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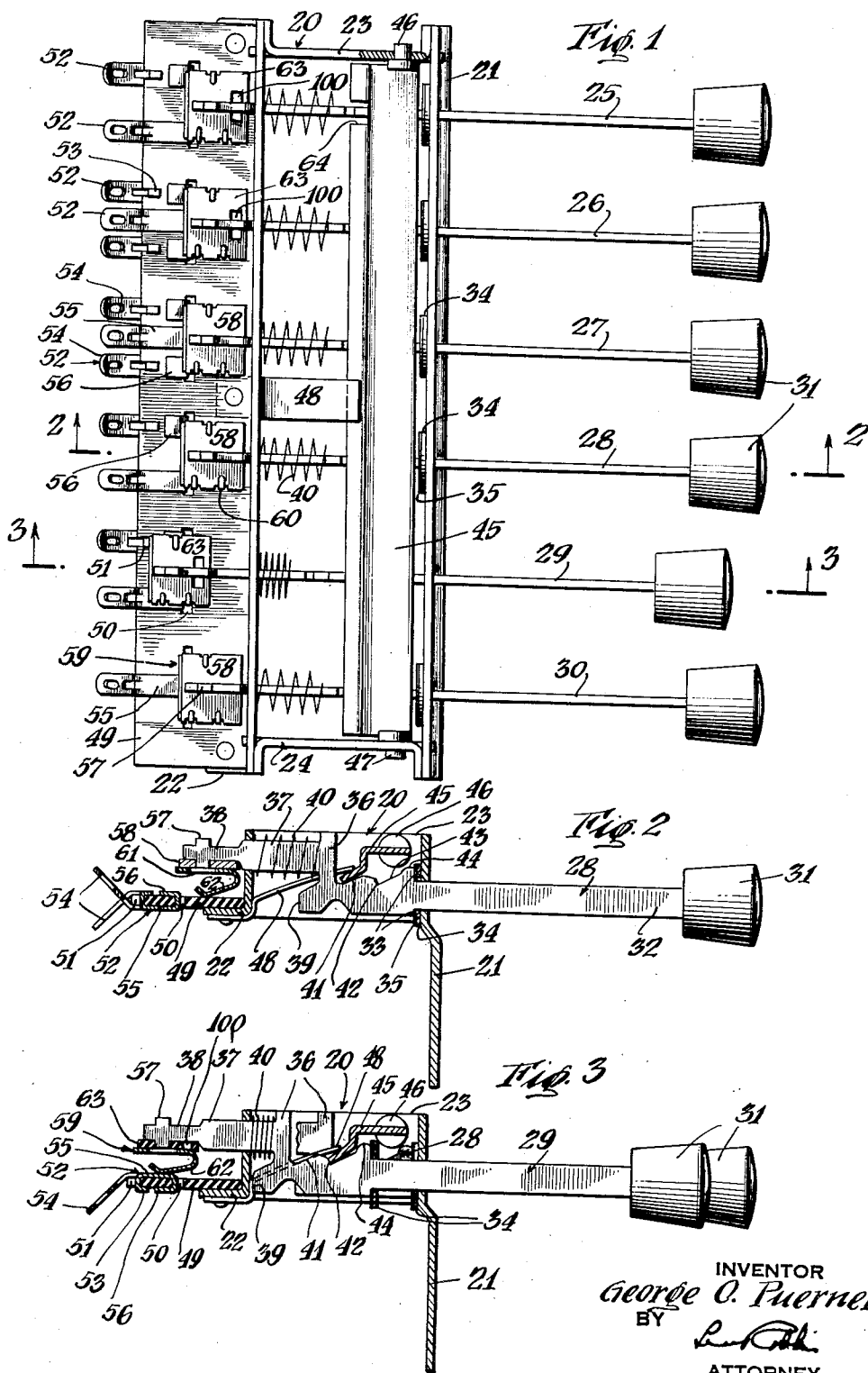
G. O. PUERNER

2,146,269

PUSH-BUTTON SWITCH

Filed Sept. 11, 1937

3 Sheets-Sheet 1



Feb. 7, 1939.

