

May 15, 1956

S. B. WELCH

2,745,913

PUSH BUTTON SWITCH

Filed Dec. 23, 1954

3 Sheets-Sheet 1

FIG. 1

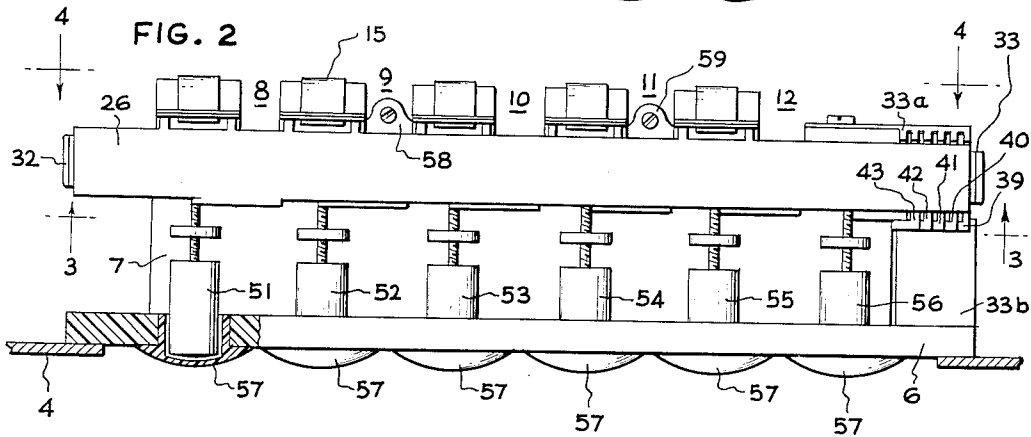
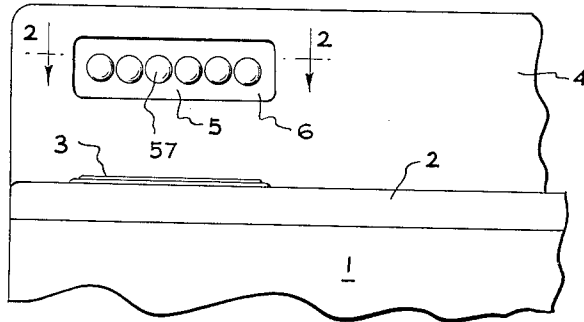
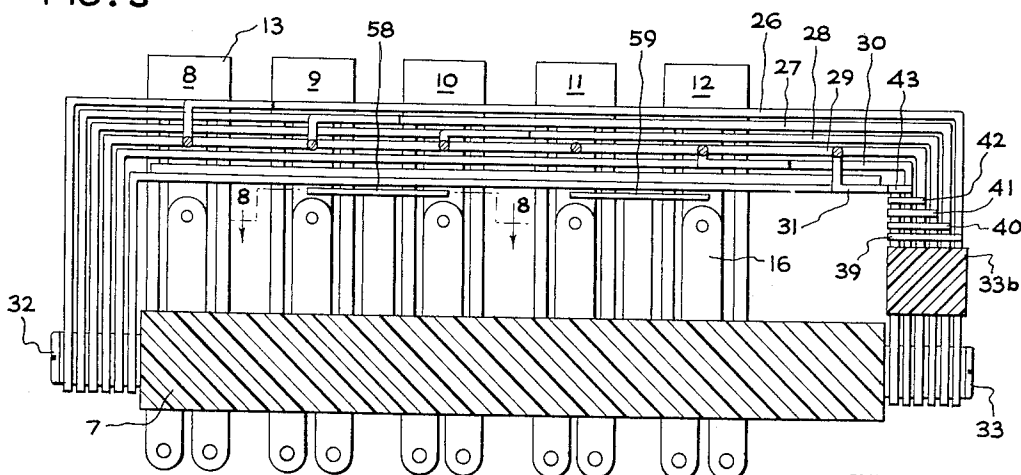


