Jan. 4, 1966 W. T. SORENSON 3,227,820

SWITCH BUTTON STRUCTURE AND ARRAY

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Fig. 1.

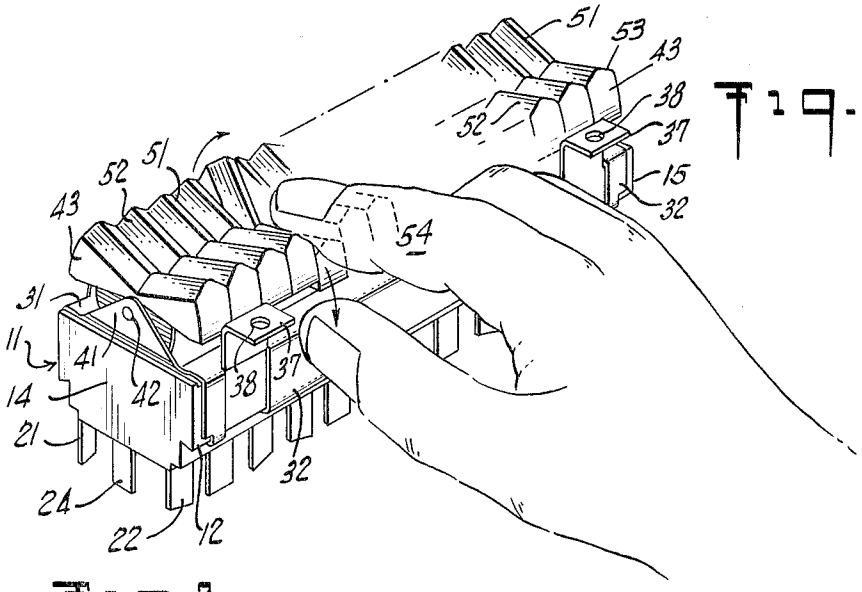


Fig. 2.

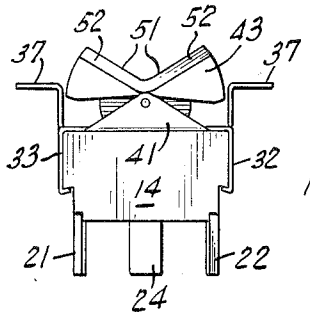


Fig. 3.

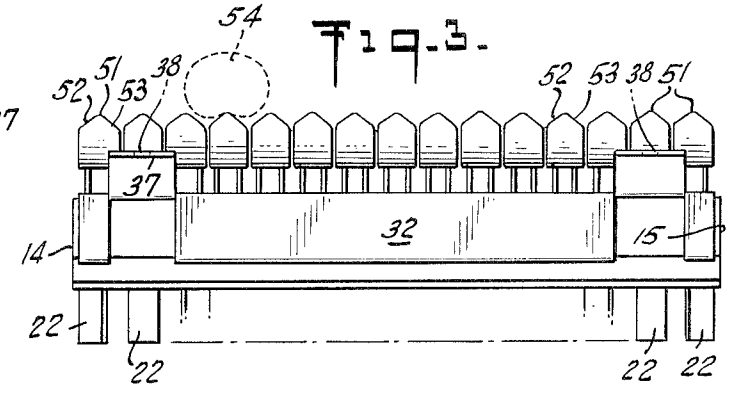


Fig. 4.

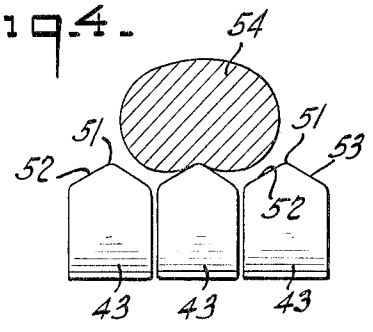
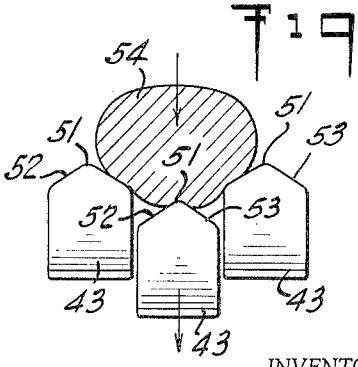


Fig. 5.



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Fig. 6.

