

Sept. 12, 1944.

C. F. ROBBINS

2,357,971

SELECTOR SWITCH

Filed July 18, 1942

4 Sheets-Sheet 1

Fig. 1

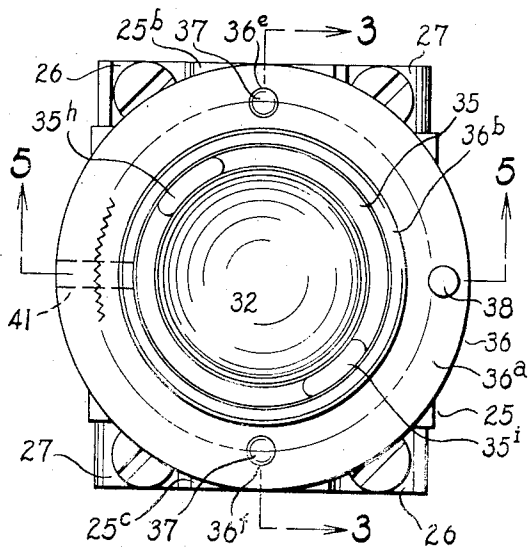


Fig. 3

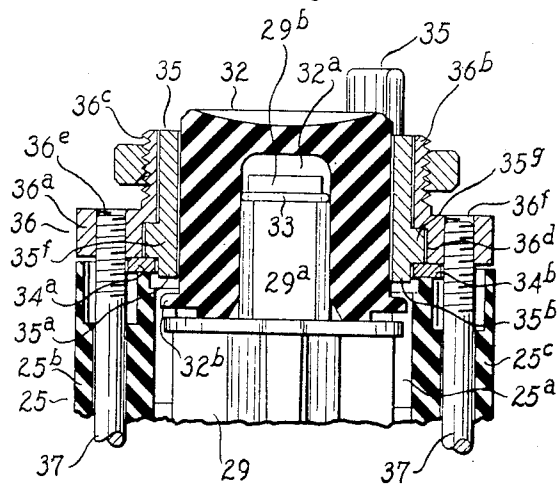


Fig. 2

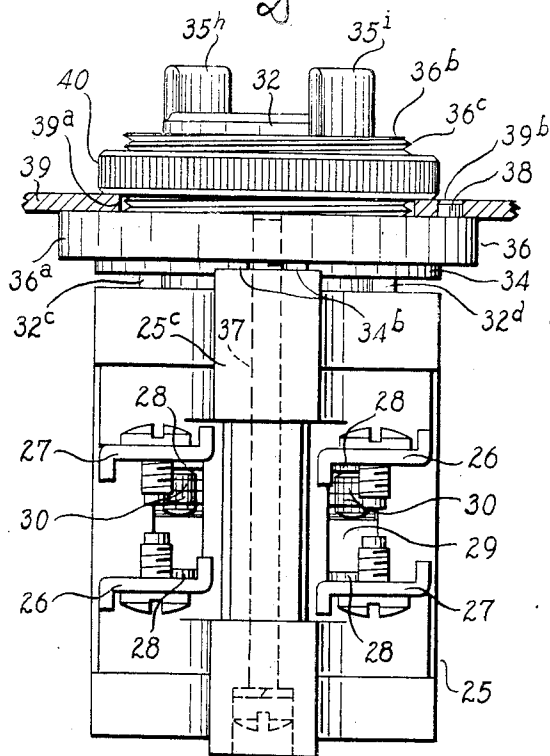
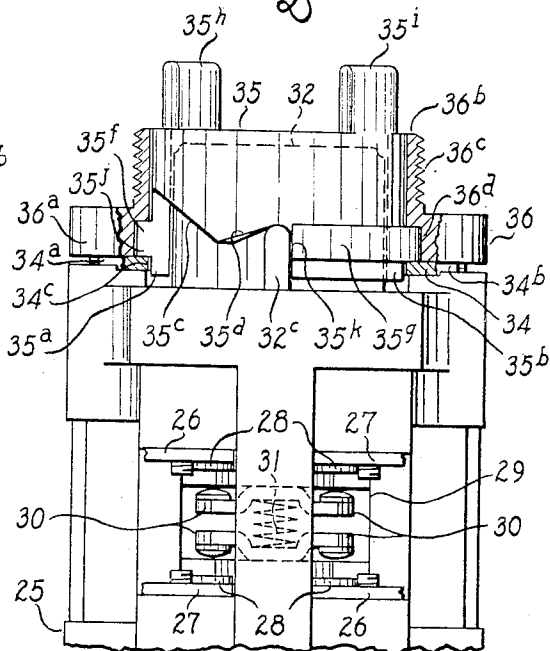


Fig. 4



Inventor
Clyde F. Robbins
By Frank H. Hubbard
Attorney

Sept. 12, 1944.

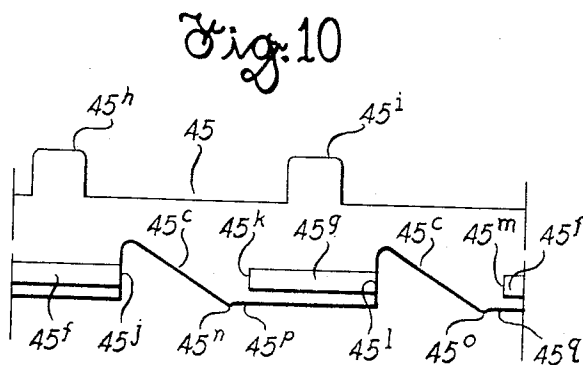
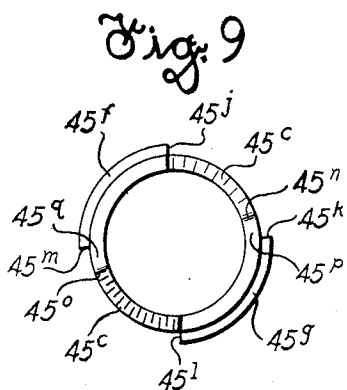
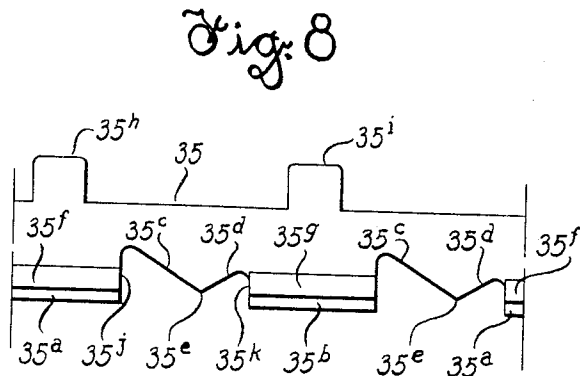
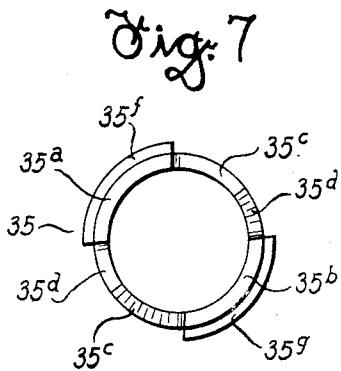
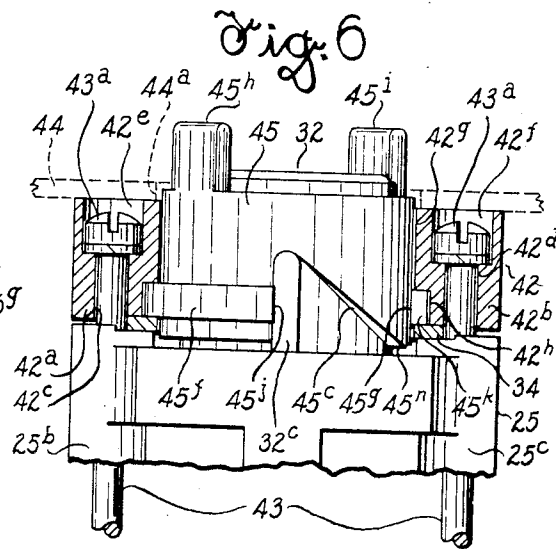
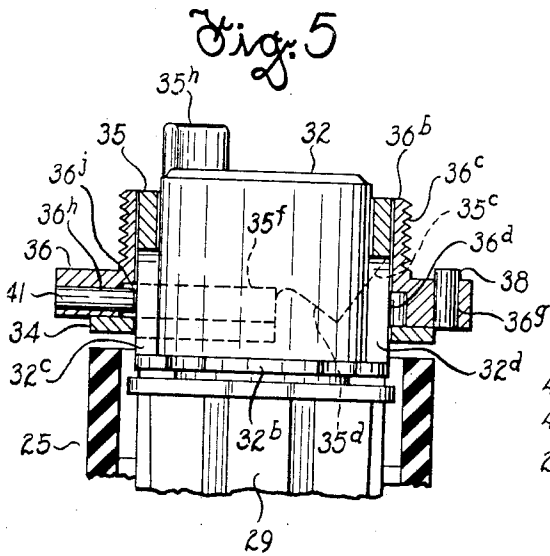
C. F. ROBBINS

2,357,971

SELECTOR SWITCH

Filed July 18, 1942

4 Sheets-Sheet 2



Inventor
Clyde F. Robbins
By Frank H. Hubbard
Attorney

Sept. 12, 1944.

