

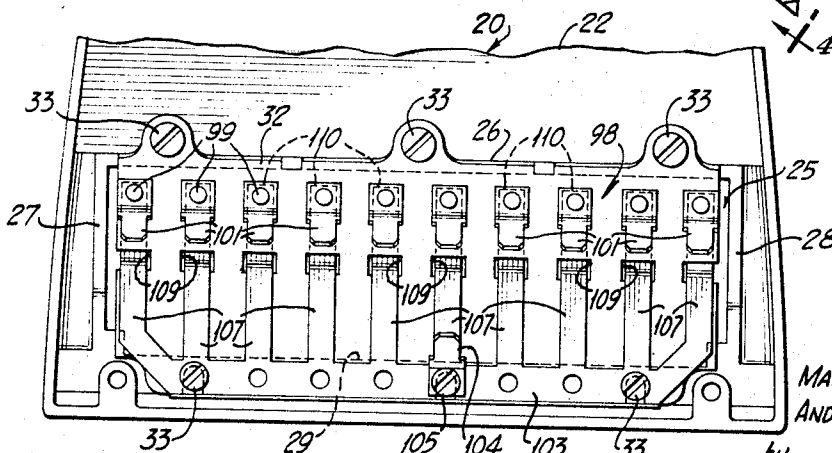
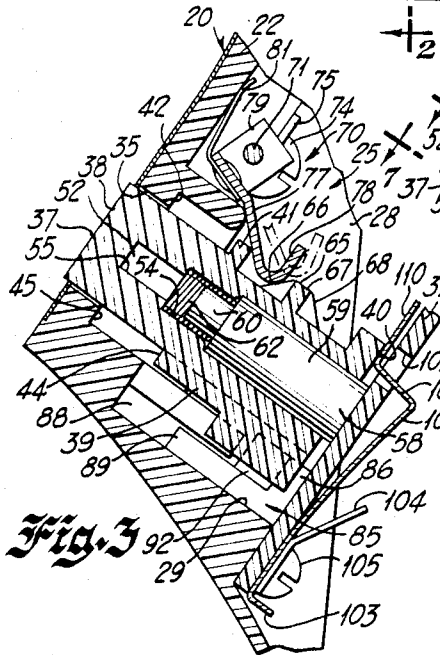
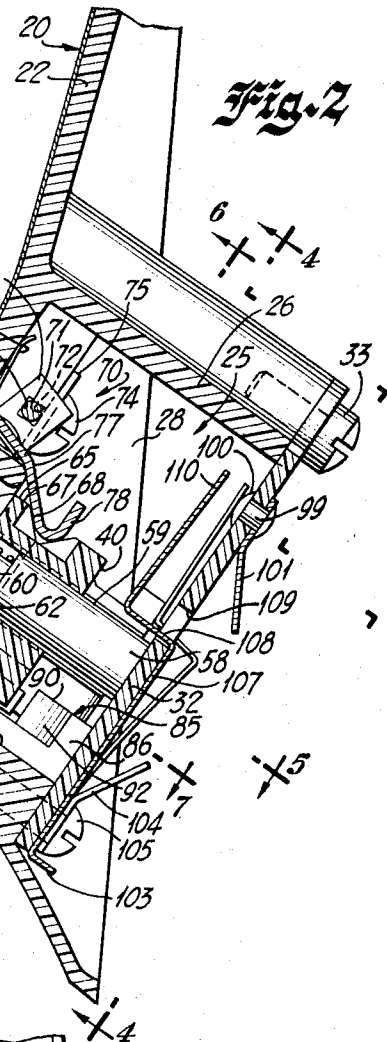
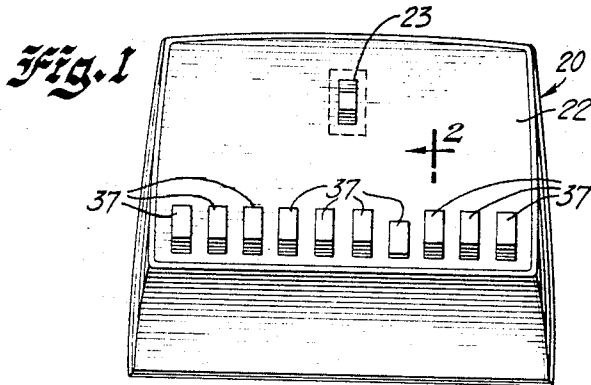
Jan. 7, 1969

