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DETENT MECHANISM, ESPECIALLY FOR ROTARY SWITCHES

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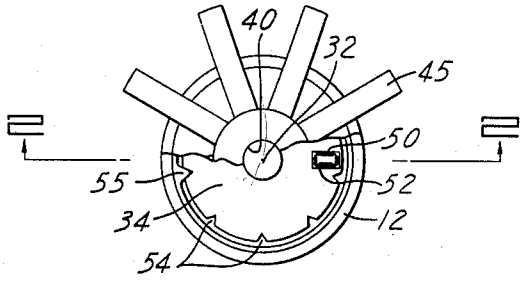

FIG_1_

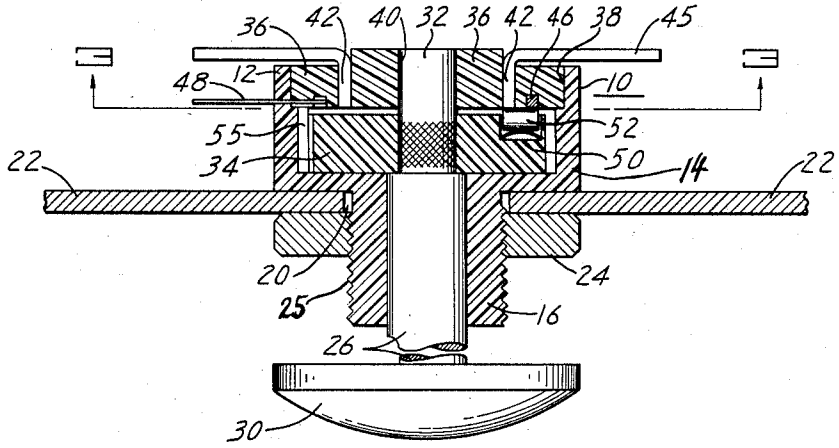

FIG_2_

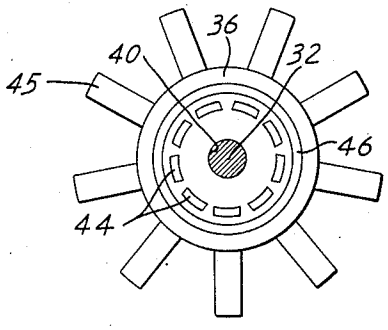

FIG_3_

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DETENT MECHANISM, ESPECIALLY FOR ROTARY SWITCHES

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The present invention relates to detent or pawling mechanisms, such as are used to check and control intermittent rotary motion. More particularly the present invention relates to detent or pawling mechanism of the type employed to stabilize the operation and center the position of rotary switches.

In their simplest form detent mechanism, of the type referred to, comprise usually a disc or ratchet which is firmly mounted upon the operating shaft of the switch and which is provided with as many notches along its edge as there are rotary positions for the switch. To yieldably retain the switch in a selected position of adjustment and to impede accidental overthrow of the switch during adjustment thereof to a desired position, a spring is arranged to urge a hook or tooth formed at the end of a lever arm into engagement with one of the notches in the edge of the disc, and to protect the described mechanism from outside interference, it is usually encased in a suitable housing.

It is an object of my invention to provide a simple and inexpensive yet effective detent mechanism.

Another object of my invention is to provide a dependably operating detent mechanism that requires a minimum of component parts, and in any case requires a substantially lesser number of component parts than the detent mechanisms of conventional design.

These and other objects of my invention will be apparent from the following description of the accompanying drawing which illustrates a preferred embodiment thereof and wherein

Figure 1 is an enlarged plan view of a rotary switch provided with a detent mechanism constructed in accordance with my invention, certain parts being broken away to expose structure underneath;

Figure 2 is a section taken along line 2—2 of Figure 1; and

Figure 3 is another section taken along line 3—3 of Figure 2 and viewed in the direction of the arrows associated with said line.

