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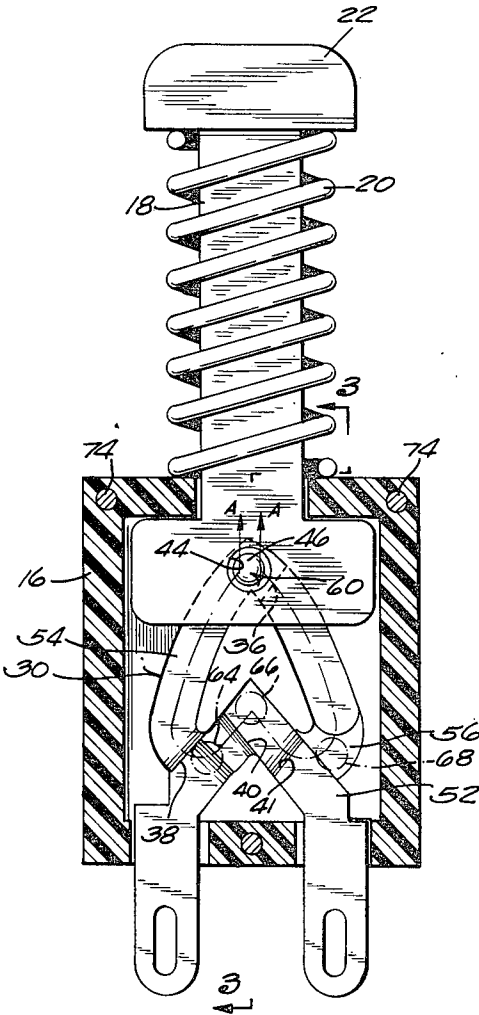
[54] **PUSHBUTTON ALTERNATE ACTION SWITCH
WITH A CONTACT ON THE CAM SURFACE OF
THE ALTERNATE ACTION MECHANISM**
5 Claims, 5 Drawing Figs.

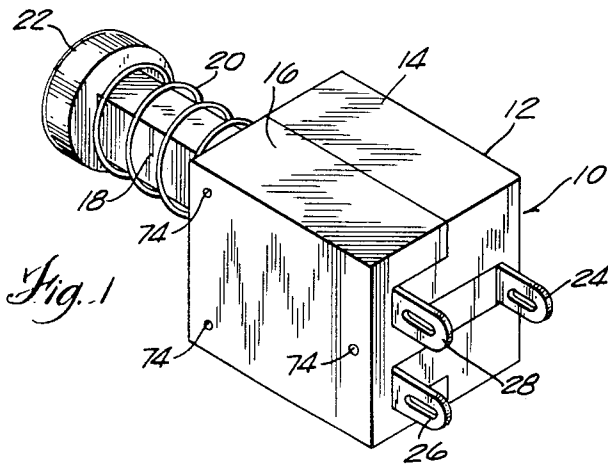
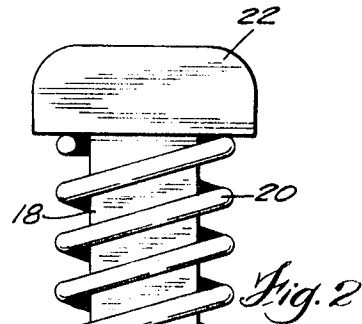
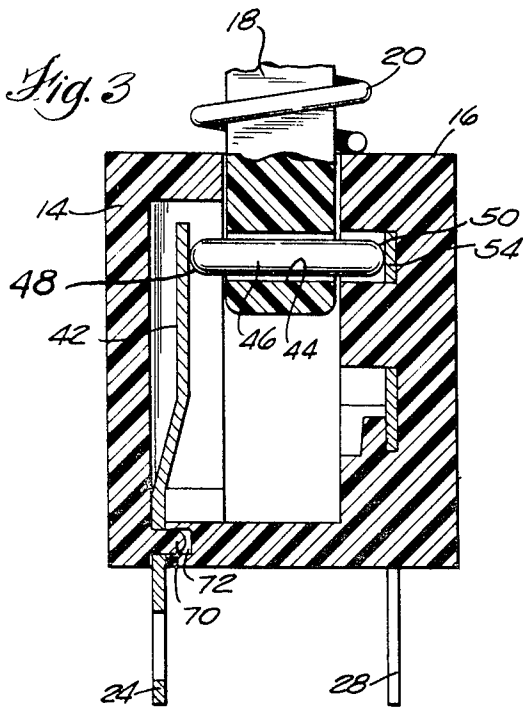
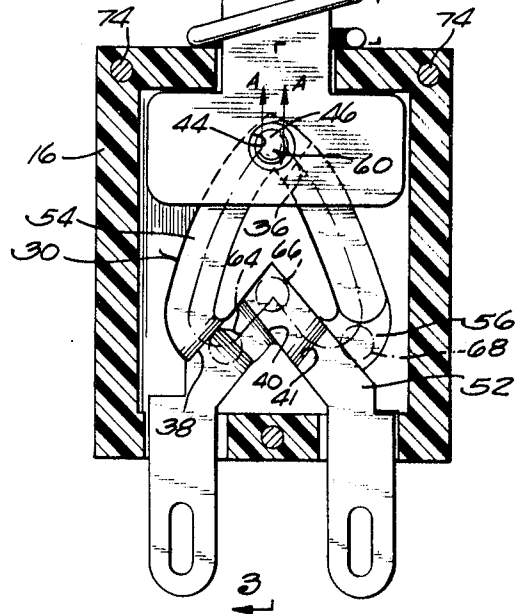
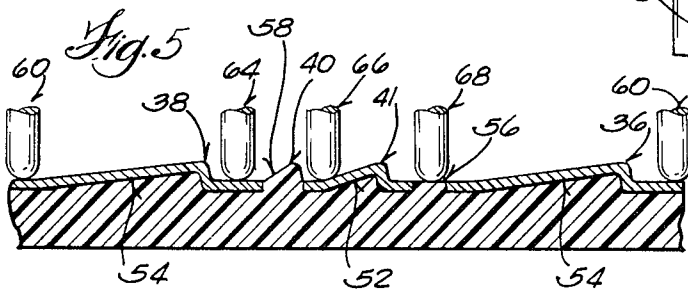
[52] U.S. Cl. **200/153 J**
[51] Int. Cl. **H01h 13/56**
[50] Field of Search **200/153 J,**
160, 159 R

