

May 26, 1970

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3,514,554

PUSHBUTTON ASSEMBLY

Filed April 18, 1969

3 Sheets-Sheet 1

Fig. 1

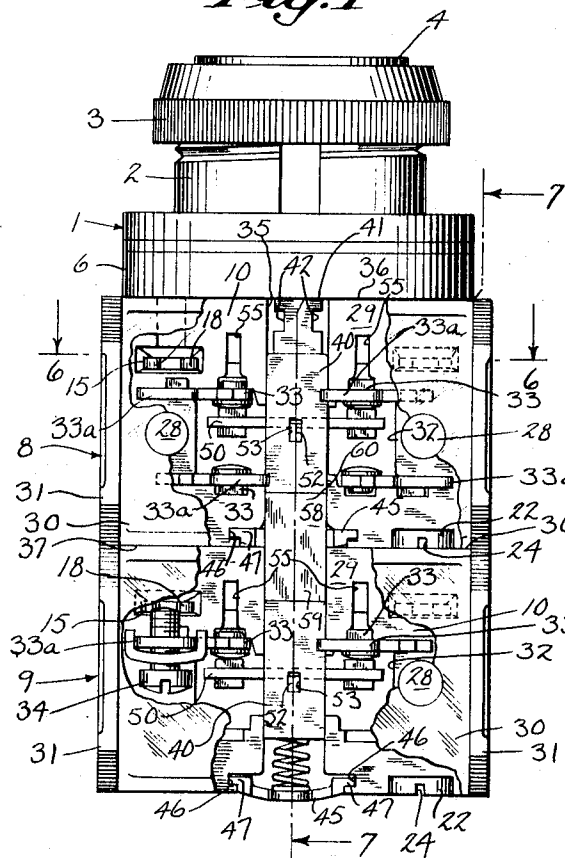


Fig. 2

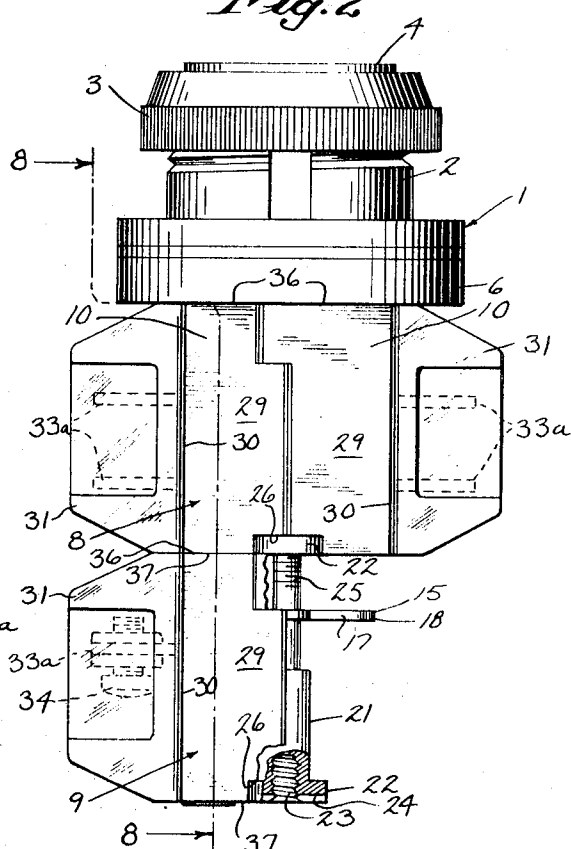
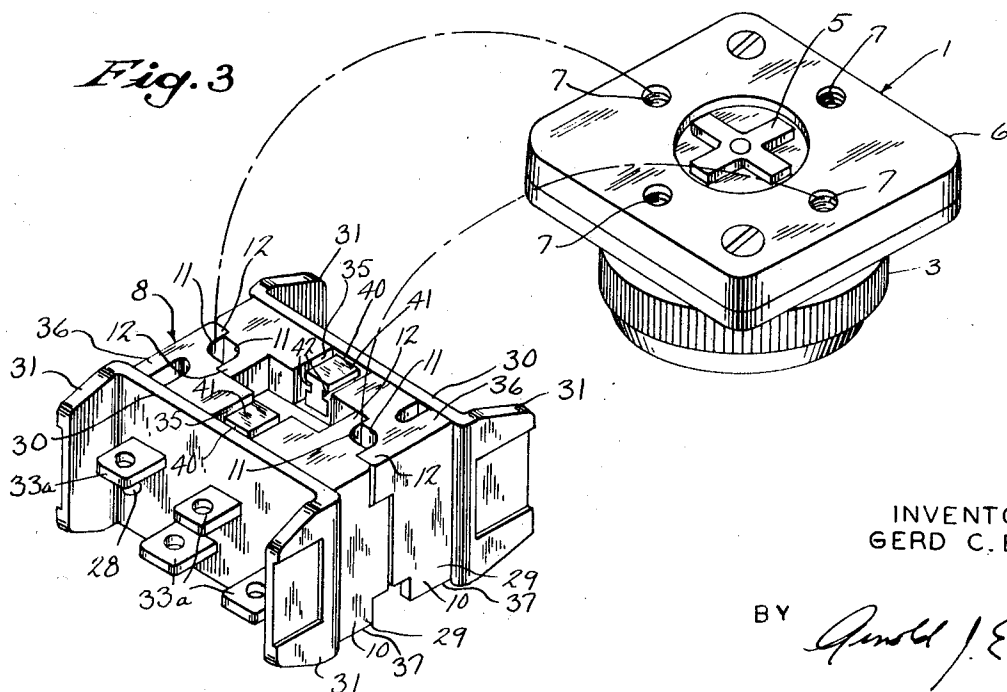


