July 12, 1949. O. H. KAMINKY 2,476,045

COMPACT SNAP-ACTING DEVICE

Filed Aug. 23, 1946

FIG. 1a

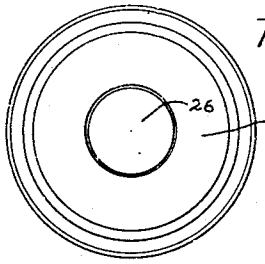


FIG. 1

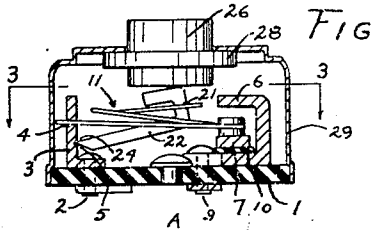


FIG. 2

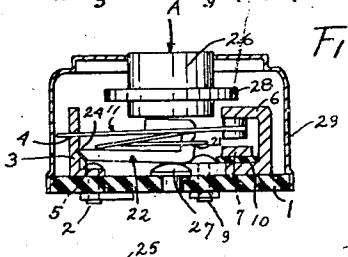


FIG. 3

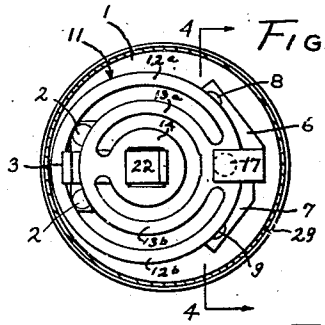


FIG. 4

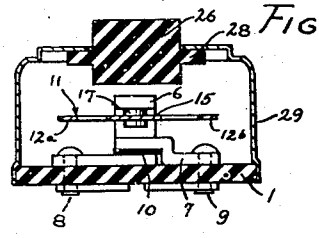


FIG. 5

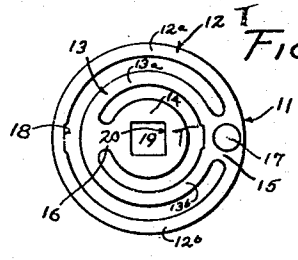
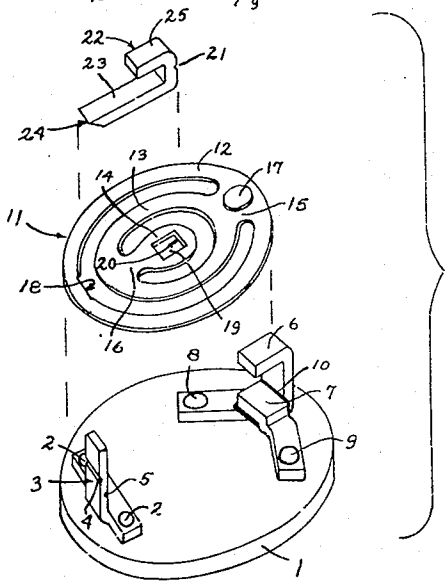


FIG. 6



INVENTOR.
Oscar H. Kaminky
BY
McCanna and Morsbach
ATTORNEYS

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COMPACT SNAP ACTING DEVICE

Oscar H. Kaminky, Sycamore, Ill., assignor to First Industrial Corporation, Wilmington, Del., a corporation of Delaware

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6 Claims. (Cl. 74—100)

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The present invention relates to improvements in snap acting devices and particularly to an improved snap acting mechanism especially adapted for use in a compact precision type electric switch.

An object of this invention is to provide a snap acting mechanism which will occupy a minimum of space; which may conveniently be incorporated within a circular casing; and which is operable by a center mounted button.

Specifically, one form of my invention contemplates the provision of a snap spring system comprising three apertured spring members, one nested within another, about a common center and so interconnected and so mounted on supports, one of which is movable that when the movable support is moved the spring system will be moved through an axis of maximum stress to move a portion of the spring system through preselected positions by snap action.