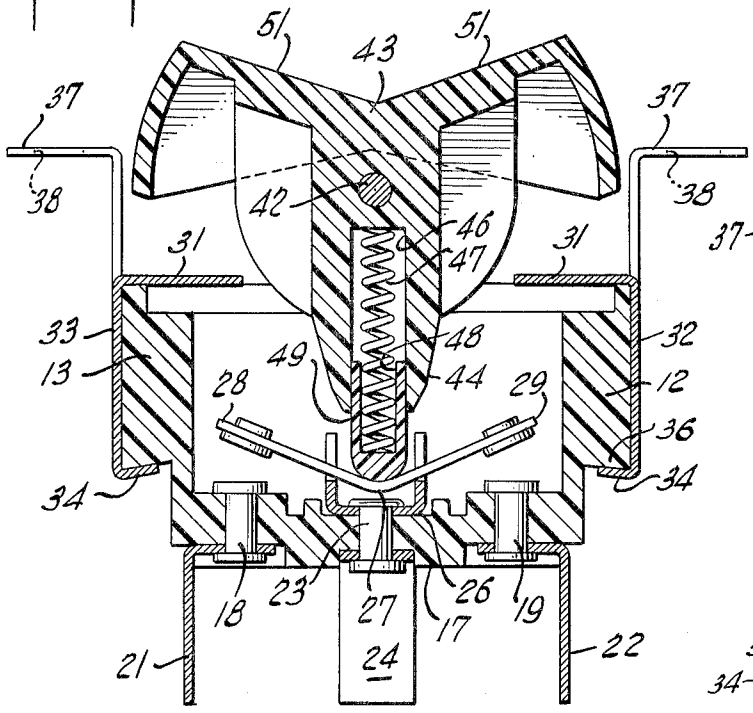


Fig. 8.

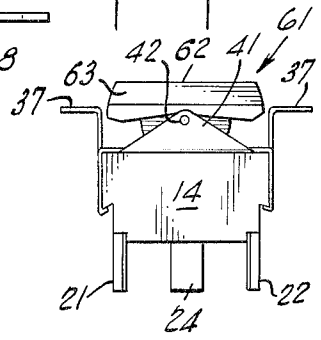


Fig. 9.

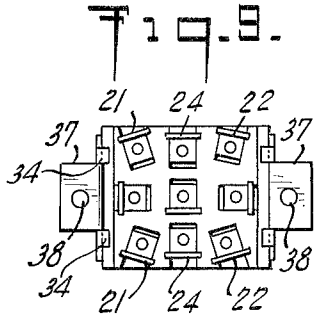


Fig. 7.

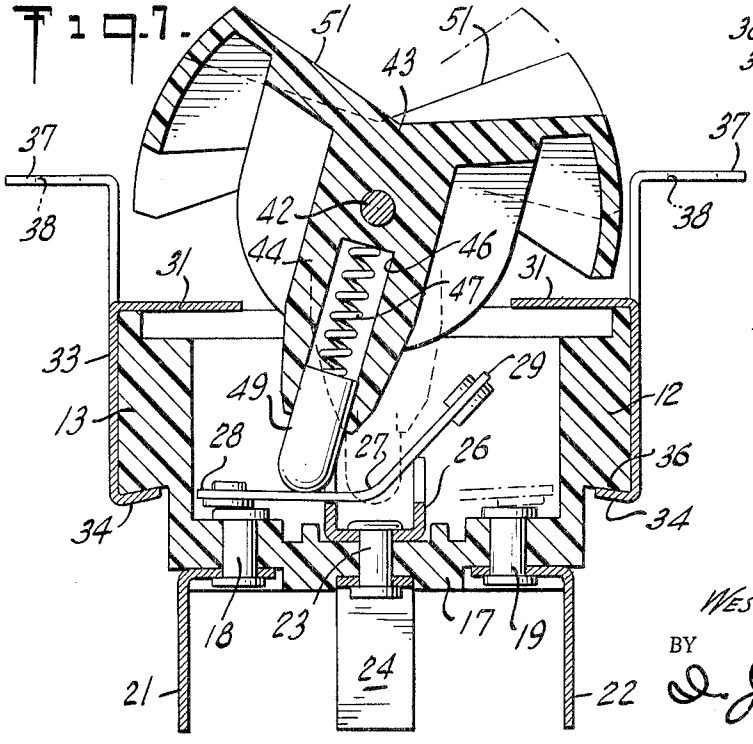
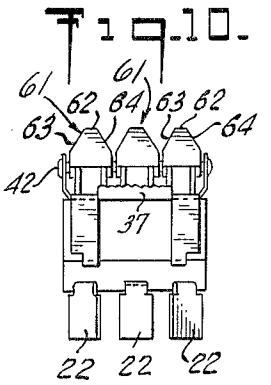


Fig. 10.