C. F. ROBBINS

2,357,971

SELECTOR SWITCH

Filed July 18, 1942

4 Sheets-Sheet 3

Fig. 11

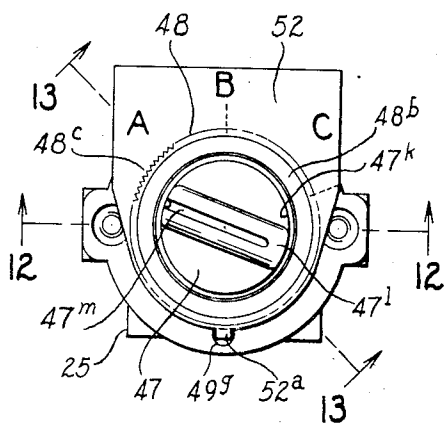


Fig. 13

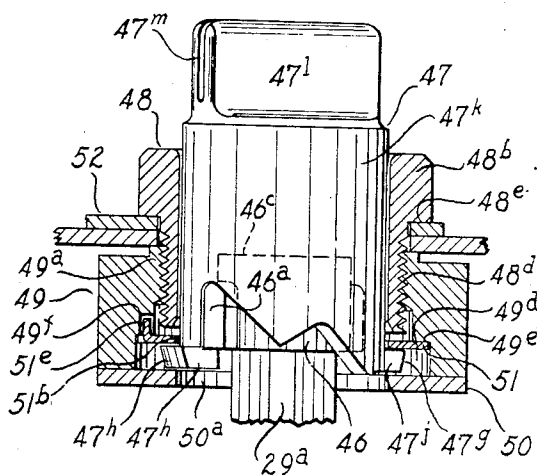


Fig. 12

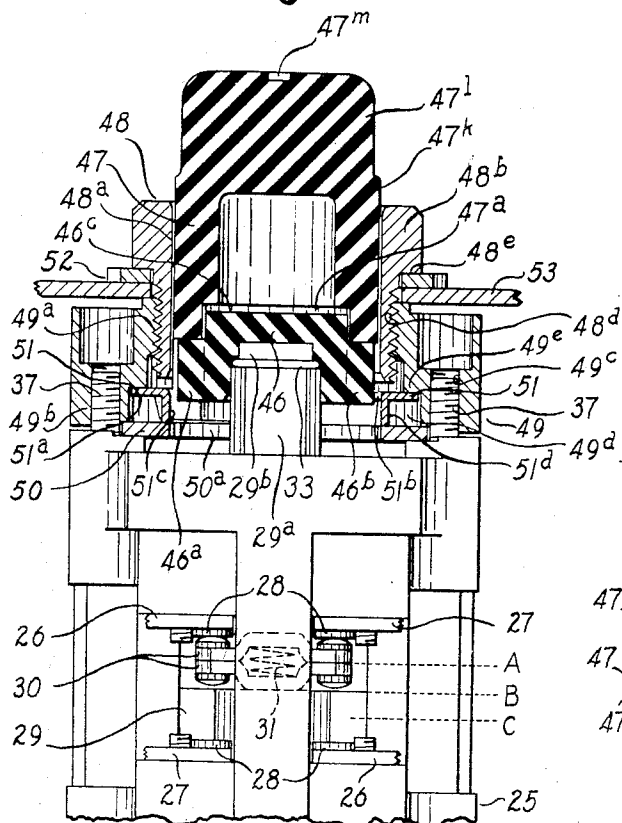


Fig. 14

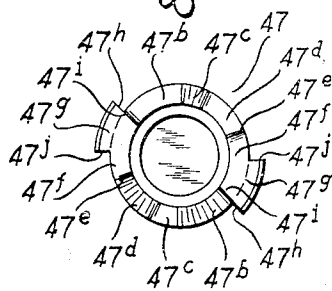
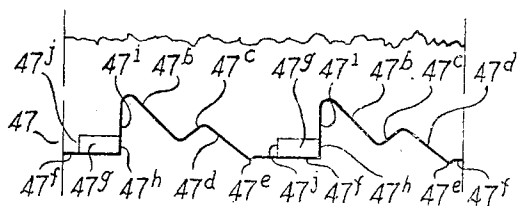


Fig. 15



Inventor
Clyde F. Robbins
By Frank H. Hubbard
Attorney

Sept. 12, 1944.

C. F. ROBBINS

2,357,971

SELECTOR SWITCH

Filed July 18, 1942

4 Sheets-Sheet 4

Fig. 16

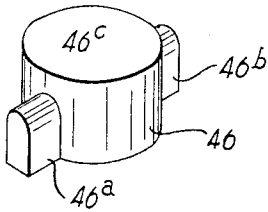


Fig. 19

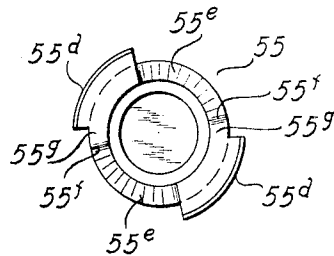


Fig. 17

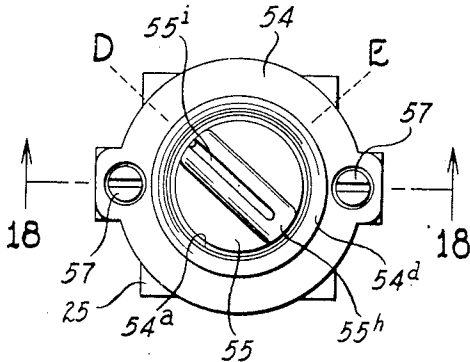


Fig. 20

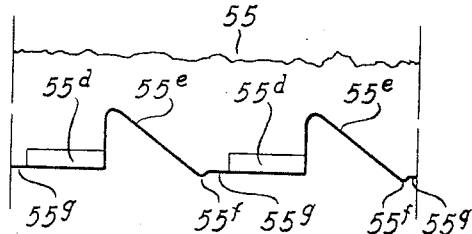


Fig. 18

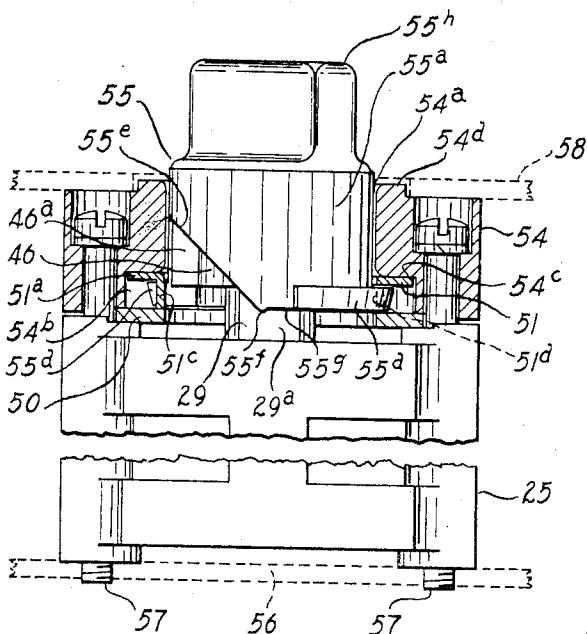
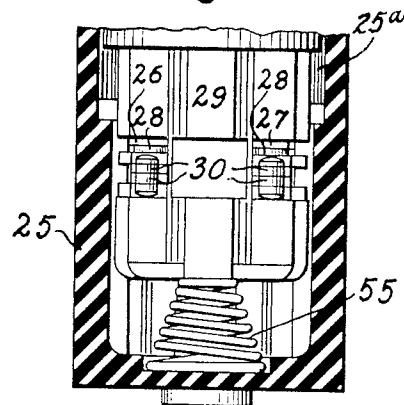


Fig. 21



Inventor
Clyde F. Robbins
By Frank H. Hubbard
Attorney

UNITED STATES PATENT OFFICE

2,357,971

SELECTOR SWITCH

Clyde F. Robbins, Milwaukee, Wis., assignor to
Cutler-Hammer, Inc., Milwaukee, Wis., a cor-
poration of Delaware

Application July 18, 1942, Serial No. 451,417

16 Claims. (Cl. 200—16)

This invention relates to improvements in selector switches, and more particularly to operators for multiple-circuit controlling switches having reciprocating contactors.

A primary object of the invention is to generally improve the construction of the parts and the operative characteristics of such switches.

Another object is to provide for more complete utilization of the structural features of a switch of the character herein disclosed whereby attainment of a maximum number of desired circuit controlling functions is made possible.

Another object is to minimize the number of different parts required to provide selector switches having substantially different circuit controlling characteristics.

Another object is to provide a selector switch all parts of which are of extremely rugged and durable construction, and adapted for quick and easy assembling.

Another object is to provide novel forms of selector type operating superstructures adapted for use in conjunction with switches of known form.