M. M. EDWARDS ET AL
MULTIPLE PUSHBUTTON SWITCH

3,420,969

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Sheet 1 of 2



Jan. 7, 1969

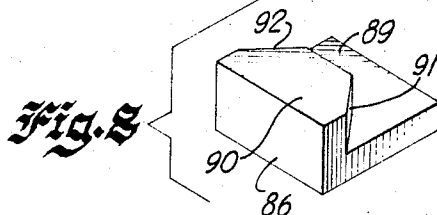
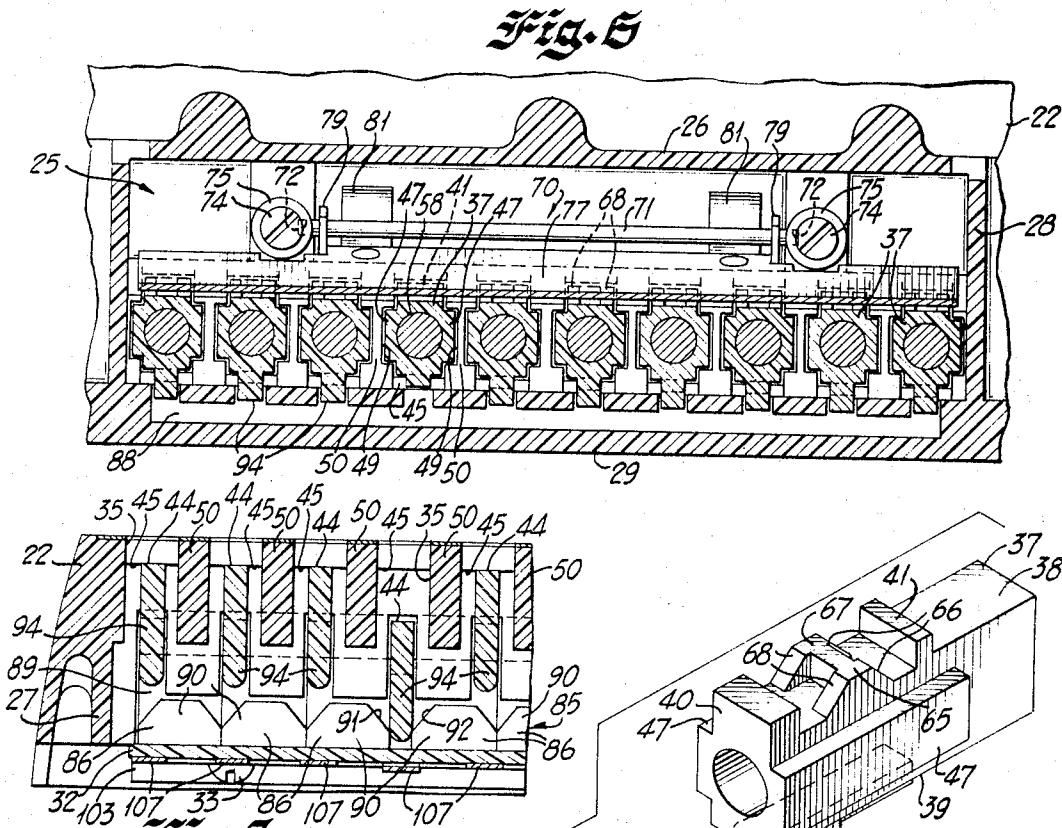
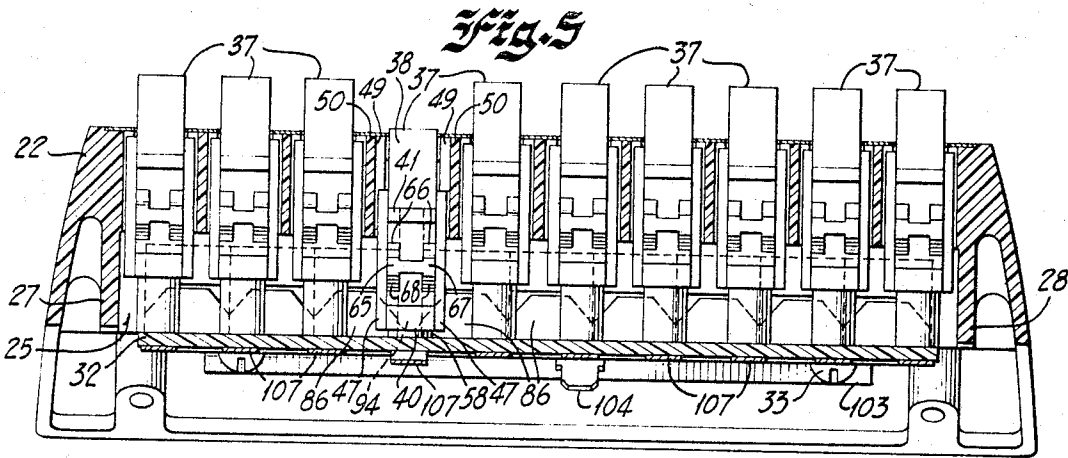
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Sheet 2 of 2



