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MINIATURE SINGLE POLE SINGLE THROW SWITCH

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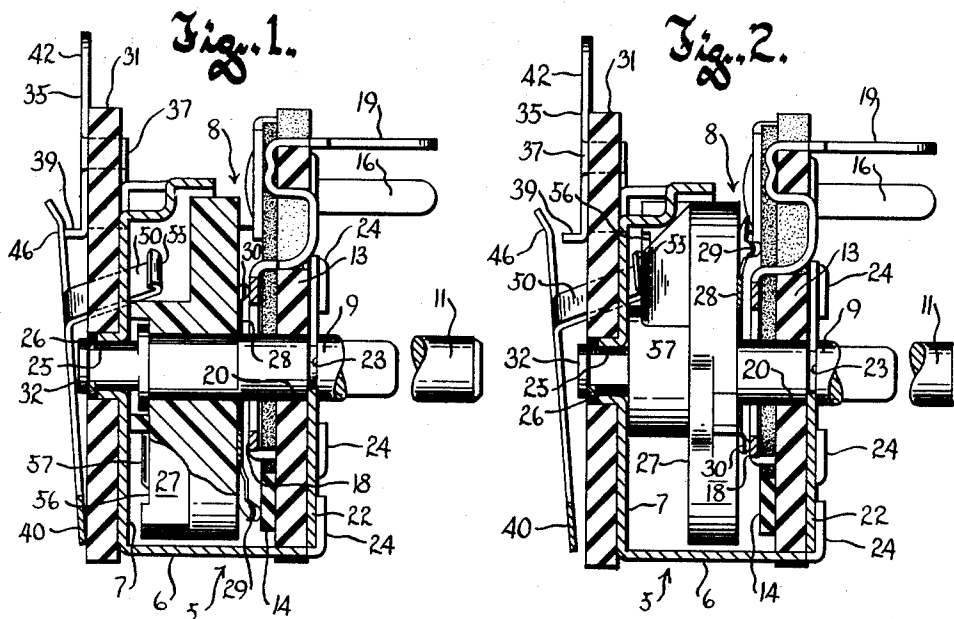
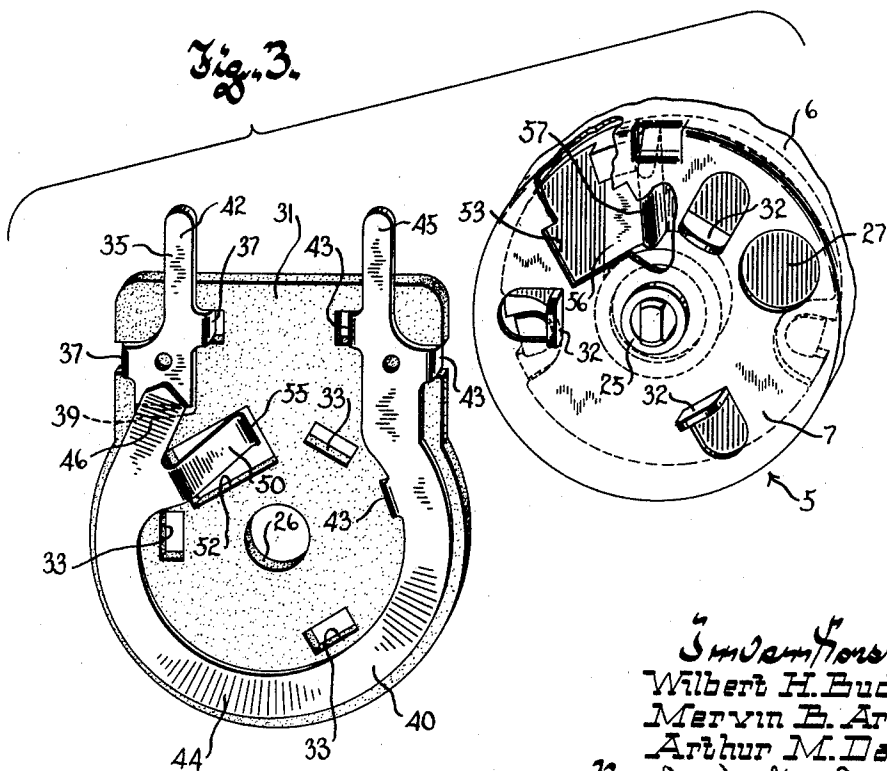


Fig. 3.



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MINIATURE SINGLE POLE SINGLE THROW SWITCH

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6 Claims. (Cl. 200—153)

This invention relates to electric switches and refers more particularly to switches intended for use in radio and television apparatus.