Fig. 3



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Fig. 4

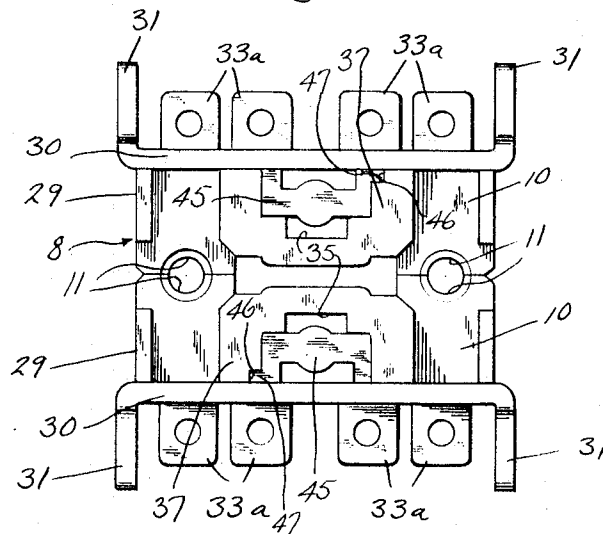


Fig. 5

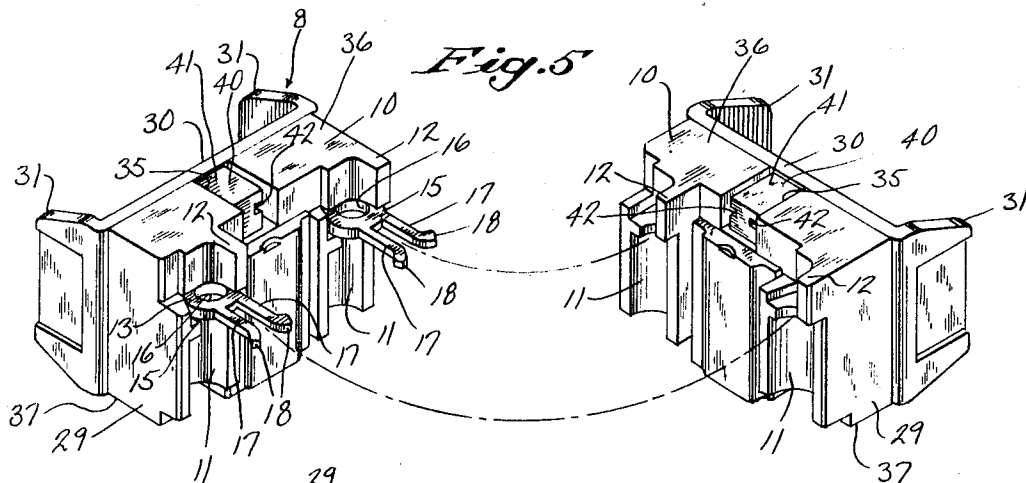
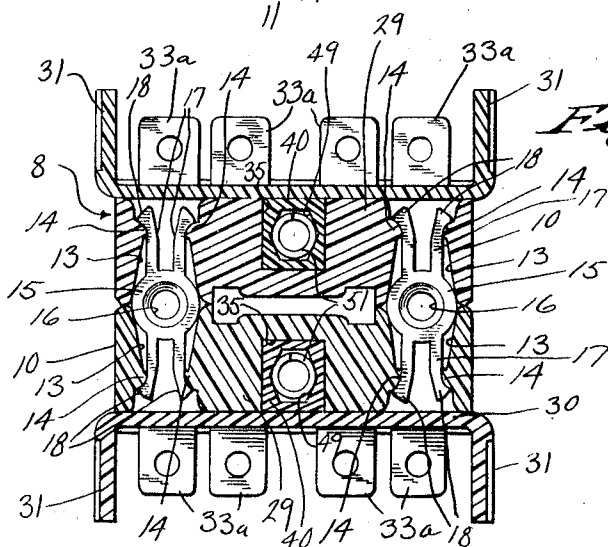


