May 30, 1967 J. F. WALDORF ET AL 3,322,927

PUSHBUTTON ADAPTER FOR ELECTRICAL SWITCH ASSEMBLY HAVING MULTIPLE PUSHBUTTON OPERATORS

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Fig. 1

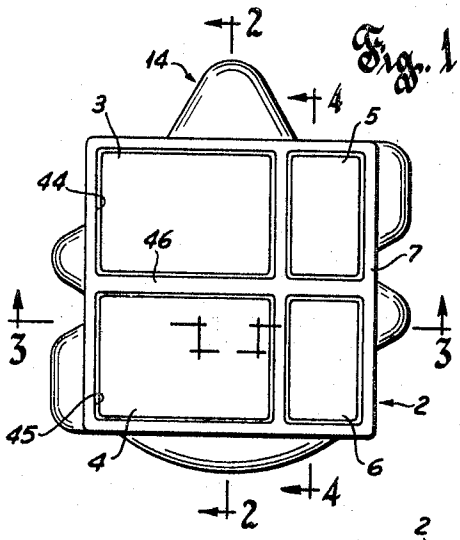


Fig. 2

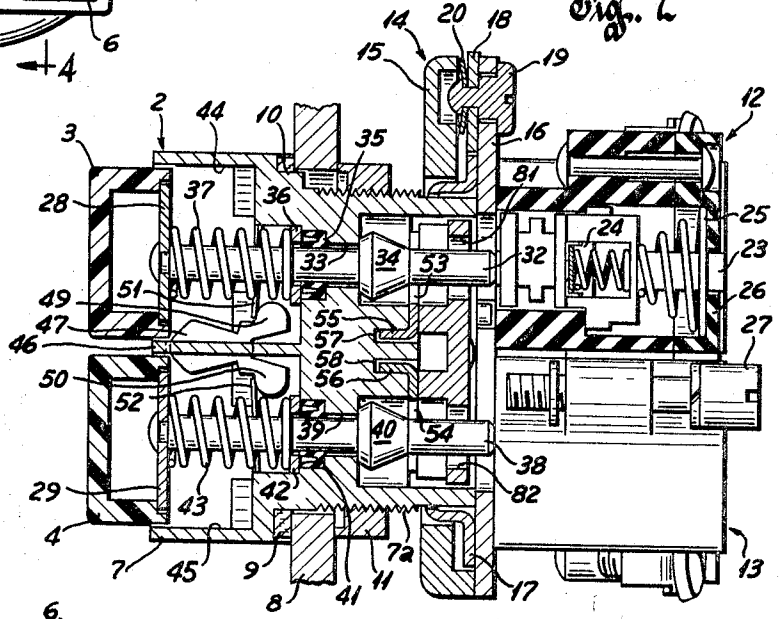
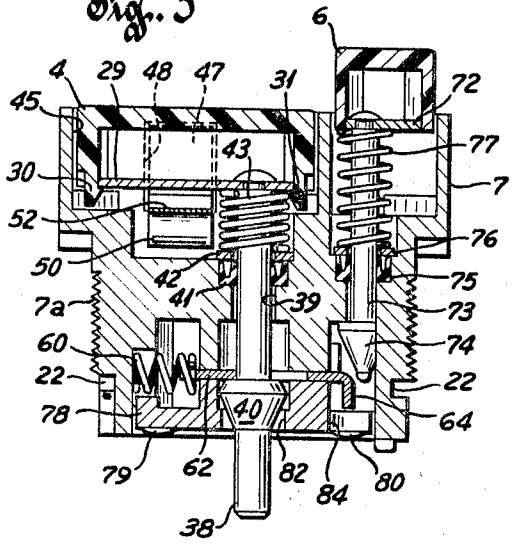


