

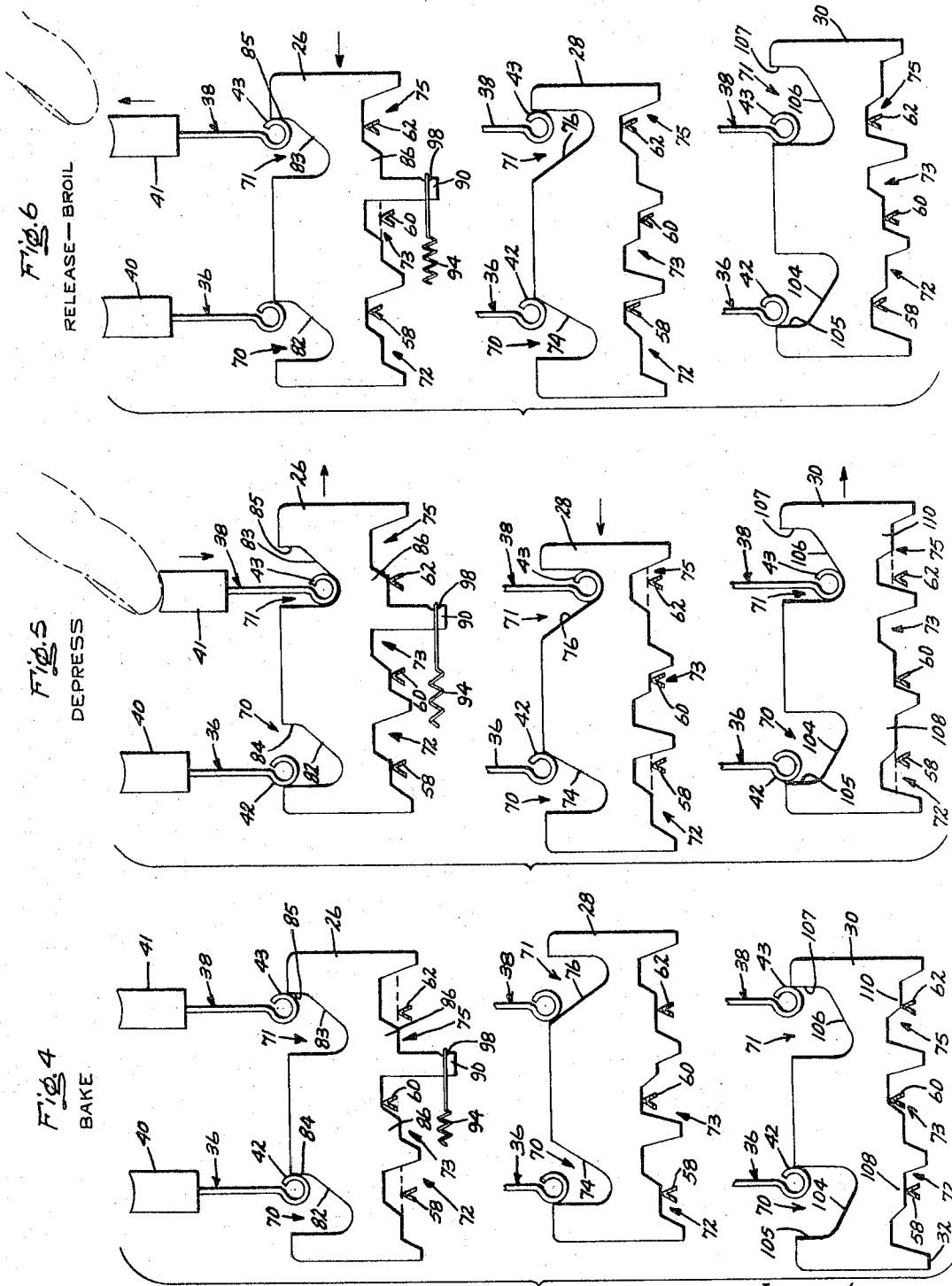
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PUSHBUTTON SWITCH ASSEMBLY WITH FLASHOVER
PROTECTION DELAY SLIDER MEANS

