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ROTARY ELECTRIC SWITCH

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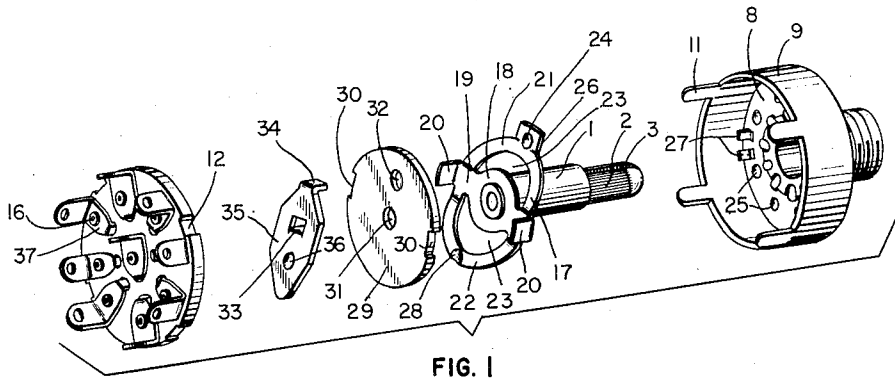


FIG. 1

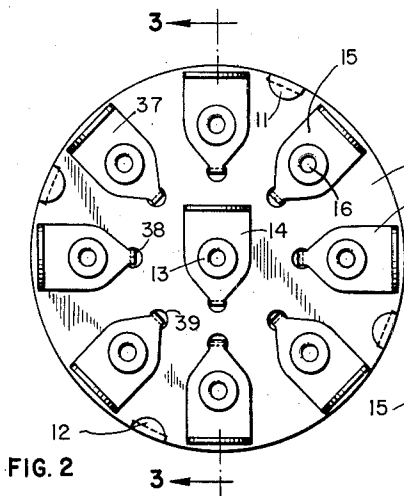


FIG. 2

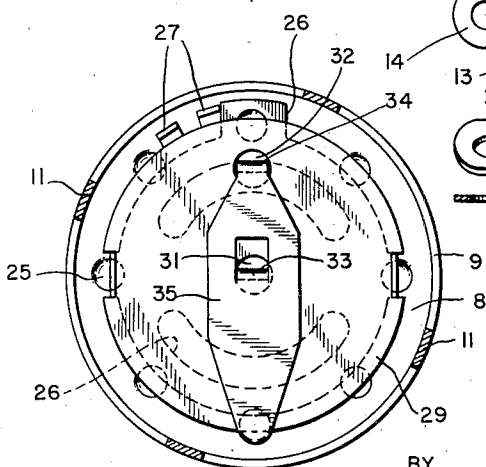


FIG. 4

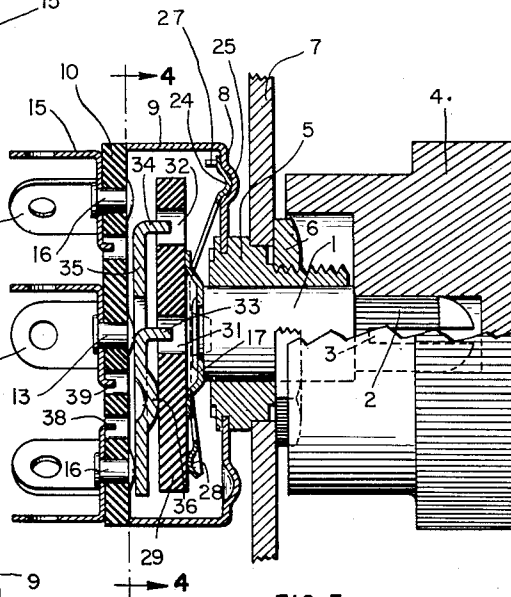


FIG. 3

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## ROTARY ELECTRIC SWITCH

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5 Claims. (Cl. 200-6)

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This invention relates to switches of the general type employed on control panels of radio apparatus and the like, and has particular reference to improvements in the form and arrangement of parts thereof.