FIG. 3



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FIG. 4

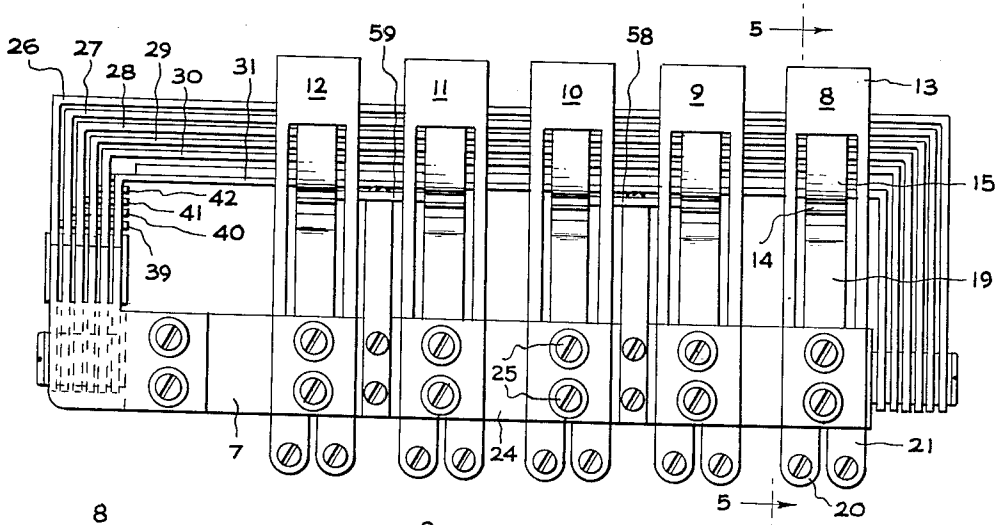


FIG. 5

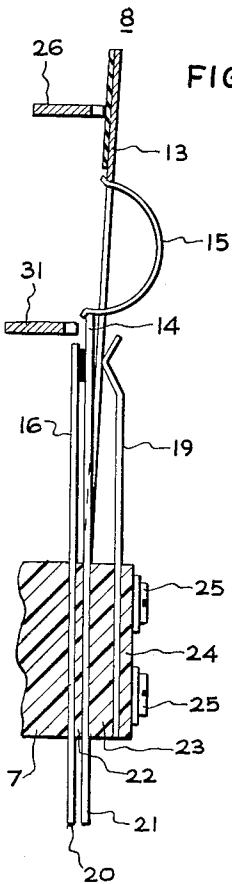


FIG. 6

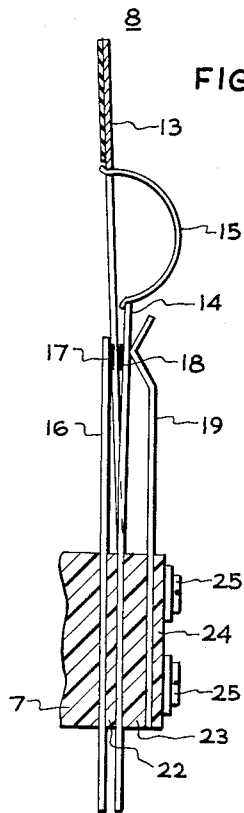


FIG. 7

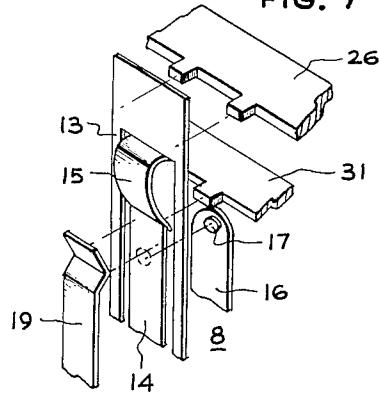
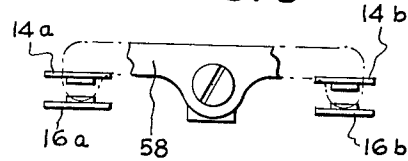