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SWITCH BUTTON STRUCTURE AND ARRAY

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7 Claims. (Cl. 200—5)

This invention relates to switches, and more particularly to switch actuator buttons which are especially adapted for manually operating multiple sets of circuits in crowded quarters.

With the present trend toward miniaturization of apparatus and the concomitant crowding of multiple sets of paired or grouped electrical circuits into small areas or containers, the problem arises of providing actuator buttons which are sufficiently small to permit manual operation thereof without interfering with adjacent actuator buttons. Conventional actuator buttons are necessarily so large that when many electrical circuits are to be placed into close juxtaposition, the size of the actuator buttons frequently delimits the number of sets of circuits that can be accommodated in the limited area.

In order to crowd a greater number of electrical circuits into a limited space, a switch button has been provided, according to the present invention, wherein a larger number of circuit actuators may be placed in close juxtaposition whereby the operation of one button by the finger of the operator does not interfere with or accidentally operate an adjacent button.

Where a bank of sets of electrical circuits has at least three or more separately operable closely positioned switch actuator buttons, the present invention provides particularly narrow buttons having symmetrical convex surfaces in cross-section aspect, whereby a single actuator button may be depressed, notwithstanding the fact that the actuating finger overlaps the top of adjacent buttons. When the selected actuator button is depressed, a pair of opposing angled surfaces on the adjacent buttons permits the actuating finger to descend into the space between said two adjacent buttons without in any way disturbing their position or accidentally depressing either or both of those other two buttons.

Still other objects and advantages of the invention will be apparent from the specification.

The features of novelty which are believed to be characteristic of the invention are set forth herein and will best be understood, both as to their fundamental principles and as to their particular embodiments, by reference to the specification and accompanying drawings, in which:

FIGURE 1 is a perspective view of a bank of switches having a plurality of actuator buttons of the present invention showing the manner in which the finger of the operator has depressed one of said buttons;

FIGURE 2 is an end view of the device shown in FIGURE 1;

FIGURE 3 is a side view of the device shown in FIGURE 1 with a cross-section of the operator's finger shown in dotted outline;

FIGURE 4 is a greatly enlarged section view of a portion of the device shown in FIGURE 3 prior to the selected actuator button being depressed;

FIGURE 5 is a view similar to FIGURE 4 showing one of the buttons having been depressed by the finger;

FIGURE 6 is a greatly enlarged vertical section view of the switch taken centrally of one of the buttons shown in FIGURES 1 and 2, some parts being shown in elevation, the switch elements being in the center-off condition;

FIGURE 7 is a view similar to FIGURE 6 showing

said button having been pivotally moved into one circuit closing position;

FIGURE 8 is an end view similar to FIGURE 2 showing a modification of the button of the present invention;

FIGURE 9 is a bottom view of a switch assembly having three pairs of circuits which are actuated by three separate buttons; and

FIGURE 10 is a side view of the device shown in FIGURE 8.

Referring now to the drawings in detail, the device of the present invention is incorporated into a boxlike case, generally designated 11, which has a pair of spaced apart side walls 12 and 13 and a pair of spaced apart end walls 14 and 15. Case 11 is made of a suitable insulating material, such as nylon, Bakelite or the like, and has a bottom wall or floor 17 integrally formed with said end walls and said side walls. The interior of case 11 contains a plurality of pairs of circuits, each of which comprises spaced apart electrically conductive studs 18 and 19 extending through floor 17 and to the bottoms of which terminal lugs 21 and 22 are respectively secured. See FIGURES 6 and 7.

Extending through floor 17 of case 11 intermediate studs 18 and 19 is an electircally conductive common circuit stud 23, to the bottom of which is secured a common terminal lug 24 which is connectable to a power source for supplying power to two separate circuits to which lugs 21 and 22 are connectable.