Oother objects and advantages will become apparent from the following description in connection with the drawings in which—

Figure 1 is a sectional side view of an electrical switch incorporating a snap acting device in accordance with the present invention; in this case it is a self-returning type of switch and Figure 1 shows it in normal position;

Fig. 1*a* is a top outside view of Figure 1;

Fig. 2 is a view similar to Figure 1 but showing the parts in their abnormal position with the operating plunger depressed;

Fig. 3 is a sectional view of Figure 1 taken on line 3—3;

Fig. 4 is a sectional view of Fig. 3 taken on line 4—4;

Fig. 5 is a top view of the spring system alone as employed in the switch illustrated, and

Fig. 6 is an exploded perspective view of certain parts of the switch.

Considering now the drawings in greater detail, the switch has a circular insulating base 1 of "Textolite" or similar material. Mounted on one side of the base by rivets or screws 2 is an upstanding anchor or support 3 having pivot grooves 4 and 5 formed on opposite sides. Diametrically across from the anchor 3 are upper and lower stationary contact members 6 and 7 mounted by rivets or screws 8 and 9, respectively, and electrically insulated from one another by an insert 10 of fiber or like insulating material.

The spring system generally designated 11 is best shown in Figs. 5 and 6. In this instance it comprises three concentric circular members 12, 13 and 14 joined at 15 and 16 respectively, and

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having mounted at 15 the double headed movable contact 17. The first member 12 is employed as a tension member comprising spaced circularly extending elements 12*a* and 12*b* having formed at one common end an inner edge 18 pivotally engageable with anchor groove 4; the second or intermediate member 13, which is employed as a compression member, comprises spaced circularly extending elements 13*a* and 13*b*; and the internal member 14 which is employed as a tension member is apertured at 19 to form an interior edge 20 engageable with the pivot groove 21 formed on the actuating member 22. It will be noted that the supporting edges 18 and 20 of spring system 11 are in substantial alignment with the freely movable portion 15; this feature is important in providing for maximum movement of the spring portion 15 in response to minimum movement of the movable edge 20. The actuating member 22 in this case is U-shaped, having a long leg 23 with an end knife edge 24 pivoted in anchor groove 5 and a short leg 25 which is engageable with the plunger 26 for operative movement. The actuating member 22 thus comprises a movable support for the spring system 11 and its movement in the downward direction is limited by the rivet or stop 27, as shown in Fig. 2, and in its upward direction by the engagement of plunger flange 28 with the bell-shaped housing or cover 29, the latter being crimped over the outside of the base 1 for engagement therewith. The contact 17 on the spring system 11 is movable between the upper and lower stationary contacts 6 and 7 which act as stops to limit the movement of the free end 15 of the spring system between preselected positions defined thereby. When the switch is employed as a double throw switch, one of the rivets 2 will be connected, as by soldering, to a common conducting wire (not shown), and the rivets 8 and 9 will be attached exteriorly of the base 1 to separate conducting wires (not shown) to which the above-mentioned common wire will be alternately connected through the spring system at alternate positions thereof.

In the present instance, the switch shown is made self-returning to the Figure 1 position by placing the anchor groove 4 above its groove 5. Conversely, it may be made self-returning to the Fig. 2 position by placing the anchor groove 4 below its groove 5; and a third design variation is possible in that the switch may be adapted to reset type of operation where it will stay in either the Figure 1 or Fig. 2 position by placing grooves 4 and 5 at substantially the same level on anchor 3.

To operate the switch the plunger 26 is depressed in the direction of arrow A in Fig. 2 to move the actuator downwardly through an axis of maximum stress which occurs at approximately the position where the actuator groove 21 is in the same plane as the tension member elements 12a and 12b. This causes the spring system 11 to snap the freely movable end 15 upward moving contact 17 into engagement with the upper stationary contact 6. When the depressing force on the button or plunger 26 is released, the reverse or self-returning action is similar in that the actuator 22 moves upwardly through an axis of maximum stress where the actuator groove 21 is substantially in the plane of the tension member elements 12a and 12b whence the contact 17 is snapped back downwardly to its normal or Figure 1 position.

It will be obvious that the spring system need not necessarily be circular in shape as shown, although for many applications this will be preferable in the interest of compactness combined with a lower operating force.