FIG. 8



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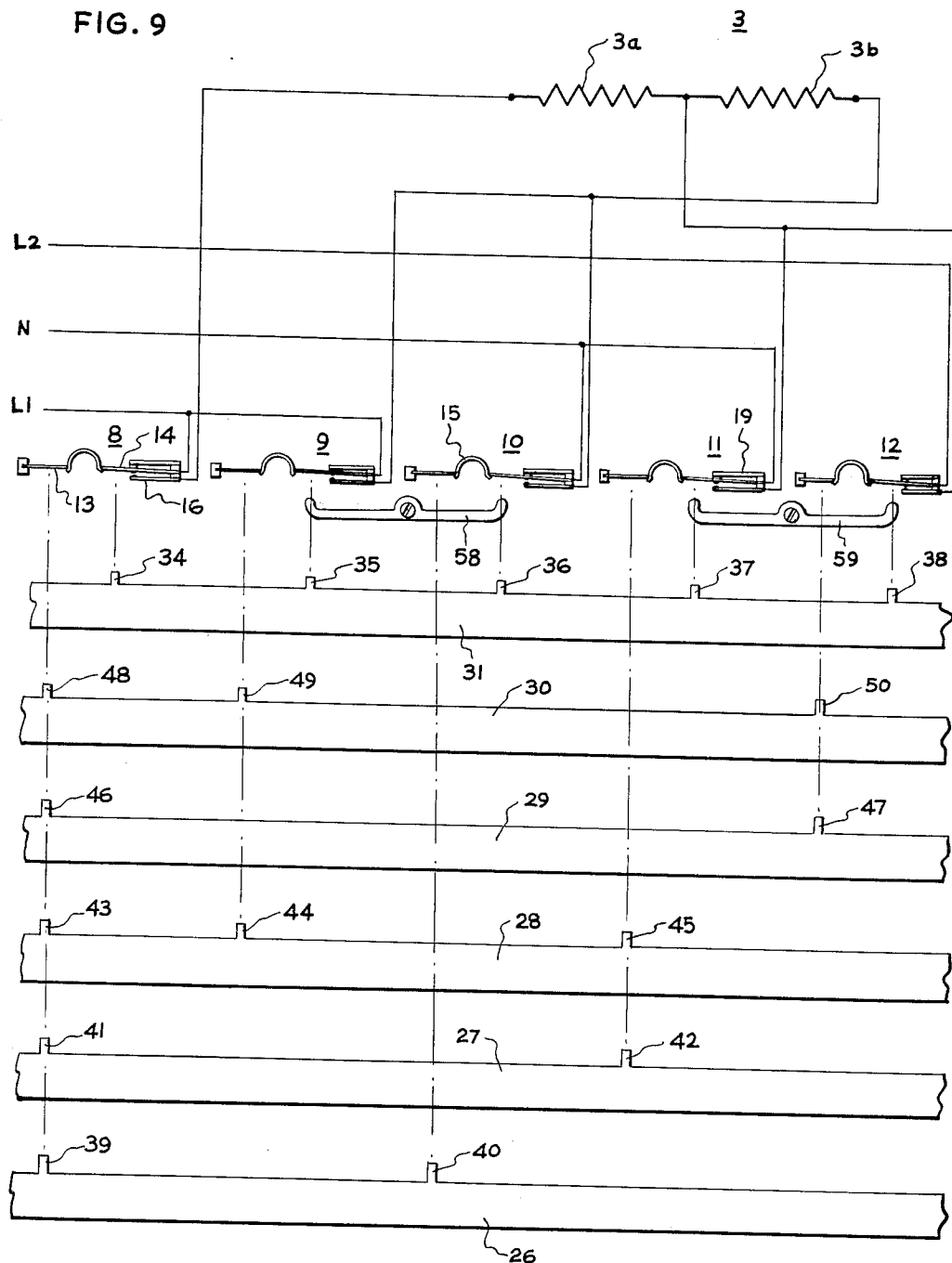
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FIG. 9



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2,745,913

PUSH BUTTON SWITCH

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Application December 23, 1954, Serial No. 477,285

4 Claims. (Cl. 200—5)

This invention relates to push button switches, and more particularly to multiple push button switches of the type particularly suitable for the control of electric heating units and the like.

