INVENTORS.
PETER J. MCLAREN &
CYRIL O. BENSON.

By
Moses, Nolle, Creny & Berry
Attys.
SNAP OVER TOGGLE SWITCH MECHANISM

Peter J. McLaren, New York, and Cyril O. Benson, Garden City Park, N. Y., assignors to The W. L. Marson Corporation, New York, N. Y., a corporation of New York

Application December 27, 1946, Serial No. 718,832

2 Claims. (Cl. 74—97)

This invention relates to snap-over toggle switches; that is, switches of the kind in which a movable contact is snapped into and out of engagement with the stationary contact abruptly, regardless of whether the switch actuator be moved rapidly or slowly.

Switches of this type referred to are not broadly new. It is an object of the present invention, however, to provide an improved toggle switch in which the parts can be more simply and easily manufactured and assembled than in prior structures, in which the dependability and durability are improved.

In carrying this object into effect, it is a feature of the invention that contact and actuating arms formed of resilient sheet metal are provided, these arms being formed with spaced confronting spring engaging edges and having a serpentine compression spring interposed between them, the arms further being provided at opposite sides of their spring engaging edges with tongues which penetrate the end convolutions of the serpentine spring and hold the latter in place.

Other objects and advantages will hereinafter appear.

In the drawing forming part of this specification—

Fig. 1 is a sectional plan view of an illustrative snap-over toggle switch embodying the present invention;

Fig. 2 is a view in sectional, side elevation of the switch in normal, or unactuated condition;

Fig. 3 is a view similar to Fig. 2 but showing the actuator depressed and the switch swung over to the opposite condition from that illustrated in Fig. 2;

Fig. 4 is a fragmentary, detail sectional view showing fragments of actuating and contact arms and an interposed serpentine spring with the parts in the relative positions illustrated in Fig. 2;

Fig. 5 is a view similar to Fig. 3 but with the parts illustrated in the positions shown in Fig. 3; and

Fig. 6 is a sectional view taken upon the line —— of Fig. 5 looking in the direction of the arrows.

The switch comprises a lower member 2 having notches 3 formed in its opposite side walls and formed with an interior block 4. The member 2 is provided with openings 5 into which attaching screws may be inserted. Upon one end of the block 4, two contact arms 6 and 7 are mounted. The arms, though side by side, extend diagonally inward so that their free or contact ends are located one directly above the other, the arm 7 being the lower one. The arm 7 is held in place by a headed screw 1a threaded into a sleeve 11 which extends through the block 4. The contact arm 6 is retained by a screw 6a, threaded into an internally threaded sleeve (not shown) extending through the block 4, and through an extension 8 of the block. A headed screw 12 threaded into the sleeve 11 holds the terminal tongue 13 in place.

The terminal tongue 13 is held in similar manner.

A combined contact arm and actuator arm member 14 is mounted upon the opposite end of the block 4. This member is cut out to form the inner actuator arm 18 which is relatively short and the outer, surrounding contact arm 16 which is relatively long. The common base of the arms 16 and 18 is clamped between the block 4 and clamping plate 17 by means of a headed screw threaded into a sleeve 28 extending through the block. A headed screw 18 is passed through a terminal tongue 19 into the sleeve 28 to hold the terminal tongue in place.

The upper surface of the insulating block 4 is provided with an elevated portion 4a, a downward sloping portion 4b, and a recessed portion 4c to afford clearance in the operation of the contact and actuating arms. A raised portion 4d extends from the surface 4b to provide a stopping abutment for the inner actuating arm under the actuator.

An insulating casing member 21, complementary in shape to the casing member 2 is secured in place by a screw 22, the screw being passed through one ear of the casing member 21 and through the insulating block 4, and being threaded into the opposite ear of the casing member 21. The top of the casing member 21 is provided with an opening 23 which is surrounded by a boss 24 at the inner side of the wall. Actuating plunger 25 is slindingly received in the bore 23 and bears against the actuating arm 18. The plunger 25 is provided with a collar 26 which engages the boss 24 and limits upward movement of the collar. The actuating arm is initially deformed and displaced upward relative to the contact arm so that it gradually holds the collar 26 up against the boss 24 when the parts are in the position illustrated in Fig. 2.

The contact arm 16 is of flat flexible construction throughout the length of the arm. The actuating arm, on the other hand, is of longitudinally flexible construction adjacent its anchored end, but is provided with longitudinally extending reinforcing ribs 27 for rendering the arm rigid at its outer end and throughout a considerable por-
tion of its length. It is the rigid portion of the arm 16 that is engaged by the actuator 25. By varying the design of the casing 21 the actuator can be located nearer to or farther from the clamped end of the arm 16 to select a desired actuator stroke, the maximum stroke available being substantially twice as great as the minimum stroke available.