In general, the object of this invention is to provide a switch of the type having a rotatable actuator, which is simple in construction, economical to produce, and very compact, so that the switch of this invention lends itself well to incorporation in a variable resistor or similar electrical control instrumentality.

More particularly, it is an object of this invention to provide an electric switch adapted to be mounted on an end wall of a housing enclosing a variable resistor or the like, and wherein the cooperating switch elements consist of two members, one of which provides a terminal and a fixed contact, and the other of which comprises a leaf spring having one end portion fixed with respect to the housing end wall and providing another terminal and its other end portion biased into contact engagement with the fixed terminal member and flexible away from the same.

In attaining the objective of providing a compact switch having a leaf spring contactor member, a problem arises because such a spring must have substantial length in order to insure that it will have a long useful life, but at the same time it must occupy a minimum of space. However, it is an object of this invention to provide a switch that is especially suitable for incorporation in a miniaturized volume control or similar instrumentality, having a leaf spring contactor with a substantial flexing length but which nonetheless occupies very little space.

It is another object of this invention to provide a compact switch, the elements of which may be readily mounted on a wall of a housing that encloses a variable resistor or the like, and which may be actuated by a cam surface on a driver that also carries the movable element of an electrical control instrumentality in the housing.

Another object of this invention resides in the provision of a switch wherein the movable element consists of a spring blade, one end portion of which provides one of the switch terminals and has integral securement means on it by which it may be anchored to a terminal head, and which has the greater portion of its length flexible to and from contact making engagement with a fixed switch element, and wherein the movable element is so shaped as to be very compact, while at the same time having a flexible portion of substantial length.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawing illustrates one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for

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the practical application of the principles thereof, and in which:

Figure 1 is a longitudinal sectional view of an electrical control instrumentality embodying a switch of this invention, the switch being shown in closed or "on" position;

Figure 2 is a view similar to Figure 1 but showing the switch in open or "off" position; and

Figure 3 is a disassembled rear perspective view of the terminal head comprising the switch of this invention along with a control instrumentality on which the same is mounted.

Referring now more particularly to the accompanying drawing, the numeral 5 designates generally a housing having a substantially cylindrical side wall 6 and an end wall 7 and which encloses an electrical control instrumentality, in this instance shown as a variable resistor 8. Rotatably journaled in the housing is an actuating shaft 9, which projects outside the housing, beyond the front end thereof, as at 11, to be accessible for actuating the control instrumentality.

The housing 5, which is preferably a cup shaped metal stamping is complemented by a wall member 13 of insulating material which fits over the open front of the housing and provides a mounting for an arcuate resistance strip 14 and terminals 16 connected with the opposite ends of the resistance strip. Also secured to the wall member 13 is a collector ring 18 from which extends another terminal 19. The actuating shaft is journaled in a bore 20 through the front wall member for rotation on an axis concentric with the resistance element and collector ring, and a plate 22, having a slot opening to one edge thereof, overlies the front face of the wall member and has its slot portion engaged in a circumferential groove 23 in the shaft to confine the shaft against axial displacement. The wall member 13 and front plate 22 are held in place, closing the front of the housing, by means of integral forwardly projecting lugs 24 on the side wall of the housing, bent radially inwardly over the front plate.

The rear housing wall has a rearwardly extruded lip 25 surrounding a central aperture therein, to provide a bearing in which the rear end portion of the actuating shaft is rotatably journaled. Inside the housing, carried by the shaft for rotation therewith, is a driver 27 made of insulating material. The driver supports a movable contactor 28 having brush portions 29 and 30 which respectively engage the resistance element and the collector ring.

Flatwise overlying the rear wall of the housing is a base or terminal head 31 comprising a substantially D-shaped disc of insulating material which carries the fixed and movable contact elements of the switch of this invention and which is secured to the rear housing wall by means of lugs 32 sheared out of the rear housing wall and projecting through slots 33 in the base. The extruded lip 25 on the rear housing wall projects into a substantially central aperture 26 in the base, and there is a second aperture 52 in the base, registering with a similar aperture 53 in the rear housing wall.

The fixed contact element comprises an elongated metal terminal member 35 having integral lugs 37 engaged in other slots in the base to secure the terminal member 35 to the base, flatwise overlying the rear face thereof. One end portion of terminal member 35 projects beyond the straight edge of the base to provide a terminal 42 connectable with a conductor (not shown), while the other end portion of the terminal member is bent rearwardly, out of the plane of the remainder thereof, to provide a fixed contact 39.

