June 8, 1954

R. P. BALLOU

2,680,794

PUSH BUTTON STATION

Filed Aug. 5, 1948

3 Sheets-Sheet 1

Fig. 1

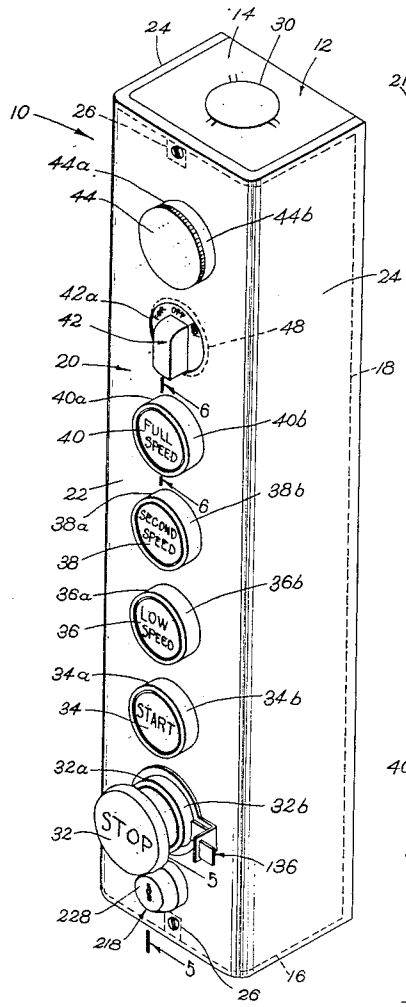


Fig. 2

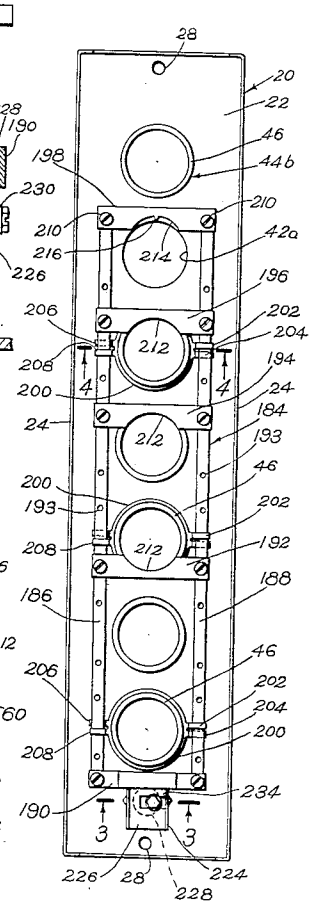


Fig. 5

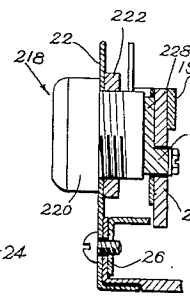


Fig. 6

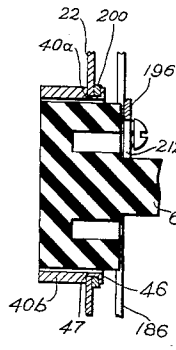


Fig. 3

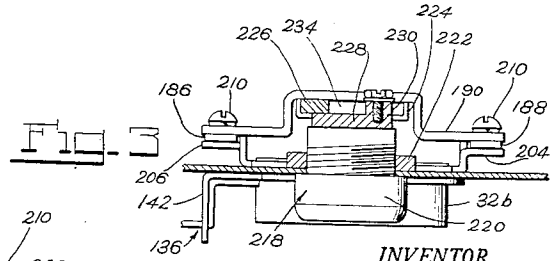
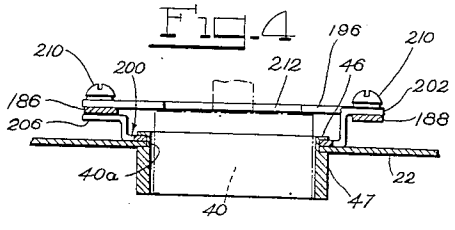