A principal object of the invention is to provide a push button switch of this character so arranged that only slight movement of the push buttons is required to operate the switch contacts.

Further objects and advantages of my 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.

Briefly stated in accordance with one aspect of my invention I provide a plurality of toggle switches each having a pair of flexible arms with an overcenter spring interposed between the ends of the arms, a plurality of push button operated actuating bars having portions engageable with certain of the switch arms, and a transfer bar associated with all of the switches and actuating bars so that all of the switches are opened upon actuation of any actuating bar, whereby the switch contacts of each toggle switch may be opened and selectively closed in predetermined combinations by very slight movement of the push buttons.

For a better understanding of my invention reference may be made to the accompanying drawings in which:

Fig. 1 is a fragmentary front elevation view of a range having the switch of the present invention mounted on the backsplash thereof.

Fig. 2 is a sectional view taken substantially along the line 2—2 in Fig. 1.

Fig. 3 is a sectional view taken substantially along the line 3—3 in Fig. 2.

Fig. 4 is a sectional view taken substantially along the line 4—4 in Fig. 2.

Fig. 5 is a sectional view taken substantially along the line 5—5 in Fig. 4.

Figure 6 is similar to Fig. 5 but shows the parts in a different position.

Fig. 7 is a fragmentary perspective view of one of the switch elements.

Fig. 8 is a fragmentary sectional view taken substantially along the line 8—8 in Fig. 3.

Fig. 9 is a diagrammatic view showing the switch connected in an electric heating circuit.

Referring to the drawings, the numeral 1 designates an electric range having a cooking top 2 on which is supported a heating unit 3, and a backplash 4 on which is mounted the push button switch 5 of my invention. In the present embodiment switch 5 controls heating unit 3 and provides five graduated heat outputs varying from a warming heat to high heat.

Switch 5 is provided with a front panel 6 which is secured in a suitable opening in backplash 4 as shown by appropriate fastening means (not shown). Front panel 6 is fixedly secured to a base member 7, both of which

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are preferably formed of insulating material. Mounted along the rear edge of base 7 at spaced intervals are five toggle switches each generally designated by the numerals 8, 9, 10, 11 and 12 respectively. It will of course be understood that a greater or lesser number of toggle switches may be employed depending upon the particular electrical circuit which is to be controlled by the switch mechanism. While the following description of the toggle switch mechanism will be confined to switch 8, it will be understood that the description applies equally to the remaining switches 9, 10, 11 and 12 inasmuch as they are all similar in construction and manner of operation.

Toggle switch 8 comprises a bifurcated flexible spring arm 13 having its two ends secured to base 7 so that the arm is supported in cantilever fashion. Also secured to base 7 and lying between the bifurcated portions of arm 13 is a flexible arm 14 which is located substantially in the plane of arm 13. Interposed between the free end of arm 14 and the lower edge of the end portion of arm 13 is an overcenter spring 15 arranged so as to bias arm 14 into one of two positions on opposite sides of arm 13. Obviously since both arm 13 and arm 14 are flexible, both arms will flex somewhat in shifting from the position shown in Fig. 5 to the position shown in Fig. 6 or vice versa.

Extending generally parallel to arms 13 and 14 and also mounted on base 7 is a contact strip 16 carrying a fixed contact 17 which cooperates with a movable contact 18 carried on the free end of flexible arm 14. Movement of contact 18 away from contact 17 is limited by a stop member 19 supported on base 7 and having its end located adjacent arm 14 as best shown in Figs. 5 and 6. Contact strip 16 is provided with a terminal portion 20 extending below base 7, while arm 14 on which contact 18 is mounted extends below the base and terminates in a terminal portion 21. Arms 13 and 14, contact strip 16, stop element 19 and suitable insulating blocks 22, 23 and 24 interposed therebetween may be conveniently secured to base 7 by means of fasteners such as screws 25 extending through all of the elements and into base 7.

