

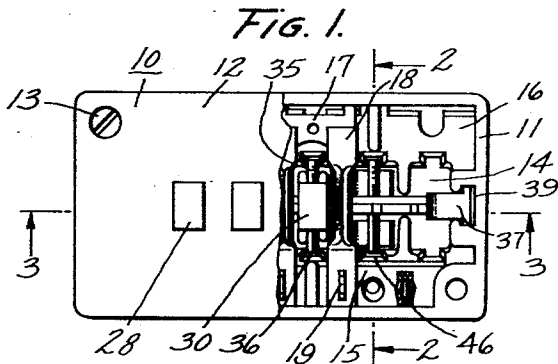
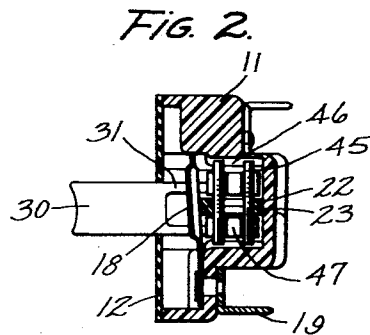
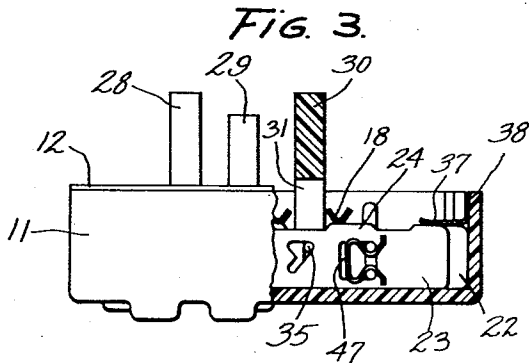
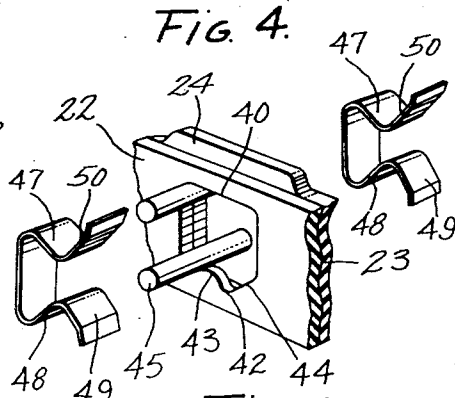
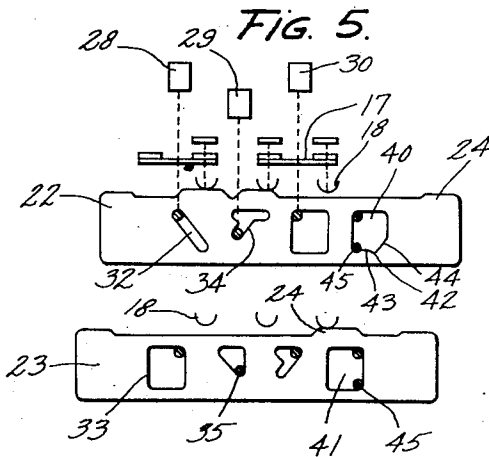
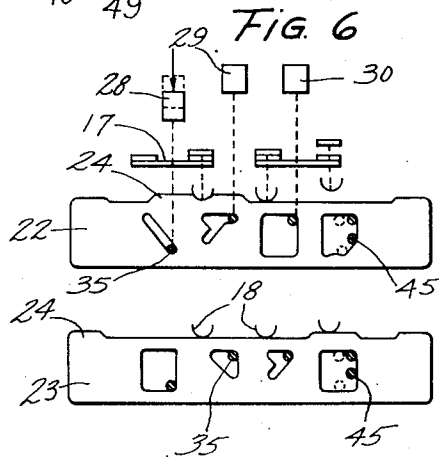
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2,810,027

PUSHBUTTON SWITCH WITH MOMENTARY CONTACT ACTION

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2,810,027

PUSHBUTTON SWITCH WITH MOMENTARY CONTACT ACTION

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4 Claims. (Cl. 200—5)

The present invention relates to a multiple pushbutton switch of the type which includes a plurality of push-buttons for actuating sliders to effect the closing of one or more pre-selected electrical circuits when one of the buttons is depressed, while preventing the simultaneous operation of a second pushbutton through a suitable interlocking mechanism. This invention is particularly concerned with providing one of the buttons of such a switch with a momentary contact action.