Fig. 4



INVENTOR.
Richard P. Ballou
BY Edwin Levinson
ATTORNEY

June 8, 1954 R. P. BALLOU 2,680,794

PUSH BUTTON STATION

Filed Aug. 5, 1948 3 Sheets-Sheet 2

Fig. 7

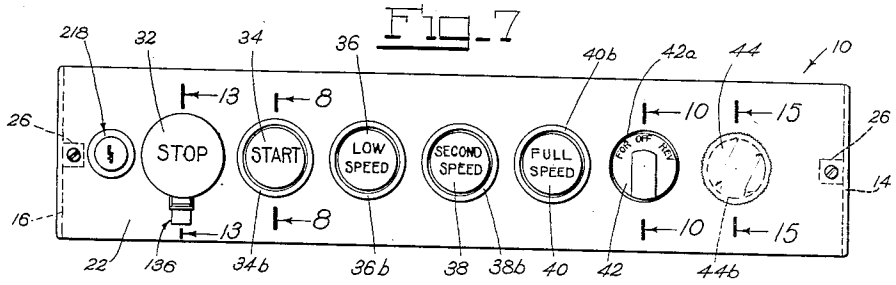


Fig. 8

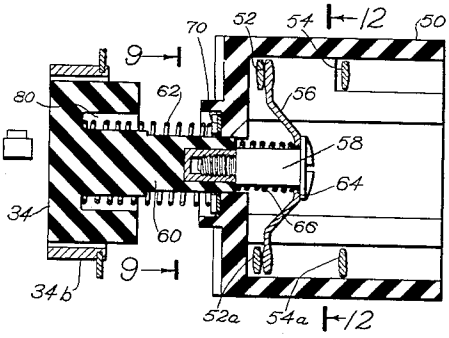


Fig. 9

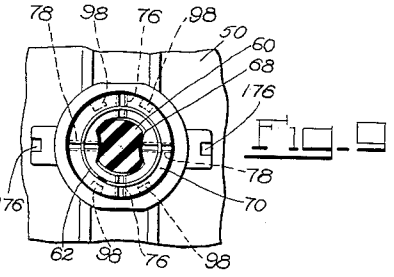


Fig. 16

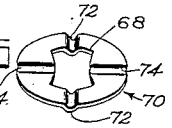


Fig. 11

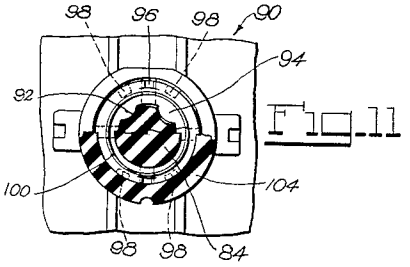


Fig. 10

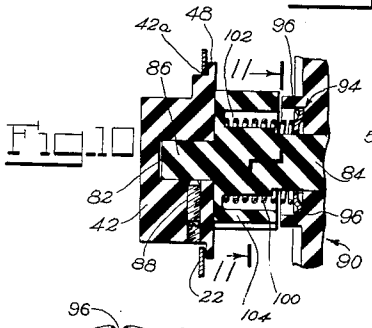


Fig. 12

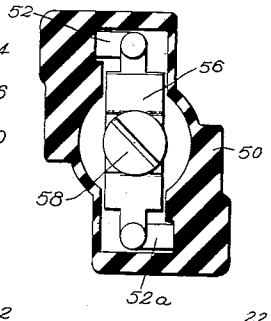


Fig. 14

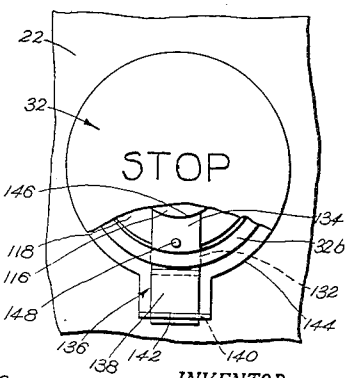


Fig. 17

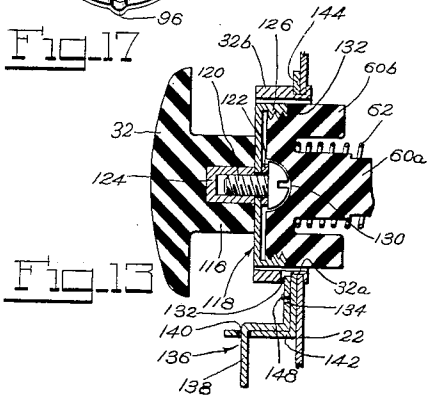
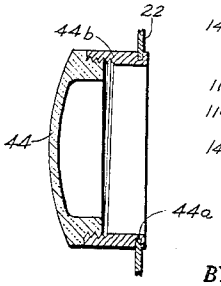


Fig. 13

Fig. 15



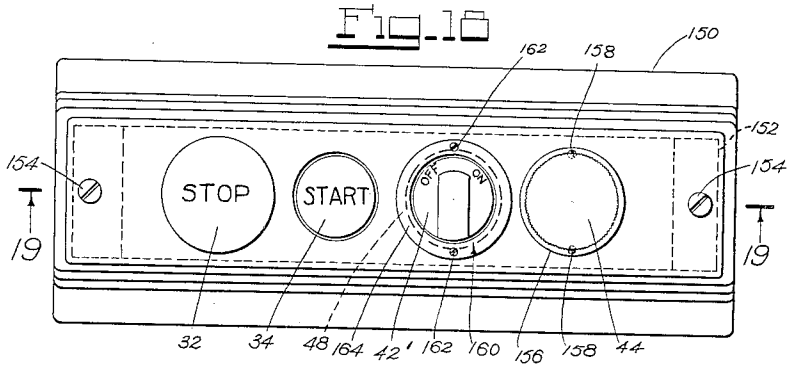
INVENTOR.
Richard P. Ballou
BY Edwin Lieselau
ATTORNEY

June 8, 1954 R. P. BALLOU 2,680,794

PUSH BUTTON STATION

Filed Aug. 5, 1948 3 Sheets-Sheet 3

Fig. 18



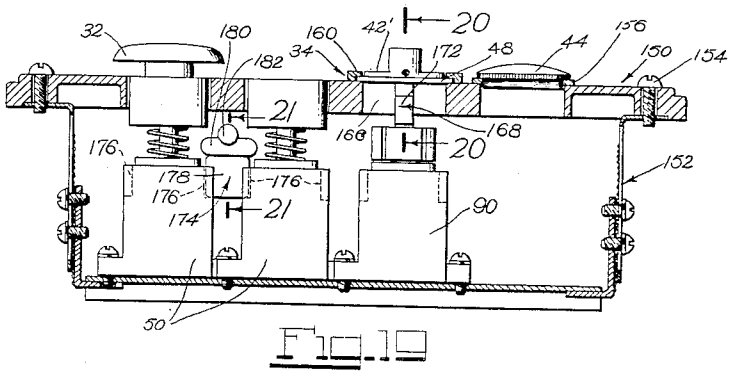


Fig. 19

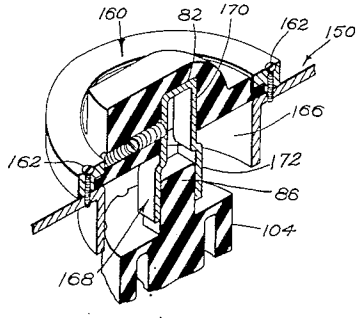


Fig. 20

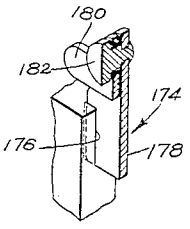


Fig. 21

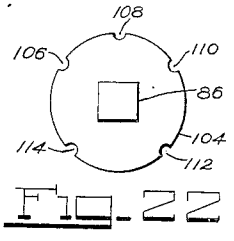


Fig. 22

INVENTOR.
Richard P. Ballou
BY Edwin Leisohn
ATTORNEY

Patented June 8, 1954

2,680,794

UNITED STATES PATENT OFFICE

2,680,794

PUSH BUTTON STATION

Richard P. Ballou, Hartford, Conn., assignor to Federal Electric Products Company, Newark, N. J., a corporation

Application August 5, 1948, Serial No. 42,718

8 Claims. (Cl. 200—159)

1

The present invention relates to push button stations which are used in conjunction with electrically operated apparatus.

