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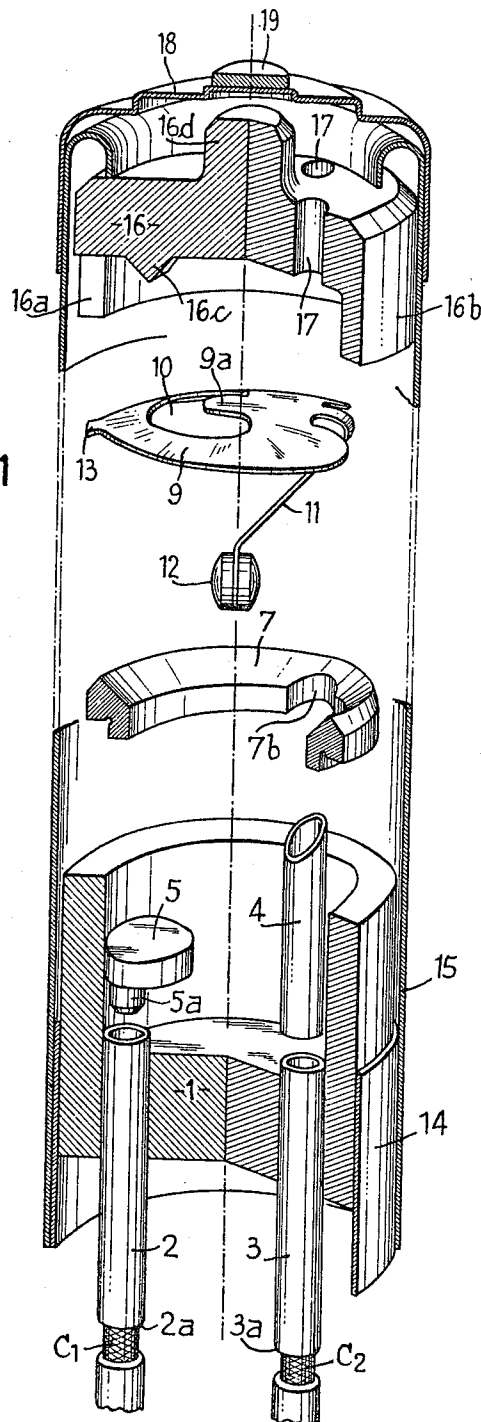
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MINIATURE SNAP-ACTION SWITCH

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Fig. 1



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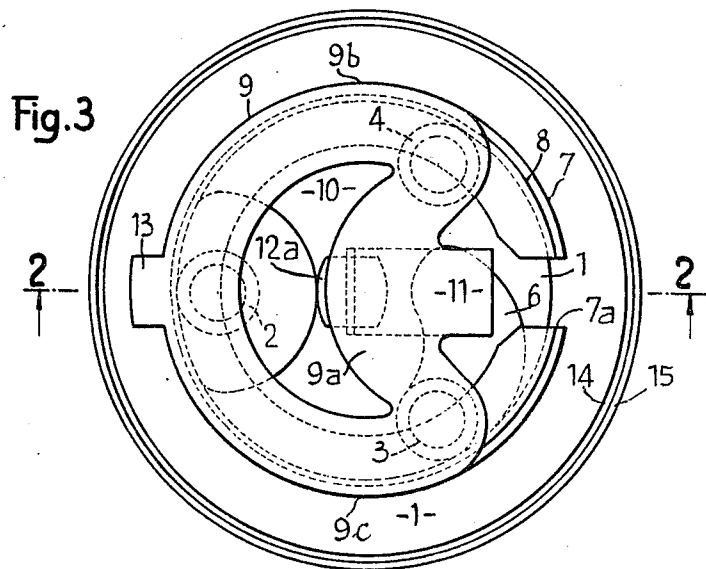
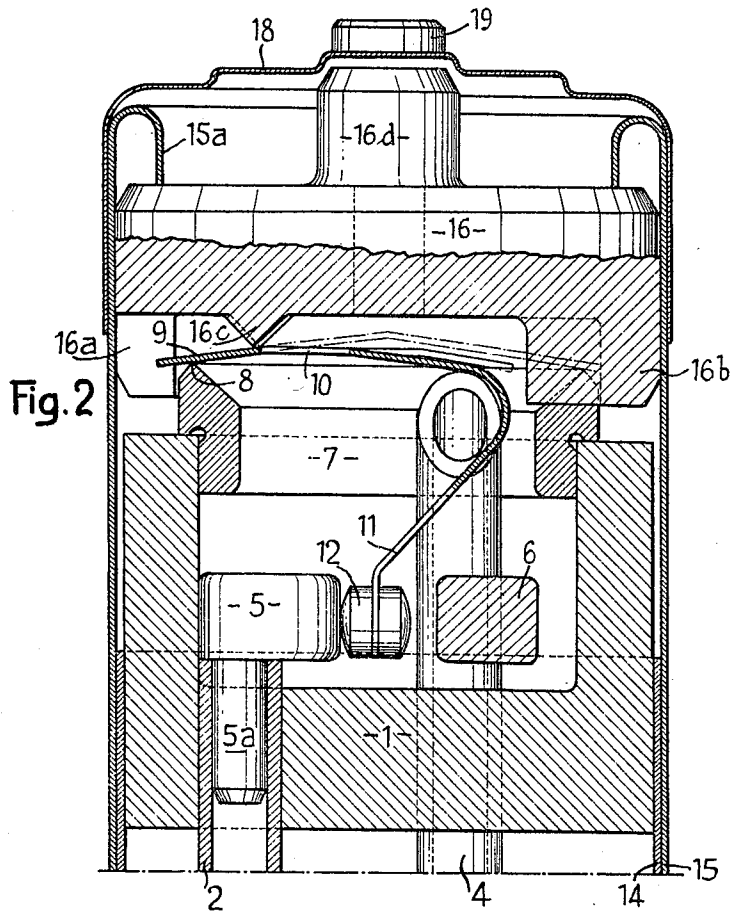
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## MINIATURE SNAP-ACTION SWITCH