To operate toggle switches 8, 9, 10, 11 and 12 so as to open and close contacts 17 and 18, I provide movable actuator bars 26, 27, 28, 29, 30 and 31 supported so as to be engageable with arms 13 and 14 of toggle switch 8 and the corresponding arms of the other toggle switches. The actuator bars are mounted for reciprocating movement toward and away from switches 8, 9, 10, 11 and 12, and extend transversely with respect to arms 13 and 14 of switch 8 and the corresponding arms of the other switches. Accordingly, the actuator bars may be formed of strips of metal having end portions bent at right angles to their body portions and pivotally secured to base 7 by means of studs 32 and 33 secured at opposite ends of base 7 and passing through the end portions of all of the actuator bars. All of the actuator bars are biased away from the toggle switches by a spring 33a having a spring finger bearing against each bar so as to bias the bars against stop member 33b.

In the present embodiment of my invention actuator bar 31 is provided with projections 34, 35, 36, 37 and 38 arranged to cooperate with switches 8, 9, 10, 11 and 12 respectively. Projection 34 is in alignment with arm 14 of toggle switch 8 and is engageable therewith so as to shift arm 14 overcenter with respect to arm 13 and thus open contacts 17 and 18. Similarly projections 35 to 38 inclusive on bar 31 cooperate with switches 9 to 12 inclusive and upon actuation of bar 31 toward the switches, cause all of the switches to move to open position. Bar 31 is shifted so as to open all of the toggle switches each time any one of the other actuator bars is actuated. This function is performed by fingers 39,

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40, 41, 42 and 43 on the right end portion (as viewed in Fig. 3) of bars 26, 27, 28, 29 and 30 respectively, all of which overlap bar 31. Thus movement of any of the bars except bar 31 toward the toggle switches carries with it bar 31. Actuator bars 26, 27, 28, 29 and 30 each are provided with either two or three projecting elements engageable with arm 13 of toggle switch 8 or the corresponding arms on switches 9, 10, 11 and 12. Thus bar 26 includes projections 39 and 40 engageable with switches 8 and 10 respectively; bar 27 includes projections 41 and 42 engageable with switches 8 and 11 respectively; bar 28 includes projections 43, 44 and 45 engageable with switches 8, 9 and 11 respectively; bar 29 includes projections 46 and 47 engageable with switches 8 and 12 respectively; while bar 30 includes projections 48, 49 and 50 engageable with switches 8, 9 and 12 respectively.

Switch 8 is opened by the force exerted by projection 34 of bar 31 on arm 14, and if force were applied in this manner only to this arm it would snap to open contact position, and remain in this position after movement of projection 34 out of engagement therewith. However, if force is applied to arm 13 by one of the projecting elements cooperating therewith (projection 48 of bar 30, for example) at the same time projection 34 engages arm 13, arm 13 is pushed further over center than is arm 14, the movement of which is limited by stop 19. Therefore as projections 48 and 34 move out of engagement with the arms the switch contacts 17, 18 return to closed position. From the foregoing it will be seen that bars 26 to 30 inclusive are utilized to select the combination of switches to be closed while bar 31 functions as a clearing bar, opening all switches in preparation for the closure of those switches required to energize the desired circuit.

Actuator bars 26 and 31 inclusive are actuated so as to operate toggle switches 8 to 12 inclusive by means of push buttons 51, 52, 53, 54, 55 and 56 respectively. Each of these push buttons is fixedly secured to its transfer bar by a connecting shaft or link portion extending from each bar, it being noted that all of these link portions terminate in a section lying in the same plane so that all of the push buttons may be located in alignment along a straight line. Inasmuch as the actuator bars need be shifted only a very small distance (of the order of 0.030 inch) to actuate the toggle switch elements, push buttons 51 to 56 inclusive travel only a correspondingly small distance, and hence the ends of the push buttons which project through front plate 6 may be covered by caps 57 formed of rubber or flexible rubber-like material thus eliminating any cracks or openings in the front plate 6.

