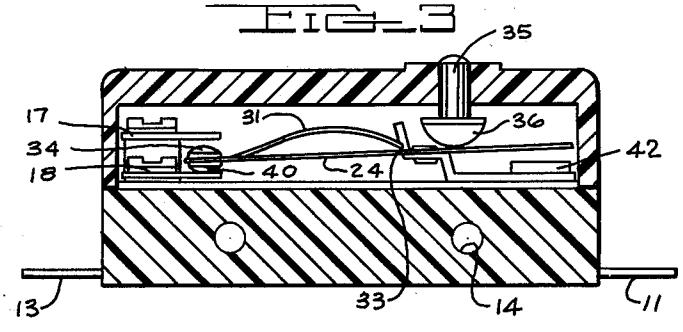



FIG. 3




INVENTOR.
CARL H. MILLERWISE
BY
SMITH, WILSON, LEWIS & McRAE

April 18, 1961 C. H. MILLERWISE 2,980,774

SNAP SWITCH

Filed March 14, 1958 2 Sheets-Sheet 2

FIG. 4

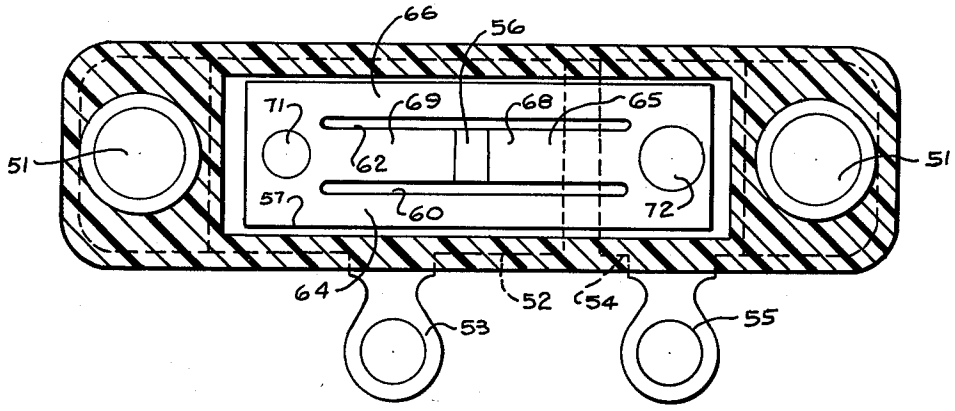



FIG. 5

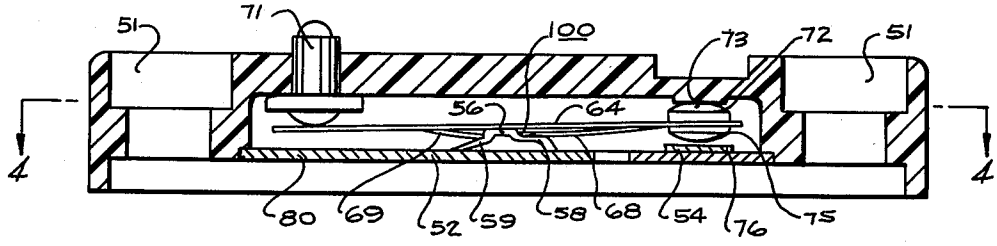
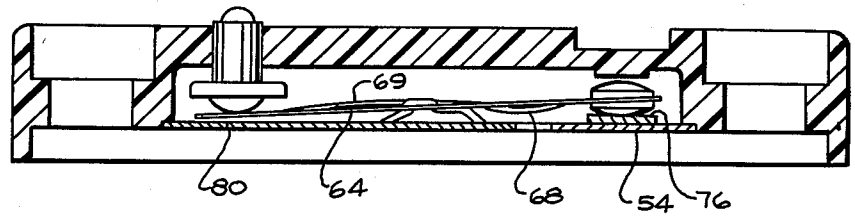



FIG. 6




INVENTOR.
CARL H. MILLERWISE
BY
SMITH, WILSON, LEWIS & McRAE

United States Patent Office 2,980,774 Patented Apr. 18, 1961



2,980,774

# SNAP SWITCH

Carl H. Millerwise, Trumbull, Conn., assignor to American Radiator & Standard Sanitary Corporation, New York, N.Y., a corporation of Delaware

Filed Mar. 14, 1958, Ser. No. 721,602

1 Claim. (Cl. 200—67)

This invention relates to a snap switch, and particularly to a switch blade construction which has considerable overtravel and long operating life.