Fig. 6



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Fig. 7

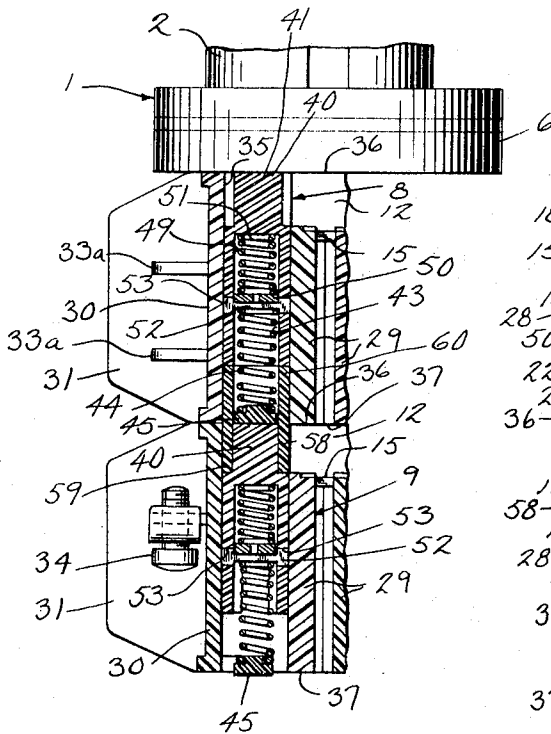


Fig. 8

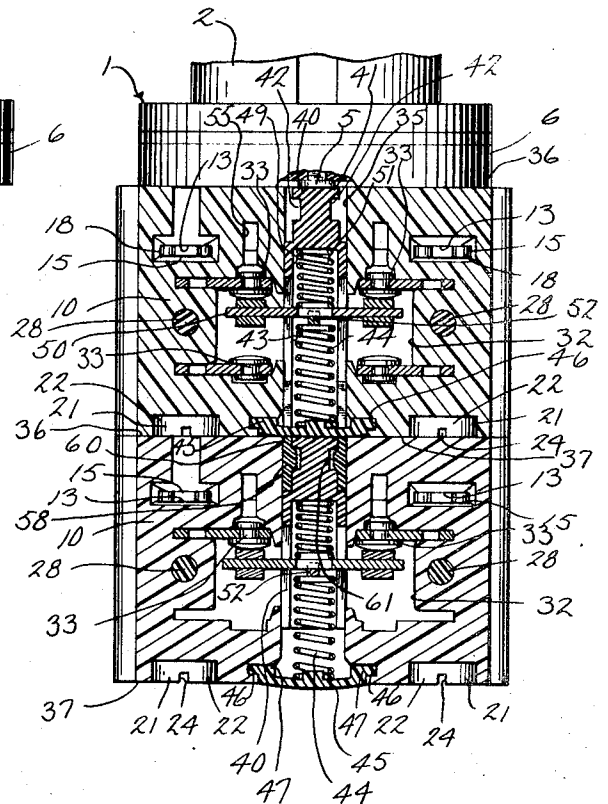
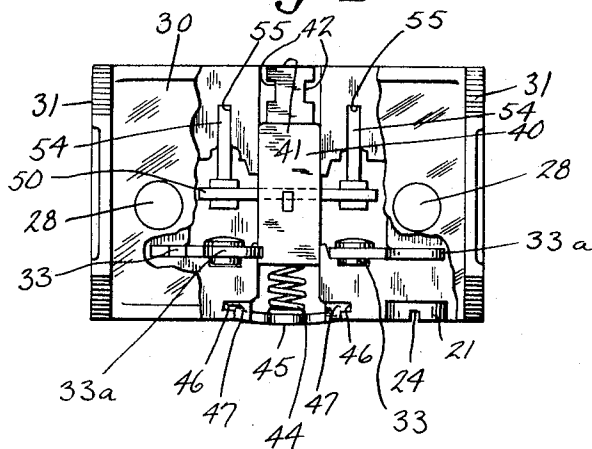


Fig. 9



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PUSHBUTTON ASSEMBLY

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U.S. Cl. 200—16

8 Claims

ABSTRACT OF THE DISCLOSURE

A pushbutton switch includes contact modules arranged for stacking assembly and each of which is split to define a pair of switch sections. A pair of double ended spring clip retainers hold the switch sections together for assembly and also serve as retainers for mounting screws for the modules, the screws having heads which engage the switch sections to clamp them against a mounting surface and to hold them in assembled relationship. The heads of the mounting screws of one module are provided with threaded sockets which receive the mounting screws of the other module to connect the two modules in stacked relationship. When arranged for tandem operation in stacked relationship, the movable contact carriers of one module are aligned end to end with the carriers of the other module, and rigid extensions are interposed between the facing ends of the carriers so that movement of the carriers of one module will be transmitted to the carriers of the other. The extensions are provided with sockets which receive reduced ends of the carriers and are held thereon by detent means for ease in assembly.

Background of the invention

This invention relates to pushbutton switches and the like, and particularly to a modular construction especially suitable for a pushbutton. Pushbutton switches of various types have been known and used, but not all such switches have proven entirely satisfactory or sufficiently versatile. It is often desirable in pushbutton applications, for example, to be able to provide for different types of contact operation, i.e., normally open, normally closed, or C-type constructions, the latter having opposed normally closed, normally open contacts. In special cases it is also desirable to provide for a particularly early or late make or break period. Prior switches have not been sufficiently versatile to allow for these varied modes of operation without being unduly expensive or complex. Modular type switches have been proposed to provide the desired versatility, but these have heretofore been unduly expensive or difficult to manufacture or assemble or have otherwise been unsatisfactory.

Summary of the invention

It is the general object of this invention to provide a modular type of construction for a pushbutton switch or the like in which there may be provided stacked contact modules, each of which is split to define separate switch sections, each of which sections may provide one or more desired operational functions, the result being greatly enhanced versatility. This object is accomplished with a construction that is efficient, durable and versatile while still being relatively simple and inexpensive to manufacture and assemble. Other specific objects and advantages will become apparent from the description of the preferred embodiment to follow.