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PUSHBUTTON SWITCH ASSEMBLY WITH FLASH-OVER PROTECTION DELAY SLIDER MEANS
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This invention relates generally to electrical switch assemblies, and particularly to multiple pushbutton switch assemblies of the type utilizing slider elements therein for electrical contact through the assembly. More specifically, this invention relates to an improved pushbutton slider type of electrical switch assembly wherein undesirable occurrences of switch flashover or shorting is prevented.

Pushbutton slider switch assemblies have obtained widespread use for controlling various appliances such as ranges, dryers, air conditioners and the like. It has been found that pushbutton slider type switch assemblies, while extremely useful, present a continuing problem of flashover, or shorting between switch means in the assembly whenever the switch assembly is connected across two or more lines.

This problem of flashover has been recognized in the past. In prior art time delay switch assemblies, the transfer time, or time between breaking contact in a first switch element and making contact in a second is entirely dependent upon the speed of depressing the push rod. A quick depression of the pushbutton may therefore result in the switch assembly flashing over. While such prior art switch assemblies are satisfactory for many applications where the switch assemblies have relatively high internal mechanical resistance, and the voltage and currents through the switch elements are relatively low, it has been found that it does not correct the flashover problem in all types of applications. Thus, in switch assemblies having unusually low mechanical resistance, and carrying relatively high currents, the flashover problem still persists. There is, therefore, a need for a pushbutton slider switch assembly that will provide a more effective solution to the flashover problem.

It is a general object of the invention to provide an improved switch assembly of the multiple pushbutton slider type.

Another object of the present invention is to provide an electrical slider type switch assembly wherein the switch flashover is minimized.

It is a further object of the present invention to provide a multiple pushbutton slider type switch assembly that achieves an adequate time delay between breaking and making electrical contact so as to prevent occurrences of flashover during operation of the switch elements.

In carrying out this invention in one form, I have provided an improved pushbutton switch assembly having a main slider of insulating material useful for controlling the opening and closing of movable contact blades or switch elements in response to actuation of pushbutton rods. I also provide, in this exemplification of my invention, a first auxiliary slider of insulating material to operate as a time delay element for eliminating flashover or shorting when switching between pairs of switch elements carrying line voltages. The auxiliary slider is normally biased into a neutral or non-obstructing position by a biasing coil spring, the auxiliary slider being actuated substantially simultaneously with actuation of the main slider by any of the push rods.

The main slider is movable in response to actuation or depression of a push rod to a position which allows one or more contact blades to close while causing other of the contact blades to open. The auxiliary slider includes

cam means along one longitudinal edge which obstructs the one or more contact blades while the push rod is depressed and prevents the one or more contact blades from closing. The auxiliary slider is movable by the push rod against the force of the spring to this obstructing position. When the push rod is released, the spring automatically forces the auxiliary slider back to the non-obstructing position, allowing the one or more contact blades to close. With the improved auxiliary slider arrangement an additional step is introduced in the operation of the switch to provide an extra time delay between breaking and making contact and thereby prevent flashover.

In accordance with another aspect of my invention, I provide a second auxiliary slider which permits the main and first mentioned auxiliary sliders to be manufactured to looser tolerances. The second auxiliary slider is movable in response to actuation of a push rod at a later time than the main slider and first auxiliary slider, thereby momentarily delaying the actuation of the one or more contact blades and allowing the first auxiliary slider to move to obstructing position so as to ensure that the one or more contact blades do not close until the push rod is released.

In accordance with a further aspect of my invention, I provide a modified form of the above first auxiliary slider. This modified first auxiliary slider has similar cam means for obstructing the switch elements as the above-described embodiment of the invention. However, I have provided a modified biasing spring arrangement.