Heating unit 3 (which includes separate heating elements 3a and 3b) may be controlled by the switch of my invention so as to provide a graduated series of five heats, for example. The circuit connections between heaters 3a and 3b, switch elements 8 to 12 inclusive, and a three wire single phase power supply are shown in Fig. 9, the power supply lines being designated L₁, L₂ and N. Ordinarily the voltage across lines L₁ and L₂ will be 236 volts while the voltage across either lines L₁ and the neutral line N or lines L₂ and N is 118 volts. Heating elements 3a and 3b may be connected in parallel across lines L₁ and L₂ to provide high heat by connecting only switches 8, 9 and 12; heater 3a alone may be connected across lines L₁ and L₂ to provide medium high heat by closing only switches 8 and 12; heaters 3a and 3b may be connected in parallel on lines L₁ and N to produce medium heat by closing switches 8, 9 and 11; heater 3a alone may be connected on lines L₁ and N to produce low heat by closing switches 8 and 11; and heaters 3a and 3b may be connected in series across lines L₁ and N to produce a very low heat by closing switches 8 and 10. Inasmuch as inadvertent closure of switch 9 while switch 10 is closed, or vice versa, would result in a dead

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short across lines L₁ and N, a pivoted interlock element 58 between these two switches is provided to prevent both switches from being in closed position at the same time. Similarly, since closure of switches 11 and 12 at the same time would also result in a short circuit a pivoted interlock bar 59 is provided to prevent these switches from being closed at the same time.

In considering the operation of the improved push button switch of the present invention, particular reference should be made to Fig. 9. The lowest heat output from heating unit 3 (usually referred to as "warm" heat) is obtained by actuating bar 26 by means of push button 51 (it being remembered that actuator bar 31 is automatically shifted upon movement of any of the other bars) so as to open switches 9, 11 and 12 and close switches 8 and 10. With this combination of switches closed, heating elements 3a and 3b are connected in series across lines L₁ and N and thus the heating unit is energized at minimum wattage. Low heat is obtained by pressing push button 52 so as to operate actuator bar 27 thus opening switches 9, 10 and 12 and closing switches 8 and 11, which connects only heater 3a across lines L₁ and N. Medium heat is obtained by depressing push button 53 which actuates bar 28 so as to close switches 8, 9 and 11 while opening switches 10 and 12 so as to connect heaters 3a and 3b in parallel across lines L₁ and N. Medium high heat is obtained by depressing push button 54 so as to actuate bar 29 which closes switches 8 and 12 while opening switches 9, 10 and 11 so as to connect heater 3a alone across lines L₁ and L₂. High heat is obtained by pressing button 55 so as to actuate bar 30 which connects switches 8, 9 and 12 while disconnecting switches 10 and 11 and thus places heaters 3a and 3b in parallel across lines L₁ and L₂. To disconnect the heater from the power supply "off" button 57 is depressed, thus actuating bar 31 so as to open all of the toggle switches which will of course remain open until one of the other push buttons is depressed.

While I have shown and described a particular embodiment of my invention, it will be evident to those skilled in the art that various changes and modifications may be made without departing from the invention in its broader aspects and I therefore aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as my invention is:

1. A push button switch comprising a base, a plurality of toggle switches mounted on said base, each of said toggle switches including first and second flexible arms lying in substantially the same plane, spring means between said arms for biasing said first arm into one of two positions on opposite sides of said second arm, a fixed contact carried by said base, and a movable contact carried by said first arm; a plurality of separately movable actuator bars each engageable with the said second arm of at least one of said toggle switches, a movable transfer bar engageable with the said first arm of each of said toggle switches, means biasing said actuator and transfer bars out of engagement with said arms, means for moving said transfer bar into engagement with said first arms so as to shift them overcenter with respect to said second arms and open said contacts upon movement of any one of said actuator bars into engagement with said second arms, and a plurality of push buttons each secured to one of said actuator bars, whereby predetermined combinations of said toggle switches may be opened and closed upon manual actuation of said push buttons.