Brief description of the drawings

FIG. 1 is a front view in elevation, with portions shown

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broken away, of a pushbutton switch constituting a preferred embodiment of the invention;

FIG. 2 is a side view in elevation and partly in section of the switch of FIG. 1, with a module section removed to illustrate the means of mounting modules relative to one another and to the pushbutton head;

FIG. 3 is an exploded view in perspective of the upper contact module comprising opposed separable sections and the operating head of the switch of FIG. 1;

FIG. 4 is a bottom plan view of the contact module shown in FIG. 3;

FIG. 5 is an exploded view in perspective of the contact module shown in FIG. 3;

FIG. 6 is a view in cross-section of the module shown in FIG. 3 taken through the plane 6—6 shown in FIG. 1;

FIG. 7 is a fragmentary view in cross-section of the switch of FIG. 1 taken through the plane 7—7 shown in FIG. 1;

FIG. 8 is a fragmentary view in cross-section of the switch of FIG. 1 taken through the plane 8—8 shown in FIG. 2, and;

FIG. 9 is a fragmentary front view in elevation illustrating a contact module having a different mode of operation than those previously illustrated.

Description of the preferred embodiment

The pushbutton switch shown in the drawings includes a generally conventional operating head 1 which includes a threaded neck 2 and a nut member 3 by means of which the entire switch can be mounted on a panel or the like. The operating head 1 includes a pushbutton 4. By means of a conventional linkage (not shown because such mechanisms are well known to those skilled in the art), depression or release of the button 4 will cause, respectively, extension or retraction of a cruciformed actuator 5 which can be seen most clearly in FIG. 3. With further reference to FIG. 3, it will be observed that an insulating mounting base 6 is provided and includes two female threaded inserts 7 for receiving mounting screws as will later be described.

Connected to the operating head 1 are an upper contact module, designated generally by the reference numeral 8, and a lower contact module designated generally as 9. The modules 8 and 9 are disposed in stacked relationship with one above the other, and are substantially identical, except as will be indicated below, and as a result like reference numerals have been used to refer to like parts thereof. Each of the modules 8 and 9 is vertically split to define front and rear switch sections 10, the two sections 10 of each module being identical except for internal contact arrangement, as hereinafter described. As can best be seen in FIG. 5, the facing surfaces of the sections 10 are provided with vertical grooves 11 which, when the two sections 10 are assembled, define vertical screw bores which extend entirely through each of the respective modules 8 and 9. Near the upper ends of the grooves 11, the facing surfaces of the sections 10 are provided with L-shaped locating projections 12 which complete the screw bores and which cooperate with one another as can best be seen in FIG. 3 to locate the two sections 12 with respect to each other.

Leading outwardly from the grooves 11 in each switch section 10 are slot-like retainer recesses 13 which, as can best be seen in FIG. 6, are further formed to define opposite detents 14 which are spaced from the associated groove 12. The recesses 13 of the two sections 10 are in alignment with one another when the sections 10 are assembled as shown in FIG. 6, and extend oppositely outwardly, forward and rearwardly, from the screw bore.

A pair of double-ended spring, clip-type retainers, designated generally by the reference numeral 15, cooperate with the recesses 13 to hold the switch sections 10 together during assembly. As can best be seen in FIGS. 5 and 6, the retainers 15 include a central section provided with an opening 16 which is in alignment with the screw bore formed by the grooves 11. Extending forwardly and rearwardly therefrom are opposed sets of bifurcated spring legs 17 provided with enlarged ends 18. The retainers 15 are made of a suitable resilient plastic, or other resilient material, so that the legs 17 and enlarged ends 18 act as spring clip means received in the recesses 13 and engageable with the detents 14, as seen in FIG. 6, to hold the two sections 10 together. Pulling the sections 10 apart or pushing them together with sufficient force will allow the legs 17 to be pulled together so that the ends 18 can pass the detents 14, but in the absence of such force the two switch sections 10 will be held together.

With reference to FIG. 2, it will be observed that metal mounting screws 21 are received in the bores formed by the grooves 11 (see also FIG. 5), and are also received through and retained by the openings 16 in the retainers 15. The screws 21 have enlarged heads 22 provided with threaded sockets 23 (see FIG. 2) and screw slots 24 (see FIGS. 1 and 8), and have threaded ends 25 which extend through the upper walls of the modules 8 and 9 when they are assembled.