The subject matter which I regard as my invention is set forth in the appended claims. The invention itself, however, together with further objects and advantages thereof may be understood by referring to the following description taken in connection with the accompanying drawings in which:

FIGURE 1 is a side elevation of the switch assembly with parts broken away illustrating the slider and push rod configuration;

FIGURE 2 is a bottom plan view of the switch assembly illustrated in FIGURE 1 with the back plate removed;

FIGURE 3 is a layout drawing showing the configuration of the several sliders of the switch assembly in a first switching position and their relation to the movable contact blades or switch elements and the push rods;

FIGURES 4-6 illustrate in layout form the sequencing of the sliders as the switch assembly is switched between first and second positions for operating the circuit of FIGURE 7;

FIGURE 7 is a schematic diagram of a circuit with which the switch assembly of FIGURES 1 and 2 may be used; and

FIGURE 8 is a layout drawing showing a modified embodiment of the first auxiliary slider illustrated in FIGURES 1-6 above.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, I have identified the switch assembly embodying one form of the invention generally by the reference numeral 10. Switch assembly 10 comprises a hollow elongate housing 12 formed of suitable molded insulating material, the housing including a top wall 14, and a base section 16. The hollow housing 12 defines therein a longitudinally extending slider chamber 18, the chamber being completed by a back plate 20 of suitable insulating material which is removably mounted in an opening 22 in the base section 16. Detailed features of the housing 12 are more fully described in Patent No. 3,127,482 granted to Hutt and my previous Patent No. 3,169,173.

The slider chamber 18 has a plurality of slider elements generally denoted by reference numeral 24 therein. These sliders are elongate and of relatively thin insulating material extending through the chamber and movable lengthwise or longitudinally in the housing. More specifically, in this exemplification of the invention, three sliders, 26, 28, and 30 are slidably mounted in the chamber 18, each being somewhat shorter than the chamber for reciprocal movement therein. Each of the sliders includes several depending leg portions 32 thereon for engagement with the back plate 20 so as to enable the sliders to be retained in the housing in all positions while still allowing the sliders to move in the chamber 18. Further, as will be observed in FIGURE 2, the slider chamber 18 is of appropriate width for holding the three slider elements so as to eliminate any undue lateral play therebetween, while still allowing the sliders to move in the chamber.

The top wall 14 of the housing 12 includes suitable openings 34 therein for receiving push rods 36 and 38. It will be appreciated that in the illustrated exemplification of the invention, a switch assembly having two push rods is shown, but that any desired number of push rods may be included in accordance with the desired application of the assembly. However, as will become apparent hereinafter, the specific embodiment of my invention is particularly adaptable for use with a small switch assembly, i.e., one having as few as two push rods, and as few as one main slider. In a small switch assembly the internal mechanical resistance or drag is relatively low, and conventional time delay arrangements which depend on this internal mechanical resistance have not been proven to be satisfactory in small switch assemblies.

The push rods 36 and 38 have the usual pushbuttons 40 and 41 respectively mounted on the upper ends thereof for enabling actuation of the push rods vertically through the openings 34. Further, each push rod includes an enlarged rounded end portion 42 and 43 respectively on the bottom thereof, the rounded end portions being slidably received in vertically extending slots or tracks 44 in the housing for facilitating use of the push rods.

A plurality of terminal tabs 46, 48, 50, 52, 54, and 56 are mounted in the switch housing. The terminal tabs 46, 48, and 50 have associated therewith movable contact blades or switch elements 58, 60, and 62 respectively, the blades being supported from the tabs and extending across switch housing in cantilever fashion, as illustrated in FIGURE 2. Similarly, the terminal tabs 52, 54, and 56 have associated therewith fixed contacts 64, 66, and 68 respectively. Thus, corresponding fixed and movable contacts provide electrical switch means for controlling the operation of various circuits by means of the switch assembly. Further, as will be appreciated by viewing FIGURE 1, the terminal tabs extend downwardly from the bottom of the switch housing, the tabs 46 and 50 being line terminals and the tabs 52 and 56 being load terminals. In accordance with the particular application of this switch, to be described hereinafter, the terminal tab 48 is connected to terminal tab 46, and the terminal tab 54 is effectively connected to terminal tab 52.

