

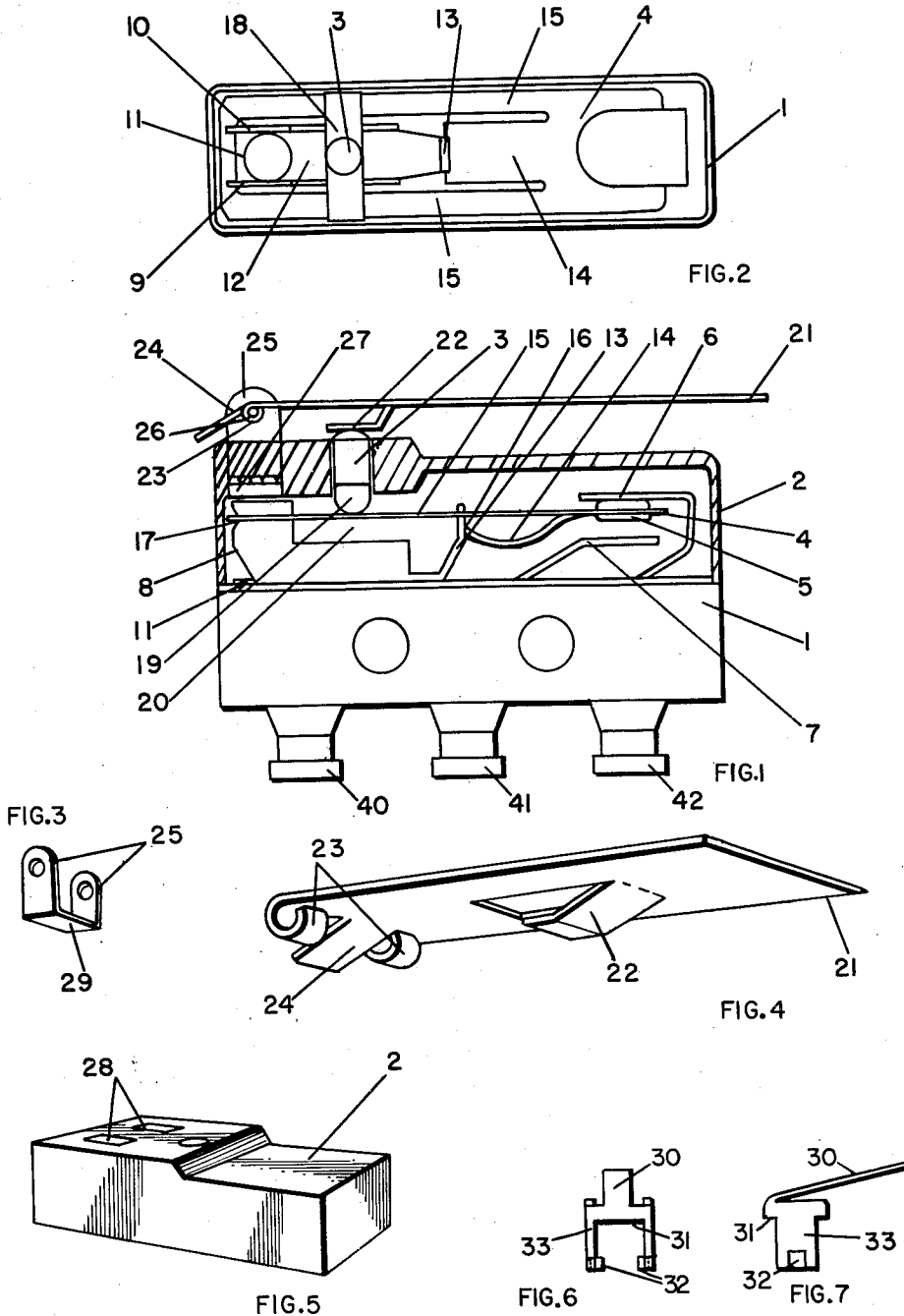
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SNAP SWITCH

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SNAP SWITCH

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This invention relates to snap switches of the type in which a thin leaf spring is utilized as the actuating member for a movable contact, to cause that movable contact to engage either of two stationary contacts mounted on opposite sides of the permitted path of movement of the movable contact.

