

Jan. 1, 1963

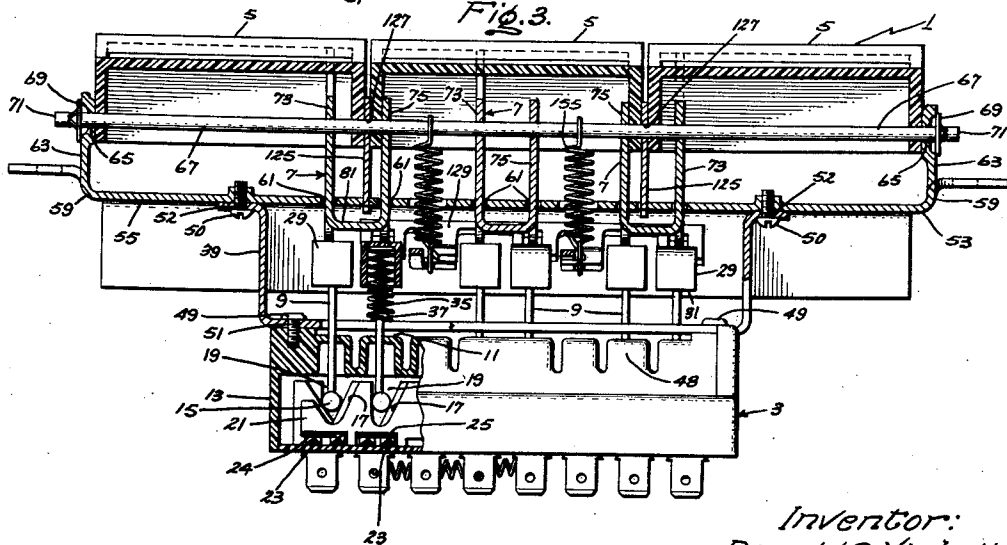
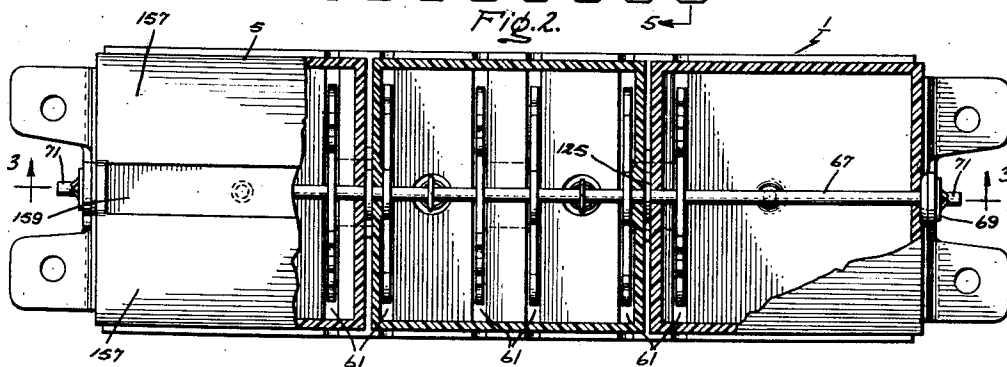
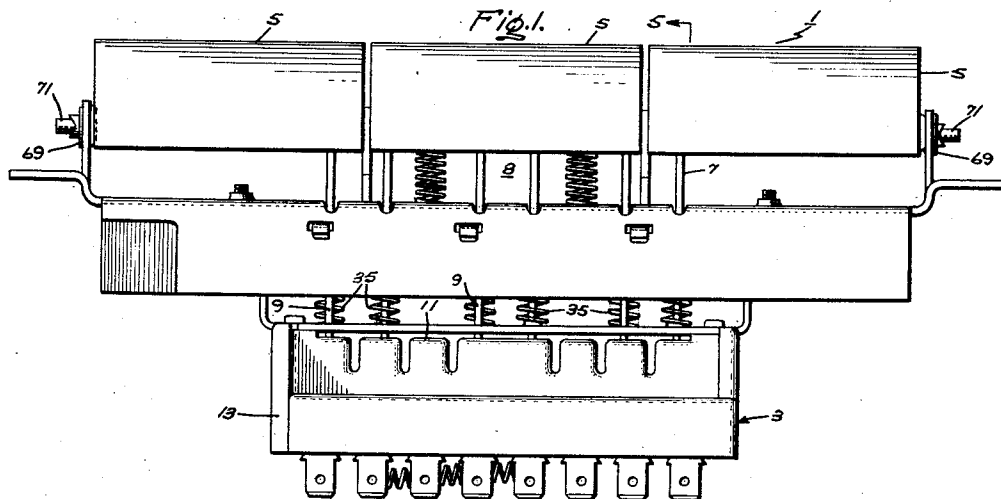
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3,071,659