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3,420,969

MULTIPLE PUSHBUTTON SWITCH

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17 Claims

Int. Cl. H01h 9/26; H01h 3/20; H01h 9/20

The present invention relates to pushbutton switches and more particularly to an improved multiple pushbutton switch which is compact, inexpensive and easily manufactured.

Multiple pushbutton switches have been commercially employed for many years in various applications requiring a fast and easily used means for selecting a given mode of operation or electrical circuit. This type of switch has great appeal to consumers since it typifies automatically operated systems. Thus, the consumer visualizes that the only effort required on his part for operating a device is the mere depression of a selected pushbutton. Consequently, when multiple pushbutton switches are employed, the user merely has to select the button producing the desired result. Therefore, it is not surprising that there is an increasing need for multiple pushbutton switches which are easily and inexpensively manufactured as well as being easily serviced when repairs are required. Naturally, the switch should be designed so that a long operating life can be expected before servicing is required.

In certain applications, a multiple pushbutton switch is needed having a considerable number of operating buttons and where the nature of the application limits the available space for receiving the switch. One such application is in an appliance food blender having ten different operating speeds which are obtained by using a tapped motor field. Obviously, a switch having ten pushbuttons can only occupy a small space because the blender base enclosing the motor is relatively small. Thus, there is a need for a switch having a large number of pushbuttons wherein the buttons are closely spaced together.

Accordingly, an object of the present invention is to provide a multiple pushbutton switch which is compact, easily manufactured and inexpensive.

Another object of the present invention is to provide a multiple pushbutton switch having compact means for guiding and biasing the pushbuttons.

Still another object of the present invention is to provide a multiple pushbutton switch having the pushbuttons closely spaced together so that the switch occupies a minimum of space.

A further object of the present invention is to provide a multiple pushbutton switch having a common conductor which is easily assembled to the switch housing and is easily actuated by the depression of one of the pushbuttons.

Further objects and advantages of the present invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of the present invention, reference may be had to the accompanying drawings in which:

FIG. 1 is a front elevational view of a multiple pushbutton electrical switch embodying the present invention;

FIG. 2 is an enlarged fragmentary sectional view taken substantially along line 2—2 of FIG. 1;

FIG. 3 is a fragmentary sectional view similar to FIG. 1 but with the pushbutton illustrated in the inner or depressed position;

FIG. 4 is a fragmentary view taken substantially along line 4—4 of FIG. 2;

FIG. 5 is a sectional view taken substantially along line 5—5 of FIG. 2;

FIG. 6 is a fragmentary sectional view taken substantially along line 6—6 of FIG. 2;

FIG. 7 is a fragmentary sectional view taken substantially along line 7—7 of FIG. 2; and

FIG. 8 is a perspective view of a slider and a pushbutton.

Briefly, the present invention relates to a multiple pushbutton switch having a housing with a plurality of openings through which pushbuttons project and are adapted for slidable movement. A latch arrangement is disposed within the housing and positioned to cooperate with a cam formed on each pushbutton for retaining the button at an inner position. Secured to the housing is a switching mechanism which is operated upon the movement of a pushbutton to the inner position. Also located within the housing is a slider system for permitting only one pushbutton at a time to slide to the inner position and this system is basically independent from the latching arrangement. Posts are placed within the housing adjacent to the switching mechanism for controlling the pushbutton biasing means and for assisting in guiding the pushbuttons and said posts are received within pushbutton cavities.

In order for the buttons to be closely spaced together, the latching arrangement and the slider system are located on opposite sides of the pushbuttons. In addition, the switch is positioned behind the pushbuttons with a portion of the switching mechanism located outside of the switch housing.