Secured to the top of stud 23 in the interior of case 11 is an electrically conductive yoke 26 on which is pivotally balanced a V-shaped elongated contact lever 27. One contact arm 28 of electrically conductive lever 27 is adapted to close and open one circuit with the upper end of stud 18 and the other contact arm 29 is adapted to close and open the other circuit with the upper end of stud 19.

Mounted over the open top of case 11 is a sheet metal cover plate 31 having a central aperture to permit access to the interior of said case. Each side of cover plate 31 has an integrally formed downwardly extending bracket 32 and 33, respectively, that lie along side walls 12 and 13, respectively, and which terminate in fingers 34 which engae spurs 36 formed integrally in said side walls, whereby said cover plate is secured in position. Formed integrally with cover plate 31 are a plurality of upwardly and outwardly extending brackets 37 having holes 38 therein to accommodate screws or the like to mount case 11 in a suitable location.

Formed at the end portions of cover plate 31 are integral upwardly extending pivot brackets 41 of triangular shape, said brackets each having an aperture near the apex thereof which accommodates the end of a pivot pin 42. Mounted on pin 42 is a plurality of independently pivotable identical actuator buttons 43 which are made of suitable insulating material such as nylon, Bakelite, or the like. Each button 43 has an integral stub 44 extending downwardly through the aperture in cover plate 31 into the interior of case 11. Each stub 44 has a longitudinal recess 46 accommodating a spring 47, the lower end portion of which is accommodated by a longitudinal recess 48 of actuator nib 49, the latter being movable longitudinally within recess 46 of said stub.

When actuator 43 is in its center-off position, nib 49 is normally urged into the inner apex of contact lever 27 whereby the latter is in the open circuit condition in respect of both circuit studs 18 and 19, as shown in FIGURE 6. When actuator button 43 is pivotally moved by being depressed on the right as shown in FIGURE 7, nib 49 is urged along contact arm 28 to move contact lever 27 pivotally on yoke 26 to cause said contact arm to come in contact with stud 18, thereby closing the electrical circuit to which lug 21 is connected. The pivotal move-

ment of actuator button 43 in the opposite direction will cause contact lever 27 to pivotally move in the opposite direction whereby contact arm 29 comes in contact with stud 19, thereby closing the electrical circuit to which terminal lug 22 is connected.

The top portion of each button 43 has a symmetrical V-shaped profile (FIGURES 2, 6, 7) constituting a pair of crests 51 arrayed at an obtuse angle relative to each other. Each crest 51 is the apex of a pair of substantially equal slopped surfaces 52 and 53 which form an inverted V-shaped actuator surface as shown in FIGURES 1, 3, 4 and 5. The lower edges of surfaces 52 and 53 are aligned with the lower edges of the surfaces of adjacent buttons when the latter are in their unactuated positions.

As shown in FIGURES 1, 3, 4 and 5, the width of each button 43 is considerably narrower than that of the average adult index finger 54. If each button of such narrow width had a flat horizontal actuating surface, the attempt to press any single button would inevitably cause the depression of at least one adjacent button if not both adjacent buttons. Because of the inverted V-shaped actuating surface of each actuator button 43 formed by converging surfaces 52 and 53, it can be seen that when a particular button (FIGURE 4) is selected by finger 54 which also extends over two adjacent actuator buttons, nevertheless only the single selected button becomes depressed as shown in FIGURE 5 to close a selected circuit as represented by FIGURES 6 and 7, without actuating either of the adjacent buttons. This selective action takes place even though, in the depressed condition of the center button in FIGURE 5, the finger has touched both adjacent buttons on either side of the depressed button. The sloping surfaces 52 and 53 of the adjacent buttons permit the convex fleshy portion of the finger to exert its actuating force only upon the selected button without depressing said adjacent buttons. Thus, by providing narrow buttons with convex actuating surfaces, a greater number of manually operated actuators for electrical circuits can be accommodated into a given space than would otherwise be possible. As indicated in the drawings, and particularly in FIGURE 5, each button is depressible in a vertical direction along a line that substantially bisects the angle between sloping surfaces 52 and 53.

In FIGURES 8 and 10 there is illustrated an alternative embodiment of the manually operated switch of the present invention comprising a plurality of pivotable actuator buttons 61, each of which has a straight, horizontal crest 62, in profile, which forms the symmetrical apex of substantially equal converging sloping surfaces 63 and 64. Here also, closely adjacent buttons 61 are considerably narrower than an adult forefinger and have sloping surfaces 63 and 64 disposed at a suitable angle relative to each other to permit the actuation of a single button by the forefinger, without interfering with the neutral condition of adjacent buttons on either side of the selected button.