2. A push button switch comprising a base, a plurality of toggle switches mounted on said base, each of said toggle switches including first and second flexible arms lying in substantially the same plane, spring means between said arms for biasing said first arm into one of two positions on opposite sides of said second arm, a fixed contact carried by said base, and a movable contact car-

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ried by said first arm; a plurality of separately movable parallel actuator bars each having a body section transverse to said arms and a pair of end sections perpendicular to its body section, a movable transfer bar having a body section and end sections parallel to the body and end sections respectively of said actuator bars, said end sections of said actuator bars and said transfer bar being pivotally mounted on said base, each of said actuator bars having at least one portion engageable with the said second arm of at least one of said switches, said transfer bar being engageable with the said first arm of each of said switches, spring means biasing said bars to a position out of contact with said arms, means for moving said transfer bar into engagement with said first arms so as to shift them overcenter with respect to said second arms and open said contacts upon movement of any one of said actuator bars into engagement with said second arms, and push button means for selectively moving said actuator bars into engagement with said arms, whereby said toggle switches may be selectively operated in predetermined combinations.

3. A push button switch comprising a base, a plurality of toggle switches mounted on said base, each of said toggle switches including a flexible bifurcated arm secured at its bifurcated end to said base, a flexible contact arm secured to said base and extending between and generally parallel to the bifurcated portions of said bifurcated arm, a U-shaped spring supported between the ends of said arms for biasing said contact arm into one of two positions on opposite sides of said bifurcated arm, a fixed contact carried by said base, and a movable contact carried by said contact arm; a plurality of separately movable actuator bars engageable with the bifurcated arm of certain of said toggle switches, a movable transfer bar engageable with the contact arm of each of said toggle switches, means for moving said transfer bar into engagement with said first arms so as to shift them overcenter with respect to said second arms and open said contacts upon movement of any one of said actuator bars into engagement with said second arms, means biasing said actuator and transfer bars out of engagement with said arms, means for moving said transfer bar into engagement with said bifurcated arms so as to shift them overcenter with respect to said contact arms and open said contacts upon movement of any one of said actuator bars into engagement with any of said bifurcated arms, and a

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plurality of push buttons each secured to one of said actuator bars, whereby predetermined combinations of said toggle switches may be opened and closed upon manual actuation of said push buttons.

4. A push button switch comprising a base, a plurality of toggle switches mounted on said base, each of said toggle switches including a flexible bifurcated arm secured at its bifurcated end to said base, a flexible contact arm secured to said base and extending between and generally parallel to the bifurcated portions of said bifurcated arm, a U-shaped spring supported between the ends of said arms for biasing said contact arm into one of two positions on opposite sides of said bifurcated arm, a fixed contact carried by said base, and a movable contact carried by said contact arm; a plurality of separately movable parallel actuator bars each having a body section transverse to said arms and a pair of end sections perpendicular to its body section, a movable transfer bar having a body section and end sections parallel to the body and end sections respectively of said actuator bars, said end sections of said actuator bars and said transfer bar being pivotally mounted on said base, each of said actuator bars having at least one portion engageable with the bifurcated arm of one of said switches, said transfer bar being engageable with the contact arm of each of said toggle switches, means for moving said transfer bar into engagement with said contact arms so as to shift them overcenter with respect to said bifurcated arms and open said contacts upon movement of any one of said actuator bars into engagement with any of said bifurcated arms, spring means biasing said actuator bars and said transfer bar to a position out of contact with said arms, and a plurality of push buttons each secured to one of said actuator bars, whereby predetermined combinations of said toggle switches may be opened and closed upon manual actuation of said push buttons.

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