Another object is to provide selector switches adapted for use with alternative forms of adapter members whereby either base mounting or one-hole mounting of the switch units is made possible.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate certain embodiments of the invention which will now be described, it being understood that the embodiments illustrated are susceptible of modification in respect of certain structural details thereof within the scope of the appended claims.

In the drawings, Figure 1 is a top plan view of a pushbutton switch of the one-hole mounting type, said switch having a rotary selector ring associated therewith to provide for disengagement of all of the contactors at will and retention thereof in disengaged position.

Fig. 2 is a side elevational view of the switch illustrated in Fig. 1, showing the manner of effecting one-hole mounting thereof to a perforated panel or similar support.

Fig. 3 is a fragmentary sectional view, on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary side elevational view, at a right angle to that of Fig. 2, showing all of the bridging contactors in their intermediate "off" position, a portion of the adapter member being broken away to illustrate one of the two sets of cam surfaces formed upon the ring.

Fig. 5 is a fragmentary sectional view, on the line 5—5 of Fig. 1, the pushbutton and a portion of the plunger being shown in elevation.

Fig. 6 is a fragmentary view of a switch having a modified form of selector ring which is rotata-

ble at will to move the switch contactors from their upper "on" position to their lower "on" position, and to latch them in the latter position; the adapter member being shown in vertical section to illustrate one of the two sets of cam surfaces formed upon the ring.

Fig. 7 is a bottom plan view of the selector ring employed in the switch of Figs. 1 to 5, showing the form and arrangement of the two sets of cam surfaces thereupon, and the combined retaining and stopping lugs formed integrally therewith.

Fig. 8 is a view showing the development of the sets of cam surfaces upon the selector ring of Fig. 7.

Fig. 9 is a bottom plan view of the selector ring employed in the switch of Fig. 6, showing the form and arrangement of the two sets of cam surfaces thereupon, and the retaining and stopping lugs like those of Fig. 7.

Fig. 10 is a view showing the development of the sets of cam surfaces upon the selector ring of Fig. 9.

Fig. 11 is a top plan view of a three-position rotary selector switch of the one-hole mounting type.

Fig. 12 is a fragmentary view, partly in vertical section, on the line 12—12 of Fig. 11, and partly in side elevation; the switch contactors being shown in their upper "on" position "A," to which they are normally biased, and the same being also adapted for movement to and retention in their intermediate "off" position "B" or their lower "on" position "C."

Fig. 13 is a fragmentary sectional view, on the line 13—13 of Fig. 11, the rotary selector member, a portion of the plunger, and the insulating cap member attached to the latter, being shown in elevation.

Fig. 14 is a bottom plan view of the rotary selector member of Figs. 11 to 13, showing the form and arrangement of the two sets of cam surfaces thereupon, and the combined retaining and stopping lugs formed integrally therewith.

Fig. 15 is a fragmentary view showing the development of the sets of cam surfaces upon the selector member of Fig. 14.

Fig. 16 is a perspective view of the insulating cap member to be associated with the switch plunger in the manner shown in Figs. 12 and 13, said cap member having integral laterally extending lugs for cooperation with the respective sets of cam surfaces upon the selector member.

Fig. 17 is a top plan view of a two-position rotary selector switch wherein the contactors are movable to and retained in either their upper or lower "on" positions, without providing for retention thereof in their intermediate "off" position, the switch including an adapter mem-

ber arranged to provide for base mounting of the device as a whole.

Fig. 18 is a fragmentary view partly in vertical section, on the line 18—18 of Fig. 17, and partly in side elevation, the upper panel or cover and the lower panel, to which the switch unit is attached, being shown in dotted lines.

Fig. 19 is a bottom plan view of the rotary selector member of Figs. 17 and 18, showing the form and arrangement of the two sets of cam surfaces thereupon, and the combined retaining and stopping lugs formed integrally therewith.

Fig. 20 is a fragmentary view showing the development of the sets of cam surfaces upon the selector member of Fig. 19, and

Fig. 21 is a fragmentary sectional view of the insulating base; the insulating plunger, the biasing spring therefor, the contactors, and certain of the contacts, being shown in elevation.

Referring first to that form of the invention shown in Figs. 1 to 5, 7 and 8, the numeral 25 designates a contact-carrying base, which is preferably a one-piece, recessed, molded insulating base of the character disclosed and claimed in my prior application Serial No. 449,756, filed July 4, 1942, for improvements in Electric switches, to which application reference may be had for a more detailed description of the various elements of the reciprocating contactor type of switch mechanism. Thus, as indicated in Figs. 1 and 2 hereof, the base 25 may have attached thereto eight combined contact and terminal members, consisting of four so-called "left-hand" members 26 and four right-hand members 27. Members 26 and 27 differ primarily in respect of the surfaces thereof to which the contact tips 28, of silver or other highly conducting and arc-resisting material, are attached, as by spot-welding. So, also, the plunger 29 may be identical in shape and size with that disclosed in said application, Serial No. 449,756; said plunger being biased toward its upper extreme position, as by means of a conical coiled compression spring (55 in Fig. 21), and said plunger being adapted to accommodate on each side thereof a pair of bridging contactors, all of which are designated by the numeral 30, the contactors of each pair being normally biased apart as by means of a coiled compression spring, as shown in dotted lines at 31 in Fig. 4.

A pushbutton 32 has a downwardly opening recess 32^a (Fig. 3) formed therein to freely receive the reduced upper end portion or extension 29^a of the plunger, a spring ring 33 being positioned within the corner notches at the lower end of the further reduced portion 29^b of extension 29^a, to provide a frictional connection between button 32 and plunger 29. Button 32 is provided with a flange 32^b adjacent to the lower end thereof, said flange being so shaped, with respect to the shape of the upper end portion 25^a (Fig. 3) of the recess in base 25, as to provide for assembly of the button to the plunger, when in the base recess, in only one or another of two positions spaced from one another by a rotary angle of one hundred and eighty degrees. The purpose of this feature is to insure that the pair of diametrically opposed laterally projecting lugs 32^c and 32^d, formed integrally with button 32, shall be positioned in a plane at right angles to a plane intersecting the lateral extensions 25^b and 25^c of base 25, to provide for proper cooperation of one or both of the manually operable lugs upon a selector ring (hereinafter described) with respect to suitable legends, to indicate the

condition of the circuit or circuits controlled by the switch.

A flat, punched sheet metal plate 34 of substantially circular contour is provided at diametrically opposite points with notched lugs 34^a and 34^b (Figs. 2, 3 and 4) to overlie portions of the upper ends of said base extensions 25^b and 25^c. Plate 34 is provided with a central circular opening 34^c of a diameter to afford rotary clearance for the lugs 32^c and 32^d upon button 32. Said opening 34^c also provides rotary clearance for the diametrically opposed segmental lower end portions 35^a and 35^b (see Figs. 3, 4, 7 and 8) of a die cast metal selector ring 35. Ring 35 is of substantially cylindrical form, as illustrated; and the same is provided between the segmental portions 35^a and 35^b with two like sets of cam surfaces 35^c, 35^d, the surfaces 35^c, 35^e and 35^d, 35^f of the respective sets being diametrically opposed to each other. One set of cam surfaces 35^c, 35^d is adapted for cooperation with button lug 32^c and the other set of said cam surfaces is adapted for simultaneous cooperation with button lug 32^d.

As best illustrated in Fig. 8 the cam surfaces 35^c, 35^d of the respective sets converge at points 35^e, 35^f which are preferably spaced upwardly a slight degree above the common plane of the lower surfaces of a pair of segmental lateral extensions 35^g and 35^h. In practice the active portion of each cam surface 35^e extends through an angle of approximately fifty-one degrees and preferably rises from the point of convergence 35^e at the rate of six thousandths of an inch for each angular or rotary degree thereof. Each of the cam surfaces 35^d preferably extends through an angle of twenty-nine degrees, and preferably rises from the point of convergence 35^f at the rate of forty-five ten thousandths of an inch for each angular degree thereof. Radii of approximately six hundredths of an inch are preferably provided at the upper ends of each of the cam surfaces 35^c and 35^d, and the points of convergence 35^e are preferably rounded with radii of approximately one-hundredth of an inch. In a given rotary position of ring 35, wherein the lugs 32^c and 32^d on pushbutton 32 are at the upper ends of the respective cam surfaces 35^c, the plunger 29 is permitted to move upwardly under its normal spring bias to the position thereof illustrated in Figs. 2, 3 and 5, wherein the upper contactors 30 of the respective pairs are adapted to bridge the upper set or sets of stationary contacts upon base 25, as best illustrated in Fig. 2.

Plunger 29, pushbutton 32, plate 34 and ring 35 are held in properly assembled relationship to each other and to base 25 as by means of an adapter member designated by the numeral 36. Adapter 36 (which is here shown as a machined metal piece) preferably consists of a lower portion 36^a of circular contour, and a reduced upper end portion 36^b of circular contour, which is externally threaded, as shown at 36^c. Portions 36^b and 36^a are internally bored, as shown, to provide rotatable clearance for the upper end portion of selector ring 35, as best illustrated in Figs. 3, 4 and 5; whereas the lower portion 36^a is provided with a counterbore 36^d, of a height corresponding to the height of the lateral projections 35^g and 35^h upon ring 35 (see Figs. 3 and 4), to provide rotary clearance for said projections. Plate 34 is supported in a position to directly underlie projections 35^g, 35^h (Figs. 3 and 4), wherefore ring 35 may be rotated relatively

to adapter 36, but is restrained against any substantial degree of movement axially thereof.