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3 Claims. (Cl. 200—67)

The present invention relates to a miniature snap-action switch of the type comprising a resiliently deformable element having a position of rest and a push button acting on the element so as to bring it to a dead-centre position and cause it to pass quickly through this position, and a moving contact connected to the element and so positioned that in said position of rest the moving contact co-operates with a fixed contact termed a "contact of rest" and that, in the course of passing through the dead-centre position, the moving contact suddenly separates from the fixed contact; this moving contact can then assume a stable or unstable position termed a "working position" in which it co-operates with a second fixed contact termed the "working contact."

In this known apparatus, the resiliently deformable element is formed by a metal washer which can be of frusto-conical shape. This washer bears on a fixed member on a circular contact line and the push button moves in a direction parallel with the axis of the washer so as to urge the washer to move suddenly or "snap" from its position of rest to its working position, the concavity and the convexity of the washer in the second position being reversed relative to the first position.

In this known apparatus, the moving contact is carried by a radial tab which is cut out in one piece with the washer and extends from an edge of the latter, this tab carrying at its end the contact studs or elements and being bent at 90° so as to bring the contact elements between the fixed studs approximately on the axis of the washer at a certain axial distance from the centre of the latter on the concave side thereof.

The object of the present invention is to provide modifications and improvements in this known apparatus of particular interest in the construction of very small apparatus.

The snap-action switch according to the invention is characterized in that the end of the tab which carries the moving contact element is connected to the ring which constitutes the washer at one point on the outer edge of the latter, and a portion of the ring which extends symmetrically on each side of the base of the tab is deformed so as to constitute in plan a re-entrant part so that the outer edge of said portion is concave and the inner edge of said portion forms a projection inside the aperture of the washer, this aperture consequently having a crescent shape, and the pressure exerted by the actuating push button is applied at a point located in the plane of symmetry of the washer near to the inner edge of the portion of the washer having a convex outer contour.

Further features and advantages of the invention will be apparent from the ensuing description, with reference to the accompanying drawings to which the invention is in no way limited.

In the drawings:

FIG. 1 is an exploded perspective view of one embodiment of the invention;

FIG. 2 is a part-elevation and part-sectional view, taken along line 2—2 of FIG. 3, of said embodiment, and

FIG. 3 is a plan view of the underside of said embodiment, the upper parts (membrane and push button) having been removed.