Fig. 3



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Fig. 4

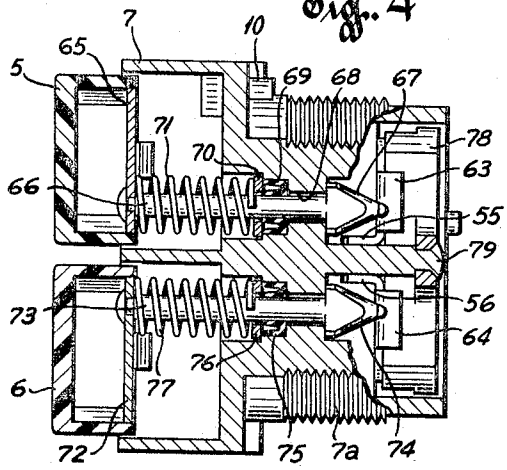


Fig. 5

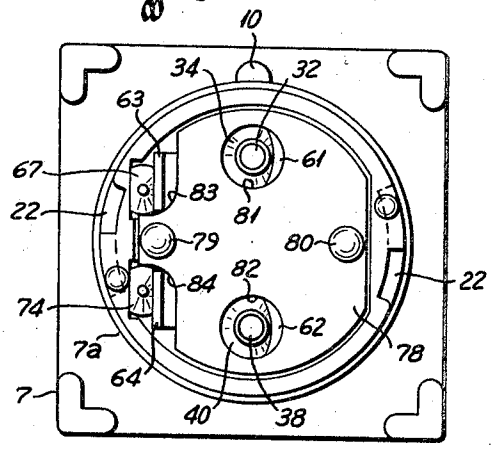


Fig. 6

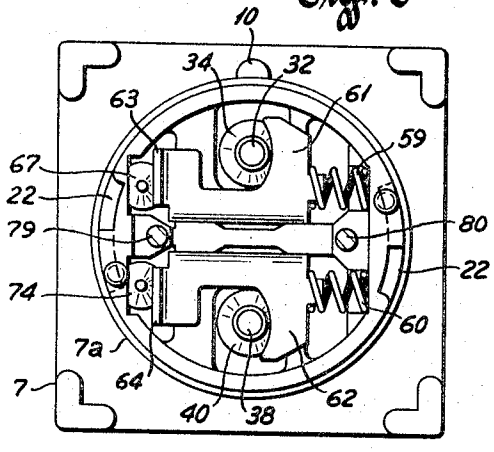


Fig. 7

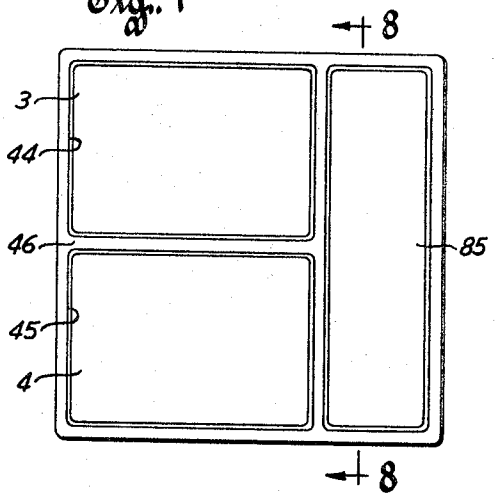
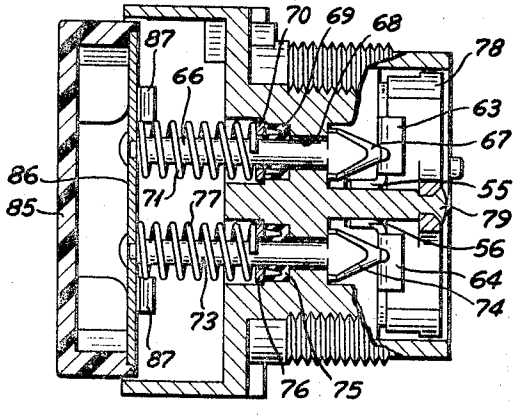


Fig. 8



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PUSHBUTTON ADAPTER FOR ELECTRICAL SWITCH ASSEMBLY HAVING MULTIPLE PUSHBUTTON OPERATORS

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5 Claims. (Cl. 200—172)

ABSTRACT OF THE DISCLOSURE

Manually operated pushbutton electrical apparatus of the one-hole mounted variety having multiple operating pushbuttons and associated latching and releasing mechanisms mounted within a unitary pushbutton adapter with contact blocks attached to the rear thereof.

This invention relates to pushbutton adapters for electrical switch assemblies having multiple pushbuttons within a unitary adapter structure and more particularly to devices of the aforesaid type having latch and release mechanisms for the pushbuttons.