Ring 35 preferably has its upper end located in a substantially flush relationship to the upper end of adapter 36, and to provide for manual rotation of ring 35 I prefer to provide a pair of diametrically opposed upstanding integral lugs 35^a and 35^b, which are vertically aligned with the respectively adjacent cylindrical wall portions of the ring, wherefore the ring 35 is freely insertable upwardly into adapter 36. The side and top edges of lugs 35^a and 35^b are preferably rounded as shown to facilitate manual rotation of the ring by engagement of an operator's fingers with said lugs.

Adapter 36 is rigidly attached to base 25 by a pair of bolts 37, 37 which are insertable upwardly into passages provided in the lateral extensions 25^b and 25^c of base 25, the threaded upper ends of which bolts take into tapped openings 36^e and 36^f provided in adapter 36, as best illustrated in Figs. 1 and 3. The portion 36^a of adapter 36 is preferably provided with a drilled opening 36^c which is adapted to receive with a drive fit a stud 38 (Fig. 5), which extends a substantial distance above the upper surface of portion 36^a. A panel or cover member 39 (shown as composed of metal) is provided with a relatively large circular opening 39^a to accommodate the reduced portion 36^b of adapter 36, and with a relatively small opening 39^b to accommodate stud 38. A milled or otherwise exteriorly roughened nut 40 is adapted for engagement with the external thread 36^c on adapter portion 36^b to provide the so-called one-hole mounting of the complete switch unit to the panel 39, or a similar support, the stud 38 (Fig. 2) fitting into opening 39^b to positively prevent rotary displacement of adapter 36 and the parts attached thereto as an incident to rotation and tightening of nut 40.

As shown in Figs. 1 and 5 I also prefer to provide portion 36^a of the adapter with a drilled radial opening or passage 36^h which is located in an area diametrically opposed to pin 38. Opening 36^h is adapted to receive with a drive fit a pin 41 whose inner end is positioned within the aforementioned counterbore 36^d (Fig. 5) in a relationship substantially flush with the aforementioned main bore of said adapter. Said inner end of pin 41 is adapted to cooperate with one or the other of the ends 35^j or 35^k (see Figs. 4, 5 and 8) to positively limit the degree of rotation of ring 35 in each direction.

As will be apparent from consideration of Figs. 4 and 5, the lugs 32^c and 32^d on pushbutton 32 would cooperate with the pairs of vertical edges or walls formed at opposite ends of the pairs of cam surfaces 35^e and 35^d to limit the degree of rotation of ring 35 in each direction, and hence, if desired, the pin 41 and drilled radial opening 36^h might be omitted. However, by employing pin 41 in the manner disclosed, any lateral force against or shearing strain upon the lugs 32^c and 32^d of button 32 is avoided.

The operation of the switch is as follows: With the switch parts in their normal positions as indicated in Figs. 1, 2, 3 and 5, the plunger 29 is freed to move upwardly under the bias of spring 55 (see Fig. 21) to effect engagement of the upper contactor or contactors 30 of the pair or pairs with the upper set or sets of stationary contacts 28, to provide for completion of a circuit or circuits to be controlled by the switch. Under these conditions the pushbutton 32 (which normally projects slightly above the upper end

of the main body portion of ring 35, as shown in Figs. 2, 3 and 5) may be manually depressed to an intermediate position, such as that shown in dotted lines in Fig. 4, wherein the upper bridging contactors are disengaged from the upper contacts on base 25; or the pushbutton 32 may be depressed to its inner extreme position, wherein the lower contactors are engaged with their cooperating lower contacts on base 25; it being understood that the switch parts will assume their normal positions (Figs. 2, 3, and 5) upon manual release of the pushbutton.

In accordance with my invention, however, the ring 35 is adapted upon rotation thereof in a clockwise direction (Fig. 1) to effect depression of button 32 (and consequently of plunger 29) to first effect disengagement of the upper contactors from the upper contacts, and to continue downward movement of the sets of contactors, but without causing engagement of the lower contactors with the lower contacts. The cam surfaces 35^d upon ring 35 then cooperate with lugs 32^c and 32^d upon button 32 to permit plunger 29 to move upwardly, carrying with it the set of contactors 30 until the latter are in the intermediate "off" position thereof shown in Fig. 4. As will be obvious, with the pushbutton 32 latched in its so-called "safe" position shown in Fig. 4, said button may be manually depressed to effect engagement of the lower contactors with the lower contacts, the contactors being automatically moved to their "off" position shown in Fig. 4 upon manual release of button 32. Similarly, upon counterclockwise movement of ring 35 to the normal position thereof shown in Figs. 1, 2, 3 and 5, the spring-biased plunger 29 will act to return the contactors to normal position, wherein the upper contactors are engaged with the upper contacts as aforedescribed.

A simple modification of the device shown in Figs. 1 to 5, 7 and 8 may be made by omitting the stop pin 41 (Figs. 1 and 5) with the result heretofore suggested; namely, that the lugs 32^c and 32^d will cooperate with edge portions of ring 35 to positively limit the degree of rotation of the ring in each direction. This is based upon the assumption that the ring 35 will be used in the normal manner aforedescribed; that is, to effect depression of pushbutton 32 and of plunger 29 to cause disengagement of the upper contactors from the upper contacts, and then to latch or retain all of the contactors in disengaged position, as illustrated in Fig. 4. However the structural form and arrangement of the parts is such that upon manual depression of button 32 to its inner extreme position the lower contactors of the respective pairs will be engaged with the cooperating lower contacts, and at the same time the upper ends of the lugs 32^c and 32^d upon the pushbutton will be positioned slightly below the plane of the lower edges of segmental portions 35^a and 35^b of ring 35.

Under such a condition, it is obvious that upon a slight degree of rotary clockwise movement of ring 35, said lower edges of segments 35^b and 35^a would respectively overlie the upper ends of lugs 32^c and 32^d, with consequent latching or retention of the lower contactors in engagement with the lower contacts. Thereafter upon a corresponding degree of counterclockwise rotation of ring 35 the switch parts would be released to move to the intermediate "off" positions thereof respectively shown in Fig. 4; or, alternatively, upon a relatively larger degree of further clock-

wise movement the switch parts would be permitted to snap to the respective normal positions thereof shown in Figs. 1, 2, 3 and 5. The switch just described would therefore provide for normal upper "on" positioning of the contactors, or alternatively for latching the latter in their intermediate "off" position or their lower "on" position, with the additional feature of providing for movement of the contactors either directly from their lower "on" position to their upper "on" position or to their intermediate "off" position. With an arrangement of the character just described suitable legends could be applied to panel 39, or to a plate attached thereto, to indicate the proper directions and degrees of rotation of ring 35 required to effect the various results afordescribed, both with and without manual depression of pushbutton 32.

Although I have shown but one arrangement of contacts and contactors in the switch of Figs. 1 to 5, 7 and 8, it is to be understood that all of the various combinations of switch elements disclosed in my aforementioned application Serial No. 449,756 may be employed in conjunction with the selector ring type of operating mechanism afordescribed.

In the modification illustrated in Figs. 6, 9 and 10 the insulating base 25 and the parts carried thereby, including the plate 34, the plunger (not shown) and the contactors and contacts, may be identical with the corresponding parts afordescribed, at least one set of lower stationary contacts and a bridging contactor for cooperation therewith being required to afford the function of latching the bridging contactor or contactors in their lower "on" position. One or two sets of upper contacts and one or two upper contactors are usually provided in such a switch, the latter contactors being normally biased into bridging engagement with the respective sets of upper contacts, in the manner afordescribed. The pushbutton 32 is identical with that afordescribed.

The switch of Fig. 6 is shown as adapted for base mounting, and for this purpose I prefer to provide an adapter member of the character shown at 42, which preferably is a metal die casting having a lower main body portion of substantially cylindrical contour, the same having lateral enlargements 42^a and 42^b extending throughout the length thereof to accommodate diametrically opposite passages 42^c, 42^d, which in turn accommodate the shanks of bolts 43, 43 extending downwardly therethrough. Passages 42^c, 42^d are provided with enlarged or countersunk upper ends to 42^a, 42^f to accommodate the heads 43^a of bolts 43. Bolts 43 are substantially longer than the bolts 37 (Figs. 2 and 3) afordescribed, the threaded lower ends (not shown) of bolts 43 being adapted to take into tapped openings in a panel or similar support, in the manner described in my aforementioned application Serial No. 449,756.