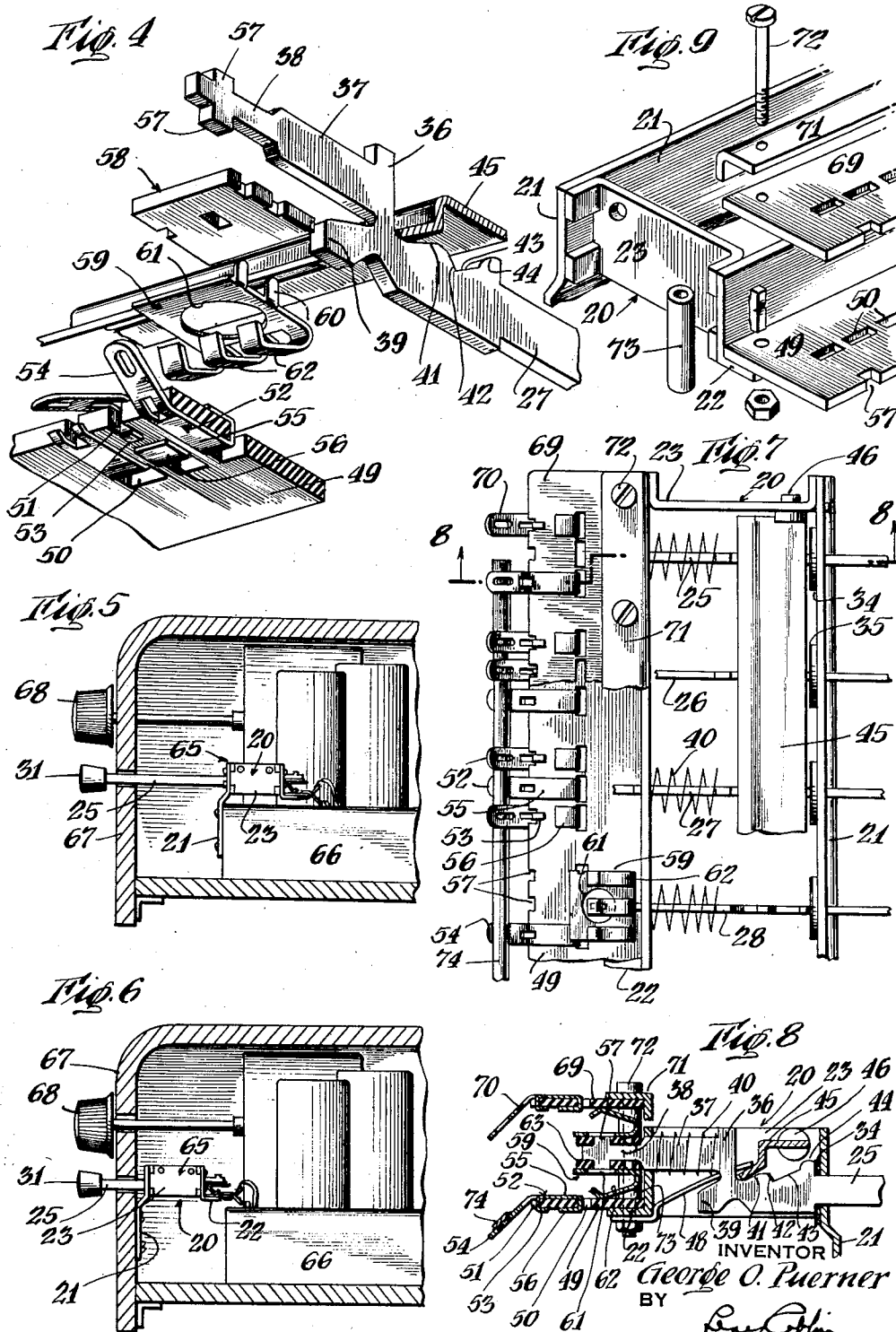
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PUSH-BUTTON SWITCH