ROCKER-OPERATED SWITCH

Filed March 23, 1960

4 Sheets-Sheet 1



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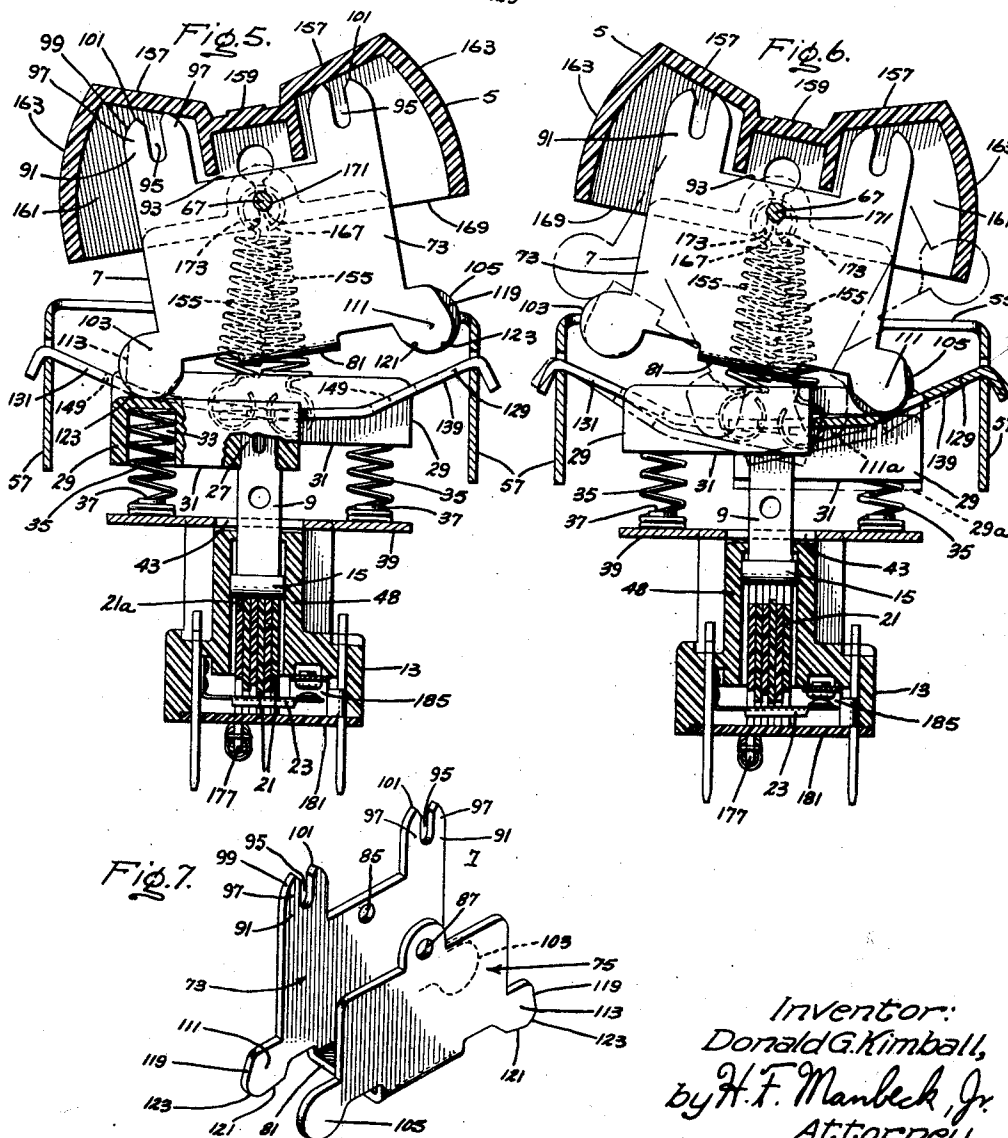
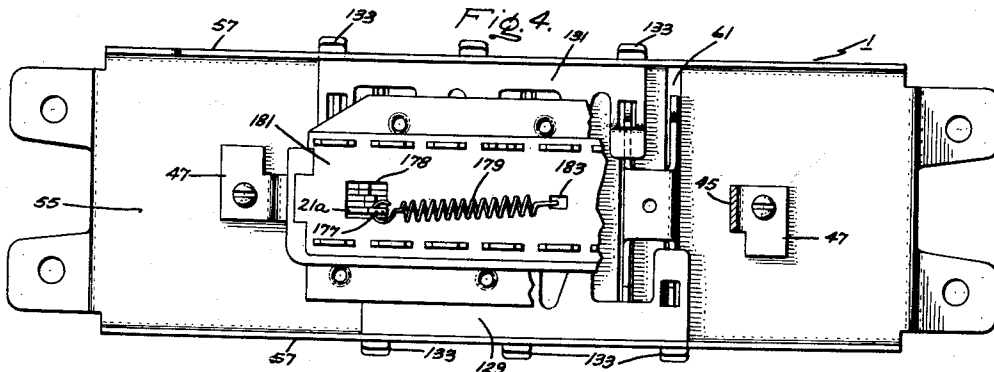
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ROCKER-OPERATED SWITCH