The panel or cover member shown in dotted lines at 44 in Fig. 6 is provided with a circular opening 44^a to accommodate and to provide rotary clearance for the metal selector ring, designated by numeral 45, at least portions of which ring extend upwardly beyond panel 44. Adapter 42 is provided with an upper circular bore 42^e to provide for upward insertion and relative rotation of the upper cylindrical portion of ring 45; said adapter 42 also having a downwardly opening recess 42^h concentric with and of relatively larger diameter than bore 42^e to accommodate

and provide rotary clearance for the diametrically opposed integral lateral extensions 45^f and 45^g in the form of flange segments. Recess 42^h is provided at diametrically opposite points with integral stops or lugs (not shown) which are aligned with and of substantially the same width as the respective pushbutton lugs, one of which is shown at 32^e in Fig. 6. Said stops upon adapter 45 respectively cooperate with the pairs of adjacent ends 45ⁱ, 45^k and 45^j, 45^m of extensions 45^f and 45^g to limit the angle of rotation of ring 45 in opposite directions.

Ring 45 is provided at its lower edge with a diametrically opposed pair of cam surfaces 45^c, 45^e, each of which preferably extends through a rotary angle of sixty-nine degrees, and each preferably rising from said lower edge at the rate of six thousandths of an inch for each angular or rotary degree thereof; which is the same as that of the cam surfaces 35^c (Fig. 8) afordescribed. At the lower end of each cam surface 45^c a convex radius of approximately one-sixty-fourth of an inch is provided, as shown at point 45ⁿ and 45^o in Fig. 10, a reversely extending cam surface being provided at each point 45ⁿ, 45^o and leading to the horizontal lower edge portions 45^p and 45^q of ring 45. Said horizontal edge portions 45^p, 45^q are preferably spaced upwardly approximately one-hundredth of an inch above the points 45ⁿ and 45^o. The ring 45 is provided at the upper edge with a pair of unstanding finger lugs 45^h and 45ⁱ which are preferably shaped and positioned the same as the lugs 35^h and 35ⁱ of ring 35 (see Fig. 8). It will thus be apparent that rings 35 and 45 differ from each other only in respect of the cam surfaces formed at the lower edges thereof, respectively. It follows that said rings may be cast in the same die by merely employing different cores to provide the different forms of cam surfaces desired. This feature is important in respect of reducing the die cost for production of the different rings.

The operation of the switch illustrated in Figs. 6, 9 and 10 differs from that of the switch first described in respect of providing for latching or retaining of the contactors in their lower "on" position, and without provision for latching all of the switch contactors in their intermediate, or "off" position. Thus, with the switch parts in their normal spring-biased positions shown in Fig. 6, wherein the upper contactors are engaged with the upper stationary contacts (if employed), the button 32 may be manually depressed to an intermediate position thereof to disengage the upper contactors from their associated upper contacts, or said button may be manually depressed to its extreme inner position to effect bridging engagement of the lower contactors with their associated lower contacts; the upper contactors being automatically reengaged with the upper contacts upon manual release of the button 32.

On the other hand, if it is desired to mechanically latch and retain the lower contactors in engagement with the lower contacts, this result may be attained by simply manually rotating the ring 45 in a clockwise direction to its opposite extreme position from the extreme position thereof shown in Fig. 6. This causes the cam surfaces 45^c, 45^e to act upon the pushbutton lugs (one of which is shown at 32^e) to depress the pushbutton, as well as the plunger and the contactors carried by the latter, until the lower contactors are in bridging engagement with the lower contacts; the cam surfaces 45^c

riding beyond the upper ends of the pushbutton lugs (see 32°) and the reverse cam surfaces at points 45^a and 45° resulting in the horizontal lower edge portions 45^b and 45^a resting upon the upper ends of said lugs. The arrangement is such that adequate pressure of the lower contactors against the lower contacts will be provided, whereas the cam formations at the lower edge of ring 45 will insure against accidental return of the switch parts to their normal or biased positions.

If it is desired to effect disengagement of the lower contactors from their associated contacts, it is only necessary to effect a slight degree of counterclockwise movement of ring 45 (to effect engagement of cam surfaces 45° with the upper ends of the pushbutton lugs), whereupon the spring bias of the plunger will cause automatic movement of all of the switch parts (including ring 45) to the normal positions thereof shown in Fig. 6.

From the foregoing descriptions of the two forms of switches it will be apparent to those skilled in the art that a ring having sets of cams adapted to perform a combination of the functions of both switches may readily be provided. In Fig. 8, for instance, two relatively longer cam areas may be provided, the left-hand ends of extension 35^e and 35^f being cut away or shortened, and cam surfaces following cam surfaces 35^d, 35^d and extending in planes parallel to cam surfaces 35^c, 35^c and leading to the horizontal lower edge portions of the ring (in the manner illustrated at 45^b and 45^a in Fig. 10) could be provided. Such sets of cams would, of course, provide for latching all of the contactors in their intermediate "off" position, or for latching the lower contactors in bridging engagement with their associated contacts. An arrangement of sets of cams similar to that just described is disclosed herein in Figs. 11 to 16, in respect of a three-position rotary switch, which will now be described.

In a switch of the character illustrated in Figs. 6, 9 and 10 it is obvious that if upper contacts are mounted upon base 25, with lower contacts omitted, a simple "on" and "off" switch mechanism may be provided; the switch contactors being then normally biased to their upper "on" position, and the same being movable to and latched in their lower "off" position by the aforementioned clockwise rotation of ring 45. Conversely, with a switch like that of Fig. 6 having lower contacts, with upper contacts omitted, the contactors would be normally biased to an upper "off" position, and the same could be moved to and latched in their lower "on" position by the aforedescribed extreme clockwise movement of ring 45.

In the switch of Figs. 11 to 16 certain of the parts may be identical with corresponding parts shown in Figs. 1 to 5, and such parts have been given like numerals of reference. Thus the base 25 and the parts carried thereby, including plunger 29, may be identical with the parts aforedescribed. As shown in Fig. 12, however, a relatively small molded insulating member 46 is recessed to provide a fairly close fit thereof over the reduced upper end 29^b of extension 29^a and a portion of the latter, the aforementioned spring wire ring 33 being employed in the manner aforedescribed to provide a frictional connection between member 46 and said plunger 29.

As best illustrated in Fig. 16, member 46 is of substantially cylindrical external contour, the

same having a pair of diametrically opposed integral laterally extending lugs 46^a and 46^b, each of which is provided with parallel flat side surfaces, a flat lower surface which is in a plane flush with the lower surface or edge of member 46, and convex upper surfaces which are of substantially circular contour. Said curved upper surfaces of lugs 46^a and 46^b are located a predetermined distance below the plane of the circular, flat upper end 46^c of member 46.

A molded insulating actuating member 47 is provided with a downwardly opening cylindrical recess 47^a (Fig. 12) to freely but rather closely fit around the cylindrical body portion of member 46; member 47 having formed in the peripheral wall of recess 47^a two diametrically opposed sets of downwardly facing cam surfaces, the corresponding cam surfaces of said sets being respectively designated 47^b, 47^c, 47^d, 47^e and 47^f (see Fig. 15). Said pairs of like cam surfaces are adapted to ride over the aforementioned lugs 46^a and 46^b on member 46 to control the vertical position of the latter, and consequently of the plunger 29 and the contactors carried thereby. Member 47 is further provided at its lower end with a diametrically opposed pair of like integral laterally extending lugs 47^g, 47^h, each of which is provided with a vertical side edge 47ⁱ which is preferably flush with the vertical wall surface 47^j adjacent to the respective cam surface 47^b, and each lug 47 is also provided with a vertical side edge 47^k spaced a predetermined rotary or angular distance from edge 47^h. Said side edges 47ⁱ and 47^k are preferably located in planes radial to the axial center of member 47, as best illustrated in Fig. 14. Said lugs 47^g are adapted to cooperate with suitable stop lugs, hereinafter described, to limit the degree of angular movement or rotation of member 47 in each direction.

The main body portion of member 47 is preferably of cylindrical form as indicated at 47^k, to freely rotate within a correspondingly shaped opening or passage 48^a in a bushing 48 whose relatively large annular upper end portion 48^b is vertically milled peripherally, as indicated at 48^c in Fig. 11, to facilitate turning or tightening thereof. Bushing 48 is provided with a reduced and externally threaded lower end portion 48^d, whereby a horizontal annular clamping shoulder 48^e is provided.

The threaded lower end 48^d of said bushing is adapted to cooperate with a threaded opening 49^a in a die cast metal adapter member 49 (Figs. 12 and 13). Interposed between the upper end of base 25 and the lower end of adapter 49 is a flat, punched sheet metal plate 50, said plate having diametrically opposed notched lugs to be interlocked with the shanks of screws 37, 37 which extend upwardly through the bolt passages in base 25 and take into tapped openings 49^b and 49^c in adapter 49. Plate 50 is provided with a central circular opening 50^a of a size to provide reciprocating clearance for the lugs 46^a and 46^b upon member 46, but the material of plate 50 around opening 50^a is adapted to underlie portions of the arcuate widths of the aforementioned lugs 47^g, 47^h on member 47, as shown in Fig. 13.