A serpentine spring 28, having a multiplicity of convolutions, is interposed under compression between the arms 15 and 16. The end convolutions 23 and 30 extend in substantial parallelism to one another and each of them is provided with a pair of spaced, aligned slots 31. The slots 31 of the convolutions 28 receive tongues 32 which extend outward from the opposite margins of the actuating arm 15. The slots 31 of the convolutions 28 receive similar tongues 33 which extend inward from the contact arm 16. Between the tongues 32 of arm 15, the convolution 38 bears against an edge 34 of the arm 15. Similarly, the convolution 28 bears against an edge 35 of the arm 16 between the ears 33 of said arm. In order that the spring 28 may rock freely upon the edges 34 and 35 and may apply its thrust directly in the planes of the arm bodies, the arms are constructed to cause the edges 34 and 35 to be disposed in the mid-planes of their respective arms, and each to be bounded by faces which are perpendicular to one another and which make angles of substantially 45° with such mid-plane. As best seen by comparing Figures 4 and 5 with Figure 6, the arm 15 has an offset portion 36 which extends through the full width of the arm and a return portion 37 which extends at an angle of 45° to the mid-plane of the arm. The tongues 32 are continued from this return portion in the plane of the body of the arm 15. The return portion 37 also includes a tongue 38 which is separated from the tongues 32 by notches 39. It is upon this intermediate tongue 38 that the edge 34 is provided. The tongue 38 extends at an angle of substantially 45° to the mid-plane of the arm 15, and terminates with its outer edge 34 in the mid-plane of said arm. The edge 34 is bounded by an end face 40 and a side face 41 of the arm 15 which are disposed at right angles to one another each of which is disposed at an angle of substantially 45° to the mid-plane of the arm 15.

As best seen in Fig. 1, the arm 16 at the outer end thereof is formed with an inwardly extending projection 42. This projection is constructed in detail exactly like the outer end of the arm 15. Corresponding reference characters have accordingly been applied to the corresponding parts with the subscript "a" added in each instance, and no further detailed description is deemed necessary.

It will be evident that the spring is held inescapably and steadily in place by the tongues which pass through the convolutions 29 and 30. It is also evident that when the edge 34 of arm 15 is substantially in the line of centers, that is to say in the mid-plane of the arm 15, the thrust of the spring is applied directly in the planes of the contact and actuating arms and against edges which provide freedom for rocking in either direction through a substantially greater angle than is required in either direction.

The operation of the switch is not fundamentally different from that of the switch disclosed in Letters Patent of the United States, C. M. Petersen #1,762,075 dated June 3, 1930. With the parts in the position illustrated in Fig. 2, the contact spring is held firmly down against the contact arm 7. As the actuator 25 is moved downward the arm 15 is displaced downward until the edge 34 crosses the line of centers. Relaxation of pressure upon the actuator 25 permits the arm 15 to move toward its Fig. 1 position under its own force, the spring arm 16 being strong enough to overcome the force of the snap-over switch 26 and compress the latter. As soon as the edge 34 crosses the line of centers in its upward movement, the snap-over spring throws the contact arm 16 to the down position illustrated in Fig. 2 and assists in moving the arm 16 to its upper limit of movement as illustrated in Fig. 2.

While two terminal tongues 10 and 11 are illustrated, either of these may be omitted, or may be left unconnected. If the tongue 13 is omitted the switch will normally maintain an open circuit condition with the parts in the position illustrated in Fig. 2. Operation of the actuator to the position illustrated in Fig. 3 would close the circuit from the terminal tongue 19 through contact arms 16 and 6 to terminal tongue 10. If, on the contrary, the terminal tongue 10 is omitted, then the circuit would be normally closed from 18 to 15 with the parts in the positions illustrated in Fig. 2, and would be opened by depression of the actuator to the position illustrated in Fig. 3.

If the terminal tongue 18 is connected to one terminal of a source of voltage, and the tongues 10 and 11 are connected in parallel to the opposite terminal of said source, then the branch including tongue 13 will be normally energized with the parts in the positions illustrated in Fig. 2, but such energization will be interrupted and the other parallel branch will be energized when the actuator is operated to the position where the parts in the positions illustrated in Fig. 3.

We have described what we believe to be the best embodiments of our invention. We do not wish, however, to be confined to the embodiments shown, but what we desire to cover by Letters Patent is set forth in the appended claims.

We claim:

1. A snap-over toggle switch comprising, in combination, a contact arm, an actuating arm, said arms being composed of resilient sheet metal, and having corresponding ends rigidly anchored in place, the free ends of the arms being formed with spaced confronting edges, a compression snap-over serpentine spring rockably interposed between said edges and having its opposite end convolutions narrowly slotted and in direct engagement with the respective arms, said arms also including tongues which extend through the slots of the respective end convolutions of the snap-over spring to maintain the spring in operative relation to the arms.

2. A snap-over toggle switch comprising, in combination, a contact arm, an actuating arm, said arms being composed of resilient sheet metal and having corresponding ends rigidly anchored in place, the free ends of the arms being formed in their central zones with spaced confronting edges, and a snap-over serpentine spring rockably interposed between said edges and hav-
ing its opposite end convolutions narrowly slotted and in direct engagement with the respective arms, each of said arms also having a pair of tongues at opposite sides of its spring-engaging edge for extending through the slotted end spring convolution engaged by it.

PETER J. MCLAREN.
CYRIL O. BENSON.

REFERENCES CITED

The following references are of record in the file of this patent:

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,912,607</td>
<td>Watts</td>
<td>June 6, 1933</td>
</tr>
<tr>
<td>2,063,216</td>
<td>Zaparka</td>
<td>Dec. 8, 1936</td>
</tr>
<tr>
<td>2,198,428</td>
<td>Turner et al.</td>
<td>Apr. 23, 1940</td>
</tr>
<tr>
<td>2,360,964</td>
<td>Wilms</td>
<td>Oct. 28, 1941</td>
</tr>
<tr>
<td>2,330,506</td>
<td>Mathias</td>
<td>Sept. 28, 1943</td>
</tr>
<tr>
<td>2,378,784</td>
<td>Obszarny</td>
<td>June 19, 1945</td>
</tr>
<tr>
<td>2,402,838</td>
<td>Obszarny</td>
<td>June 25, 1946</td>
</tr>
</tbody>
</table>