It is understood that in some embodiments the sloping surfaces 52, 53 may extend only partially toward the center of the buttons to a sufficient distance to enable the finger to pivotally actuate a single selected button. It is sufficient to arrange for the convex contour of a button top to extend an adequate distance inwardly for digital operation thereof.

I claim:

1. A switch comprising a case, a plurality of at least three closely spaced sets of circuits in said case, an actuator button pivotally mounted on said case for each of said sets of circuits, said actuator buttons being identical in configuration and being separately operable, said buttons being arrayed in close juxtaposition, the width of each button being considerably less than that of the average adult finger, the top portion of each button being convex in contour and having symmetrical sloping sides whereby the downward actuation of one of said buttons permits the actuating finger to descend therewith and despite said finger extending over adjacent buttons, the latter are not actuated thereby, the motion of each button being in the direction of a line substantially bisecting the angle between said sloping sides.

2. A switch comprising a case, a plurality of at least three closely spaced sets of circuits in said case, an actuator button pivotally mounted on said case for each of said sets of circuits, said buttons being arrayed in close juxtaposition, the width of each button being considerably less than that of the average adult finger, the top portion of each button having a symmetrical sloping contour on both sides thereof whereby the downward actuation of any one of said buttons permits the actuating finger to descend therewith, each button adjacent said actuated button remaining in its unactuated position despite the extension of a portion of the actuating finger over at least a portion of said adjacent button, the motion of each button being in the direction of a line substantially bisecting the angle between said sloping sides.

3. A switch comprising a case, a plurality of closely spaced sets of circuits in said case, an actuator button pivotally mounted on said case for each of said sets of circuits, said buttons being arrayed in close juxtaposition relative to adjacent buttons with just sufficient space therebetween to permit independent pivoting operation of each of said buttons, the width of each button being considerably less than that of the average adult finger, the actuating top area of each button having an inverted symmetrical V-shaped contour, the downward actuation of any one of said buttons permitting the actuating finger to descend therewith despite the overlapping of said finger with at least a portion of the top actuating surface of an adjacent button, the motion of each button being in the direction of a line substantially bisecting the angle of said V-shaped contour.

4. A switch comprising a case, a plurality of closely spaced sets of circuits in said case, an actuator button pivotally mounted on said case for each of said sets of circuits, said buttons being arrayed in close juxtaposition, the width of each button being considerably less than that of the average adult finger, the actuating top area of each button being formed of a symmetrical pair of converging slopes, the lower edge of each slope being aligned with the lower edge of the slope of an adjacent button when all of said buttons are in the unactuated position, the downward actuation of any one of said buttons by an actuating finger applied directly over the top of said button permitting said finger to descend therewith despite the overlapping of said finger on the adjoining slope of an adjacent button, the motion of each button being in the direction of a line substantially bisecting the angle between said sloping sides.

5. A switch comprising a case, a plurality of closely spaced sets of circuits in said case, a separately operable actuator button for each of said sets of circuits, each of said buttons being substantially identical in dimensions and being pivotally mounted in close juxtaposition on said case, the width of said buttons being considerably less than the width of the average adult finger which when applied centrally on top of one selected button normally projects sidewise over an adjacent button on either side of said selected button, the top of each button being symmetrically downwardly and divergently sloped whereby the actuating finger descends with the pivotally depressed button without moving either of said adjacent buttons, the motion of each button being in the direction of a line substantially bisecting the angle between said sloping sides.

6. A switch according to claim 5 wherein the top portion of each button has an inverted V-shaped contour.

7. A switch comprising a case, a plurality of at least three closely spaced sets of circuits in said case, an actuator button pivotally mounted on said case for each of said sets of circuits, said buttons being arrayed in close

juxtaposition relative to adjacent buttons, the width of each button being considerably less than that of the average adult finger, at least a portion of the actuating top area of each button having an inverted symmetrical V-shaped contour, the downward actuation of any one of said buttons permitting the actuating finger to descend therewith despite the overlapping of said finger with at least a portion of the top actuating surface of an adjacent button, the motion of each button being in the direction of a line substantially bisecting the angle of said V-shaped contour.

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