Adapter 49 is provided in its lower surface with an annular recess 49^d (Figs. 12 and 13) against the upper end wall 49^e of which the flat portion 51^a of a punched and stamped sheet metal ring 51 is adapted to seat, said ring having a central circular opening 51^b of substantially the same diameter as opening 50^a in plate 50. Ring 51

is provided, in substantial alinement with the periphery of opening 51^b with a pair of diametrically opposed, downwardly bent, integral, rectangular lugs 51^c and 51^d, the lower ends of which are adapted to seat against plate 50, as shown in Fig. 12.

The upper end wall 49^e of recess 49^d is provided with a pair of downwardly opening notches which are both located at one side of the vertical plane of the line 12—12 of Fig. 11, said notches being respectively spaced at an angle of forty-five degrees from said plane and at an angle of ninety degrees from each other. One of said pair of notches is shown at 49^f in Fig. 13. Ring 51 is provided with an integral rectangular peripheral lug 51^e (Fig. 13) which is displaced at an angle of forty-five degrees from lug 51^c (Fig. 12) and is bent to extend vertically upwardly from the flat portion 51^a of said ring. When lug 51^e is positioned within notch 49^f, as shown in Fig. 13, the stop lugs 51^c and 51^d will be located in alinement with the plane of line 12—12 of Fig. 11, as shown in Fig. 12; whereas, when lug 51^e is positioned within the other notch (not shown) displaced ninety degrees therefrom, the lugs 51^c and 51^d will be correspondingly positioned at an angle displaced ninety degrees from the respective positions thereof shown in Fig. 12. The purpose of such an arrangement is to provide for mounting of the complete switch unit in different angular or rotary positions with respect to a panel or similar support, while providing for proper cooperation of rotary member 47 with the legends upon an indicating plate 52, or the like.

Thus, as shown in Fig. 11, plate 52 is provided with legends "A," "B" and "C," displaced at angles of approximately forty-five degrees from each other, the legends "A" and "C" being likewise respectively spaced forty-five degrees from the plane of line 12—12. The diametrically positioned integral extension 47ⁱ is of relatively thin, elongated rectangular form in transverse cross section, and the same is preferably provided with a groove 47^m extending throughout the major portion of the upper surface and the major portion of one relatively thin side surface thereof, as shown in Figs. 11, 12 and 13. Said groove is preferably provided with a layer or coating of enamel or paint of a color (such as white) contrasting with the color of member 47 (which is preferably black).

With reference to Fig. 11, the groove 47^m is positioned in approximate alinement with legend "A," to indicate that the switch contactor or contactors are in their upper "on" position. When member 47 is rotated clockwise to its first latched position groove 47^m will be aligned with legend "B" to indicate intermediate "off" position of all of the contactors; and when member 47 is rotated to its extreme clockwise position groove 47^m will be substantially aligned with legend "C" to indicate that the bridging contactor or contactors are in their lower "on" position.

As shown in Figs. 12 and 13, plate 52 is provided with a circular opening to accommodate the reduced and threaded portion 48^d of bushing 48; and as shown in Fig. 11 said plate is provided with a downwardly bent lug 52^a, which is adapted to extend through an opening (not shown) in a supporting panel 53 and into a suitably positioned cylindrical recess 49^g in the upper surface of adapter 49. The legends "A," "B" and "C" aforementioned are, of course, merely arbitrary, and more definite legends such as "Forward,"

"Off" and "Reverse" (for instance) will normally be employed.

The two-position rotary selector switch illustrated in Figs. 17 to 20 is in general quite similar to the switch just described, and many of the aforesaid parts may be employed. Thus the base 25 and the elements associated therewith, including the combined stationary contact and terminal members, the plunger 29 (of which the extension 29^a is shown) and the contactors carried by the latter, may be the same as those aforescribed. Likewise the plate 50 and stop member 51 may be identical with the corresponding parts of the three-position rotary switch, the insulating cap member 46 being also common to these switches.

The switch of Figs. 17 to 20 is of the base mounted type, wherefore I provide a die cast metal adapter member 54 which is provided with an unthreaded central opening 54^a of a size to rotatably accommodate the intermediate cylindrical portion 55^a of the manually rotatable selector member 55, which consists of molded insulating material. Adapter 54 is provided at its lower end with an annular recess 54^b (Fig. 18) substantially corresponding to the recess 49^d of member 49 (Fig. 12). The aforescribed stop member 51 has its flat portion 51^a seated against the end wall 54^c of recess 54^b, its upwardly extending lug being adapted to fit into that notch (not shown) which corresponds to the notch 49^f in Fig. 13, to provide for positioning of downwardly extending lugs 51^c and 51^d as shown in Fig. 18.

Member 55 is provided at its lower end with a pair of diametrically opposed laterally extending integral lugs 55^d, 55^e which are of greater arcuate length than the lugs of member 47 (see Figs. 15 and 20 for comparison). Member 55 is also provided at its lower end with diametrically opposed sets of downwardly facing cam surfaces 55^e, 55^f, which are respectively adapted to cooperate with the curved upper ends of lugs 46^a and 46^b of insulating cap 46 (see Fig. 16) to control the vertical position of plunger 29 and the contactors carried thereby.

As will be apparent from comparison of Fig. 20 with Fig. 15, each cam surface 55^e extends downwardly at an angle corresponding to the angle of cam surfaces 47^b in Fig. 15, whereas the cam surfaces 55^e are continued to the lower edge of member 55, the same terminating in the humps 55^f which lead to the respective surfaces 55^e. Thus with member 55 in its extreme counterclockwise position (Figs. 17 and 18) the lugs 46^a and 46^b of cap 46 will be moved (by the spring bias of the plunger 29) to the respective upper ends of cam surfaces 55^e, one end of each of the lugs 55^d engaging the respective stop lugs 51^c, 51^d to prevent additional counterclockwise rotation of member 55. Upon clockwise rotation of member 55 the cam surfaces 55^e will coact to depress lugs 46^a and 46^b of cap 46, and also plunger 29 and the contactors carried thereby, until the lower contactor or contactors are in bridging engagement with the lower contacts of the switch, the cam surfaces 55^e finally resting upon the upper ends of lugs 46^a of cap 46, and the humps 55^f preventing accidental counterclockwise movement of member 55. At the same time the other ends of the respective lugs 55^d on member 55 will engage the opposite edges of stop lugs 51^c and 51^d on member 51 to positively limit the degree of clockwise movement of member 55.

The reduced finger grip portion 55^h at the upper end of member 55 is provided with a groove

55¹ for cooperation with legends "D" and "E" to indicate the circuit controlling condition of the switch.

Also, as will be apparent to those skilled in the art, a manually rotatable member of the length shown at 47 in Fig. 12, or of the shorter length shown at 55 in Fig. 18 may be provided at its lower edge with sets of cam surfaces corresponding to those shown at 35^a, 35^e and 35^d in Fig. 8, to provide for performance of functions similar to those of the switch shown in Figs. 1 to 5.

I claim:

1. The combination with an electric switch having a reciprocable insulating member, a pair of punched and stamped sheet metal bridging contactors of like form carried by said member and spring-biased away from each other, said member having means formed integrally therewith to positively limit the degree of separation of said contactors, said contactors being aligned with each other throughout their respective areas, spring means associated with said member to normally bias the same and said contactors to a given normal position thereof wherein said contactors are engaged with each other against said first mentioned spring-bias, a manually operable member associated with said reciprocable member, said manually operable member being rotatable between a given normal position and an extreme position spaced at a predetermined angle with respect thereto and having a plurality of cam surfaces formed thereon, and said reciprocable member having elements associated therewith and adapted for engagement by said cam surfaces to provide for movement of said reciprocable member to and for positive but releasable retention thereof in a position other than its normal position as an incident to movement of said rotatable member from its normal position through a predetermined rotary angle.

2. The combination with an electric switch having a reciprocable insulating member, a pair of bridging contactors carried by said member and spring-biased away from each other, said member having means to positively limit the degree of separation of said contactors, said contactors being of like form and the same being aligned with each other throughout the respective areas thereof, spring means associated with said member to normally bias the same and said contactors to a given normal position thereof wherein said contactors are engaged with each other against said first mentioned spring-bias, a manually operable member associated with said reciprocable member, said manually operable member being rotatable between opposite extreme positions and having a plurality of cam surfaces formed thereon, said reciprocable member having elements associated therewith and adapted for engagement by said cam surfaces to provide for movement of said reciprocable member to a plurality of positions other than its normal position as an incident to movement of said rotatable member from one extreme position thereof to the other, and said cam surfaces cooperating with said elements to positively but releasably retain said reciprocable member in any one of said plurality of other positions thereof.