Referring now to the drawings in which like reference numerals designate corresponding parts throughout the several views, there is shown a multiple pushbutton electrical switch generally designated by reference numeral 20. The switch 20 includes a housing 22 which is preferably molded from a suitable non-conducting plastic such as a general purpose phenolic. In the embodiment illustrated in FIG. 1, the housing 22 has mounted thereon an off-on switch 23 which is useful when the switch 20 is employed in an electrical appliance food blender. However, the off-on switch 23 is not a significant feature of the present invention. The housing 22 has a cup-shaped portion 25 formed by rearwardly extending top wall 26, side walls 27 and 28 and bottom wall 29. This rearwardly open, cup-shaped portion 25 is enclosed by a removable contact board 32 which is held in position by a plurality of threaded fasteners 33.

According to the present invention, the housing 22 is provided with a plurality of openings or channels 35 which provide access to the interior of the cup-shaped portion 25. In the present embodiment, there are ten openings 35 and extending therethrough are pushbuttons 37. It should be appreciated that the number of pushbuttons is not significant with respect to this application since the teachings herein permit more or less pushbuttons to be easily employed. Inasmuch as the construction of all the pushbuttons 37 is essentially the same as well as the interior configuration of the openings 35, only one pushbutton and complementary opening is discussed in detail hereinafter. Preferably, the pushbuttons 37 are molded from a suitable nonconducting plastic. Each pushbutton has a forward portion 38 which is extendable through the housing 22 so that the operator has access thereto and a rear portion 39 having a switch engaging or contacting portion 40. On the top surface of the pushbutton 37 is a stop portion 41 which is adapted to contact housing shoulder 42 for limiting the outward movement of the button. Similarly, the bottom surface of the pushbutton has an integral stop portion 44 which is disposed to abut against housing shoulder 45. In this manner, the pushbutton 37 is limited in its outward move-

ment by stop means located on its top and bottom surfaces thereby nullifying any tendency of the pushbutton to become misaligned within opening 35 while at its outer position as portrayed in FIG. 2. On each side of pushbutton 37 are longitudinally extending ribs 47 which are received in sliding relationship in grooves 49 formed in vertical walls 50 which, in part, define the openings 35 and which are disposed on each side of pushbuttons 37. Thus, the sliding movement between the pushbuttons and the housing is controlled by the relationship between the pushbutton ribs 47 and complementary grooves 49.

To help control the sliding movement of push button 37, it is provided with a cavity 52 which is open rearwardly and has internal bores 53, 54 and 55. These concentric bores 53, 54 and 55 extend longitudinally into the push button 37 and are disposed normal to contact board 32. Extending into cavity 52 is a post 58 having a large diameter portion 59 and a small diameter portion 60. The end of post 58 remote from small diameter portion 60 is supported against contact board 32. As can be easily seen in FIG. 2, the post large diameter portion 59 is in good sliding relationship with push button cavity bore 53. Disposed within cavity 52 is a coil spring 62 having one end looped around post small diameter portion 60 and the other end abutting against a shoulder 63 between cavity bores 54 and 55. It should be appreciated that the portion of the cavity defined by bore 55 is provided to facilitate the molding of the push button. Thus, the coiled spring 62 biases the push button outwardly while, at the same time, maintains the post 58 against the contact board 32. Therefore, in operation, the post 58 may be considered stationary since its relationship to the contact board 32 remains unchanged. The primary purpose of post 58 is to retain spring 62 within push button and thereby prevent buckling and rocking of the spring in operation. Furthermore, the post 58 helps to guide the sliding movement of the push button 37.

For controlling the inner position of the push button 37, there is formed on its top surface an integral cam portion 65 having a somewhat inverted, truncated, V-shaped configuration. The cam portion 65 has a front inclined surface 66, a central elevated flat surface 67 and a rear oppositely inclined surface 68. Cooperating with the cam portion 65 is a latch assembly 70 disposed within the cup-shaped housing portion 25 and located above the row of push buttons 37. The latch assembly 70 includes a stationary spindle 71 extending transversely to the sliding direction of push buttons 37 and received at its ends within spaced housing notches 72. The spindle 71 is retained in the notches 72 by means of threaded fasteners 74 and washers 75. Pivotally mounted on spindle 71 is latch plate 77 having a curved hook-shaped end 78. The latch plate 77 is provided with spaced ears 79 having openings 80 for receiving the spindle 71. Riveted to the latch plate 77 are leaf springs 81 which abut against the housing 22 and bias the latch plate 77 in a clockwise direction as viewed in FIGS. 2 and 3. That is to say, the curved latch plate end 78 is spring biased downwardly toward the push button cam portion 65.