Filed Sept. 11, 1937

3 Sheets-Sheet 2



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2,146,269

PUSH-BUTTON SWITCH

Filed Sept. 11, 1937

3 Sheets-Sheet 3

Fig. 10

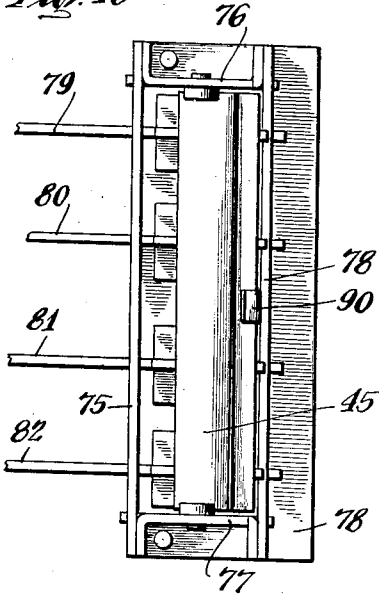


Fig. 12

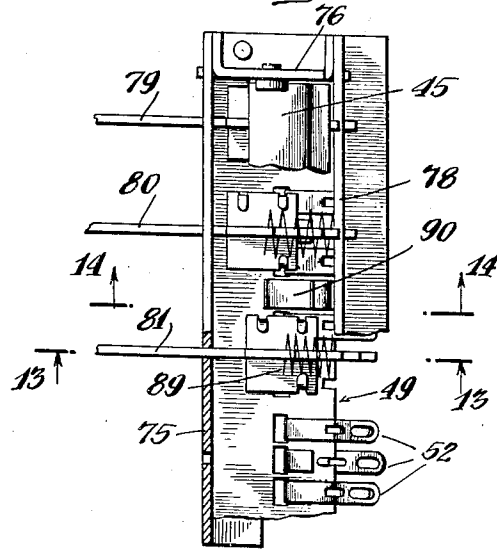


Fig. 11

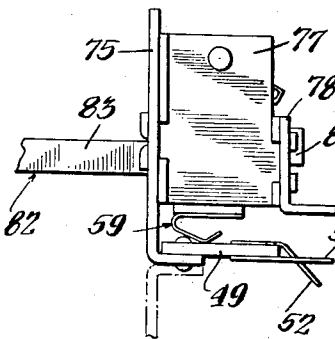


Fig. 13

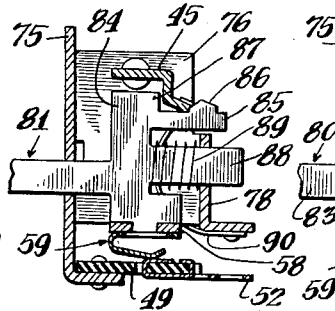


Fig. 14

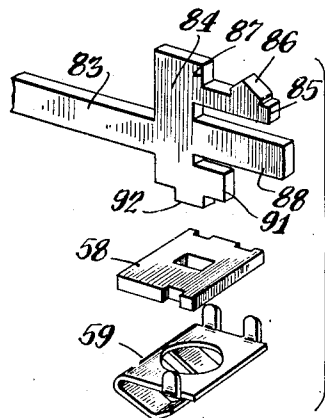
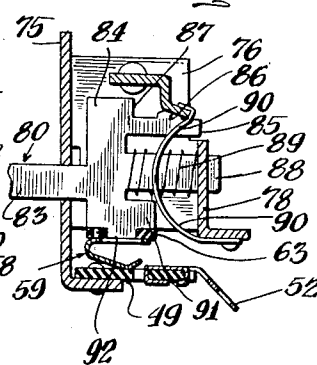


Fig. 15

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PUSH-BUTTON SWITCH

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a corporation of Delaware

Application September 11, 1937, Serial No. 163,404

17 Claims. (Cl. 200—5)

This invention relates to electric switches and particularly to push button switches.

An object of the invention is to improve the construction of electric push button switches.

Another object is to provide an electric switch suitable for station selection purposes in radio receiving sets and for other applications having similar switch requirements.

A further object is to provide an improved terminal arrangement for electric switches.

Other objects of the invention will be apparent from the following description and accompanying drawings taken in connection with the appended claims.

The invention comprises the features of construction, combination of elements, arrangement of parts, and methods of manufacture and operation referred to above or which will be brought out and exemplified in the disclosure hereinafter set forth, including the illustrations in the drawings.

In the drawings:

Figure 1 is a plan view of a push button switch embodying features of the present invention;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is a section on the line 3—3 of Figure 1;

Figure 4 is an exploded view of a portion of the switch;

Figure 5 illustrates one method of mounting the switch in a radio receiving set;

Figure 6 illustrates a modified method of mounting;

Figure 7 is a plan view of a portion of the switch with a modified terminal arrangement;

Figure 8 is a section on the line 8—8 of Figure 7;

Figure 9 is an exploded perspective view of a portion of the switch of Figure 7;

Figure 10 is a top view of a modified switch structure;

Figure 11 is an end view thereof;

Figure 12 is a top view with parts broken away to show the details of construction;

Figure 13 is a section on the line 13—13 of Figure 12;

Figure 14 is a section on the line 14—14 of Figure 12; and

Figure 15 is a detail view of the modified push-rod assembly.

The present invention relates to an electric switch, the contacts of which are closed and opened by the actuation of push buttons. In its preferred form the switch may include a latch

arrangement whereby the operation of one push button to select a circuit will cause a release of any other buttons which happen to be depressed at the time. In this form the switch is adapted for use as a station selector for radio receiving sets, for instance in connection with so-called automatic tuning systems, or by other station selection arrangements whereby upon depression of a key or push-button of the switch a predetermined signal frequency or broadcasting station is selected for reception. Other uses for the switch will readily suggest themselves, such as uses in telephonic and electronic fields.

This switch, because of its improved construction, is adapted for service in a wide variety of circuits. For instance, where used with motor actuated tuning systems the contacts may carry motor driving current of several amperes. On the other hand, the switch may also be used to control directly the tuning circuit, in which case the design of sliding contact and choice of contact material assure the low resistance required for efficient operation at the higher radio frequencies while the choice of insulating materials, design of parts and their relative spacings make possible low capacitance of high potential terminals to the frame of the switch as well as low inter-terminal capacitance.