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4 Sheets-Sheet 2



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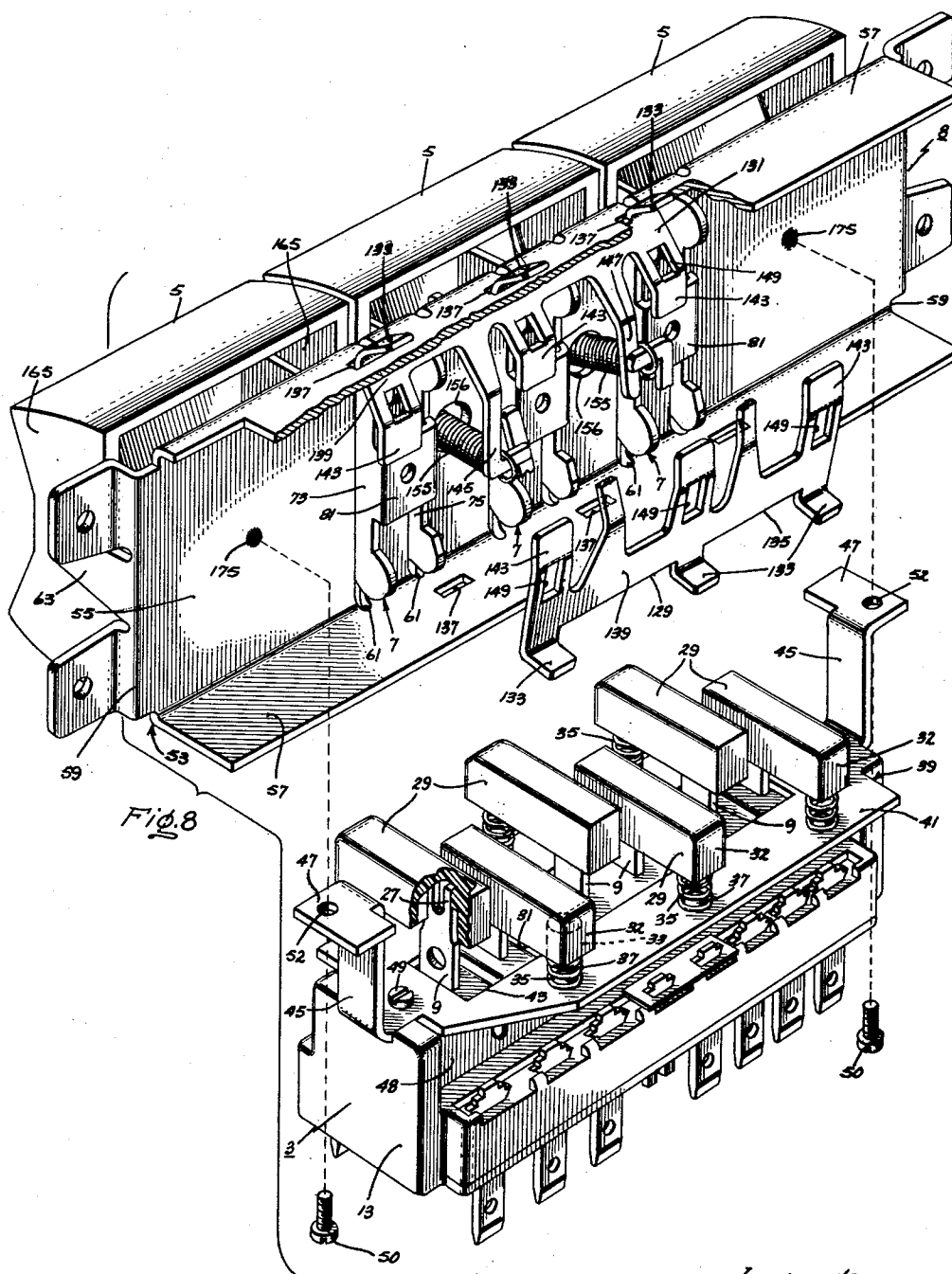
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D. G. KIMBALL
ROCKER-OPERATED SWITCH