The main objects of this invention are to provide an improved construction for small rotary electric switches so as to attain greater simplicity of individual parts, greater sturdiness of construction so as to give long life and positive action, and greater compactness so as to permit of a maximum of operating positions of the switch arm in a minimum of space; and to provide an improved spring structure in such switches, whereby a single piece of material may function as the principal driving connection between the switch arm and the operating shaft, as the yielding position detent and as the agency for producing yielding pressure between the contact arm and contact terminals.

A specific embodiment of this invention is illustrated in the accompanying drawings in which:

Figure 1 is an exploded perspective view of the parts of a rotary switch designed according to this invention for mounting it upon a control panel.

Fig. 2 is an elevation of the disc that carries the contact terminals.

Fig. 3 is an axial section of the switch assemblage.

Fig. 4 is a section taken on the line 4-4 of Fig. 3.

In the form shown the operating shaft 1 is provided with a knurled end portion 2 of reduced diameter that is split longitudinally at 3 for frictional connection with the operating knob 4.

The shaft 1 is rotatable in a bushing 5 which is appropriately shouldered to engage a panel aperture and threaded to receive a nut 6 whereby the bushing is clamped to the panel 7. The bushing carries a housing shell comprising a base disc 8, to which the bushing is centrally attached, and a cylindrical wall 9 which is closed at its outer end by the contact disc 10 which is held in place by lugs 11 for the receipt of which the disc 10 has peripheral notches 12, the lugs 11 being clenched, as shown in Fig. 2 for holding the disc 10 in place.

The disc 10 has secured thereto by rivets 13 a central contact terminal 14 and a plurality of conductor terminals 15 concentrically arranged with respect to the axis of the switch so that their respective rivets 16 will be radially spaced from the central rivet 13. The rivets 13 and 16 have

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button heads at their inner ends which serve as switching contacts as will be understood.

Fixed on the inner end of the operating shaft 1 is a contact pressure spring or operating spring 17 comprising a hub portion 18, having a pair of diametrically opposed arms 19 extending therefrom in the plane of the hub portion and terminating in outstanding lugs 20 which are generally parallel with the axis of shaft 1. Other radial arm portions or bowed members 21 and 22 of the spring are separated from the hub portion 18 by crescent-shaped slots 23 to allow them to flex readily.

The arm 21 is depressed or inclined from the plane of the hub 18 and is shaped to form at its mid point a spherical detent projection 24 which cooperates with a series of detent sockets 25 in the base 8 of the housing to provide position stops corresponding to successive switch arm positions. The arm 21 also has appropriate shoulders 26 for coaction with one or two limit stop lugs 27 struck out from the housing base 8 in appropriate positions for limiting the movement of the switch arm in opposite directions.

The bowed arm portion 22 is bent out from the plane of the hub 18 in the opposite direction from the bending of the arm 21 so as to form a pressure ridge 28 which bears against a floating insulating disc or switch operating member 29 that is peripherally recessed at 30 to loosely receive the driving lugs 20 whereby the disc or operating member 29 is rotated by the spring but may move and tilt axially to some extent.

The disc has a pair of radially spaced apertures 31 and 32 which receive spaced lugs 33 and 34 respectively on the switch arm 35 which is shaped appropriately to bridge the gap between the central terminal studs 13 and the studs 16, as will be understood from Fig. 3. The lugs 33 and 34 loosely engage the apertures 31 and 32 so that the arm 35 is free to tilt and make proper contact with the heads of the studs 13 and 16 as it rides over these heads. The arm 35 has a spherical projection 36 which serves as a fulcrum bearing on the disc 29 at a point about midway between the center contact 13 and the arc in which the contacts 16 lie. It will be noted that the pressure ridge 28 of the spring 17 bears against the disc 29 so as to cause said disc to bear against the fulcrum 36 and force the switch arm 35 into firm engagement with the contact studs 13 and 16.

In the form shown the terminals 14 and 15 are L-shaped clips comprising a base 37 perforated to receive the attaching rivet and having a lug

38 seated in a perforation 39 in the disc 10 to prevent rotation of the clips about their rivets.