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ABSTRACT: A pushbutton switch having a guide track with contact means coating therewith arranged so that electrical circuit changeover is effected only on the release stroke of a reciprocative slider bar.





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PUSHBUTTON ALTERNATE ACTION SWITCH WITH A CONTACT ON THE CAM SURFACE OF THE ALTERNATE ACTION MECHANISM

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to electrical switches, and more particularly, to electrical pushbutton switches.

Electrical pushbutton switches are typically constructed so that an electrical circuit changeover is effected upon both a depression and release of a reciprocative bar, e.g., an electrical circuit is completed upon depression of the slider bar and is opened when the slider bar is released to the deactuated position. For some applications, it is desirable to have a pushbutton switch capable of making an electrical system changeover only on a release stroke of the slider bar. For example, such a switch finds applications in some impact detonative devices where the pushbutton is depressed and the device becomes activated upon release of the slider bar when an electrical circuit changeover is made. Upon impact the slider bar is depressed again and, upon a second release of the slider bar, the explosive is detonated when another electrical circuit changeover is made. The pushbutton having this type action also can be used as a motion switch which triggers an appropriate electrical circuit when a depressing load is removed from the slider bar.

SUMMARY OF THE INVENTION

The primary object of this invention is to provide a simple, inexpensive pushbutton switch capable of making an electrical circuit changeover only on release strokes.

The pushbutton switch assembly of this invention includes a housing; a guide track located inside the housing; separate strips of electrically conductive material secured to isolated sections of the bottom of the guide track, each being connected to separate external terminals; a resilient plate member also connected to a separate external terminal; and a reciprocative slider bar carrying a contact member, one end of the contact member slidably engaging the resilient plate member and the other end thereof being urged into slidable contact with the bottom of the guide track by the plate member. The guide track and conductive strips are arranged so that, as the slider bar is released, the end of the contact member in slidable contact with the bottom of the guide track moves from one conductive strip to another, while the other end always remains in contact with the resilient plate member, thereby effecting a circuit changeover.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a pushbutton switch exemplifying this invention.

FIG. 2 is a plan view, partially in section, of the switch illustrated in FIG. 1 with the top portion of the housing removed.

FIG. 3 is a cross-sectional view, partially broken away, taken along the plane designated by 3—3 in FIG. 2 with the top portion of the housing installed.