Referring now to FIGURE 3 in conjunction with FIGURES 1 and 2, the particular configuration of the sliders 26, 28, and 30 may be appreciated. Each of the sliders 26, 28, and 30 includes means for contacting the push rods 36 and 38 in the form of a guide portion in the upper longitudinal edge thereof, denoted by reference numerals 70 and 71, respectively. Further, each of the sliders includes means for camming the contact blades 58, 60, and 62 in the form of notches cut out of the lower longitudinal edge thereof and denoted by reference numerals 72 and 73 and 75 respectively. At the outset, it should be understood that slider 28 is the main slider element, i.e., the slider element which has as its primary function the control of movable contact blades 58, 60 and 62 so as to ultimately control the circuit and thus the

appliance with which the switch assembly is used. This main slider element 28 in this exemplification of the invention is designed to control the particular circuit illustrated in FIGURE 7.

Each of the guide portions 70 and 71 in the upper longitudinal edge of slider element 28 has an oppositely inclined push rod engaging edge 74 and 76, respectively. The slider 28 is adapted, by means of these edges 74 and 76, to be moved in opposite directions between first and second positions in the chamber upon actuation by the two push rods 36 and 38. The purpose of moving the slider 28 between these positions is to control the position of the contact blades 58, 60 and 62. In this regard, the cam means 72 and 75 are designed to close the blades 58 and 62 and the cam means 73 to open the blade 60 when the slider is in the position illustrated in FIGURE 3. This position is achieved by depressing of push rods 38. It will be appreciated that the switch assembly 10 may be operated with only the main slider element 28. Obviously the contact blades 58, 60 and 62 can be controlled by the use of this slider alone. However, flashover may occur if only the main slider element 28 were used in the switch.

The exemplified switch assembly was intended for use in a two line 240 volt, alternating current 60 cycle system. The particular bake-broil circuit illustrated in FIGURE 7 was rated at 13.7 amperes. In such 60 cycle systems, it has been found that an arc is often maintained in a switch means for as long as $8\frac{1}{3}$ milliseconds. A positive time delay between breaking and closing the contacts of at least $8\frac{1}{3}$ milliseconds will therefore usually ensure against flashover.

The slider 26 is characterized as an auxiliary or time delay slider since its primary function is to prevent flashover. It includes the guide portions 70 and 71, each guide portion having an edge 82 and 83 respectively inclined in the same direction. Further, the edges 82 and 83 are each recessed from the upper longitudinal edge of the slider by a vertical edge 84 and 85 of the guide portions 70 and 71. The slider 26 also has means for holding open or obstructing the closing of the guide portions provided in the lower notches 72, 73 and 75. For this purpose, each of the lower notches includes a holding or obstructing portion 86 and a second portion 88.

It will also be observed that one of the legs 32 of slider 26, the leg denoted by reference numeral 90, is longer than the others and extends outwardly of the housing 12 through an opening 92 in the back plate 20. A coil spring 94 is mounted between the leg 90 and the housing as illustrated in FIGURE 1 having a hook end portion 96 which mounts in the housing 12 and a ring end 98 which is retained in a notch 100 in leg 90. In this manner, the auxiliary or time delay slider 26 is normally biased by the coil spring 94 to the left in a neutral non-obstructing position (referring to FIGURES 1 and 6) for a purpose to be explained more fully hereinafter.