The rotary switch shown in Figures 1, 2 and 3 comprises an enclosure 10 which is made of an elastic insulating material, such as hard rubber, nylon or the like. The enclosure 10 is composed of a cup-shaped portion 12 with a cylindrical wall 14, and a tubular stem 16 that passes through an aperture 20 in an instrument panel 22 to which the switch is secured by means of a nut 24 that engages external screw threads formed in the outer surface of stem 16 as indicated at 25. Rotatably received within the tubular stem 16 is an operating shaft 26 whose outwardly projecting end may be provided with an operating knob 30. Within cup 12 the shaft 26 is reduced in diameter forming a tenon 32 upon which is firmly mounted for rotation therewith a disc 34 which may likewise be made of an elastic insulating material, such as nylon, and which is of somewhat smaller diameter than the internal diameter of cup 12. The open end of cup 12 is closed by a lid 36 made of an insulating plastic which has the form of a disc and which is seated in an

annular recess 38 formed in the inner surface of the cylindrical wall 14 adjacent to the outer edge thereof. The lid 36 may be provided with a central aperture 40 to loosely receive the tenon 32 of shaft 26.

Molded into the lid 36 along a circle concentric with the axis of shaft 26 and in angularly equi-spaced relation to each other are a plurality of strips 42 of silver, copper or the like, which extend in a direction parallel to the axis of shaft 26 (Figure 2) from the inner surface of lid 36 where they form contact points 44 (Figure 3) to and beyond the outer surface of said lid where they are bent outwardly to form a star pattern of radially directed connector prongs 45 (Figure 1). Likewise molded into the lid 36 is an annular contact member 46 of silver, copper or the like, which is radially spaced from and concentrically surrounds the circularly arranged contact points 44 (Figure 3), and which is connected to a lead wire 48 that passes radially from the lid 36 through the wall 14 of cup 12 to the outside.

To establish electrically conductive connection between the contact member 46 and a selected one of the contact points 44, the hereinbefore described disc 34 on operating shaft 26 forms a recess 50 in its outwardly directed face adjacent the peripheral edge thereof, and received within said recess for rotation about an axis extending radially of operating shaft 26 is a cylindrical roller 52 of electrically conductive material, such as silver, which is so positioned radially of the disc 34 and is of such axial length that its outer end is in contact with the annular member 46 and its inner end is in contact with the circle defined by the contact points 44. As the shaft 26 is turned, the cylindrical roller 52 rolls along the inner surface of lid 36 adjacent the peripheral edge thereof; and depending upon the angular position of said roller with respect to the axis of shaft 26 when rotation of said shaft 36 comes to a halt, the roller will connect the annular contact member 46 with any selected one of the contact points 44.

To insure that the roller 52 will come to a halt in exactly the right position angularly of the axis of operating shaft 26, wherein it bears fully against one of the contact points 44, and to prevent accidental displacement of the roller in any one of its proper positions of rotary adjustment, notches 54 are provided in the edge of disc 34 at equal intervals corresponding to the effective positions of adjustment of operating shaft 26; and formed on the inside of the cylindrical wall 14 of enclosure cup 12 is a tooth 55 that is adapted to engage any one of the notches 54, the location of said tooth relative to the contact points 44 on stationary lid 36 being such that whenever the tooth engages one of the notches 54 in the edge of disc 34, the roller 52 in the outwardly directed face of said disc will be angularly aligned, and establish electrically conductive contact, with one of the contact points 44.

Due to the fact that the cup 12 and hence also the tooth 55 are made from an elastic material, the tooth 55 will deform and release whatever notch 54 it engages, whenever sufficient torque is applied to the operating shaft, yet will immediately resume its original shape when it encounters another notch 54 during rotation of shaft 26, and retain the disc 34 and the roller 52 in their new position when the torque upon the shaft 26 is relaxed. Thus, I achieve proper detention of a rotary switch with no more components, aside from the usual pawling disc, than a tooth formed on the customary housing for the detent mechanism, where it was formerly necessary to provide a separately pivoted lever arm and a special retaining spring which in turn necessitated the use of a larger housing than is required in accordance with the invention.