This invention is an improvement in the basic pushbutton switch patent of Andrews No. 2,431,904 which is assigned to the same assignee as is the present invention. Likewise, it is an improvement over a co-pending Hutt application Serial No. 538,031 entitled "Detent Means for a Pushbutton Switch" filed on October 3, 1955, and likewise assigned to the same assignee as in this invention.

Pushbutton switches of this general type have been used for many years for controlling the heating elements of electric ranges. Some electric ranges have an incandescent light in the oven section and a fluorescent light in the backsplash for illuminating the top of the range. Hence, it is desirable to have a pushbutton switch for controlling these lamps so as to blend with the other pushbutton switches that are visible on the backsplash. The function of the control switch for a fluorescent lamp is to complete a separate circuit through the lamp so that a preheat current can flow through the filament cathodes and heat them momentarily. The ballast in the main circuit limits the current flow through the cathode filaments; otherwise, they might be heated almost instantaneously like an ordinary filament lamp. After a few seconds the starter circuit is opened and the lamp lights. Manual starters of this type are oftentimes used for desk-type fluorescent lamps.

Accordingly, the principal object of this invention is to provide a multiple pushbutton switch with a novel momentary contact action.

A further object of this invention is to utilize the detent mechanism of a pushbutton switch so that it will provide one of the buttons with a momentary contact action.

A still further object of this invention is to provide a multiple pushbutton switch with a detent mechanism that cooperates with a modified slider to provide a button with a momentary contact action.

The present invention is an improvement over a co-pending application of Hutt, Serial No. 538,031 previously mentioned. Both this and the Hutt application have the following switch structure in common. They both have a hollow housing of insulating material, stationary contacts secured in the housing, and movable contacts in the form of cantilever spring strips cooperatively associated with the stationary contacts. A plurality of sliders are arranged longitudinally within the housing in side-by-side relationship and below the spring strips so that they are seated on the bottom wall of the housing. Each slider is provided with one or more camming surfaces on its upper edge for alternately engaging certain of the said spring strips to effect the opening and closing of the

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respective contacts in a predetermined manner. A series of diagonal working surfaces are likewise formed in each slider to be generally in alignment with, but distinct from, similar working surfaces in the other slider. A plurality of pushbuttons project into the housing and are associated with the diagonal working surfaces of the sliders. Hence, by depressing one of the buttons the innermost end of that button will engage the diagonal working surfaces of the sliders and shift one or more of the sliders to change the circuit arrangement of the switch. In addition, a pair of detent pins extend through additional openings in the sliders there being one pin above the other, while the ends of the pins are confined in a pair of opposed grooves formed in the switch housing. These pins are biased apart by one or more spring members, and the lower edge of at least one of the said openings in the sliders is provided with a cam surface which the pins must override against the resistance of the springs before that slider may shift.

The specific invention disclosed herein involves this same detent mechanism and concerns the shape of the openings in the sliders that cooperate with the detent pins. One or both of the top and bottom edges of the slider openings which lie generally parallel with the axis of movement of the sliders has a special shape to insure the proper movement of the sliders. In the preferred embodiment of my invention illustrated in the accompanying drawing, the lower edge of an opening in one of the sliders has a pair of spaced pin-receiving pockets that are separated by a raised portion, there being an inclined surface extending from one of the pockets to provide the desired momentary contact action. One of the pin-receiving pockets represents one extreme at-rest position, while the second pocket is the other at-rest position. However, when the momentary contact button is depressed the slider will shift to such a position that the lower detent pin will ride up the said inclined surface against the resistance of the detent springs. However, when that button is released, the spring will force the lower pin down the inclined surface by shifting the slider until it comes to rest in the nearest pin-receiving pocket. While I have chosen to illustrate my invention as including a special shape for the momentary contact action, it should be recognized that other modifications could be made operating on the same principle as I have suggested. For instance, there could be two oppositely inclined surfaces separated by a pin-receiving pocket to give the switch two momentary contact actions.

My invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

In the drawing:

Figure 1 is a top plan view of a pushbutton switch embodying my invention with a portion of the cover removed so that some of the switch parts may be identified.

Figure 2 is a transverse cross-sectional view taken on the lines 2—2 of Figure 1.

Figure 3 is a partial cross-sectional side elevational view taken on the lines 3—3 of Figure 1 showing clearly the detent mechanism of this switch.

Figure 4 is a partial exploded isometric view of a portion of the sliders showing the pair of detent pins and the C-shaped spring members of strip material for biasing them apart.