While a preferred embodiment of the invention is described herein, it is contemplated that considerable variation may be made in the method of procedure and the construction of parts without departing from the spirit of the invention. In the following description and in the claims, parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

Referring to the drawings the switch shown in Figures 1 to 4 comprises a metal frame 20 composed of a mounting plate 21, a contact mounting bracket 22 and a pair of end spacer brackets 23 and 24 staked to plate 21 and bracket 22 at the two ends thereof and holding these parts in spaced parallel relation.

Plate 21 and bracket 22 are provided with rectangular slots accommodating a row of metal push-rods 25, 26, 27, 28, 29 and 30 which are disposed side by side in parallel relation and extend through the plate 21 and bracket 22. The free ends of the push-rods are each provided with a button or knob 31, preferably of insulating material, whereby the rod may be manually actuated.

All of the rods are of similar construction, rod

28 shown in Figures 1 and 2, as an example, comprises a straight uniform portion 32 extending from the knob 31 to a point just behind plate 21, at which point the width increases to form shoulder portions 33. A felt washer 34 and a thin metal washer 35 are threaded onto rod 28 and positioned between shoulders 33 and plate 21 to serve as a shock absorber and sound deadening means when the rod is retracted by its co-operating spring 40 as will be later described. That wider part of rod 28 which extends inwardly from shoulders 33 has an integral side arm 36 thereon which is formed into a uniform shank 37 which slides in the rectangular opening in bracket 22 and has a reduced end portion 38 upon which the moving contact assembly is mounted.

Rod 28 is also provided with a shoulder 39 which is brought into abutment with the face of bracket 22 to limit the inward travel of rod 28 when push-button 31 is manually depressed. Thus shoulders 33 and 39 limit the outward and inward sliding motion of the rod 28.

A helical expansion spring 40 surrounds shank 37 and is held under compression between arm 36 and the face of bracket 22 thereby normally retaining the rod 28 in released or "un-operated" position with shoulders 33 pressed against plate 21 through intervening washers 34 and 35.

The upper edge of rod 28, between shoulders 33 and side arm 36 is shaped to provide a cam surface comprising (reading out from arm 36) an upwardly sloping edge 41, a notch 42 and a second upwardly sloping edge 43 ending in a rounded hump 44.

A latch bar 45 extends along the tops of the push-rods and is pivoted in two aligned holes in end brackets 23 by pivot bearings 45 and 47. Latch bar 45 comprises a piece of sheet metal stock angularly bent along two longitudinal lines to provide a flat substantially horizontal portion, a substantially vertical portion along the inner edge thereof and an inwardly sloping portion along the lower edge of the vertical portion, the sloping portion normally resting against sloping cam surface 41. A small leaf spring 48 is riveted to the under side of bracket 22 and has its free end pressing downwardly on the sloping portion of latch bar 45 to hold it in the position described.

It will be evident that when any push-button is manually depressed the sloping face of latch bar 45 will slide up over sloping cam surface 41 and the edge will fall into notch 42 as a result of the pressure of leaf spring 48. The push-rod will thus be latched in depressed or "operated" position by latch bar 45, as is illustrated for rod 29 in Figure 3.

When the push-rod 29 is thus depressed coil spring 40 is held under compression and would return the rod to released position were it not for the latch. If another button is now pressed the latch will be raised by its cam surface thereby releasing rod 29 which is snapped back into "un-operated" position by spring 40. It will be noted that the ridge between cam surface 41 and notch 42 is beveled at an angle which insures the release of one push-rod before another one is latched.

It will be noted that in the latched position shown in Figure 3 the hump 44 on the cam surface is almost in contact with a shoulder of latch bar 45. This provides an emergency release means whereby, if all the push buttons have been depressed at once and latched up by someone

tampering with the switch, the further manual depression of any one of the push buttons will raise the latch bar and release all the other push-rods. The free motion possible between the latched position and the emergency release position is very small so that it will be very difficult for a tamperer to so align the rods that they will all be latched at once.

For mounting the fixed switch contacts a strip 49 of sheet Bakelite or other insulating material is riveted along the upper face of the flange of bracket 22 and extends for a considerable distance beyond the edge of the flange. Strip 49 has a row of rectangular apertures 50 in spaced groups of three each along a line parallel to the edge of the strip and small notches 51 at corresponding positions along the edge of the strip for mounting the switch contact terminals. This mounting is shown most clearly in Figure 4. Each contact terminal, such as 52, comprises a strip of suitable contact metal stock, such as bronze, (which may be silver plated for better contact) bent at one end to pass through an aperture 50 and clamp against the two faces of strip 49. The contact also has a narrow tongue 53 struck up from its body which tongue is bent around the edge of strip 49 within a notch 51 whereby the contact terminal is firmly secured in position. The free end of each contact comprises an angularly disposed securing terminal 54 to which the circuit wires may be attached, as by soldering. It will be noted that the contacts can be mounted on either face of strip 49. In one case the central body portion 55 is the contacting surface and in the other the folded end portion 56 is the contact face.