In addition to holding the switch sections 10 together, the retainers 15 serve an important function in retaining the screws 21 in place during assembly. When it is desired to assemble the modules 8 and 9, the screws 21 are inserted through the opening 16 and one set of legs 17 of each retainer 15 then is inserted into one of the switch sections 10, as illustrated by FIG. 5, whereupon the second section 10 is then snapped into place. (The screws 21 are not shown in FIG. 5 for reasons of clarity of illustration of other elements.) The openings 16 of the retainers 15 are designed to be of such diameter as to hold the screws 21 captive in their proper position and permit their loss while assembly of the two sections 10 is taking place. After the sections 10 have been assembled, the screws 21 are used to mount the completed module 8 or 9 on a mounting surface. In the case of the upper module 8, the threaded ends 25 of the screws 21 are received and in threaded openings 7 on the underside of the operating head 1 to mount the module 8 thereon. In the case of the lower module 9, however, the threaded ends 25 of its screws 21 are received in the threaded sockets 23 of the screws 21 of the upper module 8 to connect the modules 8 and 9 in stacked relationship. In either case, the shoulder portion of the heads 22 of the screws 21 bear against recessed surface portions 26 of the bottom walls of both of the associated switch sections 10 to clamp the switch sections 10 in place against the surface on which they are being mounted, either the underside of the head 1 or the underside portion 26 of the upper module 8. This clamping action is the primary holding force after the entire switch has been assembled, and the holding force of the retainers 15 is intended primarily for use during assembly.

All of the switch section 10 are basically the same, except that they may be modified to provide for different modes of operation. For illustrative purposes, particular reference will be had to the front switch section 10 (with reference to FIG. 1) of the upper contact module 8, which has a mode of operation provided by a C-type contact arrangement; i.e., normally closed, normally open contacts. Each of the switch sections 10 include a casing made up of a base portion 29 and an apertured cover 30 which is provided at its opposite sides with outwardly extending wings 31 which provide enhanced electrical insulation with respect to adjacent switches, and which also facilitate handling of the switch section 10 during assembly. The cover 30 is fastened to the base by means of insulating rivets 28. The base 29 is shaped to define a central generally horizontally extending contact chamber 32 at four

corners of which are stationary contact members 33 which together provide two space sets of stationary contacts. The stationary contacts members 33 are disposed at appropriately shaped recesses in the base 29, and include threaded terminal portions 33a extending outwardly through the apertured cover 30 where they are provided with terminal wire clamping assemblies 34 (only one assembly 34 being shown on the lower module 9 for the sake of simplicity and clarity). The base 29 is also shaped to define a vertical recessed slideway 35 which opens outwardly through both the upper wall 36 and the lower wall 37 of the switch section 10. Reciprocally slidably disposed in the slideway 35 is a movable contact carrier 40 which is of generally rectangular cross section. The carrier 40 has an upper end 41 which is of reduced size and which is provided with opposed grooves 42. The lower end of the carrier 40 defines a seat 43 for a return spring 44 which urges the carrier 40 upwardly. The other end of the spring 44 is seated against a flanged bridging member 45 (see FIG. 4) which extends across the open lower end of the track 35 but does not seal it off completely, there being space both to the front and to the rear of the bridging member 45. As can best be seen in FIGS. 1 and 8, the base 29 is shaped to define grooves 46 on opposite sides of the lower end of the slideway 35 and the flanged bridging member 45 is a separate member that is retained by its flanges 47 in the grooves 46, horizontally relative to FIG. 1.

As can best be seen in FIGS. 7 and 8, the carrier 40 is provided with a transversely extending contact cage 49 within which there is a movable contact spanner 50 which is selectively engageable with the upper or lower stationary contact members 33. An operating spring 51 acts between the spanner 50 and the upper end of the cage 49 to urge the spanner 50 downwardly. Limiting such downward movement is transversely seated key 52, the upper surface of which receives the spanner 50 and the lower surface of which serves as the seat for the return spring 44. The enlarged ends of the key 52 are received in slots 53, and by virtue of this engagement the spanner 50 is carried by and movable with the carrier 40.