3. An electric switch unit complete in itself, comprising a recessed molded insulating base having two pairs of upper contacts and two pairs of lower contacts respectively arranged in common planes transversely of the recess, each pair of upper contacts overlying a pair of lower contacts adjacent each of two opposed walls of the

recess, a molded insulating plunger slidable within said recess, two pairs of upper and lower bridging contactors carried by said plunger at opposite sides thereof for cooperation with said pairs of upper and lower contacts selectively, a coiled compression spring interposed between the contactors of each pair and normally tending to effect a predetermined degree of separation thereof, a coiled compression spring interposed between the bottom wall of said recess and said plunger, whereby said upper contactors are normally biased into engagement with their associated pairs of upper contacts, an insulating member attached to the upper end of said plunger, said member having a pair of diametrically opposed lugs formed integrally therewith and extending laterally therefrom, a metal adapter member overlying the open upper end of said recess and adapted for rigid attachment to said base, a member carried by said adapter member and adapted for rotation through a predetermined angle relatively thereto, and said rotatable member having a plurality of cam surfaces formed thereon for cooperation with the aforementioned lugs to provide for movement of said upper contactors to and for positive but releasable retention thereof in a position other than their aforementioned normally engaged position.

4. An electric switch unit complete in itself, comprising a recessed molded insulating base having two pairs of upper contacts and two pairs of lower contacts respectively arranged in common planes transversely of the recess, each pair of upper contacts overlying a pair of lower contacts adjacent each of two opposed walls of the recess, a molded insulating plunger slidable within said recess, two pairs of upper and lower bridging contactors carried by said plunger at opposite sides thereof for cooperation with said pairs of upper and lower contacts selectively, a coiled compression spring interposed between the contactors of each pair and normally tending to effect a predetermined degree of separation thereof, a coiled compression spring interposed between the bottom wall of said recess and said plunger, whereby said upper contactors are normally biased into engagement with their associated pairs of upper contacts, an insulating member attached to the upper end of said plunger, said member having a pair of diametrically opposed lugs formed integrally therewith and extending laterally therefrom, a metal adapter member overlying the open upper end of said recess and adapted for rigid attachment to said base, a member carried by said adapter member and adapted for rotation through a predetermined angle relatively thereto, said rotatable member having a plurality of cam surfaces formed thereon for cooperation with the aforementioned lugs to provide for movement of said upper contactors to and releasable retention thereof in a position other than their aforementioned normally engaged position, and means comprising a pair of bolts common to said adapter member and said base to provide for attachment thereof as a unit to a suitable support at the rear end of said base.

5. An electric switch unit complete in itself, comprising a recessed molded insulating base having two pairs of upper contacts and two pairs of lower contacts respectively arranged in common planes transversely of the recess, each pair of upper contacts overlying a pair of lower contacts adjacent each of two opposed walls of the recess, a molded insulating plunger slidable

within said recess, two pairs of upper and lower bridging contactors carried by said plunger at opposite sides thereof for cooperation with said pairs of upper and lower contacts selectively, a coiled compression spring interposed between the contactors of each pair and normally tending to effect a predetermined degree of separation thereof, a coiled compression spring interposed between the bottom wall of said recess and said plunger, whereby said upper contactors are normally biased into engagement with their associated pairs of upper contacts, an insulating member attached to the upper end of said plunger, said member having a pair of diametrically opposed lugs formed integrally therewith and extending laterally therefrom, a metal adapter member overlying the open upper end of said recess and adapted for rigid attachment to said base, a member carried by said adapter member and adapted for rotation through a predetermined angle relatively thereto, said rotatable member having a plurality of cam surfaces formed thereon for cooperation with the aforementioned lugs to provide for movement of said upper contactors to and for releasable retention thereof in a position other than their aforementioned normally engaged position, means comprising a pair of bolts extending upwardly through said base into tapped openings in said adapter member to rigidly attach the same to each other, said adapter member having a threaded portion at the upper end thereof, and a cylindrical threaded member adapted for cooperation with said threaded portion to provide for one-hole mounting of the device as a unit upon a perforated panel or similar support.

6. In an electric switch, the combination with a molded insulating base having a main recess open at one end and also having side recesses communicating with said main recess intermediate the opposite ends of the latter, said side recesses being adapted to accommodate two pairs of contacts on each side of a plane coincident with the longitudinal axis of said main recess, said side recesses permitting the contacts to be inserted from outside the base and to be projected into said main recess and each side recess providing for a plurality of contacts opposed seats spaced from each other longitudinally of said base, a molded insulating plunger reciprocable within said main recess, said plunger having seats for bridging contactors to cooperate with all of the pairs of contacts, a coiled compression spring interposed between the bottom wall of said main recess and said plunger, whereby certain of said contactors are biased to a normal position wherein they bridge the contacts of certain of said pairs, a manually operable member rotatable between a given normal position and an extreme position spaced at a predetermined angle with respect thereto and having a plurality of sets of cam surfaces formed thereon, and said plunger having elements associated therewith and cooperable with said sets of cam surfaces to provide for movement of said last mentioned contactors to and for positive retention thereof in a position other than their normal position as an incident to a predetermined degree of movement of said rotatable member.

7. In an electric switch, the combination with a molded insulating base having a main recess open at one end and also having side recesses communicating with said main recess intermediate the opposite ends of the latter, said side recesses being adapted to accommodate two pairs

of contacts on each side of a plane coincident with the longitudinal axis of said main recess, said side recesses permitting the contacts to be inserted from outside the base and to be projected into said main recess and each side recess providing for a plurality of contacts opposed seats spaced from each other longitudinally of said base, a molded insulating plunger reciprocable within said main recess, said plunger having seats for bridging contactors to cooperate with all of the pairs of contacts, a coiled compression spring interposed between the bottom wall of said main recess and said plunger, whereby certain of said contactors are biased to a normal position wherein they bridge the contacts of certain of said pairs, a manually operable member rotatable through a predetermined angular range and having a plurality of sets of cam surfaces formed thereon, and said plunger having elements associated therewith and cooperable jointly with said sets of cam surfaces to provide for movement of said contactors to a plurality of positions other than the normal position, one of said last mentioned positions providing for disengagement of all contactors from their cooperating contacts and another of said positions providing for bridging of the contacts of other of said pairs.

8. In a rotary selector switch, in combination, a molded insulating base having a recess, an insulating plunger reciprocable within said recess and spring-biased outwardly with respect thereto, a plurality of sets of stationary contacts positioned within said recess and spaced axially of the latter, a plurality of contactors carried by said plunger and movable by the latter into and out of bridging engagement with said axially spaced sets of contacts selectively, certain of said contacts cooperating with said contactors to limit the degree of outward displacement of said plunger, said plunger having a pair of diametrically opposed lugs associated therewith at the upper end thereof, a manually rotatable member having sets of cam surfaces formed thereon and overlying said lugs, said member when rotated in opposite directions throughout a predetermined range being adapted to effect and permit reciprocation of said plunger in opposite directions selectively to provide for corresponding movements of said contactors, a metal adapter member surrounding said rotatable member and having associated means to prevent substantial axial displacement of said rotatable member and to limit the latter to rotation within a given angular range, and common means associated with said adapter member and said base to provide for rigid securement thereof to each other and to a suitable support.

9. In a rotary selector switch, in combination, a molded insulating base having a recess, an insulating plunger reciprocable within said recess and spring-biased outwardly with respect thereto, a plurality of sets of stationary contacts positioned within said recess and spaced axially of the latter, a plurality of contactors carried by said plunger and movable by the latter into and out of bridging engagement with said axially spaced sets of contacts selectively, certain of said contacts cooperating with said contactors to limit the degree of outward displacement of said plunger, a molded insulating pushbutton frictionally attached to said plunger at the upper end of the latter, said pushbutton having a pair of diametrically opposed laterally extending lugs formed integrally therewith, a manually rotatable member having sets of downwardly facing cam surfaces

formed thereon and overlying said lugs, said member when rotated in opposite directions being adapted to effect and permit reciprocation of said plunger in opposite directions selectively to provide for corresponding movements of said contactors, a metal adapter member surrounding said rotatable member and having associated means to prevent substantial axial displacement of said rotatable member and to positively limit the latter to rotation in opposite directions within a given angular range, means associated with said adapter member and said base to provide for rigid securement thereof to each other and to a suitable support, and means providing for certain manual operations of said pushbutton independently of said rotatable member in certain rotary positions of the latter.

10. In a rotary selector switch, in combination, a molded insulating base having a recess opening to one end thereof, a plunger reciprocable within said recess and guided by the side walls of the latter, a coiled compression spring interposed between the bottom wall of said recess and said plunger to normally bias the latter toward the outer extreme position thereof, axially spaced sets of stationary contacts positioned within said recess and bridging contactors carried by said plunger, certain of said sets of contacts cooperating with said contactors to positively limit the degree of outward movement of said plunger, said plunger having a pair of opposite laterally extending lugs associated therewith at the upper end thereof, a rotatable member having diametrically opposite sets of downwardly facing cam surfaces formed thereon for cooperation with said lugs, said last mentioned member in one rotary position thereof permitting bridging engagement of certain of said contactors with their associated contacts under the bias of said plunger, said last mentioned member being adapted for manual rotation to and yieldable retention in another position wherein said last mentioned contactors are disengaged from said contacts, a metal adapter member rigidly secured to the upper end of said base and adapted to provide a bearing for said rotatable member, and said bearing and said rotatable member having parts associated therewith to positively limit the degree of rotation of said rotatable member in each direction and to positively prevent substantial axial displacement of said rotatable member relatively to said adapter member.