The narrow end 38 of shank 37, comprising part of the push-rod, is provided with a pair of oppositely extending rectangular ears 57 upon which is fitted a rectangular block 58 of sheet metal. The block 58 may be replaced by a block of insulation 63 in some positions, depending on the circuit requirements. Either type of block may be pressed tightly onto ear 57 or merely fit loosely over the ear to provide a "floating" mounting, as desired. As indicated in the drawings insulating blocks 63 have a considerable portion of their material cut away leaving openings 100 for the purpose of reducing the amount of solid dielectric in the electrostatic field to reduce the capacitance between the contact 59 and shank 37.

The moving contact 59 comprises a piece of sheet spring metal (silver plated for better contact, if desired) punched to provide a rectangular portion which rests against the under face of block 58 and secured thereto by ears 60 folded into notches in the edge of the block. A large central opening 61 is cut in the rectangular portion of the contact spring to provide adequate spacing from ear 57 for insulating purposes and for the reduction of the capacitance between the contact spring and shank 37 when contact 59 is mounted on a block of insulation 63. The reduction of this capacitance is especially important since the electrostatic flux between these metallic members is through solid insulating material and contributes to the production of radio frequency losses. Along the inner edge of the rectangular portion three integral spring fingers 62 are provided which are doubled back into spaced relation with the rectangular face, the ends of the fingers being further bent to provide convex contact surfaces which will slide along the surface of insulating strip 49 and ride up onto

the contact surfaces 55 or 56 of their respective co-operating fixed contacts when their supporting push-rod is pressed inward.

It will be seen that the moving contacts 59 are normally out of contact with their co-operating fixed contacts 52 and each individually slides into contact when their respective push-button is manually depressed. The contact is maintained until the push rod is insulated by operation of another push-button whereupon they are snapped apart rapidly breaking the circuit.

A wide variety of circuit combinations are possible, a few of which are shown in Figure 1. With block 63 formed of insulation the moving contact 59 is insulated from the frame. When rod 25 is depressed contact 59 closes a circuit between the two contact terminals 52, the third terminal position being vacant. Similarly, operation of rod 26 connects three contact terminals together. Operation of push-rod 27 connects all three fixed contacts to the switch frame (which may be grounded). Operation of push rod 28 grounds two terminals to the frame and operation of rod 30 grounds a single terminal to the frame.

In some cases it may be desired to provide a push button which does not latch up. This can readily be provided by cutting a notch 64 in the active edge of the latch bar as shown in connection with rod 25 in Figure 1.

The switch may be mounted in a radio set in several ways, two of which are shown in Figures 5 and 6. In Figure 5 the switch 65 is mounted on the chassis 66 of the radio set by riveting plate 21 thereto. The push rods 25 et al. are of sufficient length to extend out through openings in the front panel 67 of the radio cabinet, the push buttons 31 being thereby disposed in a row on the face of the cabinet. If desired the switch construction can be modified to provide greater spacing between the two push buttons nearest the center so that a central space will be left on the panel for a control knob 68 connected to other apparatus in the set.

Figure 6 shows how the switch 65 can be mounted on the rear face of the front panel 67 by screws passing through plate 21. In this case the push rods 25 et al. can be shorter.

Figures 7, 8 and 9 show a modified switch structure in which a second row of contact terminals 70 is provided mounted on a second insulating strip 69. Strip 69 is reinforced with an angular metal plate 71 and is bolted in spaced parallel relation to strip 49 by bolt 72 and sleeve 73. It will be evident that twice the number of contacts can thus be controlled by each push button.

Figures 7 and 8 show a bus bar 74 soldered along one row of terminals to connect them, thereby providing a simple and convenient way for connecting several terminals to a single conductor. Obviously a wire could be similarly secured to the row of terminals.

In instances where a switch is required which will fit into a shallower space the switch illustrated in Figures 10 to 15 may be used. This switch has a considerably smaller dimension, measured from front to rear face, than the one already described. The switch comprises a front plate 75 having a rearwardly bent bottom flange, a pair of flanged end brackets 76 and 77 and a rear bracket 78.

The push rods 79, 80, 81 and 82 of this switch differ from the previous ones. Each has a straight uniform portion 83 for sliding in the aperture in the plate 75, a cross arm portion 84

and three arms extending rearwardly therefrom. The top arm 85 is formed with a cam edge 86 for cooperation with the latch in substantially the same manner as previously described for the other switch structure. The top corner 87 of cross arm portion 84 engages the under surface of the latch bar to raise it as an emergency release in case all the buttons are inadvertently locked in at once. Latch bar 45 is the same as already described and is held against the cam surfaces by leaf spring 90 riveted against the bottom flange of bracket 78. The middle arm 88 is uniform and straight so as to slide in an appropriate aperture in rear bracket 78, and is surrounded by helical compression spring 89 to force the push button outward. Lower arm 91 has a lug 92 on its lower edge for holding the moving contact assembly comprising plate 58 (or 63) and spring contact 59 as previously described.