Referring again to FIG. 1, the forward switch section 10 of the upper module 8 has its C-type contacts arranged in what can be termed a normal or unactuated position. In this position, the carrier 40 has been urged upwardly by the spring 44 to a position where its upper end 41 is flush with the upper wall 36. The spanner 50 is in engagement with the upper stationary contacts 33 (the ends of the key 52 then being at the lower ends of the slots 53) and is held in this engagement by the force of the spring 44. Upon depression of the button 4, the actuator 5 will engage the top 41 of the carrier 40 and move it downwardly against the spring 44 during the first phase of this movement, the spanner 50 will remain in place and the carrier 40 will be moved downwardly until the ends of the key 52 are at the upper ends of the slot 53. Further movement will cause the spanner 50 to be moved downwardly until it comes into contact with the lower stationary contacts 33. There is an overtravel beyond this point, and this results in the spanner 50 being lifted off the key 52 and held against the lower contacts 33 by the operating spring 51. Release of the button 4 will allow the parts to resume the position shown in FIG. 1.

It will be obvious that by varying the length and placement of the slots 53 and the size of the ends of the key 52 it will be possible to affect the timing of the operation of the spanner 50. That is, for example, increasing the length of the slots 53 upwardly as seen in FIG. 1 will result in a later break since the carrier 40 will have to move downwardly farther before the spanner 50 moves. Other variations are possible, and by properly selecting the size and placement of the parts and spring forces early or late make or break may be attained.

As previously mentioned, the forward switch section 6 of the upper module 8 has a C-type of operation in which the spanner 50 is against either the upper or lower sta-

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tionary contacts 33. The front section 10 of the lower module 9, however, is arranged to have only a normally closed type of operation. In this switch section 10, the lower stationary contacts 33 have been removed so that downward movement of the carrier 40 will result simply in the breaking of a circuit. FIG. 9 illustrates another variation in which there is a normally open operation. In this variation, the upper stationary contacts 33 have been removed so that a circuit is completed only when the carrier 40 is moved downwardly by depression of the button 4. To prevent the carrier from being too far upwardly by the spring 44, however, spacers 54 are provided and serve as stops limiting upward movement of the spanner 50. The bases 29 of all of the switch sections 10 are provided with recesses 55 to receive spacers 54 so that the same base molding can be used regardless of what type of operation is desired.

Both carriers 40 of the upper contact module 8 are in aligned end-to-end relationship with respective carrier 40 of the lower module 9, and are connected for simultaneous operation by means of rigid extensions 58. As can best be seen in FIGS. 7 and 8, the lower ends 59 of the extensions 58 are box-like and surround the upper ends 41 of the associated contact carriers 40 and butt against the bodies thereof. The upper ends 60 of the extensions 58 are bifurcated, with the bifurcated parts extending upwardly past and on opposite sides of the associated bridge 45 to bear against the bottom end of the associated upper carrier 40. Thus, downward movement of the upper carrier 40 will be transmitted through the extension 58 to the associated lower carrier 40 so that both carriers 40 will operate substantially simultaneously. As can best be seen in FIG. 8, the lower ends 59 of the extensions 58 are provided with opposite, inwardly facing detents 61, and these are in engagement with the grooves 42 of the carrier (see FIG. 1) to hold the extensions 58 in place. This especially advantageous during assembly, since the extensions 58 can be attached to the upper ends 41 of the carriers 40 of the lower module 9 before it is mounted and will not be likely to fall out during assembly.

The embodiment of the invention shown and described herein has the several important advantages referred to above. It provides an extremely versatile switch in that by virtue of the modular construction there may in effect be several varieties of switch mechanisms, each of which can have any desired mode of operation. As shown in FIG. 2, one of the sections 10 (the lower right in this case) may be omitted if desired. Also only on module 8 may be provided (not shown) or even one section 10 may be provided, if so desired. The several components are relatively simple and are extremely easy to assemble, with minimum danger of loss of loose parts. Although a preferred embodiment of the invention has been shown and described, it will be obvious that modifications in both structure and use might be made without departure from the scope or spirit of the invention. It is not intended that the invention be limited by the showing herein or in any other manner, therefore, except insofar as may be necessary.