Manually operable one-hole mounting pushbutton adapters for oiltight heavy duty electrical switch assemblies have been conventionally constructed with one pushbutton per adapter to operate one or more switch units assembled with the adapter. In order to accomplish multiple switching functions, it has been usually necessary to use a plurality of individual pushbutton units or a multiple position rotary switch or the like.

It is therefore an object of this invention to provide in a pushbutton switch assembly, a pushbutton adapter which combines certain switching capabilities of a multiple position rotary switch or the like with the operating, indicating and safety advantages of pushbuttons in a compact unitary pushbutton operated electrical switch assembly.

It is a more specific object to provide an adapter of the aforedescribed type having multiple pushbutton operators consisting of a plurality of main pushbuttons, each having latching means, together with latch releasing means comprising one or more release pushbuttons.

It is another specific object of the invention to provide an adapter of the aforedescribed type in which the pushbuttons and associated elements within the adapter can be arranged to provide a variety of latching and interlocking functions.

Other objects and advantages of this invention will be evident to those skilled in the art upon reference to the following description and claims.

While the devices hereinafter described are adapted to fulfill the objects stated, it is to be understood that it is not intended that the invention be confined to the particular preferred embodiments disclosed since they are susceptible of various modifications without departing from the scope of the appended claims.

In the accompanying drawings:

FIGURE 1 is a front elevation view of a pushbutton electrical switch assembly embodying the invention;

FIG. 2 is a partially sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is a sectional view of the pushbutton adapter of FIG. 1 taken on line 3—3 of FIG. 1;

FIG. 4 is a sectional view of the pushbutton adapter of FIG. 1 taken on line 4—4 of FIG. 1;

FIG. 5 is a rear view of the pushbutton adapter shown in FIGS. 3 and 4;

FIG. 6 is a view similar to FIG. 5 but with a rear plate removed to show the interior of the device;

FIG. 7 is a front elevation view of a modified form of the pushbutton adapter; and

FIG. 8 is a sectional view taken on line 8—8 of FIG. 7.

Referring to the drawings, FIG. 1 shows a pushbutton adapter 2 having two main pushbuttons 3 and 4. Two smaller release pushbuttons 5 and 6 are placed adjacent the main pushbuttons 3 and 4. All of the pushbuttons are movably supported within a die cast frame or retainer 7. Retainer 7 is adapted to be mounted within a hole in a panel 8 (FIG. 2). As shown in FIG. 1, the portion of retainer 7 in front of the panel 8 is rectangular in shape. The rearward extending portion 7*a* of retainer 7 is in the form of a round cylindrical bushing which passes through the panel 8. when retainer 7 is mounted in panel 8, a gasket 9 is interposed between retainer 7 and panel 8 for sealing purposes. A key 10 is formed on the periphery of portion 7*a* to index with a keyway formed in the otherwise circular mounting hole in panel 8 to thereby prevent unwanted rotation of retainer 7. A nut 11 is turned upon the threaded periphery of bushing 7*a* to tighten against the rear of panel 8 to securely fasten retainer 7 to panel 8.

A pair of substantially identical contact blocks 12 and 13 are mounted on the rear of bushing 7*a* by means of a mounting device 14. Mounting device 14 comprises a housing member 15, a rear plate 16 and a latch ring 17. Housing member 15 is fastened to plate 16 and latch ring 17 is rotatably held therebetween. A gear 18 is attached to a rotatable shaft 19 and engages the periphery of latch ring 17. A spring washer 20 is also mounted on shaft 19. Mounting device 14 is attached to bushing 7*a* by turning shift 19 to thereby rotate latch ring 17. A pair of lugs (not shown) on latch ring 17 then engage a pair of grooves 22 formed in bushing 7*a* to firmly attach mounting device 14 to bushing 7*a*. Each of contact blocks 12 and 13 is of the type having a plunger 23 and a bridging contact member 24 which may be reciprocally actuated. A return spring 25 is interposed between a housing 26 and plunger 23 to provide a return force thereto. Each of contact blocks 12 and 13 is fastened to plate 16 by a pair of screws such as screw 27 shown in FIG. 2 which may be turned to engage a threaded hole (not shown) in plate 16. The structure of such contact blocks, the structure of mounting device 14, and the method of mounting the pushbutton assembly are more completely described in the copending application Ser. No. 520,444, filed Jan. 13, 1966, by Roy A. Mukai, Allan P. Charbonneau, Joseph F. Waldorf and Robert Pearson, and assigned to the present assignee.