To understand the cooperation between the latch assembly 70 and the push button cam portion 65, reference may be had to both FIGS. 2 and 3. The push button 37 in FIG. 2 is disposed at its outer position and the latch plate end 78 is biased downwardly toward and adjacent to rear inclined cam surface 68. When the push button is slid inwardly, the latch plate end 78 is pivoted upwardly to a dotted position illustrated in FIG. 3. Once the push button has reached its inner position, the latch plate end 78 engages with the front inclined cam surface 66 thereby locking the push button at this position. When another push button is pushed inwardly, its rear inclined cam surface 68 again forces the latch plate end 78 upwardly until it is in contact with the

cam central flat surface 67. At this point, the push button which was previously at the inner position is released and biased to the outer position by spring 62 disposed within the push button cavity 52. On further depression of the second push button, the latch end 78 again pivots downwardly to lock the second push button at the inner position as the latched plate end 78 contacts the front inclined cam surface 66. Therefore, with the present latch assembly 70, the depression of one push button 37 releases any other push button which is at the inner position and also the latch assembly retains the push buttons at the inner position. It should be noted that the latch assembly 70 is disposed so that the center of curvature for the curved latch plate end 78 is always above a line passing through the center of the spindle 71 and perpendicular to a point on the front inclined cam surface 66. With this arrangement, the latch plate end 78 cannot become bound with the front inclined surface 66 in an over-center toggle relationship while the button is attempting to move outwardly.

To insure that only one push button at a time is locked at the inner position, there is provided a slider assembly generally denoted by the reference numeral 85. The slider assembly consists of a plurality of slider members 86 which are disposed in a slot 88 formed in housing 22 between the bottom wall 29 and the contact board 32. Each slider member is identical and has a general L-shaped configuration with a flat portion 89 adapted to slide longitudinally within slot 88 and an upright portion 90 having opposed inclined surfaces 91 and 92. To relate the push buttons to the slider assembly, each push button 37 has a downwardly extending integral protuberance portion 94. The length of housing slot 88 is greater than the combined width of slider members 86 and is sufficiently longer so that only one push button protuberance portion 94 may be inserted between the slider members 86. To illustrate this arrangement, reference may be made to FIG. 7, wherein is disclosed that the slider members 86 are abutting one another in side by side relationship and that there is a sufficient gap between two adjacent slider members to receive one push button protuberance portion 94. The inclined cam surfaces 91 and 92 are sufficiently angled so that no matter which push button is depressed, the push button protuberance portion 94 slides the slider members 86 to the side. Since space is provided to receive only one push button protuberance portion 94, if another button is depressed, it merely abuts against the slide members 86 and the push button cannot be moved to the inner position. It should be appreciated that the slider assembly 85 is essentially disposed below the row of push buttons 37 and the latching assembly 70 is located above the push buttons thereby forming a very compact design.

Secured to the contact board 32 is switching assembly 98 including a plurality of electrical contacts 99 each having a head portion 100 disposed within the cup-shaped housing portion 25 and riveted to a terminal portion 101 which is adapted for receiving an electrical lead. The electrical contacts 99 are disposed in a row which extends parallel to the row of push buttons 37 and is disposed thereabove. The switching assembly 98 also includes a common conductor 103 which is fastened to the outside surface of contact board 32 and to a terminal 104 by means of a threaded fastener 105. Therefore, as seen in FIG. 4, a common conductor 103 is held to the outside of contact board 32 by threaded fastener 105 along with two fasteners 33, all of which also hold the contact board 32 to the cup-shaped housing portion 25. The common conductor 103 is formed from an electrically conducting resilient material and has a plurality of fingers 107 which extend along the outside surface of contact board 32 and have a bend portion 108 projecting through contact board openings 109. The conductor fingers 107 are formed with a remote end 110 which is essentially parallel to the portion of

the finger adjacent to the outside surface of the board 32. As seen in FIG. 2, the finger remote end 110 is disposed adjacent to the electrical contact head portion 100. Moreover, the conductor fingers 107 are in alignment with the push buttons 37 so that when one of the push buttons is depressed to the inner position, the push button contacting portion 40 abuts against the finger remote end 110 and biases it into good electrical engagement with its complementary electrical head portion 100. The resilient fingers 107 are disposed so that once the push button is slid to its outer position, the finger will spring away from the contact head portion 100 to break the electrical engagement therebetween. In FIG. 2, the conductor fingers are illustrated in both the electrically open and closed positions.