I claim:

1. A contact module for a pushbutton switch or the like comprising:

a housing that is split to define two facing switch sections, the facing surfaces of the sections being provided with aligned grooves which together define a mounting screw bore extending through the housing and also being provided with aligned retainer recesses extending laterally relative to the axis of said bore;

movable and stationary contact means in each switch section;

a retainer provided with oppositely extending spring clip means removably received in the respective retainer recesses to hold the switch sections together,

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the retainer also being provided with a central opening aligned with the bore; and

a mounting screw in the bore that is received through the retainer opening and having a threaded end extending outwardly through one end of the bore and a head at its other end that is adapted to engage the switch sections to clamp them against a mounting surface.

2. A contact module according to claim 1 wherein there are two sets of grooves and retainer recesses, two retainers and two screws, the two screws being aligned and parallel and disposed in laterally spaced relationship.

3. A contact module according to claim 2 in combination with a like module, the heads of the mounting screws of one module being provided with outwardly opening threaded sockets which receive the threaded ends of the mounting screws of the other module to connect the two modules in stacked relationship.

4. A set of stacked contact modules according to claim 3 wherein:

each switch section includes upper and lower walls, a carrier slideway extending therethrough that opens through said walls, stationary contact means, and a movable contact carrier that has an upper end of reduced size and a lower end and that is reciprocally movable in the slideway between a normal position wherein its upper end is flush with the upper wall and an actuated position in which its upper end is moved downwardly, the lower end of the carrier being spaced above the lower wall in both of said positions, the carriers of the two modules being in aligned vertical end-to-end relationship, the carriers being provided with movable contact means movable therewith to be selectively engageable with the stationary contact means; and

wherein there is a bridge member extending across the lower end of each carrier track with spaces on opposite sides thereof, and there is a return spring operable between the bridge member and the lower end of the carrier to urge the carrier toward its normal position; and

wherein there is a rigid extension interposed between the facing ends of the two carriers to transmit motion of one to the other, the upper end of said extension being bifurcated to define arms which pass on opposite sides of the bridge member to engage the lower end of the upper carrier and the lower end of said extension being shaped to receive the reduced upper end of the lower carrier and bear against the body thereof, there being detent means to removably hold the extension on the upper end of the lower carrier.

5. In a pushbutton switch or the like comprising a pair of vertically stacked contact modules each of which has a carrier track and a contact carrier reciprocally movable along the track, the two carriers being in vertically aligned end-to-end relationship the improvement wherein:

there is a bridge member extending across the lower end of the carrier track of the upper module with spaces on opposite sides thereof; and

there is a return spring interposed between the bridge member and the upper carrier to urge the same upwardly; and

the upper end of the lower carrier is of reduced size; and

there is a rigid extension interposed between the lower end of the upper carrier and the upper end of the lower carrier to transmit motion of one to the other, said extension including an upper end that is bifurcated to define arms that pass on opposite sides of the bridge member and bear against the lower end of the upper carrier and a lower end that receives the reduced upper end of the lower carrier and bears against the body thereof; and

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there is a detent means to removably hold the extension on the lower carrier.

6. A switch section for a pushbutton switch or the like comprising:

a housing having an exposed surface provided with a semi-circular groove defining an enlarged recessed surface at one end of said groove;

movable and stationary contact means in said switch section;

a mounting screw seated in said groove and having a threaded end extending outwardly of one end of the groove and an enlarged head adapted to be received in seating relationship with the enlarged recessed surface at the opposite end of the groove to clamp the switch section against a mounting surface.

7. A switch section according to claim 6 wherein there is provided a retainer recess extending laterally relative to the axis of said groove, and a retainer provided with spring clip means removably received in the retainer recess, and including an opening externally of the recess to receive and hold captive said mounting screw.

8. A switch section according to claim 7 wherein said retainer includes oppositely extending spring clip means to be received in the retainer recess of a like switch

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section housing which when combined with the first mentioned housing will provide a contact module having both sections held together and clamped against a mounting surface by means of the said mounting screw seated in aligned semi-circular grooves of said sections.

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200—168