In the exemplary embodiment of the invention described hereinbefore, both the cup 12 which forms the

tooth 55, and the pawling disc 34 are made from an elastic material, such as nylon. For the device of the invention to operate, it may be sufficient, however, to make only the tooth 55 of an elastic material, while the pawling disc 34 may be made from a more rigid material, such as steel, bronze or brass. Alternatively, the pawling disc alone may be made from elastic material, while the cup 12 and the tooth 55 may be made from a more rigid material.

While I have illustrated my invention as applied to a rotary switch, it will be understood that the invention may usefully be employed, wherever a detent mechanism is needed. Also, while I have explained my invention with the aid of an exemplary embodiment thereof, it will be understood that this invention is not limited to the specific constructional details shown and described, which may be departed from without departing from the scope and spirit of the invention.

I claim:

1. A detent mechanism for a rotary member comprising a disc mounted for rotation in unison with said member and having a number of notches formed in its edge, a casing of an elastic material surrounding said disc and having a tooth formed on its inner wall integral with and of the same material as said casing, for yieldable engagement with the notches in the edge of said disc.

2. A detent mechanism for a rotary shaft comprising a disc mounted firmly upon the shaft for rotation therewith and having number of angularly equi-spaced notches formed in its edge, and a casing of an elastic material surrounding said disc in radially spaced relation thereto and having a tooth formed on its inner wall integral with and of the same material as said casing for yieldable engagement with the notches in the edge of said disc.

3. A multi-position switch comprising a first disc of insulating material, an annular conductive member received in said disc, a plurality of circularly arranged individual contact points received in said disc in concentric relation to said annular member, a rotatable disc of insulating material supported adjacent said stationary disc, a conductive member mounted in said rotatable disc adjacent said stationary disc to establish conductive connection between said annular member thereof and a selected one of said individual contact points depending upon the rotary position of said rotatable disc, said rotatable disc having a number of notches formed in its peripheral edge each corresponding to one of the individual contact points in said stationary disc, means for turning said rotatable disc, and a casing of elastic material surrounding said rotatable disc in radially spaced relation thereto and having on its inner wall a tooth integral with and of the same material as said casing for yieldable engagement with the notches of said rotatable disc.

4. A multi-position switch comprising a stationary disc of insulating material, an annular conductive member disposed concentrically with and received in said disc, a plurality of circularly arranged individual contact points received in said disc in concentric relation to said annular member, a rotatable disc of an elastic insulating material supported adjacent said stationary disc for rotation about an axis coincident with the center axis of said stationary disc, a conductive member mounted in said rotatable disc adjacent said stationary disc to establish conductive connection between said annular member thereof and a selected one of said individual contact points depending upon the rotary position of said rotatable disc, said rotatable disc having a number of notches formed in its peripheral edge each corresponding to one of the individual contact points in said stationary disc, means for turning said rotatable disc, and a casing of elastic material surrounding said discs and having on its inner wall a tooth integral with and of the same material as said casing for yieldable engagement with the notches of said rotatable disc.

References Cited in the file of this patent

UNITED STATES PATENTS

886,225	Valette	Apr. 28, 1908
983,414	Watkinson et al.	Feb. 7, 1911
1,194,480	Clum	Aug. 15, 1916
1,205,549	Kruesheld	Nov. 21, 1916
1,264,473	Baker	Apr. 30, 1918
1,410,855	Veneria	Mar. 28, 1922
1,624,374	Swoboda	Apr. 12, 1927
1,754,754	Jacobi	Apr. 15, 1930

FOREIGN PATENTS

600,344	Great Britain	Apr. 6, 1948
573,636	Germany	Apr. 4, 1933