Referring now to the circuit diagram illustrated in FIGURE 7, a typical application of the switch assembly 10 in a range will now be more fully explained. As will be observed from the lower diagrammatic portion of FIGURE 7, either bake or broil positions may be selected, a circle denoting an open condition of the contact blade and an "X" denoting a closed condition of the contact blades. In order to correspond with the view of FIGURE 3, the circuit diagram of FIGURE 7 is illustrated in "broil" condition with the contact blades 58 and 62 closed and blade 60 open. In this condition, the broil heating elements H_1 and H_2 are connected in series-parallel relation with bake heating element H_3 across the power supply when switch S is closed. Of course, with the circuit in bake condition, only the bake heating element H_3 is connected across the power supply.

The flashover problem in the circuit application illustrated in FIGURE 7 is particularly severe. A direct short may result if contact blades 60 and 62 are closed or nearly

closed at the same time. Referring now to FIGURE 4, the switch assembly as illustrated therein is positioned so as to achieve a "bake" condition in the circuit. The contact blade 60 is closed and blades 58 and 62 are opened. The spring 94 has biased the slider 26 back to the left inasmuch as the operator has removed pressure from the pushbutton 40 of push rod 36. This movement of slider 26 to the left or to a nonholding position causes the previously depressed push rod 36 to raise in the housing as it rides up edge 82.

To transfer to the "broil" condition, the operator must initially depress the push rod 38 to the position shown in FIGURE 5. The main slider 28 is moved to the left as actuator 42 strikes edge 76. The contact blade 60 will open as it moves up the camming slope of cam means 73 of slider 28. When the actuator has traversed only vertical portion 85 of guide portion 71, the blade 60 will be fully opened, but arcing between blade 60 and fixed contact 66 may occur. As the push rod 38 engages camming slope 83, it moves delay slider 26 to the right carrying holding means 86 under blades 58 and 62.

Also, as the push rod 38 is depressed, blades 58 and 62 are in a position where they can be closed and place the circuit in the "broil" condition. However, before blades 58 and 62 can close, the holding or obstructing means 86 of slider 26 must be moved to the left. As long as the operator keeps the push rod in the depressed or actuated position of FIGURE 5, the circuits through switch assembly 10 will remain open.

Upon release of the pushbutton 40 of push rod 38, the spring 94 will automatically cause the delay slider 26 to return to its normal position as illustrated in FIGURE 6. Release of the pushbutton 40 will cause the holding means of slider 26 to move to the left thereby permitting the blades 58 and 62 to close and complete the "broil" circuit as seen in FIGURE 6. It is believed that a number of factors contribute to the time delay in the closing of blades 58 and 62. These factors include the time associated with the depression of the push rod, releasing the external operating force from the push rod and the spring return of the slider. It has been found that the extra time provided by the use of my improved slider arrangement ensures that the arc in one switch means is extinguished prior to closing an adjacent switch means. It will be understood that my slider 26 has useful application in larger switch assemblies wherein the currents involved are relatively high.

It will be noted that a second auxiliary or time delay slider 30 of somewhat different configuration than time delay slider 26 may be used in conjunction with slider 26. The guide portions 70 and 71 of this slider are designed with oppositely inclined push rod engaging or camming edges 104 and 106 respectively that are recessed away from the upper edge of the slider by vertical portions 105 and 107. With this configuration, the slider 30 will move in response to actuation of either push rod 36 or 38 at a later time than the slider 28 is moved thereby as the push rods must move down the vertical portions 105 and 107 prior to engaging the camming edges 104 and 106.

The function of slider 30 may best be explained by reference again to FIGURES 4-6. As push rod 38 is depressed, referring to FIGURES 4 and 5, the main slider 28 immediately begins to move to the left. However, slider 30 does not begin to move until the push rod 38 is slightly beyond the initial position since the edge 106 is recessed, and the camming portions 108 and 110 of cam means 72 and 75 will hold the blades 58 and 60 open until the slider 30 is moved to the right as push rod 38 engages edge 106. Thus, slider 30 will prevent actuation to a closed condition of blades 58 and 62 during the initial travel of slider 28. This is important since, if the guide portions 70 and 71 of slider 26 are constructed so that the slider 26 does not move to the right soon enough, or if obstructing portions 86 of slider 26 are too short, it may be possible for blades 58 and 62 to start closing before slider

26 obstructs their closing. The use of the auxiliary slider 30 in conjunction with the time delay slider 26 results in the advantage that manufacturing tolerances of sliders 26 and 28 are less critical.