3,071,659

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4 Sheets-Sheet 3



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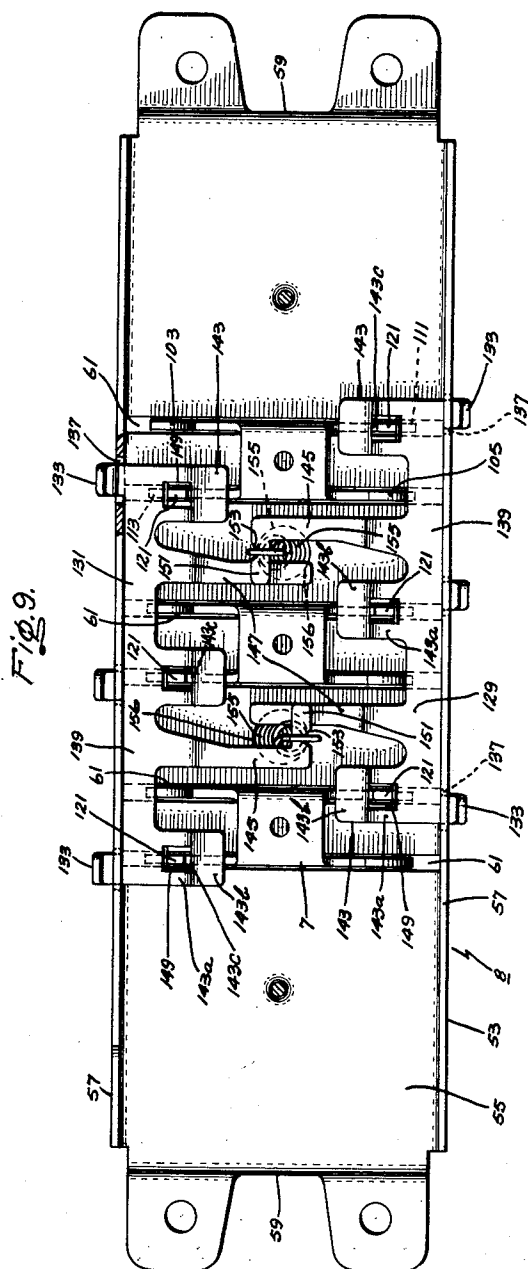
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D. G. KIMBALL
ROCKER-OPERATED SWITCH

3,071,659

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4 Sheets-Sheet 4



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3,071,659

ROCKER-OPERATED SWITCH

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10 Claims. (Cl. 200-5)

This invention relates to an improved rocker-operated electric switch and particularly to a multiple pushbutton type switch having one or more rockers for operating some of the pushrods thereof.

Pushbutton type switches have found widespread application as appliance switches for electric ranges, washing machines, and room air conditions, etc. In certain of these applications, it is highly desirable to have a low cost and efficient means for operating such a switch by the limited rotation of an actuating member such as a rocker, rather than by the manual depression of a pushrod. By using a rotary actuating member such as a rocker to operate a pair of adjacent pushrods, the total number of actuating members necessary for controlling the switch may be reduced, and, at the same time, the overall styling of the switch may be greatly improved. To enhance the appearance of the switch and make its manipulation very convenient, the rockers used in such switches as these are sometimes relatively large in size. Such large sized rockers of the prior art have required relatively complex motion transfer mechanisms for selectively transmitting the rotary motion from each rocker to the pushrods, thereby adding appreciably to the overall cost of the switch. In addition, the detent mechanisms for such rockers have often proved inefficient. It has therefore been found desirable to provide a new and improved switch of the rocker-operated type which incorporates a simple and improved means for transferring the rotary motion of one or more rockers to a pair of adjacent pushrods of a pushbutton switch. In addition, it has also been found desirable to obtain an improved means for providing control of the rotary motion of these large size rockers to prevent any loose play thereof as they perform their selective rotary functions in the switch housing.