FIG. 4 is a plan view, partially broken away, showing the guide track contour and the various positions of the contact member during movement of the slider bar.

FIG. 5 is an elevation view taken along the plane designated as A—A in FIG. 2 showing the profile of the bottom of the guide track and the positions of the contact member relative to the levels and stops thereof during movement of the slider bar.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawing, pushbutton switch 10 exemplifying this invention includes a two-piece housing 12, constructed from an insulating material and having a top portion 14 and a bottom portion 16, a slider bar 18 slidably mounted in and extending outwardly from housing 12, return spring 20,

pushbutton 22 and external terminals 24, 26 and 28 for connecting the switch to the appropriate electrical circuits.

Disposed inside of the bottom portion 16 of housing 12 is a closed contour guide track 30 incorporating a hollow cam notch with two points or peaks 32 and 34 and a variable depth forming bevels and stops 36, 38, 40 and 41. The guide track 30 can be molded integrally into the bottom portion of housing 12 or can be a separate component which is attached to the inside of the bottom portion of housing 12 in any convenient manner, such as by bonding with an adhesive.

A resilient, plate or blade member 42, constructed from an electrically conductive material, such as silver-plated brass, is disposed inside the top portion 14 of housing 12 and is connected electrically to terminal 24. Plate member 42 and terminal 24 can be formed as a single unit or can be separate components connected electrically in any suitable manner, such as by soldering.

Slider bar 18, made from an insulating material, includes an aperture 44 extending laterally therethrough in which free floating contact member 46, made from an electrically conductive material, is carried. As shown in FIG. 3, contact member 46 can be a cylindrical-shaped pin with hemispherical upper and lower ends 48 and 50, respectively, or can be of any other convenient shape capable of performing the function described hereinafter. Aperture 44 is somewhat larger than the outside diameter of contact member 46 so that it is free to move with a rocking movement when slider bar 18 is actuated. Plate member 42, acting as a leaf spring slidably engages the upper end 48 of contact member 46 and urges the lower end 50 of contact member 46 into slidable engagement with the bottom of guide track 30 as contact member 46 is guided along the contour thereof during the actuation of slider bar 18.

As shown in FIGS. 2 and 5, strips 52 and 54 of the electrically conductive material are secured to the bottom of the guide track 30 with insulating sections 56 and 58 separating them. Conductive strips 52 and 54 are connected electrically to terminals 26 and 28, respectively.

As shown in FIG. 5, the bottom of guide track 30 is preferably formed with recesses to accommodate conductive strips 52 and 54 and insulating sections 56 and 58 are an integral part of the base in which guide track 30 is located. The recesses are preferably the same depth as the thickness of conductive strips 52 and 54 so that there is a smooth movement of contact member 46 as it moves along the contour of guide track 30 as described hereinafter.

Conductive strips 52 and 54 can be formed from a thin sheet of metal such as silver-plated brass, and adhesively bonded to the bottom of the guide track 30 with a suitable adhesive. Conductive strip 52 and terminal 26, as well as conductive strip 54 and terminal 28, can be formed as single units or can be separate components connected electrically in any suitable manner. Alternatively, conductive strips 52 and 54 can be formed from a thin metallic foil, such as a silver-copper alloy foil, which is adhesively secured to the bottom of guide track 30 or by depositing a conductive path by conventional electroplating techniques. When the latter such techniques are used, terminals 26 and 28 are separate components and are connected electrically to their respective conductive strips.

Referring to FIGS. 2, 4 and 5, the operation of the pushbutton switch will be described. In FIG. 4 the conductive strips 52 and 54 have been removed for the sake of clarity in showing the contour of the bottom of guide track 30. When slider bar 18 is in the deactuated position, the lower end of contact member 46 is in position 60 in guide track 30 with a conductive path existing between terminals 24 and 28 via plate member 42, contact member 46 and conductive strip 54. As slider bar 18 is depressed, the lower end of contact member 46 is guided along the contour of guide track 30 in the direction of arrow 62 and rides over bevel 38 into position 64 when slider bar 18 becomes fully depressed. During this inward stroke of slider bar 18, the upper end of contact member 46