The art of snap switches has been rather well developed in which a leaf spring type of actuator for a contact is controlled according to the overcenter or toggle principle.

Such switches have been reduced in size to the minimum practical limit where intended for use in industrial applications. In many of the military applications, however, where space and weight are important factors, and also in present computers where space and weight has also become important, a still smaller switch with a still smaller order of dimensions, would be desirable if it could be made to provide the same advantageous features of snap action.

The primary object of our invention therefore, is to provide such a snap switch, utilizing well established and acceptable principles of operation, but with a smaller order of dimension to permit the switch to be made to provide a satisfactory operation in smaller dimensions and in a smaller weight than has been accepted heretofore as a practical limit.

Another object of this invention is to provide a snap switch having a novel construction which will permit miniaturization, when auxiliary actuators are employed, by eliminating the need for conventional external fastening and anchoring means, such as screws and bolts, with a consequent reduction in the dimensions of the switch parts by eliminating fractions of the dimensions of those parts where space was needed solely for receiving and anchoring such external anchoring means.

Another object of the invention is to provide a novel construction, which is not in itself necessarily limited to miniaturized subminiature switches, but which provides a new principle of construction that permits a new method of assembling such a snap switch.

In present conventional snap switches of small size utilizing leaf springs, the contact members and the usual positioning elements for the leaf spring are anchored to a suitable molded base structure with appropriate screws and bolts. Such screws and bolts, as well as the anchoring elements needed to hold them in place in the molded base, require extra space merely for their own accommodation. As a result, the size and weight of such a snap switch is generally more than would be necessary solely to accommodate the operating parts that establish the switching function and operation.

This invention is directed to a construction which combines the usual switch contacts as inserts in the molded body, to begin with, and provides a new type of support for a movable switch blade, which permits the switch blade to be directly applied and placed in normal operating position without requiring the application of other and further outside fastening or anchoring means for the switch blade itself.

As a result, various advantages are derived. First, the switch may be more easily and readily assembled. Second, the dimensions of the switch parts in the molding operation can be more accurately controlled, with the re-

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sult that close manufacturing tolerances can be more closely observed and maintained.

Briefly, the switch base is molded with stationary contact members embedded therein as inserts during the molding operation. At the same time appropriate supports are formed integrally in the molded structure to receive the switch blade which is to operate the movable contact member between the two stationary contact members. The two supports for the blade are shaped to embody two oppositely facing notches at the opposite end of the molded body away from the contact elements, so that the spring may be mounted on one notched support as a pivoted cantilever. The blade is of generally rectangular frame shape with a re-entrant portion from one of the short side walls, and that re-entrant portion fits into the second notch of the support in such manner as to place the re-entrant piece in compression so that the two long side walls of the frame of the blade are placed in tension to hold the pivoted end of the blade in its notch for proper self-adjusting pivotal operation.

Other objects and features of the invention, as embodied in this switch, will be referred to in the following description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a side elevational view of the switch embodying the principles and construction of this invention;

FIG. 2 is a plan view of the switch shown in FIG. 1, with the cover removed;

FIG. 3 is a perspective view of a pivot bracket for the switch-actuating lever;

FIG. 4 is a perspective view of the actuating lever for the switch; and

FIGS. 5, 6 and 7 show perspective views of parts for an alternative type of operation of the switch.

The switch consists of a molded base 1, a molded cover 2, a molded button 3, a flexible spring 4 upon which is mounted a moving contact 5, two stationary contacts 6 and 7 which are molded into the base, a pivot 8 consisting of two laterally spaced elements 9 and 10 and a centrally disposed element 11 with horizontal portion 12 and a generally vertical portion 13.

The spring member is composed of a central compression member 14 and two tension members 15. The vertically extending portion 13 of the pivot 8 is provided with a notch 16 and the back portions of the pivot 8 are provided with notches 17 in 9 and 10. The compression force on the compression member 14 is obtained by placing the spring in notches 16 and 17 which give a stable three point suspension. The tension members straddle the vertical pivot members 9 and 10.