A push button station ordinarily comprises, in one enclosure, an assembly of manually operable switches and may include one or more push button switches, for example, a start switch and a stop switch manually operable by push buttons, a rotary selector switch which is usually actuated by a manually operable rotary knob, and one or more pilot lights. However, a push button station may be provided only with push button switches or only with rotary switches or only with pilot lights, or with any combination of such elements. Furthermore, these elements may be mounted in different positions within the enclosure. Also, one or more of the push buttons, especially the stop button, may have mushroom heads, and various other devices, such as interlocks, lock-offs, or key locks may be added. Heretofore, the various elements and modifications usually required that the enclosure be provided with openings of different sizes. For this reason, it was heretofore necessary for the manufacturer either to manufacture the push button stations on order, in accordance with the requirements specified in advance with the order, or to keep in stock a very large number, say several hundred, different covers in order to satisfy the different requirements of push button stations equipped with various elements or with different numbers of elements.

One object of the present invention is to reduce the number of different covers necessary to meet the different requirements of various push button stations. Another object is to provide a station that may be mounted either in a vertical position or in a horizontal position and yet have all markings or functional designations of the elements disposed horizontally for normal reading thereof. Another object is the provision of a mechanical design whereby the same elements can be provided either in a station of the surface type or in a flush station, with minimum adaptation requirements. A further object is to provide a station which eliminates the requirements for name or designation plates for the switches or pilot lights.

A further object of the present invention is the provision of an improved key lock device for one or more switches of a push button station.

Another object of the invention is to provide a push button station in which one or more of the push buttons may be provided with heads of the mushroom type, the push buttons of said type

2

being of improved construction, particularly in respect to their removable securement to the companion stems of the push buttons, whereby to enable said heads to be properly secured to said stems and yet be removable therefrom, externally of the cover of the station, when it is desired to remove said cover for access to the interior of the station enclosure.

Another object is the provision of an interlock for adjacent push button switches of a push button station in order to prevent the simultaneous operation of both switches, the switch casings of the interlock being of such character as to enable the interlock to be mounted in position without the use of fastening devices or other fittings.

The above and other objects, features and advantages of this invention will be fully understood from the following description considered in connection with the accompanying illustrative drawings.

In the drawings:

Fig. 1 is a perspective view of a push button station embodying the present invention, said station being shown in vertical position, and the functional designations or legends being horizontally disposed for correct reading;

Fig. 2 is an inner plan view of the cover, removed from the frame of the enclosure, showing also the key lock;

Figs. 3 and 4 are sectional views on the lines 3—3 and 4—4, respectively, of Fig. 2, one of the push buttons being shown in dotted lines in Fig. 4;

Figs. 5 and 6 are fragmentary sectional views on the lines 5—5 and 6—6, respectively, of Fig. 1;

Fig. 7 is a front view, in elevation, of the push button station, showing the same in horizontal position, and showing the functional designations or legends in horizontal positions for the correct reading thereof;

Fig. 8 is a sectional view of a push button switch, on the line 8—8 of Fig. 7;

Fig. 9 is a sectional view on the line 9—9 of Fig. 8;

Fig. 10 is a fragmentary sectional view of a selector or rotary switch, on the line 10—10 of Fig. 7;

Fig. 11 is a sectional view on the line 11—11 of Fig. 10;

Fig. 12 is a sectional view on the line 12—12 of Fig. 8;

Fig. 13 is a sectional view on the line 13—13 of Fig. 7;

Fig. 14 is a front view of the parts shown in Fig. 13, the push button being shown locked in retracted position, a part of the head of the push

button being cut away for the purpose of illustration;

Fig. 15 is a sectional view on the line 15—15 of Fig. 7;

Figs. 16 and 17 are perspective views of releasable holding elements of the push button and rotary switches, respectively;

Fig. 18 is a front view of a push button station of the flush type;

Fig. 19 is a sectional view on the line 19—19 of Fig. 18, the switches being shown in side elevation;

Fig. 20 is a perspective sectional view on the line 20—20 of Fig. 19;

Fig. 21 is a perspective sectional view on the line 21—21 of Fig. 19; and

Fig. 22 is an end view of the operating member of the selector switch, the operating knob being removed.

Referring now to the drawings in detail, there is shown a push button station 10. The enclosure 12 is in the form of a frame having similar end walls 14 and 16 and a rear wall 18 of the same width as said end walls. As here shown, the cover 20 of the enclosure is U-shaped in cross section having the front part 22 and the side parts 24. The end walls 14 and 16 of the frame 12 are provided with screw threaded brackets 26, and the front part 22 of the cover is provided with apertures 28 to receive screws which engage the brackets 26, respectively, for securing the cover 20 to the frame 12. Said frame and its cover are preferably formed of sheet metal, and knockouts 30 may be provided in each of the end walls 12 and 16 and, if desired, in the rear or side wall 18, for wiring the elements of the push button station to the electrical devices which are operable under the control of the switches of the station.