The mechanism associated with pushbutton 3 bears a mirror image relationship to the mechanism associated with pushbutton 4. These mechanisms are otherwise similar and some of the corresponding elements are identical. Pushbuttons 3 and 4 are respectively assembled to plates 28 and 29 by means of integral lugs such as lugs 30 and 31, on pushbutton 4 shown in FIG. 3 which resiliently snaps over the opposite edges of plate 29. Plate 28 is riveted to the end of a reciprocatory pushrod 32 which extends slidingly through an aperture 33 in retainer 7 to communicate at the rear thereof with the plunger 23 of contact block 12. An enlarged portion 34, which comprises two frusto-conical surfaces base-to-base, has a front edge which engages retainer 7 to stop pushrod 32 against movement in a return direction beyond that position shown in FIG. 2. A resilient ring seal 35 surrounds pushrod 32 to prevent liquid transport through aperture 33. A washer 36 covers seal 35. The return force is applied to the mechanism of pushbutton 3 by a compression spring 37 interposed between washer 36 and plate 28. Similarly, plate 29 is riveted to the end of pushrod 38 which extends through aperture 39, to operate the plunger (not shown) of contact block 13. The enlarged portion 40 of pushrod 38 is identically shaped as portion 34 of pushrod 32 and

similarly serves as a stop. A seal 41 surrounds pushrod 38 to seal aperture 39. A washer 42 covers seal 41. A return force to pushbutton 4 is provided by a compression spring 43 between washer 42 and plate 29.

Pushbuttons 3 and 4 fit loosely within cavities 44 and 45 formed in the front face of retainer 7. Cavities 44 and 45 are separated by a wall 46 and are of such depth as to allow pushbuttons 3 and 4 to be depressed sufficiently to actuate contact blocks 12 and 13.

An interlock 47 is placed in a rectangular aperture 48 in wall 46. A pair of legs 49 and 50 on interlock 47 straddle the rear edge of aperture 48. Interlock 47 pivots upon wall 46 at the juncture of legs 49 and 50. A pair of cantilever flat springs 51 and 52 are each fastened at one end to retainer 7 and, at their other ends, bear rearwardly against the respective ends of legs 49 and 50. The resilient equal pressures of springs 51 and 52 on legs 49 and 50 tend to keep the opposite wedge shaped end of interlock 47 centered within wall 46 and extending equally into cavities 44 and 45. As one or the other of pushbuttons 3 and 4 is depressed, the engagement of the depressed pushbutton forces the wedge shaped end of interlock 47 toward and further into the cavity of the opposite pushbutton to there interfere with the depression of that opposite pushbutton. As interlock 47 moves to one side or the other, it pivots upon wall 46 against the centering pressure of one or the other of springs 51 and 52. Simultaneous depression of pushbuttons 3 and 4 is thereby prevented. If desired, interlock 47 and springs 51 and 52 may be omitted. Pushbuttons 3 and 4 could then be operated simultaneously but the operation of the adapter mechanism would not in any other way be affected.

Latching means are provided for each of pushbuttons 3 and 4 to hold the pushbuttons and associated contact block mechanisms in the depressed or actuated position. Two sliding generally C-shaped sliding latches 53 and 54, as best shown in FIG. 6, are furnished to latch pushrods 32 and 38, respectively. The latches 53 and 54 are of sheet metal construction and bear a mirror image relationship to one another. Edges 55 and 56 of latches 53 and 54 are bent forwardly to slidingly engage a corresponding pair of grooves 57 and 58 and thereby guide the reciprocatory movement of latches 53 and 54. A pair of compression springs 59 and 60 (FIG. 6) are interposed between retainer 7 and latches 53 and 54 so that the curved legs 61 and 62 are biased toward pushrods 32 and 38 to engage the forward edges of enlarged portions 34 and 40 when pushbuttons 3 and 4 are fully depressed. The rearward conical surfaces of portions 34 and 40 serve to cam legs 61 and 62 away from pushrods 32 and 38 against the bias of springs 59 and 60 when the pushbuttons 3 and 4 are depressed.