Objects of the invention are to provide a snap switch wherein:

(1) The switch has wide contact gap, long overtravel, good contact pressure, lack of contact bounce, and ability to separate the contacts with a sliding action so as to break the contact welds.

Other objects of this invention will appear in the following description and appended claim, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

Fig. 1 is a sectional view of one embodiment of the invention taken on line 1—1 in Fig. 2.

Fig. 2 is a side elevational view of the Fig. 1 embodiment with parts of the switch housing broken away to show the configuration of the switch blade.

Fig. 3 is a view similar to Fig. 2, but with the switch blade in an actuated condition.

Fig. 4 is a view of a second embodiment of the invention taken on line 4—4 in Fig. 5.

Fig. 5 is a view similar to Fig. 2, but of the Fig. 4 embodiment.

Fig. 6 is a view similar to Fig. 3, but of the Fig. 4 embodiment.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In Figs. 1 through 3 of the drawings there is shown a switch comprising a two piece dielectric housing 10 having terminals 11, 12 and 13, and mounting holes 14.

Terminal 11 is electrically connected with a metallic plate 15 which forms a support structure for metallic blade 16. Terminals 12 and 13 are connected with respective ones of metallic stop members 17 and 18. Blade 16 thus serves to alternately connect terminal 11 with either terminal 12 or terminal 13, depending on whether it is in its Fig. 2 position or its Fig. 1 position.

Blade 16 is provided with two longitudinal slots 20 and 22, which subdivide the blade into three sections 24, 26 and 28. Central section 26 is cut through at an intermediate point to form a blade mounting portion 29 and a blade stressing portion 31. Prior to installation the blade is flat and without stress. In the installed position, mounting portion 29 is riveted onto flat surface 32 of support structure 15, and blade stressing portion 31 is seated in a notch 33 formed in structure 15, the arrangement being such that the blade normally assumes its Fig. 2 position with contact 34 engaged with stop 17.



In order to actuate the switch there is provided a depressible plunger 35 which carries a yoke 36. Yoke 36 includes a web portion 37 and two depending flanges 38 and 39, which engage respective ones of blade sections 24 and 28.

In operation, when plunger 35 is depressed blade sections 24 and 28 are moved from the Fig. 2 position downwardly past notch 33 to the Fig. 3 position so as to move the left end of the blade downwardly with a snapping action. In the Fig. 2 position the compressive force of portion 31 acts on the blade in an imaginary line from notch 33 to the left end of the blade. This imaginary line runs at an upward angle with respect to the plane of blade sections 24 and 28 as to push the blade toward stop 17. In the Fig. 3 position the force line from notch 33 to the left end of the blade acts at a slight angle downwardly to the plane of sections 24 and 28 so as to push blade contact 40 against stop 18. In a typical unit the contact pressure is about twenty-five grams.

In the event that plunger 35 is depressed below its Fig. 3 position there is no permanent deflection, deformation or injury to the blade because blade sections 24 and 28 are free to be moved downwardly alongside of support structure 15. Ultimately the right end area of the blade bottoms on a fixed stop member 42. This stop member determines the maximum downward deflection which blade mounting portion 29 can take (though the design is such that blade portions 24 and 28 can enjoy further overtravel after the blade bottoms against stop member 42).

When the downward pressure on plunger 35 is released the compressive forces developed in the highly arched portion 31 cause it to return toward its "low arched" position as shown in Fig. 2 so as to snap the blade toward stop 17.