A substantially U-shaped leaf spring 40 provides the movable contactor of the switch and the other terminal 45 thereof, and, like the terminal member, it may be readily made as a stamping. Near one of its ends the

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leaf spring has a plurality of integral lugs 43 which engage in slots in the base to anchor the leaf spring thereto. The lugs hold the leaf spring with its end portion adjacent to the lugs projecting beyond the adjacent straight edge of the base to provide the terminal 45, which is parallel to and spaced from the terminal 42 to adapt the switch for mounting upon a printed circuit panel. The bight portion 44 of the leaf spring is disposed substantially concentric with the actuating shaft and lies closely adjacent to the curved edge of the base, and it will be observed that the spring thus occupies a very small space but nevertheless has a relatively long flexible arm. The free end portion of the leaf spring is biased toward flatwise engagement with the base and provides a movable contactor 46 which is free to flex toward and from the fixed contact 39 and is normally in "switch closed" engagement therewith.

Near its free end portion the leaf spring has an integral finger 50 bent forwardly therefrom and projecting into the housing through the registering apertures 52 and 53 in the base and the rear wall of the housing. The free inner end of the finger 50 provides a cam follower 55 which co-operates with a rearwardly facing cam surface 56 on the driver to translate rotation of the driver to and from a "switch off" position into flexing of the contactor portion of the leaf spring into and out of engagement with the contact 39.

As the driver is rotated toward the "switch off" position by means of the actuating shaft, a small ridge 57 on the driver passes under the cam follower 55 to provide a detent effect and to insure snap action separation of the movable contactor 46 from the fixed contact 39. At the "switch off" position of the driver its cam surface 56 holds the free end portion of the leaf spring out of engagement with the fixed contact to maintain the switch open. As the driver is rotated away from the "switch off" position, the ridge 57 again passes under the cam follower to provide a detent action, and the driver thereafter abruptly disengages from the inner end of the finger to insure that the switch will be closed with a quick and definite action. The cam surface is so arranged that the switch is closed throughout most of the rotational range of the actuating shaft, during which the brush contact 29 is contacting different portions of the resistance element.

From the foregoing description, taken together with the accompanying drawings, it will be apparent that this invention provides a compact and very simple and efficient switch wherein the fixed and movable contact elements, together with their terminals and securement means, comprise only two simple stampings, and that one of said stampings comprises a leaf spring type of movable contactor which has a relatively long effective flexing arm but which nevertheless occupies very little space because of its substantially U-shaped configuration and its location overlying an end wall of a housing, adjacent to the edge thereof.

What is claimed as our invention is:

1. In a device of the type comprising an electrical control instrumentality, a substantially cup shaped metal housing enclosing the control instrumentality and having a rear wall and a substantially cylindrical side wall, and an actuating shaft rotatably journaled in the housing and projecting to the exterior of the housing to be accessible for actuation, switch means actuatable by said shaft, said switch means comprising: a driver in said housing, secured to the shaft for rotation therewith to and from a switch open position, said driver having a rearwardly facing axial cam surface; a plurality of lugs struck rearwardly from the end wall of the housing; a substantially D-shaped disc of insulating material having a plurality of apertures therethrough, in certain of which said lugs are engaged to hold the disc flatwise over the rear face of the housing end wall, the curved edge of said disc substantially coinciding with the edge of the rear wall of the housing; a

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fixed terminal member secured to the disc and having a terminal portion connectable to a conductor and a contact portion exposed at the rear face of said disc adjacent to a junction between the straight and curved edges of the disc; a substantially flat U-shaped leaf spring overlying the rear face of the disc; means securing one end portion of said leaf spring to the disc adjacent to the other junction of the straight and curved edges of the disc and holding the leaf spring with its bight portion closely adjacent to the curved edge of the disc and its free end portion in line with the contact portion of the terminal member so that by flexure of the leaf spring its free end portion is movable between a switch closed position engaging said contact portion and a switch open position disengaged therefrom, the leaf spring being biased to hold its free end portion in one of its said two positions; and a forwardly projecting finger on the leaf spring extending through one of the apertures in said disc and through an aperture in the rear wall of the housing for engagement with said cam surface on the driver and through which rotation of the driver flexes the leaf spring in the direction opposite to that in which it is biased.