Pursuant to one of the objects of the present invention all of the openings in cover 20 are of the same size. More particularly, as here shown, the push button station is provided with a plurality of push button switches, indicated at 32, 34, 36, 38 and 40, with a rotary or selector switch, the rotary knob of which is indicated at 42, and with a translucent pilot light cover indicated at 44. The pilot light (not shown) may be mounted in any suitable way on wall 18. The openings in cover 20 which, as stated, are of the same size are indicated by the numerals 32*a*, 34*a*, 36*a*, 38*a*, 40*a*, 42*a* and 44*a*, respectively. With the exception of opening 42*a*, a ring is secured in each of the cover openings, said rings being indicated at 32*b*, 34*b*, 36*b*, 38*b*, 40*b* and 44*b*. Each ring has a snug fit in the companion cover opening and has its inner end bent over at the inner side of cover 20 as indicated at 46 (see Figs. 2, 4 and 6), the peripheral shoulder 47 of each ring abutting the outer surface of the cover. As shown in Fig. 15, ring 44*b* for the pilot light cover 44 is internally threaded for holding said pilot cover in position. Rings 32*b*, 34*b*, 36*b*, 38*b* and 40*b* constitute guard and guide rings for the companion push buttons, respectively, and project forwardly of the front 22 of the station cover. Ordinarily, with the exception of the stop button ring 32*b*, these rings are of such axial extent that the outer ends of said rings are substantially flush with the outer ends of the push buttons. However, in the case of the stop button 32, the companion ring 32*b* is shorter than the other rings in order that the stop button may project beyond the outer end of the ring so that the stop button is more easily accessible for operation. It will be understood, that as usual, the push buttons are movable axially of the companion openings through which they project and, of course, axially of the companion rings which are secured in said openings.

As shown in Figs. 1 and 10, the rotary knob 42 of the selector switch is disposed directly in the cover opening 42*a* and has a peripheral flange 48 which overlaps the adjacent inner surface of the cover part 22 for preventing removal of said knob through cover opening 42*a*. It will be observed that the push buttons and the rotary knob 42 are each provided with an appropriate legend or functional designation engraved on or otherwise applied thereto. As illustrated by Figs. 1 and 7, these legends are horizontally disposed, for correct reading, both when the station is mounted vertically, that is when the row of cover openings extends vertically, as shown in Fig. 1, and also when said station is mounted horizontally, that is when the row of said openings extends horizontally, as shown in Fig. 7. The manner in which this desirable result is accomplished, pursuant to one of the objects of the present invention, will now be described. Although the push button 32 is shown as of the mushroom type, it will be understood that said push button may be of the same type as the other push buttons. Referring first to the push button switches which are operable by axial movement of their push buttons, respectively, each of said switches may be of the construction illustrated in Figs. 8, 9, 12 and 19. Each push button switch comprises an insulation casing 50 which is provided with a pair of stationary contacts 52, 52*a* and another pair of stationary contacts 54, 54*a*. A movable bridging contact 56 is movable longitudinally between said pairs of contacts for engagement therewith or disengagement therefrom, according to the requirements of the circuit controlled by the particular switch. As shown in Fig. 8, bridging contact 56 is normally in engagement with contacts 52, 52*a*. Said bridging contact is connected by a shouldered screw pin 58 to the stem 60 of the push button. A spring 62 normally holds contact 56 in engagement with contacts 52, 52*a* and also holds the companion push button in its forward or projected position.

Although the push button may be turned about its axis, for the purpose which will be presently described, contact member 56 is not turned but is held in alignment with the stationary contacts, by the adjacent inner surface portions of the switch casing 50 as will be readily apparent from an inspection of Fig. 12. In this connection it will be observed that contact member 56 has a central opening 64 through which pin 58 projects and that a spring 66 holds said contact member against the head of said pin, as clearly shown in Fig. 8. Referring to Fig. 9, it will be noted that the stem 60 is non-circular and projects through a similarly shaped opening 68 of a retaining disk 70. This disk is provided with a pair of ribs 72 and a pair of ribs 74 which are at right angles to each other and which engage the casing 50 in grooves 76 and 78, the last mentioned grooves being at right angles to grooves 76. Spring 62 which holds the push button in its outwardly projected position bears at one end thereof against the confronting surface of retaining member 70 and bears at its other end against the bottom of an inner circumferential recess provided in the push button as indicated at 80.

When it is desired to adjust the push button

in order that its legend which is marked thereon may be horizontally positioned, as hereinbefore referred to, for correct reading thereof, said push button is turned about its axis through 90°. During this turning movement the rounded ribs 72 and 74 of the disk 70 move out of the grooves 76 and 78 in which they were positioned, and at the end of the 90° turning movement of the push button said ribs again enter said grooves, by reason of the pressure of spring 62 on member 70, for releasably holding the push button in its adjusted position. The stop button 32, which is of the mushroom type as hereinafter more particularly described, and is not integral with or otherwise immovably fixed to the axially movable stem, is adjusted in the same way as the other push buttons as will be readily understood, it being noted in this connection that the stem 60*a* and the part 60*b* correspond to the stem 60 and the push button of the construction illustrated in Fig. 8.