In operation, the switch arm 35 always bears on the central contact stud 13 and rides over the contact studs 16 as the shaft is rotated. The spherical fulcrum 36 and loosely held studs 33 and 34 allow the switch arm to tilt freely upon the operating disc 29. Rotation of the shaft 1 rotates the disc 29 through the lugs 20 on the spring 17; and the disc 29, through lugs 33 and 34, rotates the switch arm 35. The position detents 24 on the spring 17 coast with detents 25 on the housing 8 to align the switch arm 35 with the respective contacts, while the arm 22 of the spring transmits the necessary contact pressure through discs 29 and fulcrum 36. The novel construction of the spring 17, provides adequate support and driving power for the disc 29 and switch arm 35 and the bowed formation of the arms 17 and 22 provides a durable structure even when the material of the spring is quite thin for sensitivity of flexure. The bowed arm 21 braces the detent lug 24 in such manner as to provide both tension and thrust resistance to overthrow of the knob 4 when the lug 24 abuts the limit stops 27.

Although but one specific embodiment of this invention is herein shown and described, it will be understood that numerous details of the structure shown may be altered or omitted without departing from the spirit of the invention as defined by the following claims.

**I claim:**

1. In a rotary switch, a housing, a shaft extending into said housing, a floating switch mechanism in said housing rotatable on the axis of said shaft, and an operating spring comprising a hub fixed on said shaft, diametrically opposed arms extending outward from said hub and operatively connected adjacent their ends to said switch mechanism, and a bowed member spaced from said hub and having its ends attached to said diametrically opposed arms respectively and bent to normally hold said bowed member in a plane intersecting the plane of said opposed arms, a detent on said bowed arm, and switch positioning detents on said housing coacting with the detent on said bowed arm.

2. A rotary switch, comprising a shaft, a bearing for said shaft, a cup-shaped housing fixed on said bearing, a dielectric disc mounted on said housing, a pair of radially spaced contact terminals mounted on said disc, a contact arm rotatable into and out of contact with said terminals, a movable insulating disc supporting said contact arm, a spring plate fixed on said shaft and comprising arms tiltably supporting said movable discs and other arms respectively bearing in opposite directions on said insulating disc and cup-shaped housing.

3. A rotary electric switch, comprising a pair of spaced parallel plates, a shaft journaled at right-angles to one of said plates, one of said

plates having thereon a plurality of circuit terminals angularly spaced about the axis of said shaft, a contact arm coacting with said terminals, the other plate having position detents located to correspond with different contact arm positions respectively, and a driving connection between said contact arm and shaft, comprising an insulating disc carrying said contact arm and having angularly spaced lug recesses there-through, and a spring between said insulating disc and shaft and comprising a hub portion fast on said shaft, said spring having lugs axially slidable in said lug recesses and said spring having a pair of radial arms, one normally urged to bear toward and cooperate with said position detents and the other normally urged to bear on said insulating disc.

4. In a rotary switch, a housing, a shaft extending into said housing, switch mechanism in said housing, a floating operating member for said switch mechanism, a spring connecting said shaft and said operating member, said spring comprising a hub fixed on said shaft and having diametrically opposed arms extending radially therefrom and operatively connected adjacent their ends to said operating member, a bowed member spaced from said hub and having its ends attached to said diametrically opposed arms respectively and bent to normally hold the bowed member in a plane inclined to the plane of said hub, a detent on said bowed member, and switch positioning detents on said housing coacting with the detent on said bowed member.

5. In a rotary switch, a housing, a shaft extending into said housing, switch mechanism in said housing, a floating operating member for said switch mechanism spaced from the inner end of said shaft, a spring connecting said shaft and said operating member, said spring comprising a hub fixed on said shaft and having diametrically opposed arms extending radially therefrom and operatively connected adjacent their ends to said operating member, a pair of bowed members spaced from opposite sides of said hub and each having its ends attached to said diametrically opposed arms respectively and bent to normally hold the respective bowed member in a plane inclined to the plane of said hub, one of said bowed members being inclined toward and bearing against said operating member and the other bowed member being inclined oppositely, a detent on said other bowed member, and switch positioning detents on said housing coacting with the detent on said bowed member.

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**REFERENCES CITED**

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

**UNITED STATES PATENTS**

| Number    | Name | Date          |
|-----------|------|---------------|
| 1,929,492 | Hall | Oct. 10, 1933 |