2. An electric switch of the type adapted to be combined with a variable resistor, the instrumentalities of which are enclosed within a housing and include a rotor which is adjustable by a rotatable control shaft passing through one wall of the housing, said switch comprising: a base of insulating material on the housing opposite the wall of the housing through which the shaft passes, and substantially normal to the axis of the control shaft, said base having a hole therethrough spaced radially outwardly of the control shaft axis and opening to the interior of the housing; a stationary contact mounted on said base and exposed at the exterior face thereof; an elongated movable contactor formed of resilient metal; means fixedly securing one end portion of said contactor to the base with its opposite free end portion overlying the exterior face of the base in line with the stationary contact so that by flexure of the contactor its free end portion is movable between a switch closed position engaging the stationary contact and a switch open position disengaged therefrom, said contactor being biased to hold its free end portion in one of said two positions; a cam follower on the movable contactor projecting through said hole in the base and into the interior of the housing; and a switch actuating cam on the rotor operable upon rotation of the shaft to engage said cam follower and thereby move the contactor in the direction opposite to that in which it is biased.

3. In an electric switch of the type adapted to be combined with an electrical control device wherein the instrumentalities of the device are contained within a housing having opposite end walls and are actuatable by a rotatable control shaft which enters the housing through one of said end walls: a switch base mounted on the exterior of the opposite end wall, said base and the underlying end wall of the housing having a hole therethrough at a point spaced radially of the shaft axis; a switch actuating cam on the shaft inside the housing and facing said end wall upon which the switch base is mounted for rotation with the shaft; a stationary contact on the exterior of the switch base; an elongated resilient movable contactor; means anchoring one end portion of the movable contactor to the base, the opposite free end portion of the contactor overlying the stationary contact and being yieldingly biased into engagement therewith; a finger on said elongated resilient movable contactor near its free end extending through said hole in the base and the adjacent end wall of the housing to project into the housing and into the orbit of the cam so as to be engaged by the cam as it is moved by the shaft, whereby rotation of the shaft, acting through the cam, lifts the free end portion of said movable contactor out of engagement with the stationary contact.

4. The switch of claim 3 further characterized by the

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fact that the elongated contactor is substantially flat and substantially U-shaped and has its bight portion substantially concentric with the actuating shaft axis and spaced a substantial distance therefrom.

5. A device of the type comprising an electrical control instrumentality operable by a rotatable control shaft and an electric switch operable by the same shaft, wherein said switch comprises: a substantially flat switch base on the device normal to the control shaft, said switch base having a hole therethrough radially spaced from the shaft axis; a switch actuating member secured to the shaft for rotation therewith and having a cam surface facing one side of the switch base; a stationary contact secured to the switch base and exposed at the other side thereof, radially spaced from the shaft axis; a substantially flat U-shaped leaf spring having one end anchored to the base at a location spaced from both the shaft axis and the stationary contact, said leaf spring overlying said other side of the base and with its bight portion substantially concentric with the axis of the shaft and its free end near the stationary contact; a movable contact at the free end of the leaf spring engageable with and disengageable from said stationary contact by flexure of the leaf spring; the leaf spring being biased in one direction of flexure; and a finger extending from the leaf spring near the free end thereof, and engaged with said cam surface on the switch actuating member through the hole in the base to flex the leaf spring in the direction opposite to that in which it is biased, so that rotation of the shaft through a predetermined angle in one direction effects engagement of the movable contact with the stationary contact while rotation of the shaft through said predetermined angle in the other direction effects disengagement of the movable contact from the stationary contact.

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6. A device of the type comprising an electrical control instrumentality operable by a rotatable control shaft, electric switch means mounted on a substantially flat base normal to the control shaft and comprising a stationary contact exposed at one side of the base, a leaf spring having one end fixed to the base and overlying said one side of the base with its free end near the stationary contact, and a movable contact carried at the free end of the leaf spring and biased thereby toward engagement with the stationary contact, and a driver for the switch means secured to the control shaft for rotation therewith: said device being characterized by the fact that the driver has a cam surface facing the side of the base remote from the switch means; further characterized by the fact that the leaf spring is substantially flat and substantially U-shaped and extends around a substantial portion of the marginal edge of the base; and further characterized by a finger on the leaf spring, near the free end thereof, projecting through a hole in the base to engage said cam surface on the driver, so as to be propelled in the direction to carry the free end of the leaf spring away from the stationary contact in consequence of rotation of the driver in one direction.

References Cited in the file of this patent

UNITED STATES PATENTS

2,172,396	Meuer	Sept. 12, 1939
2,436,750	Gray	Feb. 24, 1948
2,447,718	Simpson	Aug. 24, 1948
2,632,830	Aust et al.	Mar. 24, 1953
2,646,484	Vaksvik	July 21, 1953