The principle of operation of the switch assembly is similar when switching from "broil" to "bake" also. Thus, with the push rods 36 and 38 and sliders 26, 28 and 30 in their respective positions as illustrated in FIGURE 6, push rod 36 may be depressed to change back to "bake" condition. Depression of push rod 36 will move main slider 26 to the right opening contact blades 58 and 62 and placing blade 60 in a position where it can be closed. The first auxiliary slider 26 will also move to the right, however, since camming slope or edge 82 is inclined in the same direction as edge 83, and the obstructing means 86 of slider 26 will pick up and hold blade 60. The slider 30 will move to the left shortly after push rod 36 is actuated, retaining blade 60 open until slider 26 picks it up. Of course, upon release of pushbutton 40, spring 94 takes over, moving slider 26 to the left allowing blade 60 to close.

Referring now to FIGURE 8, a modified embodiment of the above auxiliary slider 26 is illustrated and is generally denoted by reference numerals 126A and 126B. The auxiliary sliders 126A and 126B are both slidably mounted in housing 112 and serve essentially the same function in the switch assembly as does slider 26, i.e., they provide an extra time delay between breaking a first contact and closing a second contact.

The auxiliary slider 126A includes notches 172A, 173A and 175A cut out along the lower longitudinal edge thereof, corresponding to the notches 72, 73 and 75 in slider 26. Further, these notches, similarly to the notches in slider 26, each includes a holding or obstructing portion 186A and a second portion 188A. The auxiliary slider 126B is similarly provided with notches 172B, 173B and 175B, each having holding portions 186B and second portions 188B.

The slider 126A has an operating slot or guide means 170A for engaging the push rod 136 and a clearance slot 171A along the upper longitudinal edge thereof. The slot 170A has a first lower inclined edge 182A and a second parallel inclined edge 183A. As will be seen from FIGURE 8, depression or actuation of push rod 136 will cause the slider 126A to slide to the right as the push rod engages edge 182A, and an upward movement of push rod 136 will cause the slider 126A to slide to the left as the push rod engages edge 183A. However, since clearance slot 171B has no inclined edges, movement of push rod 136 will not move slider 126B. These two positions of the slider 126A will provide a time delay in the same fashion as described above in relation to the operation of slider 26. Thus, it will be seen that in this modified arrangement, a main slider 128 is provided to control the contact blades 158, 160 and 162. When the slider 128 is in the position illustrated in FIGURE 8, the blades 158 and 162 are held open by the camming portions 208 and 210, and the blade 160 is ready to be closed upon release of the button 140 of push rod 136. The slider 128 also includes guide portions 168 and 169 having the oppositely inclined edges 173 and 175 respectively for engaging the push rods 136 and 138.

In order to return the slider 126A from an actuated position, a biasing means in the form of coil spring 194 is provided. The spring 194 is mounted on push rod 136 and is retained between the upper wall 114 of the switch housing and the pushbutton actuator 140 of the push rod 136. The spring 194 acts to normally bias the push rod 136 to an initial or upper position. The spring 194 is compressed upon actuation of the push rod 136 and at this time the slider 126A is moved to the right or to the obstructing position. Upon release of the push rod 136, the spring 194 causes the push rod to raise to the initial position, and the push rod carries the slider 126A back to the left, or out of obstructing position.