In order that the latches 53 and 54 may be released to allow pushrods 32 and 38 to return to their released positions, a latch releasing mechanism is provided for each of the main pushbutton mechanisms. At the ends of latches 53 and 54 opposite springs 59 and 60, a pair of tabs 63 and 64 are bent perpendicular to the principal plane of latches 53 and 54 to form cam follower surfaces. In the embodiment illustrated in FIG. 1 through FIG. 6, the latch release mechanisms are separate and are operated by depression of one or the other of release pushbuttons 5 and 6, release pushbuttons 5 being effective to release main pushbutton 3 and release pushbutton 6 being effective to release main pushbutton 4. Release pushbutton 5 is snap fastened to a plate 65 which is in turn riveted to a pushrod 66. At the rearward end of pushrod 66, there is a generally conical cam 67 which when moved rearwardly encounters the cam follower surface 63 to move latch 53 against the bias of spring 59 and thereby release pushbutton 3. One side of conical cam 67 is flattened to conform with the adjacent interior wall of retainer 7 as shown in FIG. 6. Pushrod 66 is slidingly supported in aperture 68 in retainer 7. A seal 69 surrounds pushrod 66 and a washer 70 covers seal 69. A compression spring 71

provides a biasing return force to pushbutton 5. Similarly, pushbutton 6 is fastened to plate 72 which is riveted to a pushrod 73. Pushrod 73 with its associated elements is identical to pushrod 66. A conical cam 74 when moved rearwardly engages surface 64 to release pushbutton 4. A seal 75, a washer 76, and a return spring 77 correspond to seal 69, washer 70 and spring 71.

Latches 53 and 54 are held slidingly in place by a rear plate 78 which is riveted to the rear of retainer 7 by rivet portions 79 and 80. FIG. 5 shows plate 78 in place and FIG. 6 shows the adapter mechanism with plate 78 removed. A pair of holes 81 and 82 and a pair of cut-outs 83 and 84 provide clearance for the reciprocating movement of the associated pushrods.

FIGS. 7 and 8 illustrate a modified version of the adapter in which a single release pushbutton 85 is used to simultaneously release both latch mechanisms. Pushbutton 85 is snap fastened to a single plate 86 by means of resilient lugs 87. The mechanism is otherwise identical to those of the previously described version and are similarly numbered. The plate 86 is riveted to both pushrods 66 and 73.

We claim:

1. A unitary compact pushbutton adapter of the one-hole mounting variety for operating a plurality of reciprocally actuable electrical switching means attached thereto comprising:

a retainer member having a front side and a rear side and adapted to be mounted in a hole in a mounting panel with first and second reciprocally actuable electrical switching means attached to the rear side thereof;

first pushbutton means extending through and reciprocally supported within said retainer and having a released position and a depressed position, said first pushbutton means being manually operable from the front side of said retainer, for engaging and actuating said first switching means when depressed;

means biasing said first pushbutton means to its released position;

second pushbutton means extending through and reciprocally supported within said retainer and having a released position and a depressed position, said second pushbutton means being manually operable from the front side of said retainer, for engaging and actuating said second switching means when depressed;

means biasing said second pushbutton means to its released position;

first latching means supported by said retainer for latching said first pushbutton means in its depressed position;

second latching means supported by said retainer for latching said second pushbutton means in its depressed position; and

latch releasing means releasing said first and second latching means and allowing said first and second pushbutton means to return from their depressed positions to their released positions comprising release pushbutton means reciprocally supported within said retainer and manually operable from the front side of said retainer between a normal position and a depressed position for engaging and moving said first and second latching means when depressed to thereby release said first and second pushbutton means.

2. The invention as defined in claim 1 together with means biasing said release pushbutton means to its normal position.

3. The invention as defined in claim 1 in which said release pushbutton means comprises a single pushbutton for simultaneously moving both of said first and second latching means.

4. The invention as defined in claim 1 in which said release pushbutton means comprises two separate and

individually operable pushbutton means for independently moving said first and second latching means.

5. The invention as defined in claim 1 together with interlocking means interlocking the operation of said first and second pushbutton means whereby depression of said first pushbutton means prevents depression of said second pushbutton means and vice versa.

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