The present multiple push button electrical switch is easily serviced by simply removing the fasteners 33 and 105 exposing all of the internal parts. The subject switch is easily manufactured since all of the assembly work is done on the rear side of the switch. Moreover, the switch is inexpensive since most of the operating parts may be formed from plastic material. It should be appreciated that the specific number of push buttons employed may be easily changed by using the appropriate number of push button assemblies. Moreover, the same push buttons and post can be employed within a variety of switches. Further, the integration of the various components is such to provide a very compact design and allow the push buttons to be closely spaced together thereby requiring a minimum space for a switch having a considerable number of push buttons.

While there has been illustrated and described a single preferred embodiment of the invention, it will readily be understood by those skilled in the art that numerous changes and modifications can be made without departing from the present invention. It is aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A multiple push button electrical switch comprising a housing having a plurality of outwardly extending channels each of which is adapted for receiving in sliding relationship a push button so that said push buttons are slidable between an outer and inner position, each of said push buttons molded from plastic material and formed with an integral stop portion for limiting the outwardly movement thereof with respect to said housing, a latch plate pivotally mounted within said housing and spring means biasing said plate toward said push buttons, switch means in said housing disposed for actuation by said push buttons when said buttons are slid to the inner position, each of said push buttons being provided with an integral cam portion which cooperates with said latch plate whereby said latch plate can hold said push buttons in the inner position and the inwardly movement of any of said push buttons can cause its said cam portion to pivot said latch plate sufficiently for releasing said push buttons in the inner position, each of said push buttons formed with a longitudinally extending cavity facing inwardly toward said housing, a spring disposed within each of said push button cavities for biasing them outwardly, a post supported by said housing adjacent said switch means and in alignment with and extending into each of said push button cavities for guiding and restricting the movement of said springs, each of said push buttons having an integral contact portion for actuating said switch means when said button is at the inner position.

2. The multiple push button electrical switch of claim 1 wherein said housing defines an elongated slot extending transversely to said posts, a plurality of sliders disposed within said housing slot and arranged so that only one of said push buttons is permitted to be at the inner position at the same time.

3. The multiple push button electrical switch of claim

2 wherein each of said push buttons is provided with an integral protuberance portion which is disposed on the opposite side of said push button cavity from said contact portion and said protuberance portion is for engaging said sliders, the length of said housing slot being greater than the combined length of said sliders in the elongated direction of said slot so that said sliders can slide within said slot, the spacing between said sliders being sufficiently small whereby only one of said push button protuberance portion can enter among said sliders.

4. The multiple push button electrical switch of claim 1 wherein said switch means including a plurality of stationary electrical contacts secured to said housing and a plurality of leaf springs, said contacts being positioned on one side of said push buttons and said leaf springs being anchored to said housing on the other side thereof with said springs extending through said housing toward said contacts and normal to the sliding direction of said push buttons, said push button contact portions being aligned with said leaf springs whereby the inwardly movement of said push button causes said contact portion to bias said leaf spring into electrical engagement with its complementary switch means contact.

5. A multiple push button electrical switch comprising a housing having a cup-shaped member and a board closing and secured to said member, said member defining a plurality of closely spaced openings, push buttons molded jecting through said openings, said push buttons molded from plastic material and formed with a longitudinal cavity facing inwardly and also formed with integral cam portions on the top thereof, said board supporting a plurality of posts which are in alignment with and extend into said push button cavities for guiding the movement of said push buttons between an inner and outer positions, latch means positioned within said housing above said push buttons and adapted for retaining push buttons in the inner position by cooperating with said integral cam portions, said member and said board defining therebetween a passageway below said push buttons, a plurality of sliders disposed in said passageway, said push buttons formed with integral protuberances extending downwardly and positioned to cooperate with said sliders whereby only one of said push buttons can be disposed at the inner position, switch means secured to said board and positioned for actuation by said push button when they are at the inner position, said push buttons having an outer surface for allowing the user to press the push buttons inwardly and an inner surface for engaging said switch means.