The slider 126B has its operating and clearance slots 170B and 171B in reverse position than the slots 170A and 171A of slider 126A. Thus, the push rod 136B will effect movement of slider 126B while not moving slider 126A for delaying the closing of the blades 158 and 162 in accordance with the operation of my invention. Of course, the push rod 138 will also operate main slider 128 in the usual manner. Further, a compression coil spring 195 is mounted on push rod 138 between push-button 141 and housing wall 114 to raise the push rod, the push rod 138 engaging edges 182B and 183B to control the movement of slider 126B. With the modification of the invention illustrated in FIGURE 8, it is therefore possible to provide a time delay during operation of the switch assembly.

From the foregoing description, it will be apparent that this invention provides a novel and improved time delay slider for use in a pushbutton switch assembly that minimizes flashover even in extreme switching applications. Further, the improved slider arrangement permits the sliders used in the assembly to be manufactured to relatively loose tolerances thereby providing desirable cost reduction of the assembly. It will be understood that the delay slider 26 of this invention can be used to hold open all the blades in the switch assembly as illustrated, or a selected number of the blades and that more than one such delay slider can be used in the assembly.

It will be appreciated, however, that the embodiments which I have disclosed and described herein are intended for illustrative purposes only. I therefore intend by the appended claims to cover all such modifications that fall within the true spirit and scope of the invention.

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

1. A pushbutton switch assembly having a housing, a plurality of movable switch elements in the housing, at least one main slider in the housing, said main slider having cam means for actuation of said switch elements, a plurality of push rods extending into the housing and engaging said main slider for effecting longitudinal movement thereof, said main slider being movable by one of said push rods for closing at least one selected switch element and for opening at least one of said switching elements, an auxiliary slider in said housing, said auxiliary slider having camming means, said auxiliary slider being normally maintained in a first position for permitting actuation of said selected switch element to a closed condition and being movable to a second position upon actuation of said one push rod for holding the selected switch element in an open condition, and means for moving said auxiliary slider from said second position to said first position upon release of said one push rod to permit the selected switch element to be closed thereby providing a delay between the closing of the selected switch element and the opening of at least one of said other switch elements.

2. The switch assembly of claim 1 wherein said auxiliary slider includes guide means for engaging said push rods to move said auxiliary slider to said second position upon actuation of any of said push rods, and said camming means of said auxiliary slider obstructing the closing of said selected switch element when said auxiliary slider is moved to said second position.

3. The switch assembly of claim 1 wherein said means for moving said auxiliary slider comprises spring means engaging said auxiliary slider and biasing said auxiliary slider to said first position, said auxiliary slider being moved to said second position against the bias force of said spring means upon actuation of a push rod and returned by said spring means to said first position upon the release of the actuated push rod.

4. The switch assembly of claim 1 wherein said first auxiliary slider is slidably disposed for longitudinal movement in said housing, and a second auxiliary slider is also

disposed in said housing for longitudinal movement, said second auxiliary slider having cam means for preventing the actuation to a closed condition of the selected switch element until said first named auxiliary slider is moved to said second position thereby ensuring a delay between closing said selected switch element and opening the other switch elements.

5. The switch assembly of claim 4 wherein the means for moving said auxiliary slider includes spring means for biasing said first named auxiliary slider to said first position when a push rod is released, and upon actuation of a push rod, said first named auxiliary slider is moved to the second position substantially simultaneously as the main slider element is moved thereby.

6. The switch assembly of claim 1 wherein said main slider includes a pair of oppositely inclined camming edges for engagement by said push rods, said main slider thereby being movable in opposite directions by alternately depressing one and another of said push rods, said auxiliary slider having a pair of camming edges inclined in the same direction and engageable with said push rods to move said auxiliary slider in one direction.

7. The switch assembly of claim 1 wherein the means for moving said auxiliary slider includes spring means for biasing said one of said push rods to an initial position, said auxiliary slider including guide means for engaging said one of said push rods to move said auxiliary slider to said second position against the bias force of said spring means upon actuation of said one of said push rods, and said spring means biasing said one of said push rods to said initial position and said auxiliary slider to said first position, said camming means of said auxiliary slider obstructing the closing of said selected switch element when said auxiliary slider is moved to the second position.