The button 3 is an inverted T configuration with a round section protruding through the cover and a rounded section 19 in contact with the spring member. The horizontal section of the button 3 is guided by a slot (not shown) in the cover 2 to prevent the button from turning during actuation. In a fully depressed position the center section of button 3 will rest on portions 20 of the pivot 8 while the tension members 15 will straddle the vertical members 9 and 10. This prevents any pinching or distortion of the spring member in this position. The spring member 4 is a floating member and is not rigidly fastened at any point and thus avoids the stresses of a cantilever or similar type mounting which does not permit the spring member to flex for its entire length.

When the button 3 is depressed the horizontal portion 18 forces the lateral tension members 15 downward to an overcenter position which results in the moving contact 5 transferring from contact 6 to contact 7 with a snap action.

As an additional optional feature, if auxiliary actuators are desired, cover 2 can be provided with a recess 27

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and two lateral slots 28 extending up through the top surface of the cover 2. The recess 27 and two slots 28 are for mounting either leaf 30 or lever 21 actuators to the switch housing.

The lever mechanism consists of a lever 21 assembled to shaft 26 by means of two hinge sections 23. A formed section 22 contacts the switch actuating button 3. It is joined down to permit adjustment of the lever 21 to operate position to very close tolerances. The tab 24, by coming in contact with the corner of the cover 2, prevents the lever 21 from travelling beyond a predetermined point. The lever mounting shaft 26 is positioned by the yoke 25 which consists of two vertical portions 25 and a horizontal portion 29. The yoke is inserted in the cover recess 27 with the vertical portions 25 protruding through the cover slots 28 and the horizontal portion 29 bottomed in the recess 27. The yoke may be held in place by means of an adhesive since the forces on the yoke 29 are all in an upward direction when the lever 21 is depressed.

The leaf actuator 30 is a formed piece consisting of a spring leaf 30 supported by two vertical portions 33. The vertical portions 33 are inserted in the cover slots 28 and located by the cover 2 surface and surfaces 31 of the vertical members 33. Spring tabs 32 in each of the vertical members 33 snap into the recess 27 when they reach a point below the cover slots 28. This locks the leaf actuator in position.

Referring back to the pivotal support 8, including the two elements 9 and 10 and the spring 4 to operate the movable contacts, it will be seen from FIGS. 1 and 2, that the pivot support elements provide an inherent stability in the accuracy of their tolerances. The two pivot notches 17 at the rear, and the one pivot notch 16 at the front of the supporting structure for the spring 4, provide a three-point stable support for the actuating spring 4. At the same time, the construction is such that the spring 4 may be easily assembled upon its supporting structure without any particular type of tools, except perhaps small hand forceps, where the size of the spring is so reduced that forceps must actually be used to hold and manipulate the actuating spring 4 and to apply it to its pivotal supports.

Similarly, the two stationary contacts 6 and 7 are formed of two conductive elements that are initially embedded and molded in the molded base 1, so that no external anchoring screws or similar devices are needed to hold those stationary contact elements in position. After the molding operation, those stationary contacts may be finally adjusted to their ultimate positions for desired spacing and tolerances.

The push-button 3 to operate the switch has been shown as of a type for a self-restoring switch which will move back to the top to stationary contact 6 when the pressure on the push-button 3 is relieved. For the type of switch shown here, that is self-restoring, the movement of the push button 3 downward should be enough to press the side wall tension elements 15 of the spring to a location below the line of the front pivot 16 which then serves as the toggle point for the spring 14. The push-button 3 may then have still further permitted movement, as lost motion, down to the top surfaces 20 that serve to prevent excessive stress in the two side tension elements 15 of the actuating spring 4.

In order that the spring may re-set itself to upper position, where it is indicated in FIG. 1, the spring will be formed with an initial stress and form in tension sides 15 that will raise the curvature of those sides above the pivot line 16, when pressure is removed from the top of the push-button 3 and the spring 4 is free to assume its normal curvature while the contact 5 is in the lower position engaging the stationary contact 7. The spring 4 will thereupon operate again as a toggle and snap its contact 5 upward against contact 6.