11. In a rotary selector switch, in combination, a molded insulating base having a recess opening to one end thereof, a plunger reciprocable within said recess and guided by the side walls of the latter, a coiled compression spring interposed between the bottom wall of said recess and said plunger to normally bias the latter toward the outer extreme position thereof, axially spaced sets of stationary contacts positioned within said recess and bridging contactors carried by said plunger, certain of said sets of contacts cooperating with said contactors to positively limit the degree of outward movement of said plunger, said plunger having a pair of opposite laterally extending lugs associated therewith at the upper end thereof, a rotatable member having diametrically opposite sets of downwardly facing cam surfaces formed thereon for cooperation with said lugs, said last mentioned member in one rotary position thereof permitting bridging engagement of certain of said contactors with their associated contacts under the bias of said plunger, said last mentioned member

being adapted for manual rotation to and yieldable retention in another position wherein said last mentioned contactors are disengaged from said contacts, a metal adapter member rigidly secured to the upper end of said base and adapted to provide a bearing for said rotatable member, said bearing and said rotatable member having parts associated therewith to positively limit the degree of rotation of said rotatable member in each direction and to positively prevent substantial axial displacement of said rotatable member relatively to said adapter member, and means associated with said adapter member and said base to provide for rigid securement thereof as a unit to a suitable support.

12. In a rotary selector switch, in combination, a molded insulating base having a recess opening to one end thereof, a plunger reciprocable within said recess and guided by the side walls of the latter, a coiled compression spring interposed between the bottom wall of said recess and said plunger to normally bias the latter toward the outer extreme position thereof, axially spaced sets of stationary contacts positioned within said recess and bridging contactors carried by said plunger, certain of said sets of contacts cooperating with said contactors to positively limit the degree of outward movement of said plunger, said plunger having a pair of opposite laterally extending lugs associated therewith at the upper end thereof, a rotatable molded insulating member having diametrically opposite sets of downwardly facing cam surfaces formed thereon for cooperation with said lugs, said last mentioned member in one rotary position thereof permitting bridging engagement of certain of said contactors with their associated contacts under the bias of said plunger, said last mentioned member being adapted for manual rotation to and yieldable retention in another position wherein said last mentioned contactors are disengaged from said contacts, a metal adapter member rigidly secured to the upper end of said base and adapted to provide a bearing for said rotatable member, said bearing and said rotatable member having parts associated therewith to positively limit the degree of rotation of said rotatable member in each direction and to positively prevent substantial axial displacement of said rotatable member relatively to said adapter member, means associated with said adapter member and said base to provide for rigid securement thereof as a unit to a suitable support, said last mentioned means including a flanged bushing having threaded engagement with said adapter member to provide for clamping engagement of the latter with the inner surface of a panel or similar support, and said bushing having an opening to accommodate an intermediate portion of the length of said rotatable member to provide an additional bearing for the latter.

13. In an electric switch of the reciprocating contactor type, in combination, a one-piece molded insulating base having a recess formed therein and opening to one end thereof, a one-piece molded insulating plunger positioned within said recess and slidably engaged with the side walls thereof, a coiled compression spring interposed between the bottom wall of said recess and said plunger to normally bias the latter outwardly with respect thereto, a plurality of axially spaced sets of stationary contacts positioned within said recess, a plurality of bridging contactors carried by said plunger and having a predeter-

mined degree of axial movement with respect thereto, certain of said sets of contacts cooperating with said contactors to positively limit the degree of outward movement of said plunger, said plunger having a reduced upper end portion, a recessed molded insulating member telescopically engaged with said reduced end of the plunger, a spring wire ring interposed between the periphery of said reduced end and said member to provide a frictional connection between said parts, said member having a pair of diametrically opposed laterally extending lugs formed integrally therewith, a rotatable actuating member having a portion surrounding the main body portion of said insulating member, and said rotatable member having diametrically opposite sets of downwardly facing cam surfaces formed thereon for cooperation with the upper end portions of said pair of lugs, whereby said rotatable member is adapted in one rotary position thereof to permit engagement of certain of said contactors with certain of said contacts and is adapted upon rotary movement thereof to another position to effect disengagement of said last mentioned contacts and yieldable retention of the latter in such disengaged position.

14. In an electric switch of the reciprocating contactor type, in combination, a one-piece molded insulating base having a recess formed therein and opening to one end thereof, a one-piece molded insulating plunger positioned within said recess and slidably engaged with the side walls thereof, a coiled compression spring interposed between the bottom wall of said recess and said plunger to normally bias the latter outwardly with respect thereto, a plurality of axially spaced sets of stationary contacts positioned within said recess, a plurality of bridging contactors carried by said plunger and having a predetermined degree of axial movement with respect thereto, certain of said sets of contacts cooperating with said contactors to positively limit the degree of outward movement of said plunger, said plunger having a reduced upper end portion, a recessed molded insulating member telescopically engaged with said reduced end of the plunger, a spring wire ring interposed between the periphery of said reduced end and said member to provide a frictional connection between said parts, said member having a pair of diametrically opposed laterally extending lugs formed integrally therewith, a rotatable actuating member having a portion surrounding the main body portion of said insulating member, said rotatable member having diametrically opposite sets of downwardly facing cam surfaces formed thereon for cooperation with the upper end portions of said pair of lugs, whereby said rotatable member is adapted in one rotary position thereof to permit engagement of certain of said contactors with certain of said contacts and is adapted upon rotary movement thereof to another position to effect disengagement of said last mentioned contacts and yieldable retention of the latter in such disengaged position, and said rotatable member being also adapted in another rotary position thereof to effect engagement of other of said contactors with other of said contacts and to yieldably maintain such engagement.

15. In an electric switch of the reciprocating contactor type, in combination, a one-piece molded insulating base having a recess formed therein and opening to one end thereof, a one-piece molded insulating plunger positioned within said recess and slidably engaged with the side walls

thereof, a coiled compression spring interposed between the bottom wall of said recess and said plunger to normally bias the latter outwardly with respect thereto, a plurality of axially spaced sets of stationary contacts positioned within said recess, a plurality of bridging contactors carried by said plunger and having a predetermined degree of axial movement with respect thereto, certain of said sets of contacts cooperating with said contactors to positively limit the degree of outward movement of said plunger, said plunger having a reduced upper end portion, a recessed molded insulating member telescopically engaged with said reduced end of the plunger, a spring wire ring interposed between the periphery of said reduced end and said member to provide a frictional connection between said parts, said member having a pair of diametrically opposed laterally extending lugs formed integrally therewith, a rotatable actuating member having a portion surrounding the main body portion of said insulating member, said rotatable member having diametrically opposite sets of downwardly facing cam surfaces formed thereon for cooperation with the upper end portions of said pair of lugs, whereby said rotatable member is adapted in one rotary position thereof to permit engagement of certain of said contactors with certain of said contacts and is adapted upon rotary movement thereof to another position to effect disengagement of said last mentioned contacts and yieldable retention of the latter in such disengaged position, a metal adapter member rigidly attached to the upper end of said base and adapted to provide a bearing for said rotatable member, and said bearing and said rotatable member having parts associated therewith to positively limit the degree of rotation of said rotatable member in each direction and to restrain the latter against substantial axial displacement.

16. In an electric switch of the reciprocating contactor type, in combination, a one-piece molded insulating base having a recess formed therein and opening to one end thereof, a one-piece molded insulating plunger positioned within said recess and slidably engaged with the side walls thereof, a coiled compression spring interposed between the bottom wall of said recess and said plunger to normally bias the latter outwardly with respect thereto, a plurality of axially spaced sets of stationary contacts positioned within said recess, a plurality of bridging contactors carried by said plunger and having a predetermined degree of axial movement with respect thereto, certain of said sets of contacts cooperating with said contactors to positively limit the degree of outward movement of said plunger, said plunger having a reduced upper end portion, a recessed molded insulating member telescopically engaged with said reduced end of the plunger, a spring wire ring interposed between the periphery of said reduced end and said member to provide a frictional connection between said parts, said member having a pair of diametrically opposed laterally extending lugs formed integrally therewith, a rotatable actuating member having a portion surrounding the main body portion of said insulating member, said rotatable member having diametrically opposite sets of downwardly facing cam surfaces formed thereon for cooperation with the upper end portions of said pair of lugs, whereby said rotatable member is adapted in one rotary position thereof to permit engagement of certain of said contactors with certain of said contacts and is adapted upon rotary

movement thereof to another position to effect disengagement of said last mentioned contacts and yieldable retention of the latter in such disengaged position, said rotatable member being also adapted in another rotary position thereof to effect engagement of other of said contactors with other of said contacts and to yieldably maintain such engagement, a die cast metal adapter member rigidly attached to the upper end of said base and adapted to provide a bear- 10

ing for said rotatable member, said bearing and said rotatable member having parts associated therewith to restrain said rotatable member against axial movement in either direction and to positively limit the degree of rotation thereof, and said adapter member having elements associated therewith to provide for one-hole attachment of said switch as a unit to a suitable support.

CLYDE F. ROBBINS.