Figure 5 is a diagrammatic view showing the position of the sliders and the movable and fixed contacts when the central "Off" button is depressed.

Figure 6 is another diagrammatic showing similar to that of Figure 5 when the left hand momentary contact button is held down.

Referring in detail to the drawing, and in particular to

Figures 1-3, 10 represents a hollow switch housing comprising a molded base 11 of suitable insulating material and a thin insulating cover plate 12 which is fastened by screw means 13 that threads into the base to complete the assembly. The base is recessed with a deep longitudinal central cavity 14 and relatively shallow side cavities forming shelves 15 and 16. Fixed contacts 17 are mounted on shelf 16 of the base while spring strips or blades 18 which form the movable contacts of the switch are fastened at one end to terminals 19 that extend through the shelf 15 and outwardly of the housing, as is best seen in Figure 2.

The movable contacts 18 are normally biased into engagement with the fixed contacts 17. The positions of the movable contacts are controlled by a pair of sliders 22 and 23 of insulating material as is best seen in Figures 5 and 6. The top edge of each slider is formed with a pattern of raised cam surfaces 24 which are adapted to hold the movable contacts away from the fixed contacts. Looking at Figure 5, it will be understood that all of the movable contacts 18 are in the open position since they all rest on a cam surface 24 of the sliders. However, this is not true in Figure 6 where the left-hand movable contact 18 is disposed between two raised cam surfaces 24 and hence, the movable contact is allowed to make engagement with the fixed contact 17.

The present invention is shown embodied in a three-position switch having three pushbuttons 28, 29 and 30 which are molded of suitable insulating material with a lower end that is bifurcated as at 31 in Figure 2 to straddle the two sliders 22 and 23. Each slider is provided with a series of three openings generally designated as 32 having different combinations of vertical and diagonal working surfaces 33 and 34, respectively. There is such an opening 32 in each slider for each pushbutton and hence there are six openings in all. They are generally in alignment as may be visualized in the diagrammatic showings of Figures 5 and 6 so that a pin 35 which is carried by the bifurcated end of each button may extend through the sliders for cooperation with the before-mentioned diagonal working surfaces 34. Such pins 35 are guided at their ends in vertical grooves 36 on opposite sidewalls of the central cavity 14 of the base. When the cover 12 is fastened over the base, the pushbuttons 28-30 extend through close-fitting openings in the cover so that the buttons are guided for straight-line movement by both the pins 35 and the cover 12. It is well to furnish means to prevent the sliders from rising off of the floor of the base 11. This function is provided by an L-shaped spring clip 37 shown in Figures 1 and 2 as overlying the sliders at each end with an upwardly extending portion 38 that is confined in the notch 39 of the base so that the clips will be held down by the cover plate 12 and in turn they will hold the sliders down.

The structure which has been described above is conventional and merely a modification of the teachings of the beforementioned Andrews Patent No. 2,431,904. This invention involves the addition of a mechanism which will not allow the left hand momentary contact button 28 of Figure 6 to stay down when the manual force is released. This mechanism is best shown in Figure 4 where the two sliders 22 and 23 are shown in part. For illustration purposes the positions of the two sliders have been reversed in Figure 4. Each slider 22 and 23 contains a fourth opening indicated as 40 in slider 22 and 41 in slider 23. The opening 41 is generally square in shape, while the opening 40 has a similar configuration except for the lower edge. This lower edge has several portions, namely, two pin-receiving pockets 42 separated by a raised cam surface 43 and an upwardly inclined corner surface 44.

A pair of detent pins 45 are arranged to extend through the openings 40 and 41 of the sliders and to be confined in vertical grooves 46 in the base as seen in Figure 1, similarly to the grooves 36. A pair of identical spring

members 47 of generally C-shape are arranged between the ends of the vertically spaced pins 45 to normally bias them apart. The two ends of each spring 47 first converge towards each other as at 48 and then turn at about 90 degrees to diverge away from each other as at 49. These surfaces 48 and 49 form recesses 50 therebetween so that the spring 47 may clip onto the pins 45 and not become disengaged easily. These detent pins 45 and spring members 47 are similar in nature to the detent mechanism of a co-pending application to Hutt Serial No. 538,031 mentioned previously.