rides in contact with plate member 42 and the lower end of contact member 46 rides in contact with conductive strip 54 thereby maintaining the conductive path between terminals 24 and 28. Upon the release of slider bar 18, bevel 38 prevents contact member 46 from being returned backwards under the influence of return spring 20 and therefore moves in the direction of arrow 62 and rides over bevel 40 towards position 66, contact member 46 being able to rock or slant freely because of the side play permitted by the size and shape of aperture 44. During this release stroke, the upper end of contact member 46 continues to ride in contact with plate member 42 but the lower end thereof passes over insulating section 58 and contacts conductive strip 52. Hence, the conductive path between terminals 24 and 28 is broken and a conductive path is established between terminals 24 and 26 via plate member 42, contact member 46 and conductive strip 52. Bevel 40 prevents contact member 46 from being returned backwards under the influence of return spring 20 thereby maintaining contact with conductive strip 52.

When slider bar 18 is depressed again, the lower end of contact member 46 is prevented from returning backwards by bevel 40 and therefore moves in the direction of rotation of arrow 62 and rides over bevel 41 towards position 68. During the second depression of slider bar 18, the upper and lower ends of contact member 46 remain in contact with plate member 42 and conductive strip 52, respectively, thereby maintaining a conductive path between terminals 24 and 26. Upon release of slider bar 18, bevel 41 prevents contact member 46 from being returned backwards under the influence of return spring 20 and contact member 46 returns to home position 60. The bottom of guide track 30 is sloped along the entire right leg and ends in bevel 36 which prevents contact member 46 from returning backwards when slider bar 18 is depressed again. During the second release stroke, the upper end of contact member 46 continues to ride in contact with plate member 42 with the lower end thereof passes over insulating section 56 and contacts conductive strip 54. Hence, the conductive path between terminals 24 and 26 is broken and the conductive path between terminals 24 and 28 is reestablished.

As shown in FIG. 3, the upper portion of housing 12 is preferably constructed with a nib 70 into which plate member 42 and terminal 24 and press-fitted before assembly of the housing. Upon assembly of housing 12, nib 70 is press-fitted into aperture 72 in the lower portion 16 of housing 12. As seen in FIG. 2, the lower portion 16 of housing 12 is also provided with a plurality of nibs 74 which are press-fitted into apertures (not shown) of the upper portion 14 of housing 12 upon assembly. This structure provides simple and inexpensive means for assembling the housing. The plate member and upper portion of the housing can be assembled as a subassembly in proper alignment, as can be the lower portion of the housing, the conductive strips, the slider bar, the contact member, the return spring, and the pushbutton. The final assembly is

completed by merely fitting the two-piece housing together.

It should be understood that various alterations and modifications may be made in the structure of the preferred embodiment of this invention described without departing from the scope and spirit thereof.

1. A pushbutton switch comprising:

- a. a housing
- b. a guide track of the heart cam type with the bottom thereof having bevels and stops disposed inside said housing;
- c. electrically conductive material disposed on selected first and second sections of the bottom of said guide track, said first and second sections of conductive material being electrically insulated from each other and connected to first and second terminal means, respectively, for external electrical connection;
- d. a resilient member of electrically conductive material disposed inside said housing and connected to a third terminal means for external electrical connection;
- e. a reciprocative slider bar slidably mounted in and extending out of said housing carrying an electrically conductive contact means, one portion of said contact means slidably engaging said resilient member which urges another portion of said contact means into slidable engagement with the bottom of said guide track; and
- f. said contact means coacting with said resilient member and said guide track so that a changeover between a first electrical path from said first to said third terminal means and a second electrical path from said second to said third terminal means is effected only upon a release stroke of said slider bar.

2. The pushbutton switch according to claim 1 wherein the bevels and stops of said guide track and said first and second sections of conductive material are arranged so that, upon an initial depression of said slider bar, a said first electrical path is maintained, upon release of said slider bar after an initial depression said first electrical path is opened and said second electrical path is completed, upon a second depression of said slider bar said second electrical path is maintained and upon release of said slider bar after the second depression said second electrical path is open and said first electrical path is completed.

3. The switch according to claim 2 wherein said slider bar includes an aperture and said contact member is a cylindrical pin loosely disposed through said aperture.

4. The pushbutton switch according to claim 3 wherein said first and second sections of conductive material comprise a thin metallic layer adhesively bonded to the bottom of said guide track.

5. The pushbutton switch according to claim 3 wherein said first and second sections of conductive material comprise a thin metallic layer electrically deposited to the bottom of said guide track.

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