While a particular form of the present invention has been shown it will be apparent that minor changes therein will readily suggest themselves to others skilled in the art without departing from the spirit and scope of the invention. Having thus described the invention, what is claimed as new is:

1. In a snap acting device, a spring system having an axis of maximum stress comprising first, second and third stressed members nested together, said first and second members having an integrally interconnected portion, said second and third members having an integrally interconnected portion in spaced relation with the interconnected portion of the first and second members, the interconnected portion between said first and second members being movable between preselected positions, means for mounting said first and third members at positions remote from their respective interconnected portions to stress said members, and means engageable with one of said mounting means to move the supported portion of the respective stressed member through the axis of maximum stress to move the interconnected portion between the first and second members between its preselected positions with a snap action.

2. In a snap acting device the combination of, a base, a snap spring mounted to overlie said base and formed from a metal stamping comprising first spaced tension members interconnected at opposite ends, second spaced tension members spaced from said first spaced tension members and interconnected at opposite ends and spaced compression members disposed between said first and second spaced tension members and interconnected at opposite ends and interconnected at spaced positions with said first and second spaced tension members respectively, one of said interconnected portions of said first spaced tension members being movable between preselected positions, a bracket mounted on said base to support the other interconnected end of said first spaced tension members, a pivotally mounted lever supporting one of the interconnected portions of the second spaced tension members, and means engageable with said lever for moving the interconnected end of the second spaced tension members through the axis of maximum stress to move said interconnected end of the first spaced tension members between the preselected positions with a snap action.

3. In a snap acting device, a spring system formed from flat spring sheet material comprising an apertured tension member having a first portion freely movable between preselected positions and having a second portion in spaced relation to said first portion, means for supporting said second portion, an apertured compression member positioned interiorly of said tension member and rigidly connected to the freely movable portion thereof, a second apertured tension member positioned interiorly of said compression member and connected thereto at a position remote from the latter's connection with the first tension member, means for supporting the second tension member at a portion remote from its connection with said compression member, and means for moving one of said supported portions of said spring system through an axis of maximum stress to move said freely movable portion between said preselected positions by snap action.

4. In a snap acting device the combination of, a base, opposed stops mounted on said base, a bracket mounted on said base in spaced relation with said stops, a lever pivotally supported on said bracket and overlying said base intermediate the bracket and the stops and having an end free to move between opposed positions, a first annular member supported by said free end, a second annular member in spaced relation with said first member and supported by said bracket at a point spaced on said bracket from a pivot point of said lever and having a portion movable between said stops, a third annular member disposed between said first and second annular members and having portions respectively integrally interconnected therewith at diametrically opposite points, said first, second, and third annular members forming a snap spring system having an axis of maximum stress, and means engageable with said lever for moving the interconnected portion between the first and third annular members through the plane of said second annular member whereby to move said portion of the second member between the stops with a snap action.

5. In a snap acting device the combination of, a base, a snap spring having an axis of maximum stress overlying said base comprising a first arcuate shaped stressed member, a second arcuate shaped stressed member concentric with said first member and in spaced relation thereto, said second member having a portion movable between preselected positions, and a third arcuate shaped stressed member concentrically interposed between said second and third stressed members and integrally connected therewith at diametrically opposite points, a bracket rigidly mounted on said base for supporting said second stressed member, a lever pivotally supported on said bracket having an end supporting said first stressed member, and means for actuating said lever whereby said first member is moved from one side of said second and third members to the other side thereof whereby to move said portion between the preselected positions with a snap action.

6. In a snap acting device the combination of, a base, a snap spring having an axis of maximum stress overlying said base comprising a first annular stressed member, a second annular stressed member concentric with said first member and in spaced relation thereto, said second

member having a portion movable between preselected positions, and a third annular stressed member interposed between said first and second stressed members and having portions, respectively, integrally connected therewith at diametrically opposite points, means for supporting said second stressed member at a point remote from the movable portion, a pivotally supported lever having an end supporting said first stressed member, and means for actuating said lever whereby the interconnected portion between the first and third annular members is moved through the plane of said second member to move said portion of the second member between the preselected positions with a snap action.

OSCAR H. KAMINKY.

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