Now turning to a consideration of Figure 5, the middle or "Off" button 29 is depressed so that all of the movable contacts 18 are open and out of engagement with the fixed contact 17. The button 28 is the momentary contact button and when it is depressed and held down as shown in Figure 6 slider 22 will shift to the left while slider 23 remains in place. As slider 22 is moving to the left the lower detent pin 45 must ride over the raised cam surface 43 and ultimately climb up the inclined surface 44. However, in so doing the springs 47 must be compressed which tends to retard the movement of the slider and build potential energy in the springs which will be released when the manual force holding the button down is released. Once the hand is removed from the button 28 the detent pins will separate due to the expansion of the springs 47 until the lower pin 45 engages in the nearest pin-receiving pocket 42. Then the switch is at rest and the button 28 is in intermediate position between fully opened and fully closed. It is this particular nature of the opening 40 in the slider 22 which provides the unobvious result of a momentary contact action in a multiple pushbutton switch.

Having described above my invention of a multiple pushbutton switch with a novel momentary contact action as well as a detent action, it will be well understood by those skilled in this art that this improvement has been made by adapting a detent mechanism to perform the additional function of a momentary contact action. I have accomplished this with little or no increase in cost of manufacturing and with an easy method of assembly and fabrication. While I have chosen to illustrate my invention showing the opening of the slider as having a unique lower edge it will be well understood by those skilled in this art that the same edge could be duplicated at the top of the slider so as to make the opening symmetrical about the horizontal axis. Alternatively, the novel edge could be only at the top edge. This invention is not limited to embodiments having a pair of pin-receiving pockets but other modifications may suggest themselves to those skilled in this art. For instance, the edge might include two oppositely inclined surfaces that are separated by a pin-receiving pocket.

Modifications of this invention will occur to those skilled in this art and it is to be understood, therefore, that this invention is not limited to the particular embodiments disclosed, but that it is intended to cover all modifications which are within the true spirit and scope of this invention.

What I claim is new and desire to secure by Letters Patent of the United States is:

1. A multiple pushbutton switch comprising a hollow housing, contact means arranged in the housing including fixed contacts and movable contacts, a plurality of sliders having camming surfaces that actuate the movable contacts, a series of diagonal working surfaces formed on each of the sliders, and means for actuating the sliders comprising a plurality of pushbuttons projecting into the housing and guided for straight-line movement, each button having an inner portion for engagement with selected ones of the aligned working surfaces as the button is depressed to move said sliders to predetermined contact controlling positions, and detent means for retarding the movement of the sliders, there being an opening of generally square shape in at least one of the sliders, the lower

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edge of the opening defining two spaced pockets separated by a raised portion, and an upwardly inclined corner surface communicating with one of the said pockets, a spring-biased detent pin extending through the sliders and guided for reciprocating movement by fixed wall members of the switch housing, the pin being biased against the lower edge of the said slider openings whereby the force of the spring must be overcome before the slider may shift as a button is depressed, the switch being provided with a momentary contact action for at least one of the buttons whereby the detent pin will not remain in place on the inclined corner surface when the related button is released but will be pressed downwardly by its spring and thereby shift the slider to open the previously closed movable contact.

2. A multiple pushbutton switch as recited in claim 1 wherein there are two detent pins, one above the other and biased apart by a pair of spring members one at each side of the group of sliders, the bottom pin being adapted to engage the lower edge of the said slider opening.

3. A multiple pushbutton switch as recited in claim 2 wherein each of the said pair of springs is of nearly closed C-shape with diverging end portions that engage the detent pins and hold the springs assembled therewith.

4. A multiple pushbutton switch comprising a hollow housing, contact means arranged in the housing including fixed contacts and movable contacts that are operated by

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camming surfaces on a plurality of sliders, a series of diagonal working surfaces formed on each of the sliders, and means for actuating the sliders comprising a plurality of pushbuttons projecting into the housing, each button having an inner portion for engagement with selected ones of the diagonal working surfaces as one of the buttons is depressed to move said sliders to predetermined contact controlling position, and detent means for at least one of the sliders comprising an opening in said slider for receiving a pair of detent pins whose ends are guided in opposed slots formed in the housing on opposite sides of the group of sliders, one edge of the opening that is generally parallel with the axis along which the slider moves having an inclined surface that is engaged by one of the detent pins, and spring means biased between the two detent pins to force them apart so that one pin will be resiliently biased against the said inclined surface, the said edge of the slider opening having in addition two spaced pockets for indexing the detent pin and hence, the slider for proper positioning of the slider.

References Cited in the file of this patent

UNITED STATES PATENTS

2,228,167	Kimball	Jan. 7, 1941
2,431,904	Andrews	Dec. 2, 1947