As hereinbefore indicated the knob or manually operable part 42 of the rotary selector switch may also be positioned for correct reading in either the vertical or horizontal mounting of the push button station. In this connection it will be noted that the knob 42 carries the legends "For," "Off" and "Rev." which of course mean "forward," "off," and "reverse," respectively. In order to enable the knob 42 to be correctly positioned said knob is provided with a non-circular, preferably square recess 82 (Fig. 10), and the rotary stem 84 by which the selector switch is actuated is provided at its forward end with a non-circular projection 86 which has a removable fit in said recess. Also, as herein shown a removable set screw 88 may be provided for removably securing knob 42 to the switch-actuating stem 84. It will be understood that the selector switch may be of any suitable construction and includes a plurality of relatively movable contacts (not shown) for making the desired switch connections. However, it is preferred that the casing 90 of the selector switch be of the same size and external configuration as the casing of the several push button switches, as shown for example in Fig. 19. The cross section of stem 84 is non-circular and has a sliding fit in a correspondingly non-circular opening 92 in a releasable retaining member 94 (Figs. 10, 11 and 17). Retaining member 94 is provided with a pair of rounded projections 96 which are engageable in the recesses 98 and grooves which correspond to the grooves 76, and 78 of casing 50. Referring to Fig. 9 it will be noted that casing 50 of the push button switch is also provided with recesses 98 which, however, are not used in the case of the push button switches since the ribs 72 and 74 of the push button retaining members 70 are longer than recesses 98. On the other hand, the projections 96 of the retaining member 94 of the selector switch can enter recesses 98 as well as grooves 76 and 78. In this connection it will be understood that the provision of the recesses 98 as well as the grooves in the push button switch casings 50 and in the selector switch casings 90 enable the casings produced by the same mold to be used either as casings of the push button switches or casings of the selector switches. As in the case of the push button switch, a spring 100 holds the retaining member 94 in position but allows said member to be turned by stem 84. More particularly, as shown in Fig. 10, one end of spring 100 bears against member 94 and the other end of said spring bears against the end wall of the recess 102 in the enlarged integral cylindrical part 104 of stem 84. As shown by Figs. 10, 11 and 22, said part 104 is provided with a plurality of circumferentially spaced longitudinal grooves 106, 108, 110, 112 and 114, in which a locking member of a key-lock hereinafter described is engaged for locking knob 42 in a desired position. Grooves 106, 108 and 110 are used for the 3-position selector switch indicated in Figs. 1 and 7, while grooves 112 and 114 are used for the 2-position selector switch the knob of which is indicated at 42' in Figs. 18 and 19. This feature of the invention will be subsequently more specifically described.

As hereinbefore indicated, push button station may be provided with a "Stop" button of the mushroom type. Since the head of such button is larger than the opening 32*a* of cover 20, it is necessary to attach the button to the push button stem 60*a* after the cover is placed in position, and this in turn requires provision for removably attaching the button to said stem. Also, it will be understood that it is necessary to detach this button from the switch-actuating stem in order to effect the removal of cover 20 from frame 12. The construction provided for accomplishing these results is illustrated in Fig. 13. As here shown the shank 116 of the button is attached to metal cap 118 by a screw 120 and a lock washer 122. For this purpose shank 116 is provided with a recess having a screw-threaded metal insert 124 therein. Cap 118 has an internally screw threaded flange 126 which engages a complementary screw-threaded portion on the forward end of the head 60*b* of stem 60*a*. A recess 130 is provided in the end of head 60*b* to receive the head of the fastening screw 120. It will be noted that the outer peripheral surface of cap 118 is flush with the outer cylindrical surface of head 60*b* forming a unit which has a movable fit, with proper clearance, in guard ring 32*b*. In the attachment of the push button to the switch-actuating stem 60*a*, when the cover 20 is in position, the button 32 and cap 118 are first attached to each other by screw 120 sufficiently tight to prevent free relative movement of said button and cap but loose enough to allow the button to be turned. Then the cap 118 having the push button fastened thereto is screwed onto the head 60*b* of the stem, and since the screw threads of said cap and head are rather coarse, the edge of the cap abutting the shoulder 132 at the base of the screw-threaded portion of said head 60*b* provides a definite stop against further turning movement of said cap in the same direction on said head. The push button 32 is then turned until the "Stop" legend, engraved or otherwise applied thereto, is in the proper horizontal reading position, according to Fig. 1 or Fig. 7, as may be required, after which the cap and button assembly is unscrewed from the stem head 60*b* to permit tightening of the fastening screw 120 to tightly secure the button 32 to said cap in the correct reading adjustment thereon. Finally the cap 118 having the button 32 thus tightly fastened thereto is again screwed onto head 60*b*, completing the operation of attaching the button to the switch-actuating stem for operation and with the "Stop" legend in the correct position. It will be understood that once the button 32 is thus secured to stem 60*a*, with the correct adjustment for the horizontal reading position of the legend, the button may be turned in the same manner as the other push buttons in case it is desired to change the push button station from

a vertical mounting as shown in Fig. 1 to a horizontal mounting as shown in Fig. 7, or vice versa.

The push button station may be provided with a lock-off device as indicated above. This device is shown in Figs. 1, 7, 13 and 14 and will now be described. Said lock-off device comprises the guard ring 32b which in this case is provided with a slot 132 through which the part 134 of a lock-off member 136 is movable with slight clearance. Said lock-off member also has an offset part 138 which has a sliding fit, with a slight clearance, in a slot 140 which is spaced laterally of slot 132. Said slot 140 is provided in a lug 142 which is integral with a ring 144 secured against the front part 22 of cover 20 by guard ring 32b. It will be understood that when it is desired to lock the push button 32 in its circuit opening position, said push button having been moved inwardly, locking member 136 is moved so as to project its part 134 through opening 132 from the position shown in Fig. 13 to the position shown in Fig. 14, in overlying relation to the front surface of cap 118, until the arcuate end 146 of said part 134 engages the shank 116 of the push button. A nib or small projection 148 is provided on part 134 of said locking member so that the latter is not movable by gravity when the push button station is in the horizontal position illustrated in Fig. 7. It will be understood however that a rather slight but positive pull on the locking member 136 is sufficient to overcome the retaining effect of nib 148 when it is desired to retract the locking member from its locking or projected position shown in Fig. 14 to its retracted or unlocked position shown in Fig. 13.