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In the illustrated embodiment, the snap-action switch comprises a fluidtight body 1 containing three pillars formed by tubes 2, 3 and 4 composed of conductive metal. The pillars 2 and 3 carry two contacts 5 and 6 which respectively form the contact of rest and the working contact. These contacts are provided with spigots such as 5<sup>a</sup>, which extend into the ends of the pillars 2 and 3 and are brazed to the latter in a sealed manner. Further, the outer ends 2<sup>a</sup>, 3<sup>a</sup> of the pillars 2 and 3 are welded to conductors C<sub>1</sub>, C<sub>2</sub>. The pillar 4 is a common pillar electrically connected to the moving contact in the manner described hereinafter; it is also employed as an aperture for emptying the switch and filling the latter with an inert gas.

In the circular opening formed by the annular flange of the body 1 (FIG. 2) is fitted a copper member or collector which has a ring shape and a gap at 7<sup>a</sup> (FIG. 3). The inner wall of this collector has a notch 7<sup>b</sup> (FIG. 1) in which is partly disposed the pillar 4 which is brazed to this collector.

The upper wall of the collector as viewed in the position shown in the drawing, comprises a circular edge 8 (also having a gap at 7<sup>a</sup>) on which bears a resiliently yieldable element 8 carrying the moving contact. This element 9 consists of a washer composed of a resilient conductive metal having a central aperture 10 (FIG. 3). This washer has the general shape of a ring in plan (FIG. 3) and includes a portion 9<sup>a</sup> which is re-entrant within the aperture 10 so that the washer can be considered as comprising a concave or re-entrant portion 9<sup>a</sup> whose ends are connected by two convex portions 9<sup>b</sup>, 9<sup>c</sup> and that the aperture of the washer has a crescent shape as can be seen in FIG. 3. A tab 11 is fixed to the centre of the portion 9<sup>a</sup> (or, better still, cut from the same piece as the rest of the washer). This tab is bent or cranked as shown in FIG. 2 and carries a contact rivet 12.

The washer also comprises a positioning tab 13 (FIGS. 1 and 3) which is diametrically opposed to the tab 11.

The fluidtight body 1 is encompassed by a cylindrical skirt 14 brazed to the body and this skirt is surrounded by a cylindrical cap 15, the skirt 14 and cap 15 being interconnected by a circular seam weld. Disposed within the cap is a push button 16 which is composed of insulating material and is axially slidable but retained by a formed-over flange 15<sup>a</sup> of the cap 15. The push button, which has a bell shape, includes a skirt portion provided with a notch 16<sup>a</sup> in which is disposed the positioning tab 13, and a tenon 16<sup>b</sup> which extends into the gap 7<sup>a</sup> in the collector 7. The push button further comprises on its lower face a projection 16<sup>c</sup> which is in contact with the left part of the washer 9 as viewed in FIG. 3, near to the inner edge of the washer and in the plane of symmetry thereof (plane 2—2 of FIG. 3).

The sliding of the push button 16 is facilitated by the provision of vents 17 (FIG. 1).

The upper part of the cap is closed by a thin elastic membrane 18 which is connected to the cap 15 by a circular weld. This membrane is provided with a stud 19 through the medium of which a central boss 16<sup>b</sup> of the push button is depressed.

It can be seen that the common pillar 4 brazed to the collector 7 is in constant electrical contact with the washer 9 and consequently with the moving contact 12. In the illustrated position of rest, in which the washer 9 is in its position of rest, the moving contact 12 bears against the contact of rest 5 and the pillar 4 is consequently in electrical contact with the pillar 2.

If the stud 19 is depressed the push button is moved downwardly and this causes the washer to "snap" to another position or, in other words, creates a sudden deformation of the washer whose two outer portions 9<sup>b</sup>, 9<sup>c</sup> become concave so that there is exerted on the two ends

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of the re-entrant portion 9<sup>a</sup> a bending force which causes the tab 11 to pivot toward the right as viewed in FIG. 2 so that the rivet 12 is applied against the working contact 6. The electrical contact is therefore broken between the pillars 4 and 2 and established between the pillars 4 and 3.

If the pressure of the stud 19 is released, the washer 9 automatically snaps back to the shape it has when at rest and the switch resumes the position shown in FIG. 2.

The invention can be embodied in the form of a very small switch. For example, the diameter of the switch assembly could be of the order of 8 mm. The tubes forming the pillars 2, 3 and 4 can have outside diameters of 1.2 mm. and a wall thickness of 0.2 mm. The members 14 and 15 can have a wall thickness of 0.1 mm.