8. In a pushbutton switch assembly including a housing defining a slider chamber therein, a plurality of electrical switch means in the chamber, each including a movable switch element, at least one slider disposed in said slider chamber and actuable by push rods to open and close selected ones of said electrical switch means, a time delay slider disposed in said slider chamber and movable by depression of one of said push rods to a hold position for delaying the closing of at least one of said electrical switch means for a predetermined time by holding at least one of said movable switch elements in an open condition, said time delay slider being moved out of said hold position when the depressed push rod is released thereby to close said at least one of said electrical switch means.

9. The switch of claim 8 including spring means disposed between the time delay slider and said housing for normally biasing said time delay slider out of said hold position, said time delay slider having cam means disposed for engagement with a push rod for holding at least one of said switch elements in an open condition when a push rod is depressed, and said spring means urging said time delay slider out of said hold position when the push rod is released to allow said at least one of the switch elements to close.

10. In a pushbutton switch assembly including a housing, a plurality of electrical switches in the housing, at least one main slider element slidably disposed in the housing and movable therein by push rods to close at least one of said electrical switches, at least two delay sliders in the housing for delaying the closing of said at least one electrical switch, a first of said delay sliders being normally maintained in an initial position, said first delay slider being moved to a hold position upon actuation of a push rod and being moved back to said initial position only upon release of the actuated push rod, said first delay slider including obstructing means thereon for preventing actuation of said at least one electrical switch when in said hold position whereby an electrical circuit through the switch assembly can be completed only when the first delay slider is in said initial position, the second

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of said delay sliders having camming means for preventing the actuation of said one electrical switch until the first delay slider is moved to said hold position thereby ensuring a delay between opening one or more of said electrical switch means and closing said at least one electrical switch.

11. The pushbutton switch assembly of claim 10 including a spring means disposed between said first delay slider and said housing for normally biasing said first delay slider in said first position.

12. The pushbutton switch assembly of claim 10 including spring means disposed between the push rods and the housing for normally biasing the push rods into an initial position, said first delay slider including first guide means for engaging at least one of the push rods whereby depression of said at least one push rod will move said first delay slider to said hold position, and said first delay slider including second guide means for engaging said at least one push rod whereby said spring means biases said at least one push rod to return said first delay slider to said initial position.

13. A pushbutton switch assembly having a housing, a plurality of movable switch elements in the housing, at least one main slider in the housing, said main slider having cam means for actuation of said switch elements, a plurality of push rods extending into the housing and engaging said main slider for effecting longitudinal movement thereof, said main slider being movable by one of said push rods for closing at least one selected switch element and for opening at least one of said switch elements, and said main slider being movable by another of said push rods for closing said one of said switch elements and opening said selected switch element, a pair of auxiliary sliders in said housing, each of said auxiliary sliders

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having camming means, one of said auxiliary sliders being normally maintained in a first position for permitting actuation of said selected switch element to a closed condition and being movable to a second position upon actuation of said one of said push rods for holding the selected switch element in an open condition, the other of said auxiliary sliders being normally maintained in a first position for permitting actuation of said one of said switch elements to a closed condition and being movable to a second position upon actuation of said another push rod for holding the one of said switch elements in an open condition, first spring means for biasing said one of said push rods to an initial position, said one auxiliary slider including guide means for engaging said one of said push rods to move said one auxiliary slider to said second position against the bias force of said first spring means upon actuation of said one of said push rods, said other of said auxiliary sliders including guide means for engaging said another push rod to move said other of said auxiliary sliders to said second position against the bias force of said second spring means upon actuation of said another push rod, the camming means of said one auxiliary slider obstructing the closing of said selected switch element when said one auxiliary slider is moved to the second position, and the camming means of said other of said auxiliary sliders obstructing the closing of said one of said switch elements when said other of said auxiliary sliders is moved to the second position.

No references cited.

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