Referring to Figs. 18 to 20, there is shown a push button station of the flush type. Said station comprises a cover 150 and a frame 152 to which said cover may be removably secured in the usual way as by screws 154. Said cover may be made of sheet metal, as in the case of cover 20 of push button station 10 described above, but it may be desirable to provide a cover which is cast, for example an aluminum or zinc casting. When the cover is cast it is desirably thicker than the sheet metal cover and the holes in the cover for the switch and other elements are preferably slightly larger than the push buttons which are of the same diameter as those referred to above in the description of push button station 10. Such larger holes cannot properly accommodate the pilot light cover 44 or the selector switch knob 42' when, in accordance with one or more of the objects of the present invention, said last-mentioned elements are of the same size and construction as those used in a push button station of a specifically different construction, such as that shown in Fig. 1, for example. Accordingly, in order to enable these elements to be used interchangeably either with a sheet metal cover or with a cast metal cover additional elements are provided. In order to mount the pilot light cover in position, an internally screw-threaded ring 156 is fastened to the station cover 150 in any suitable way as by screws 158. In the case of the selector switch, the knob 42' thereof which is of the same size and construction as knob 42, hereinbefore described, is mounted in a flanged ring 160 which is fastened to the front of cover 150 in any suitable way as by screws 162. It will be noted that the flange 48 of knob 42' is mounted between the front flange 164 of ring 160 and the marginal surface of cover 150 around the cover opening 166. The thickness of the cover 150 results in the selector switch knob 42' being spaced from the end 86 of the switch-actuating stem whereby the latter cannot be fitted into the recess 82 of said knob in the manner herein described with reference to Fig. 10. This difficulty is overcome in accordance with the present invention by the provision of a removable connecting member 168 shown in Figs. 19 and 20. Said connecting member 168 comprises a part 170 which fits into recess 82 in the knob, and a part 172 which fits on the end portion 86 of the selector switch-actuating stem, as clearly seen in Fig. 20.

A mechanical interlock may be provided between any two adjacent push button switches. An interlock device 174, made according to the present invention is illustrated in the push button station shown by Figs. 18 and 19. It will be noted that the switch casings 50 are provided with grooves 176 (Figs. 9, 19 and 21), and that the interlock device 174 includes a flat plate-like part 178 which has a slidable fit in the two confronting grooves 176 of two adjacent switches. A cross member 180 is pivoted intermediate the ends thereof on a shouldered pivot member 182 which is secured to part 178. As illustrated in Fig. 19, the opposite end portions of cross member 180 are in the paths of movement of buttons 32 and 34 of the adjacent switches respectively. Cross member 180 allows either push button to be depressed but prevents simultaneous depression of both push buttons. In this connection, it will be understood that if only one push button is depressed cross member 180 can move on its pivot 182 and therefore offers no impediment to the movement of one push button at a time, while on the other hand if an attempt is made to depress both push buttons by an amount sufficient to actuate their switches, the lower ends of both push buttons simultaneously engage the opposite ends of said cross member so that the latter cannot be moved out of the path of either of the two push buttons, thus preventing movement of said push buttons to the extent required for the operation of the companion switches respectively. It will be noted that the interlock device 174 may be readily placed in position between any two switches and may be easily removed when desired, since the interlock device is mounted and supported in the casing grooves 176 without any auxiliary fastening device or fittings.

As hereinbefore indicated push button stations may be provided with a key lock. This is illustrated in Figs. 2 to 6, and as will presently appear, the cover 20 of the enclosure of the push button station does not require any modification on account of the provision of the key lock.

As here shown, the key lock comprises a locking frame 184 which includes the laterally spaced longitudinal bars 186 and 188, the end-connecting member 190 and the cross members 192, 194, 196 and 198. The locking frame is mounted for longitudinal movement adjacent the inner side of the front part 22 of the cover 20 by members 200 which as here shown are in the form of rings clamped against the inner side of the cover portion 22 by the bent-over edge portions 46 of certain of the guard rings, as clearly shown in Figs. 2 and 4. Each of said frame mounting members 200 is provided at diametrically opposite points with a pair of oppositely offset lugs 202, 204, at one side of member 200 and 206, 208 at its opposite side. Said sets of lugs 202, 204 and 206, 208 form guides for the side bars 186 and 188 of the locking frame and in the longitudinal movement thereof and also hold the locking