The principal object of this invention is to provide a new and improved rocker-operated electric switch with a novel and efficient means for obtaining rocker actuation.

A further object of this invention is to provide a rocker-operated electric switch which includes a multiple pushbutton type switch and an improved means for transferring motion from one or more rockers to certain pushrods of the switch to operate the switch.

An additional object of this invention is to provide an improved rocker-operated electric switch with one or more rockers specially constructed and arranged to provide improved control of the positioning thereof.

In carrying out my invention, in one form thereof, I apply it to a multiple pushbutton type switch with movable sliders. Each slider has a series of inclined working surfaces which are acted upon by pushrods, and cam surfaces for engaging movable contact supporting arms of the switch. These sliders serve to provide an interlocking mechanism for the switch by preventing simultaneous depression of more than one pushrod and by returning any previously depressed pushrod back to its outermost position upon the subsequent depression of another of the pushrods. A lateral extension is formed on the outer end of each pushrod of at least one pair of adjacent pushrods of the pushbutton switch. The extensions of this pair of pushrods extend in opposite directions and are coplanar when each pushrod of the pair is in its outermost position. By my invention, a rocker is pivotally mounted above the outer ends of each pair of pushrods. This rocker includes a pair of axially and angularly spaced

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operating segments and a pair of detent segments. One of the detent segments is associated with each of the operating segments. Each of the operating segments or cams substantially overlies an extension of one of the adjacent pushrods and is engageable therewith upon the selective rotation of the rocker to depress the pushrod associated with the engaged extension and thus actuate the switch by movement of one of the movable contact supporting arms. A pair of co-operating spring biased levers are pivotally mounted in interlinked relationship upon the switch support. The detent segments selectively co-operate with these detent levers to accurately control the rotary motion of the rockers actuating the switch.

Further aspects of my invention will become apparent hereinafter, and the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which I regard as my invention. The invention, as to organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description when taken in conjunction with the accompanying drawings in which:

FIG. 1 is a side view of an improved rocker-operated switch embodying my invention;

FIG. 2 is a top view of the switch of FIG. 1 which is partially in section and partially broken away to show the rockers;

FIG. 3 is a side view, partially broken away, and partially in section along line 3-3 of FIG. 2;

FIG. 4 is a bottom view of the switch of FIG. 1, partially broken away to show one of the rockers;

FIG. 5 is a cross sectional view taken generally along line 5-5 of FIG. 1, showing the switch with one of its pushrods urged into a depressed position by its associated rocker;

FIG. 6 is a sectional view similar to FIG. 5 but showing another of the pushrods urged into a depressed position by the same rocker as that shown in FIG. 5, and with dotted lines also indicating momentary positions of the detent levers and rocker;

FIG. 7 is a perspective view of one of the rockers used in the switch of FIG. 1;

FIG. 8 is a perspective view of the switch of FIG. 1, which is partially exploded, partially in section and partially broken away to show detail; and

FIG. 9 is a bottom view of the switch of FIG. 1 with the pushbutton switch and a part of its support removed to show the rocker detent mechanism.

Referring in detail to the drawings, and in particular to FIGS. 1-3, there is shown a rocker-operated switch 1 with which my invention has been advantageously employed. This particular switch 1 has been designed to provide simplified and efficient operation of a pushbutton switch 3 by means of the selective rotation of relatively large sized actuating handles 5. The rotary motion of these handles 5 is transmitted to the pushbutton switch 3 by means of pivoted rockers 7, which form a part of a motion transfer mechanism generally indicated at 8. The structure and operation of motion transfer mechanism 8 forms an important aspect of my invention and it shall hereinafter be described in detail.

Pushbutton switch 3 is of the multiple pushbutton type, and, as shown in FIG. 3, it includes six pushrods 9 which are disposed in pairs that are spaced apart. All of the pushrods 9 are arranged in line and they are also in parallel relationship. These pushrods 9 extend outwardly through appropriate apertures in top wall 11 of insulating body 13. Each pushrod 9 has a cylindrically curved actuating portion 15 formed at its innermost end to co-operate with various inclined upper working surfaces 17 formed in actuating recesses 19 of sliders 21.