The fixed contacts 52 in this case are mounted on insulating strip 49 riveted to the top face of the horizontal flange on front plate 75 so as to be disposed below the latch mechanism of the switch instead of behind it as in the former arrangement.

The operation of both types of switch is substantially the same and the contact combinations may be varied in numerous ways for both. While four and six-button switches are shown it is obvious that any practicable number of buttons may be provided, evenly spaced or irregularly spaced as required.

An advantage of the present switch resides in the fact that moving contactor 59 has been so shaped as to provide an upward thrust of the contact shoe against the push rod so the tension is maintained at all times assuring sufficient contacting pressure under all variations of mechanical tolerances to maintain the required low contact resistance. An additional advantage secured by this type of construction is the contact which this pressure assured at the edge of the slot in the back bracket. It is important when using contactors grounded to the push rod to provide for short and direct circuits to frame especially if radio frequency circuits are being connected to frame by the action of the switch.

An important feature of the contacting arrangement is the fact that "trifurcation" of the contactor allows balanced contacting pressure with one, two or three terminals. This is accomplished by so positioning the terminals used with respect to the three fingers on the contactor that the upward thrust at each edge of the contact shoe is balanced. For example, when one terminal alone is used it will be positioned at the center so that the two outer contact fingers ride with equal pressure on the Bakelite surface and the center finger rides up on to the contact; if two terminals are desired these will be positioned in the two outside sets of holes so that the center finger rides on the Bakelite with equal pressure distributed on the two outer contacts as they ride up on to the terminal.

While the present invention, as to its objects and advantages, has been described herein as carried out in specific embodiments thereof, it is not desired to be limited thereby but it is intended to cover the invention broadly within the spirit and scope of the appended claims.

What is claimed is:

1. A push-button electric switch comprising, in combination, a frame having a front plate, a rear plate in spaced parallel relation thereto, 75

said front and rear plates each having a rectangular slot aperture therein, said slots lying with their major axes in a plane perpendicular to the planes of said plates and their minor axes staggered, and a push-rod extending through said pair of apertures, said rod comprising a flat member having an elongate uniform portion arranged to slide in the slot in said front plate, a second elongate uniform portion parallel thereto but offset therefrom in the same plane arranged to slide in the slot in said rear plate, said portions being connected between said plates and contacts actuated by the sliding of said push rods.

2. A push-button electric switch comprising, in combination, a frame having a front plate, a rear plate in spaced parallel relation thereto, front and rear plates each having a rectangular slot aperture therein, said slots lying with their major axes in a plane perpendicular to the planes of said plates and their minor axes staggered, and a push-rod extending through said pair of apertures, said rod comprising a flat member having an elongate uniform portion arranged to slide in the slot in said front plate, a second elongate uniform portion parallel thereto but offset therefrom in the same plane arranged to slide in the slot in said rear plate, said portions being connected between said plates, and contacts behind said rear plate actuated by said push rods.

3. A push-button electric switch comprising, in combination, a frame having a front plate, a rear plate in spaced parallel relation thereto, said front and rear plates each having a rectangular slot aperture therein, said slots lying with their major axes in a plane perpendicular to the planes of said plates and their minor axes staggered, and a push-rod extending through said pair of apertures, said rod comprising a flat member having an elongate uniform portion arranged to slide in the slot in said front plate, a second elongate uniform portion parallel thereto but offset therefrom in the same plane arranged to slide in the slot in said rear plate, said portions being connected between said plates, and a compression type coil spring surrounding said second elongate portion in the region between said plates.

4. A push-button electric switch comprising, in combination, a frame having a front plate, a rear plate in spaced parallel relation thereto, said front and rear plates each having a rectangular slot aperture therein, said slots lying with their major axes in a plane perpendicular to the planes of said plates and their minor axes staggered, and a push-rod extending through said pair of apertures, said rod comprising a flat member having an elongate uniform portion arranged to slide in the slot in said front plate, a second elongate uniform portion parallel thereto but offset therefrom in the same plane arranged to slide in the slot in said rear plate, said portions being connected between said plates, said first portion having a cam surface on one edge thereof between said plates, a latch adapted to co-operate with said cam surface, and a compression type coil spring surrounding said second elongate portion in the region between said rear plate and the connection between said portions.

5. A push button electric switch comprising a frame including a plate having two plane portions at right angles to each other, a push rod passing through an aperture in one of said plane portions, a block of sheet material carried by said rod, a sheet of insulating material disposed on the inner face of the other of said plane portions, said block and sheet presenting opposed parallel

faces, and co-operating contacts mounted on said faces and adapted to be moved into and out of contact by longitudinal motion of said push rod the one of said contacts mounted on said sheet comprising a metal strap having a plane portion lying on the face of said sheet and anchoring portions extending through said sheet.