An advantageous feature of the construction is that the

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rear wall edge of the spring frame 4 is free to pivot in its slot. Consequently, no operating flexural stresses are impressed on that part of the blade, that might otherwise change the intended and desired operation of the switch blade. Thus, the initial stressing which is introduced in order to make the blade switch self-restoring, is unaffected by any twisting forces that might otherwise be introduced if external anchoring elements were applied to different parts of the switch blade. This freedom of the switch blade to adjust itself enables the blade to adjust to a minimum of total internal stresses during operation, thereby assuring against any overstressing of the switch blade, notwithstanding its small dimensions.

Another feature of the invention is the manner in which the cover is designed so that the push-button actuators may be directly attached to the cover also without external anchoring devices. Thus, by providing the recesses within the cover area, the actuator for the push-button may be placed in position and accurately adjusted to provide the desired amount of operation of the push-button to operate the switch.

A further feature of the invention is the provision of the terminal contacts or connection to an external circuit. These terminals are similarly molded into the base as part of the initial molding operation. Thus, in accordance with the invention as disclosed herein, a novel construction of snap action switch is shown, which not only makes possible further miniaturization of such switches to a still further order of smaller dimensions, but the principle disclosed herein is available also to current conventional sizes and dimensions, with the advantages of ease of assembly and stability in dimensional control during operation.

The invention is not necessarily limited to the exact arrangement that is illustrated herein since the principles thereof may be utilized with structural variations and rearrangements without departing from the spirit and scope of the invention as defined and claimed.

What is claimed is:

1. A snap switch, comprising switch elements and operating means therefor, a housing including a base and a cover for enclosing said switch elements, said cover having a pair of spaced perforations through its wall, a push-button extending through a wall of said cover to energize said operating means, an actuator for the push-button, said actuator including an integrally formed hinge portion, a bracket anchored in the two perforations of the cover, and a pivot pin supported by said bracket, said hinge portion being in operative engagement with said pin and capable of pivotally supporting the actuator.

2. A snap switch, as in claim 1 in which the bracket anchored in the cover, consists of a U-shaped element having its two side arms extending outwardly through the perforations and supporting said pivot pin.

3. A snap switch, as in claim 1 in which the actuator includes an element to engage the push-button and a tail piece to engage the cover after limited angular movement of the actuator away from the push-button, to limit such movement of the actuator.

4. A miniature, precision snap action switch comprising a base block made of an insulating material, a switch cover fitting onto said base block, three conductive members extending through said block to provide respective external connecting terminals, two of said conductive members including opposed portions beneath said cover containing respective stationary contact means, a flexible tension member, a compression member integral therewith, a movable contact situated toward the interconnected portion of said members, an anchor bracket formed from a flat sheet of material for supporting both of said members and electrically connected to the third conductive member, said bracket including first and second separated side walls having respective notches in their ends facing away from said movable contact, a third wall perpendicular to said side walls and having a notch in the side thereof of facing said movable contact, and a portion intermediate

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said walls resting on said base block, said intermediate portion being connected to the third conductive member, said compression member being braced against the notch of said third wall, and said tension member being supported solely in the notched ends of said first and second walls, plunger means extending through said cover in operative engagement with said tension member intermediate said notched ends and said third wall, and stop means for limiting overtravel of said plunger.

5. A miniature precision snap action switch according to claim 4, wherein said stop means comprises indented portions of said first and second walls, the upper surfaces of said indented portions being beneath the notches in the ends of said side walls, said plunger adapted to abut against said upper surfaces after said switch is actuated.

6. The switch according to claim 4, further including perforations in said cover, a bracket member extending through said perforations, a pivot pin supported by said bracket and an actuator pivoted to said pin and in operative engagement with said plunger.

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7. A snap acting switch according to claim 6, wherein said actuator includes a first integral element normally resting on said plunger and an integral hinge portion surrounding a part of said pivot pin whereby said hinge portion and first element are capable of pivotally supporting said actuator.

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