(See FIG. 3.) Sliders 21 selectively co-operate with actuating portions 15 of pushrods 9 in the well-known manner to provide a switch interlocking and actuating mechanism, the sliders being disposed in parallel side-by-side relationship to reciprocate longitudinally and actuate movable contact supporting arms 23. More particularly, the lower edge 24 of each slider, as shown in FIG. 3, has one or more cam surfaces 25 formed thereon for selectively engaging certain movable contact supporting arms 23. Longitudinal movement of each slider effects the opening and closing of predetermined contact pairs by camming one or more movable contact supporting arms 23 in certain operating position(s) of the slider.

The inclined working surfaces 17 of the sliders are so arranged on the different sliders that only one pushrod may be fully depressed at any one time. More specifically, to achieve switch interlocking, each pushrod actuating portion 15 extends into a group of generally aligned actuating recesses 19 of the sliders, as shown in FIG. 3, and co-operates with the working surfaces 17 thereof. For the pushrod return operation, one or more inclined surfaces 17 of certain slider recesses move longitudinally to engage portion 15 of the depressed pushrod and return it to its outermost position upon the subsequent depression of another pushrod. As is thus well-known in the art, the depression of one of the pushrods 9 returns any previously depressed pushrod to its outermost position by coaction between one or more of the sliders and the previously depressed pushrod, and it also causes the longitudinal movement of one or more of the sliders for actuating one or more pairs of contacts of the switch by engagement of cam surfaces 25 of the sliders with movable contact supporting arms 23.

According to my invention, the switch 1 is actuated by a plurality of identical rockers 7. In order to transmit the motion of these rockers to the pushrods 9, the outer end 27 of each pushrod is fitted into a laterally extending pushbutton 29. These pushbuttons or extensions 29 are alternately disposed laterally in opposite directions so that the pushrods 9 of each adjacent pair have pushbuttons 29 which extend outwardly from the pushrods and overlie different sides of the switch body 13. (See FIG. 8.) It will also be noted that each adjacent pair of pushbuttons 29 is spaced apart longitudinally from the next pair of pushbuttons by the arrangement of the pushrods 9 in the pushbutton switch.

The underside 31 of each pushbutton 29 also includes a cylindrical cavity 33 for receiving a pushbutton biasing spring 35. (See FIG. 5.) This cavity 33 is formed in underside 31 of each pushbutton near end 32 of the pushbutton which is spaced remotely from the pushrod connection. One end of each compression spring 35 is received within the cylindrical cavity 33 of the pushbutton, and the other end of the spring encircles and receives annular flange 37 which is formed in supporting arch 39. With one end of each spring 35 housed within cavity 33 of pushbutton 29 and the other end of this spring encircled about flange 37 of arch 39, the springs 35 are effectively restrained from any lateral movement, and are free to apply an outward force upon each pushbutton to bias each pushrod attached thereto to its undepressed or outermost position.

Arch 39 not only serves to help support and position pushbutton biasing springs 35, but it also serves to properly position motion transfer mechanism 8 above pushbutton switch 3. To effect these functions, as shown in FIG. 8, arch 39 includes base portion 41 which has a longitudinal slot 43 formed therein, vertical arms 45 which are connected to and extend upwardly from the outer ends of base portion 41, and flanged ends 47 which extend outwardly and perpendicularly from arms 45. The aforementioned annular flanges 37 are grouped on each side of the base portion. Base portion 41 overlies a central raised portion 48 of insulating body 13 of the

pushbutton switch so that pushrods 9 may extend outwardly through slot 43. To attach arch 39 to the pushbutton switch 3, screws 49 are extended through suitable apertures 51 of the arch near each end portion 41 and threaded into engagement with threaded apertures in top wall 11 of body 13. (See FIG. 3.) Flanged ends 47 of the arch 39 each have an aperture 52 formed therein for the purpose of receiving the shanks of screws 50 to attach the pushbutton switch 3 to motion transfer mechanism 8, as shall be hereinafter described.