frame against movement transversely of its own plane, as well as preventing lateral movement of said locking frame. The cross members are each removably secured at their opposite ends to the side bars 186 and 188 in any suitable way as by screws 210 which are received in companion threaded openings provided in said bars. It will be noted that said bars are provided with sets of additional openings, identified by the small circles on said bars, defining additional positions at which the various cross locking-members, such as members 192, 194, 196, 198, may be disposed for locking action. The locking members 192, 194, and 196 are each provided with an arcuate recess 212, and locking member 198 is provided with a similar arcuate recess 214 so that in the neutral position of the locking frame, illustrated in Fig. 2, the locking members are clear of the push buttons or other elements to allow free movement thereof when it is desired that they be unlocked, and also to permit the removal of the cover 20. In this connection it will be understood that when the locking member 184 is moved longitudinally, one or more of the cross locking members are disposed in the path of inward movement of the push buttons, as illustrated in Figs. 4 and 6 with reference to the push button 40. Thus, it will be noted that when for example the locking frame is moved toward the end wall 16 locking members 194, 196 are moved to their locking positions under the inner ends of push buttons 38 and 40 respectively and thereby prevent operation of said push buttons, while on the other hand if the locking frame is moved toward the opposite end of the cover 20 or end wall 14 of the frame 12, the locking member 192 is positioned under the inner end of the push button 36 and prevents operation of the latter. It will be readily understood that provision may be made for locking one or more of the push buttons when the frame 184 is moved in one direction to one locking position, and that one or more of the push buttons may be locked when the locking frame is moved in the opposite direction to its other position. It will be observed that all of the cross locking members, including member 198, are reversible and may be positioned either like member 192 or like member 194. For example, when it is desired to lock button 36 by movement of the frame toward end wall 12 of the enclosure, cross member 192 is removed from the position shown in Fig. 2, and placed in a position in which it is secured in a pair of the above mentioned additional openings indicated at 193, the arcuate portion 212 of said cross member facing the end wall 16 of the enclosure. The cross locking member 198 is especially designed for locking the rotary selector switch in any of its three positions, when it is a 3-position switch as illustrated in Fig. 1, or in either of its two positions when it is a 2-position switch as illustrated in Fig. 18. For this purpose member 192 is provided with a projection 216 in the arcuate recess 214, for releasable engagement with the knob 42, or 42' as the case may be, said locking projection 216 being received in any one of the companion locking recesses or grooves 106 to 114 hereinbefore described. In this connection it will be observed that the locking grooves 106, 108 and 110 are provided for use in conjunction with locking projection 216 in the case of the 3-position selector switch and that grooves 112 and 114 are provided for use in conjunction with the locking projection 216 when the selector switch is of the 2-position type. In this connection it will be understood that the provision of a full set of the five locking grooves on the rotary stem of the selector switch enable the same casing to be used either for selector switches of the 3-position type or for selector switches of the 2-position type.

The locking frame 184 is movable to its neutral or to either of its locking positions by a key-operated mechanism. Thus as here shown a key lock 218 is mounted on the front of the cover 20 near one end of the latter, the casing 220 of said key lock being fastened in position by the nut 222 (Figs. 3 and 5). A stationary guide 224 is fixed to the inner end of casing 220 for a lock bolt 226 and actuator which is slidable in said guide and which is operated by the turning movement of the key-operated lock barrel 228. The latter has an eccentric projection or pin 230 which engages the member 226 in a groove slot 234 provided therein. When the lock barrel 228 is turned by the proper key in one direction, the locking frame is moved to a corresponding locking position and of course when the lock barrel is turned by the key in the opposite direction the locking frame is moved to its other locking position. It will be understood that in order to remove the key (not shown) from the lock 218 it is necessary to turn the barrel 228 to one of said two positions in which said frame has a locking action on one or more of the push buttons and/or on the selector switch, as predetermined by the positions of the cross locking members of the locking frame. It will be noted that the slidable locking member 226 which is operated by the eccentric pin 230 of the lock barrel is secured to the cross connecting member 190 of the locking frame. Also it will be noted that said locking member 226 provides a lock for the cover 20 in one of the positions of said locking frame, namely in the lower position of said locking frame viewing Fig. 1 or in the left hand position of said locking frame viewing Fig. 7. This is illustrated in Fig. 5 wherein the locking member is shown in a locking position overlapping the inner end of bracket 26 which, therefore, prevents the removal of cover 20 since the lock casing 220 is fixed to said cover and is not removable except by access thereto at the inner side of the cover.

Thus, it is seen that the construction, organization and arrangement of the several parts of the push button station are well adapted to the accomplishment of the several objects of the invention. It will be understood that a push button station may be provided with all of the auxiliary devices hereinbefore referred to or that all of such devices may not be required, or that only one or more of said devices may be provided in any one push button station. It is to be noted however that the construction and arrangement and the relation between the cover 20 of the enclosure of the push button station and the various switches and other elements and auxiliary devices are such as to enable the latter to be used interchangeably for push button stations for satisfying various specific requirements. It is believed to be obvious, however, that if a push button station requires only one or two switches or other elements, enclosures of appropriate size, shorter than that illustrated in Fig. 1 would ordinarily be provided. In actual practice the enclosures may be stocked in a range of from one to eight sizes with a corresponding variation in the number of openings provided in the covers respectively. However, the covers of different lengths do not vary in respect to the size of the

openings therein, and accordingly allow the use of switches and other elements of the same construction and size in push button stations of different sizes. Also, as hereinbefore described, the switches and other elements can be applied to push button stations which as described with reference to Figs. 18 and 19 have cast metal covers. Finally it will be understood that the invention is not to be limited to the specific push button stations and devices herein disclosed, and that certain changes in the details of construction and in the arrangement of parts may be made without departing from the underlying idea or principles of this invention within the scope of the appended claims.

The key lock disclosed herein is claimed in my divisional application Serial No. 117,596, filed September 22, 1949, which issued as Patent No. 2,579,168 on December 18, 1951. Certain of the features disclosed herein are claimed in my divisional application Serial Number 371,526 filed July 31, 1953.

Having thus described my invention, what I claim and desire to secure by Latters Patent, is:

1. In a push-button station, a frame having a cover provided with a plurality of spaced openings disposed in a row, a plurality of switches carried by said frame and each provided with an operating stem disposed axially of one of said openings of the cover, a manually operable part carried by each stem and projecting through one of said openings for access at the front of said cover for manual operation of the companion switch, said manually operable parts being provided, on their front exposed portions, with designations of the functions of the companion switches, respectively, at least one of said manually operable parts being a push-button and at least one of said manually operable parts being operable by rotation, each of said manually operable parts being movable with the stem thereof to two different positions at right angles to each other with respect to the axis of said opening, whereby said designations may be disposed horizontally for correct reading both when said frame is mounted with said row of openings extending horizontally and when said frame is mounted with said row of openings extending vertically.