6. A push button electric switch comprising a frame including a plate having two plane portions at right angles to each other, a push rod passing through an aperture in one of said plane portions, a contact mounted on said rod, a sheet of insulating material disposed on the inner face of the other of said plane portions, and a contact mounted on the face of said sheet, said contacts being adapted to co-operate responsive to longitudinal motion of said push rod, a second sheet of insulating material in spaced parallel relation to said first sheet on the other side of said push rod, and a contact mounted on the face of said sheet, a second contact mounted on said rod, said contacts also being adapted to co-operate responsive to longitudinal motion of said rod.

7. A push button electric switch comprising, in combination, a frame having a front plate, a rear plate in spaced parallel relation thereto, said plates having a pair of substantially aligned rectangular apertures, and a push rod of rectangular cross section passing through the aperture in said front plate, said rod being formed with three parallel branches in the region between said plates, one of said branches passing through the aperture in said rear plate, another of said branches having a cam surface and the third of said branches having a contact mounted thereon, a latch co-operating with said cam surface and a fixed contact co-operating with said first contact responsive to longitudinal sliding motion of said push rod.

8. A push button electric switch comprising a terminal strip of sheet insulating material, a plurality of contact elements mounted thereon, said contact elements comprising contact portions on one side of said strip and circuit connecting portions extending through openings in said strip to the other side thereof, and a plurality of parallel push rods arranged side by side along the contact side of said terminal strip and means supporting said push rods for longitudinal motion, the direction of motion thereof being parallel to the plane of said terminal strip, an insulating plate carried by each of said push rods and contacts mounted on said plates, each of said contacts making wiping engagement with at least two of said contact elements on said terminal strip to electrically connect them in one position of the push rod.

9. A push button electric switch comprising a frame, a series of push rods supported side by side therein for reciprocation longitudinally, insulating contact mounting plates carried by said push rods individual thereto, bridging contacts mounted thereon, a common terminal strip of insulating sheet material alongside said series of push rods and in a plane parallel to said series of rods, contact-terminals mounted on said terminal strip adjacent each of said push rods and having terminal portions adapted for connection to external circuit elements and contact making portions on the side of said terminal strip nearest said bridging contacts, said bridging contacts on said contact mounting plates making wiping contact with the contact making portions of the adjacent contact terminals.

10. A push button electric switch comprising

a frame, a series of push rods supported side by side therein for reciprocation longitudinally, insulating contact mounting plates carried by said push rods individual thereto, bridging contacts mounted thereon, a common terminal strip of insulating sheet material alongside said series of push rods and in a plane parallel to said series of rods, contact-terminals mounted on said terminal strip adjacent each of said push rods and having terminal portions adapted for connection to external circuit elements and contact making portions on the side of said terminal strip nearest said bridging contacts, said bridging contacts on said contact mounting plates making wiping contact with the contact making portions of the adjacent contact terminals, said push rods extending outward from one side of said frame, push buttons secured to the ends thereof to enable manual actuation, spring means for restoring said push rods after actuation thereof, and interconnecting latch means to latch any selected push rod in actuated position and to release any other previously latched push rod responsive to actuation of the selected push rod.

11. A push button electric switch comprising a frame, a series of push rods supported side by side therein for reciprocation longitudinally, insulating contact mounting plates carried by said push rods individual thereto, a common terminal strip of insulating sheet material alongside said series of push rods and in a plane parallel to said series of rods, contact-terminals mounted on said terminal strip adjacent each of said push rods and having terminal portions adapted for connection to external circuit elements and contact making portions on the side of said terminal strip nearest said push rods, and bridging contacts on said contact mounting plates making wiping contact with the contact making portions of the adjacent contact terminals, one of each of the co-operating contacts lying flat against its insulating support and the other of said contacts comprising a spring finger adapted to slide over the surface of said flat contact and over the adjacent surface of insulating material against which said flat contact is mounted.

12. A push button electric switch comprising a frame, a series of push rods supported side by side therein for reciprocation longitudinally, insulating contact mounting plates carried by said push rods individual thereto, bridging contacts mounted thereon, a common terminal strip of insulating sheet material alongside said series of push rods and in a plane parallel to said series of rods, contact-terminals mounted on said terminal strip adjacent each of said push rods and having terminal portions adapted for connection to external circuit elements and contact making portions on the side of said terminal strip nearest said bridging contacts, said bridging contacts on said contact mounting plates making wiping contact with the contact making portions of the adjacent contact terminals and a second common terminal strip of insulating sheet material parallel to said first mentioned terminal strip on the opposite side of said series of push rods therefrom, contact-terminals mounted on said second terminal strip, and contacts carried by said contact mounting plates on said push rods and co-operating with said contact-terminals on said second terminal strip.