For supporting my new and improved rocker-operated motion transfer mechanism 8, and mounting this mechanism upon the pushbutton switch 3, I have provided a U-shaped supporting bracket 53. As shown in FIG. 8, bracket 53 includes an elongated base panel 55 and a pair of oppositely disposed parallel sides 57 which are turned perpendicularly outwardly from panel 55. To provide a means for supporting rockers 7 of my switch, a vertical extension 63 is turned upwardly as a central extension from each end 59 of base panel 55. Each extension 63 has a supporting aperture 65 formed therein for receiving and supporting axle 67. (See FIG. 3.) Lanced snap-on fasteners 69 are mounted around each end 71 of axle 67 and these fasteners are positioned outwardly from and adjacent to extensions 63 to limit longitudinal movement of the axle 67 after it has been assembled in the bracket. Intermediate to the ends 59 of base panel 55, three pairs of spaced parallel slots 61 are formed transversely therein. (See FIG. 2.) The purpose of these slots shall become apparent hereinafter.

Turning now to a very important aspect of my invention, it will be seen that I have rotatably mounted three rockers 7 upon axle 67. These rockers are identical, and the structure thereof may be clearly seen in the perspective view of FIG. 7. Each rocker 7 includes a pair of spaced parallel plates 73 and 75. Plates 73 and 75 are formed from a single sheet of metal and are connected together at their lower ends by an integral base portion 81. Plate 73 is larger than plate 75, but the main portion of plate 73 somewhat resembles plate 75. So that each rocker may be pivotally mounted upon axle 67, a pair of aligned bearing apertures 85 and 87 are formed in plates 73 and 75, respectively. The axis of these bearing apertures 85 and 87 is generally perpendicular to the surfaces of plates 73 and 75, aperture 85 being formed in the main portion of plate 73 and aperture 87 being formed in an arcuate projection of plate 75. For transmitting rotary motion from a suitable switch actuating handle, such as for example the illustrated actuating handle 5, to each rocker 7, each plate 73 includes a pair of spaced prolongations 91. Prolongations 91 extend outwardly from near the opposite ends of the upper edge of plate 73, and each prolongation has a slot 95 formed in the center thereof to provide a pair of spaced tines 97. Slots 95 of rocker 7 may be used to receive the ribs of certain handles which have not been shown. Each tine 97 includes a relatively sharp point 101 for engaging the underside of an inclined surface of an actuating handle, and a curved outer portion 99. (See FIG. 5.) In the illustrated switch 1, the points 101 of the innermost tines 97 engage the undersides of each handle 5 to provide the desired transmission of rotary motion from each handle 5 to its associated rocker 7. It will be understood by those skilled in the art that various other combinations of tines and prolongations may be utilized to provide the desired co-operative engagement of actuating handles with the rockers, depending upon the surface configuration of the underside of each rocker.

For effectively transmitting the selective rotary motion of each rocker to any pushrod of an associated adjacent pair of pushrods by means of engagement of the rocker with the pushbutton of that pushrod, each rocker 7 has two operating segments or cam portions 103 and 105 formed upon it. As best shown in FIG. 7, operating segment 103 is in the form of a ball-shaped radial extension

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projecting outwardly from the lower right hand corner of plate 73 as viewed in FIG. 7. Operating segment 103 is identical to segment 103, and takes the form of a ball-shaped radial extension projecting outwardly from the lower left hand corner of plate 75. Operating segments 103 and 105 are thus formed on plates 73 and 75 respectively so that they are angularly and axially spaced from each other, with respect to the axis of rotation of rocker 7. With this rocker structure, as shall hereinafter become apparent, operating segments or cams 103 and 105 may be selectively rotated into engagement with pushbuttons 29 of a pair of adjacent pushrods, to depress the associated pushrods and actuate certain pairs of movable contacts of the pushbutton switch 3.

In addition to having two angularly and axially spaced operating segments, each of my rockers also includes a pair of detent segments 111 and 113. These detent segments form a further important aspect of my invention. The detent segment 111 is formed as a radial extension projecting outwardly from the lower left hand corner of plate 73 as viewed in FIG. 7. Detent segment 113 is identical to detent segment 111 and takes the form of a radial extension projecting outwardly from the lower right hand corner of plate 75. Detent segments 111 and 113 each include relatively flat side and bottom edges 119 and 121 respectively and an intermediate rounded edge portion 123. (See FIG. 5.) Portion 123 is specially curved to co-operate with a spring biased lever arrangement as shall be described in detail hereinafter. Detent segments 111 and 113 are thus formed on the spaced parallel plates 73 and 75 in such a manner that they are axially spaced and angularly spaced from each other, with respect to the axis of rotation of rocker 7. In addition, detent segment 111 of plate 73 is axially spaced from and angularly coincident with operating segment 105 of plate 75, and detent segment 113 of plate 75 is axially spaced from and angularly coincident with operating segment 103 of plate 73. The reason for this arrangement of the detent segments is so that the angularly coincident adjacent pairs of operating and detent segments shall be able to co-operate with each other upon selective rotation of rocker 7 not only to efficiently provide actuation of a pushrod which is engaged by the operating segment through its associated pushbutton, but also, at the same time, to efficiently control the rotary motion of rocker 7 by an improved detent action. The respective operative functions of these operating and detent segments shall be described in detail hereinafter.