2. In a push-button station, a frame having a cover provided with a plurality of spaced openings disposed in a row, a plurality of switches carried by said frame and each provided with an operating stem disposed axially of one of said openings of the cover, a manually operable part carried by each stem and projecting through one of said openings for access at the front of said cover for manual operation of the companion switch, said manually operable parts being provided, on their front exposed portions, with designations of the functions of the companion switches, respectively, at least one of said manually operable parts being a push-button and at least one of said manually operable parts being operable by rotation, each of said manually operable parts being movable with the stem thereof to two different positions at right angles to each other with respect to the axis of said opening, whereby said designations may be disposed horizontally for correct reading both when said frame is mounted with said row of openings extending horizontally and when said frame is mounted with said row of openings extending vertically, each switch having a casing, and spring pressed means releasably engaging the stem and the casing of the companion switch, respectively, for releasably holding the companion manually operable part of the switch in either of said positions.

3. In a push button station, as defined in claim 1, wherein the stem carrying said push button is non-circular in cross-section, a retaining disk having an opening complementary in shape to said latter stem which projects therethrough, said disk having a plurality of ribs equally spaced circumferentially thereof, the casing of the switch companion to said latter stem being provided with spaced grooves to receive said ribs, respectively, and spring pressed means releasably engaging said latter stem and said retaining disk for releasably holding said ribs in said grooves, respectively, in either of said positions.

4. In a push button station, as defined in claim 1, wherein the stem carrying the manually operable part which is operable by rotation is non-circular in cross-section, a retaining disk having an opening complementary in shape to said latter stem which projects therethrough, said disk having a pair of projections diametrically thereof, the casing of said switch companion to said latter stem being provided with spaced portions to receive said projections, respectively, and spring pressed means releasably engaging said latter stem and said retaining disk for releasably holding said projections in said portions, respectively, in either of said positions.

5. In a push-button station, a switch provided with an operating stem, said stem being rotatable to two different positions at right angles to each other, a retaining disk having an opening through which said stem extends for axial movement relative to said disk, said opening and said stem being shaped to prevent relative rotation of said disk and said stem, said disk having a plurality of ribs equally spaced circumferentially thereof, a casing for said switch provided with spaced grooves to receive said ribs, respectively, and spring means releasably engaging said stem and said retaining disk for releasably holding said ribs in said grooves, respectively, in either of said positions of said stem.

6. In a push-button station, a switch provided with an operating stem, said stem being rotatable to two different positions at right angles to each other, a retaining disk having an opening through which said stem extends for axial movement relative to said disk, said opening and said stem being shaped to prevent relative rotation of said disk and said stem, said disk having a pair of projections diametrically thereof, a casing for said switch provided with spaced portions to receive said projections, respectively, and spring means releasably engaging said stem and said retaining disk for releasably holding said projections in said positions, respectively, in either of said positions.

7. A push button station comprising, a frame for supporting a plurality of switches, a cover for said frame, said cover having defined therein a row of spaced openings all of which are of the same diameter, and a plurality of switches mounted on said frame, said switches including a switch having a push button operating member and a switch having a rotary operating member, said push button member being mounted for movement axially thereof in one of said openings and projecting therefrom for access externally of said cover for manual operation, said push button member having an outer diameter smaller than the inner diameter of said open-

ings, a guard and guide ring for said push button member mounted in said one opening and filling the space between said inner and outer diameters, said rotary operating member projecting through another of said openings, and an actuating knob for said rotary operating member, said knob having freely engageable surfaces projecting outwardly of said cover for manual operation thereof, and said knob having a portion in rotary engagement with the inner diameter of said other opening and closing said other opening, and a pilot light cover provided with a mounting ring, said latter ring being mounted in a further one of said openings in engagement with the inner diameter thereof, whereby said cover is adapted to mount alternatively in each opening thereof a push button member, a rotary operating member or a pilot light cover.

8. A push button station comprising, a frame for supporting a plurality of switches, a cover for said frame, said cover having defined therein a row of spaced openings all of which are of the same diameter, and a plurality of switches mounted on said frame, said switches including a switch having a push button operating member and a switch having a rotary operating member, said push button member being mounted for movement axially thereof in one of said openings and projecting therefrom for access externally of said cover for manual operation, said push button member having an outer diameter smaller than the inner diameter of said openings, a guard and guide ring for said push button member mounted in said one opening and filling the space between said inner and outer diameters, said rotary operating member projecting through another of said openings, and an actuating knob for said rotary operating member, said knob having freely engageable surfaces projecting outwardly of said cover for manual

operation thereof, and said knob having a portion in rotary engagement with the inner diameter of said other opening and closing said other opening, and an additional push button member having an outer diameter smaller than the inner diameter of said openings, a guard and guide ring for said additional push button member mounted in a further one of said openings and filling the space between the inner and outer diameters of said additional push button and opening, and said additional button member having a head projecting from said additional ring and having a diameter greater than said additional ring, whereby said cover is adapted to mount alternatively in each opening thereof a rotary operating member, said first mentioned push button member or said additional member.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
902,962	Goodridge	Nov. 3, 1908
1,197,853	Platt	Sept. 12, 1916
1,317,382	Newton	Sept. 30, 1919
1,476,911	Nelson	Dec. 11, 1923
1,734,678	Krogel	Nov. 5, 1929
2,034,938	Bierenfeld	Mar. 24, 1936
2,277,555	Meuer	Mar. 14, 1942
2,295,517	Meuer	Sept. 8, 1942
2,307,258	De Smidt et al.	Jan. 5, 1943
2,319,868	Killaire	May 25, 1943
2,343,412	Immel	Mar. 7, 1944
2,370,519	Bolesky	Feb. 27, 1945
2,420,066	Conway	May 6, 1947
2,421,865	Beeman	June 10, 1947
2,445,635	Poliakoff	July 20, 1948
2,471,848	Von Hoorn	May 31, 1949
2,506,505	Jeffry	May 2, 1950