6. The multiple push button switch of claim 5 wherein said push buttons are provided with an integral stop portion adapted for engagement with said member for limiting the outwardly movement thereof, and a spring disposed within each push button cavity biasing said push button outwardly.

7. The multiple push button switch of claim 6 wherein said switch means including a plurality of stationary, spaced electrical contacts on said board facing inwardly and being in electrical connection with a terminal on the outside of said board and a conductor secured to the outside of said board having a plurality of resilient fingers extending into said housing adjacent to said contacts, said push buttons slidable to the inner position for biasing said fingers into electrical engagement with said contacts.

8. A multiple push button switch comprising a housing having a board attached thereto, said housing defining a plurality of openings, push buttons projecting through said openings, said push buttons including a longitudinally extending cavity facing said board, posts supported by said board and in alignment with and extending into said push button cavities for guiding said push buttons in a direction normal to said board, said posts contacting said board along a first line, switch means secured to said board and including a plurality of spaced electrical contacts attached to the inside of said board and disposed

above said line and a conductor attached to the outside of said board below said line, said conductor having a plurality of resilient fingers, means whereby said resilient fingers extend through said board above said first line and further extend to a position adjacent said contacts, means whereby said push buttons slide to engage and bias the portions of said resilient fingers which are disposed inside of said housing to electrically connect said fingers with said contacts.

9. The multiple push button switch of claim 8 including a plurality of terminals attached to the outside of said board and in electrical connection with said contacts.

10. The multiple push button switch of claim 9 including latching means disposed within said housing above said push buttons and adapted for cooperation with cam means integral formed on top of said push buttons, and slider means within said housing below said push button cavities for allowing only one of said push buttons to contact said conductor resilient fingers at the same time.

11. The multiple push button switch of claim 8 wherein said board is removably secured to said housing permitting the switch to be easily serviced, fastening means securing said board to said housing also attaching said conductor to said board.

12. In a multiple push button switch including a housing having a plurality of openings through which push buttons projecting and sliding in a given direction through said openings, a plurality of button springs, means whereby each of said push buttons is biased outwardly by each of said button springs, said push buttons being molded with an integral inverted generally V-shaped cam having an outer inclined surface, a central horizontal surface and an inner oppositely inclined surface, latch means for retaining said push buttons at an inner position comprising a single latch plate with a curved end for engaging said cam, said plate being pivotally mounted to said housing on an axis normal said given direction, latch spring means biasing said latch plate curved end toward said cams so that said curved end engages said outer cam surface when said push button is at the inner position, the inward movement of said button from the outer position to the inner position causing said curved latch plate end to pivot along said outer cam surface to said cam central surface which moves said plate sufficiently so that said plate releases any push button at the inner position.

13. In the multiple push button switch of claim 12 wherein when said push button is at the inner position so that there is an engagement between said outer inclined cam surface and said curved latch end, the center of curvature for said curved end lies above a line running through the latch axis and normal to said outer inclined cam surface.

14. In the multiple push button switch of claim 13

wherein said latch plate is pivotally mounted on a stationary spindle extending between two spaced grooves in said housing, and threaded fastener means adjacent said grooves for retaining said spindle therein.

15. A multiple push button electrical switch comprising a housing molded from plastic material and defining a cup-shaped portion having closed and open ends, push buttons having opposite sides, a member secured to said housing over said open end of said cup-shaped portion to form a chamber, means whereby said push buttons are disposed in sliding relationship with said closed end, said push buttons being extendable through said housing closed end whereby they are pushable inwardly, electrical contact means secured to said member, said push buttons upon inward movement actuating said contact means, latch means located in said chamber on one of said sides of said push buttons for latching said push buttons at an inner position where said electrical contact means is actuated and slider means engaged by said member for sliding movement and located within said chamber on the other of said sides of said push buttons and permitting only one of said push buttons at a time to be at the inner position, whereby the distance between said housing portion closed end and said member is relatively short.

16. The multiple push button electrical switch of claim 15 wherein said plastic housing is molded with a slot on the other side of said push buttons within said chamber for receiving said slider means in sliding relationship, said slider means being retained within said slot by the position of said member, said latch means secured to said housing portion closed end on the one side of said push buttons.

17. The multiple push button electrical switch of claim 16 wherein said push buttons are formed with cavities each of which are provided with a spring for biasing said buttons outwardly, a plurality of posts in engagement with said member and in alignment with each of said cavities for retaining said springs therein.

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