13. A push button electric switch comprising a frame, said frame including a front and a rear plate in spaced parallel relation and braces holding said plates in rigid assembly, said plates being

apertured and a series of parallel push rods extending through aligned apertures in said front and rear plates, a shoulder on each of said rods between said plates to limit the forward travel of said rods, a latch bar co-operating with said rods to latch any selected rod in rearward position, an insulating panel mounted on said frame parallel to and alongside said series of rods, co-operating contacts mounted on said panel and on said rods and adapted to be opened and closed by reciprocation of said rods, springs individual to said rods urging said rods forward, and a shock absorbing member between each of said rod shoulders and said front plate to absorb the shocks incidental to the return of said rods to forward position by said individual springs upon release of said rods by said latch bar.

14. A push button electric switch comprising a frame, said frame including a front and a rear plate in spaced parallel relation and braces holding said plates in rigid assembly, said plates being apertured and a series of parallel push rods extending through aligned apertures in said front and rear plates, a shoulder on each of said rods between said plates to limit the forward travel of said rods, a latch bar co-operating with said rods to latch any selected rod in rearward position, an insulating panel mounted on said frame parallel to and alongside said series of rods, co-operating contacts mounted on said panel and on said rods and adapted to be opened and closed by reciprocation of said rods, springs individual to said rods urging said rods forward, and a shock absorbing member between each of said rod shoulders and said front plate to absorb the shocks incidental to the return of said rods to forward position by said individual springs upon release of said rods by said latch bar, said shock absorbing means comprising a metal washer and a felt washer, said felt washer being disposed between said metal washer and said front plate.

15. A push button electric switch comprising a metal frame including two parallel, elongate, apertured sheet metal plates extending along the front and rear of said switch, braces holding said plates in spaced rigid assembly, a series of push rods supported side-by-side in said frame, each of said rods extending through apertures in said front and rear sheet metal plates for longitudinal reciprocation therein, a shoulder on each of said rods at a point between said plates to limit the forward travel of said rods, a spring individual to each of said rods urging said shoulder against said front plate, a latch bar mounted between said plates and common to said push rods, spring means urging said latch bar against said rods, a shoulder on each of said rods engageable by said latch bar when said rod is moved rearwardly against its respective spring, said latch bar thereby being capable of holding each of said rods in depressed position, cam means on each of said rods engageable with said latch bar to lift said latch bar out of engagement with the shoulder of any other rod during the rearward travel of any of said push rods, a block of insulating material mounted on each of said rods, a panel of insulating material extending along said switch and secured to said frame, said panel being equidistant from all of said push rods and lying in a plane parallel to the lines of travel of said rods, contacts mounted on said panel having terminal portions for connection to external circuit elements and contact making portions, and bridging contacts mounted on said insulating blocks adapted to move into and out of bridging engage-

ment with selected groups of said panel contacts upon reciprocative motion of their respective push rods.

16. A push button electric switch comprising a terminal strip of sheet insulating material, a plurality of contact elements mounted thereon, said contact elements comprising contact portions and circuit connecting portions, and a plurality of parallel push rods arranged side by side along the side of said terminal strip and means supporting said push rods for longitudinal motion, the direction of motion thereof being parallel to the plane of said terminal strip, an insulating plate carried by each of said push rods and contacts mounted on said plates, each of said contacts making wiping engagement with at least two of said contact elements on said terminal strip to electrically connect them in one position of the push rod, each of said push rods having at least one integral ear on one edge thereof and its associated insulating plate having an aperture of substantially the same dimensions, said ear being disposed within the aperture in said plate when said rod and plate are assembled.

17. A push button electric switch comprising a metal frame including two parallel, elongate, apertured sheet metal plates extending along the front and rear of said switch, braces holding said plates in spaced rigid assembly, a series of push rods supported side-by-side in said frame, each of said rods extending through apertures in said front and rear sheet metal plates for longitudinal

reciprocation therein, a shoulder on each of said rods at a point between said plates to limit the forward travel of said rods, a spring individual to each of said rods urging said shoulder against said front plate, a latch bar mounted between said plates and common to said push rods, spring means urging said latch bar against said rods, a shoulder on each of said rods engageable by said latch bar when said rod is moved rearwardly against its respective spring, said latch bar thereby being capable of holding each of said rods in depressed position, cam means on each of said rods engageable with said latch bar to lift said latch bar out of engagement with the shoulder of any other rod during the rearward travel of any of said push rods, a flat block of insulating material mounted on each of said rods, a panel of insulating material extending along said switch and secured to said frame, said panel being equidistant from all of said push rods and lying in a plane parallel to the lines of travel of said rods, contacts mounted on said panel having terminal portions for connection to external circuit elements and contact making portions, said flat insulating blocks each being mounted in a plane parallel to said insulating panel and bridging contacts mounted on said insulating blocks adapted to move into and out of bridging engagement with selected groups of said panel contacts upon reciprocative motion of their respective push rods.

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