The Fig. 4 embodiment includes a dielectric housing 50 having mounting holes 51. Fixedly mounted in housing 50 is a metal plate 52 having an integrally formed terminal 53. A second fixed metal plate 54 carries another terminal 55.

Plate 52 is formed with an integral upstanding projection which constitutes a support structure 56 for switch blade 57. Support structure 56 provides a flat seating surface 58 and a notch 59.

Blade 57 is slotted at 60 and 62 to form three spaced blade sections 64, 65 and 66. Section 65 is cut through at two longitudinally spaced points to remove a portion of the blade and thereby form a blade mounting portion 68 and a blade stressing portion 69. Mounting portion 68 is welded onto support structure surface 58, and stressing portion 69 is seated in notch 59. Prior to installation the blade is flat.

In order to actuate the switch there is provided a depressible plunger 71, which engages the left end area of the blade so as to move it from the Fig. 5 position to the Fig. 6 position. In the Fig. 5 position the blade is located with its contact 72 pressuringly engaging stop surface 73, and there is no flow of current through the switch. In the Fig. 6 position the blade is located with its contact 75 pressuringly engaged with stop surface 76 so as to complete a circuit from terminal 53 through blade 57 to terminal 55.

In the Fig. 5 position blade portion 69 is in longitudinal compression so as to act at a slight upward angle on the blade in a manner forcing blade contact 72 against surface 73. As plunger 71 is depressed the central areas of blade portions 64 and 66 pass below point 100 so as to change the line of action of portion 69 into a direction at a slight downward angle to blade sections 64 and 66 (as shown in Fig. 6); as a result the blade is caused to snap down toward surface 76.

When the external pressure on plunger **71** is decreased below a predetermined "release" value blade portion **69** is enabled to move from its Fig. 6 "highly arched" condition to its Fig. 5 "low arched" condition.

In both the Fig. 1 and Fig. 4 embodiments the arch of the stressing portion (**31** or **69**) is changed during movement of the blade between the "released" and "actuated" positions so as to cause a slight longitudinal sliding of the blade contacts as they leave the stop surfaces. This sliding movement tends to prevent failures due to "contact welding."

A feature of the illustrated embodiment resides from the fact that after the snap point is reached (and the contacts move to their Fig. 3 and Fig. 6 positions) the operating force of the plunger required to effect overtravel of the blade decreases. This is in contrast to the usual blade construction wherein the operating force increases after the snap point is reached.

The "decreasing operating force" feature has particular advantage in those cases where a number of the switches are actuated by a single power arm, either together or in sequence. Because the operating force decreases after the snap point is reached the maximum force required to be developed by the power arm is much less than when conventional switch structures are employed. As a result the instant structures have an increased range of application as compared with the conventional structures.

I claim:

A switch comprising an elongated blade slotted longitudinally to define a first tension section and a second interconnected compression section; said second section being severed laterally at an intermediate point therealong to form a flexible mounting portion and a bowable stressing portion; support structure positioned between the mounting portion and the stressing portion and defining a notch pivotally seating an end of the stressing portion and a substantially flat surface to which a flat portion of an end area of the mounting portion is fixed; a pair of opposed stop members adjacent one end of the blade for limiting blade movement in opposite directions; and an actuator engaging the blade adjacent its other end, with the stressing portion bowed out of the blade plane in one direction, and with the mounting portion extending out of the blade plane in the opposite direction; said actuator having a pretravel movement to move the tension section for increasing the bow in the stressing portion and snapping the blade from one stop member to the other stop member, and said actuator having an overtravel movement causing the mounting portion to buckle and effect a decrease in the bow of the stressing portion for thereby decreasing the force necessary to be maintained on the actuator to accomplish the overtravel movement.



**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 2,417,169 | Kaminky | Mar. 11, 1947 |
| 2,429,813 | Hausler | Oct. 28, 1947 |
| 2,565,790 | Van Ryan et al. | Aug. 28, 1951 |
| 2,599,473 | Miller | June 3, 1952 |
| 2,669,618 | Bradley | Feb. 16, 1957 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 644,520 | Great Britain | Oct. 11, 1950 |