Although a specific embodiment of the invention has been described, many modifications and changes may be made therein without departing from the scope of the invention as defined in the appended claims.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. A snap-action device comprising a resilient deformable dished washer, normally concave relative to the general mean plane of said washer and having a symmetry plane, said washer comprising; a substantially C-shaped portion having an inner edge and an outer edge and two end portions, and an intermediate arcuate re-entrant portion bridging the gap between said two end portions and having a curved inner edge and a curved outer edge, said latter inner edge having a radius of curvature smaller than that of the former inner edge whereby said two inner edges define a substantially crescent shaped aperture, a tab integral with said intermediate portion, extending from the middle point of said outer edge of said intermediate portion and bent in said symmetry plane and having a free end portion; said snap-action device further comprising a pressure means movable relative to said C-shaped portion along a line perpendicular to the general mean plane of said washer and comprising a projection so positioned as to be capable of engaging said C-shaped portion at a point near the middle point of the inner edge thereof upon application of a pressure on said pressure means, whereby the concavity of said washer is inverted with a snap-action and the free end portion of said tab is rapidly displaced in said symmetry plane, the device returning to its normal state upon release of the pressure application.

2. A miniature snap-action switch comprising: a body, a resilient deformable dished washer, normally concave relative to the general mean plane of said washer and having a symmetry plane, said washer comprising; a substantially C-shaped portion having an inner edge and an outer edge and two end portions, and an intermediate arcuate re-entrant portion bridging the gap between said two end portions and having a curved inner edge and a curved outer edge, said latter inner edge having a radius of curvature smaller than that of the former inner edge whereby said two inner edges define a substantially crescent-shaped aperture, a tab integral with said intermediate portion, extending from the middle point of said outer edge of said intermediate portion and bent in said symmetry plane and having a free end portion, an electric contact element mounted on said free end portion of said tab and constituting the moving contact of said switch, first and second electric contact studs in spaced relation to each other and mounted on said body, a copper ring member fixed to said body and having electrical contact with the first of said studs, a circular edge

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provided on said ring member and supporting the outer periphery of the washer, said second contact stud having an electric contact element which faces the electric contact element of said tab; and pressure means slidably mounted in said body, said means having a projection so positioned as to be capable of engaging said C-shaped portion at a point near the middle point of the inner edge thereof upon application of a pressure on said pressure means, whereby the concavity of said washer is inverted with a snap-action and said moving contact is rapidly displaced in said symmetry plane, the device returning to its normal state upon release of the pressure application.

3. A miniature snap-action switch comprising: a body, a resilient deformable dished washer, normally concave relative to the general mean plane of said washer and having a symmetry plane, said washer comprising; a substantially C-shaped portion having an inner edge and an outer edge and two end portions, and an intermediate arcuate re-entrant portion bridging the gap between said two end portions and having a curved inner edge and a curved outer edge, said latter inner edge having a radius of curvature smaller than that of the former inner edge whereby said two inner edges define a substantially crescent-shaped aperture, a tab integral with said intermediate portion, extending from the middle point of said outer edge of said intermediate portion and bent in said symmetry plane and having a free end portion, an electric contact element mounted on said free end portion of said tab and constituting the moving contact of said switch, first and second electric contact studs in spaced relation to each other and mounted on said body, a copper ring member fixed to said body and having electrical contact with the first of said studs, a circular edge provided on said ring member and supporting the outer periphery of the washer, said second contact stud having an electric contact element which faces the electric contact element of said tab; and pressure means slidably mounted in said body, said means having a projection so positioned as to be capable of engaging said C-shaped portion at a point near the middle point of the inner edge thereof upon application of a pressure on said pressure means, whereby the concavity of said washer is inverted with a snap-action and said moving contact is rapidly displaced in said symmetry plane, the device returning to its normal state upon release of the pressure application, the snap-action switch further comprising a third electrically conductive tube extending through the body and an electrically conductive member which is fixed to said third tube, and a contact member fixed on the free end of said tab facing the contact member on said third tube.

#### References Cited by the Examiner

##### UNITED STATES PATENTS

840,819	1/1907	Black.
2,420,880	5/1947	Hetherington.
2,624,819	1/1953	Spina et al.
3,185,806	5/1965	Bowman et al.

##### FOREIGN PATENTS

1,330,289	5/1963	France.
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