To rotatably mount rockers 7 upon their supporting axle 67, before positioning axle 67 through both of its supporting apertures 65, parallel plates 73 and 75 of each rocker are slipped through a pair of the adjacent spaced parallel slots 61 of supporting bracket 53 from the underside of base panel 55. (See FIG. 3.) It is important to note at this point, however, that plate 73 of each of the outermost or end rockers is slipped through an outermost or end slot 61. The reasons for such an arrangement of the end rockers are so that large sized handles may be used to actuate the relatively small rockers, and also so that handles may be conveniently connected to the prolongations of the outermost rockers. (See FIG. 3.) The free ends of plates 73 and 75 of each rocker thus extend outwardly in a generally perpendicular manner from base panel 55 of bracket 53, and connecting portion 81 of each rocker lies underneath the underside of base panel 55 between each pair of parallel slots 61. With the rockers arranged in this manner, axle 67 is then pushed through bearing apertures 85 and 87 of each rocker 7 and extended through supporting apertures 65 on extensions 63 so that the rockers are rotatably supported on axle 67 with their axis of rotation extending longitudinally along the center of bracket 53 and spaced above base panel 55.

In my particular switch 1, I have also provided additional bearing support for axle 67 by means of a pair of

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struts 125. These struts 125, as shown in FIG. 3, extend perpendicularly outwardly from base panel 55 between the plates of the outermost rockers 7. Each strut 125 is staked at its lower ends to base panel 55 and at its upper end includes a supporting bearing aperture 127 through which axle 67 is also extended. After the rockers have been properly positioned on axle 67 and the axle has also been extended through strut apertures 127 and the supporting apertures 65, the previously mentioned fasteners 69 are then snapped around the outer ends 71 of axle 67 to limit any longitudinal movement thereof.

Turning now to another important aspect of my invention, in order to provide a simple and efficient means for transmitting detent biasing force to each rocker 7 upon the selective rotation thereof, as shown in FIGS. 8 and 9, I have provided a pair of spring biased detent levers 129 and 131. Levers 129 and 131 are identical, and so that each lever may be pivotally mounted on bracket 53, each of these levers includes three spaced tabs 133 whereby these slots co-operate with the aforementioned rocker detent segments shall be described in detail hereinafter. For spring biasing and interlocking detent levers 129 and 131, arm 145 of each detent lever has a longitudinally directed tab 151 which serves as an extension of its innermost or free end. Tab 151 of each arm 145 has a notch 153 formed on one of its edges to retain the looped end of a coiled biasing spring 155.

Viewing now FIGS. 8 and 9, it will be seen that the detent levers 129 and 131 are pivotally mounted from the oppositely disposed sides 57 of bracket 53 so that fingers 143 and arms 145 and 147 of each lever extend generally inwardly or transversely toward the center of the bracket. (See also FIGS. 5 and 6.) It will thus be seen that levers 129 and 131 are pivotally mounted in cantilever fashion. Levers 129 and 131 are not disposed so that their fingers 143 are opposite to each other but they rather are arranged so that one of the fingers 143 lies underneath each detent segment of each rocker 7, the fingers and arms of the two levers being appropriately longitudinally spaced from each other for that purpose. As shown in FIG. 9, slot 149 of each finger 143 is thus generally disposed underneath the bottom edge 121 of each detent segment. In order to interlink the two detent levers 129 and 131, when pivotally mounting them on bracket 53, tab 151 of arm 145 of each lever is placed underneath outstretched arm 147 of the other lever. (See FIG. 9.) One looped end of a coiled biasing spring 155 is then placed around the center of each tab 151, with notch 153 retaining that end of each of the springs in position. The springs 155 are extended upwardly through apertures 156 in base panel 53 of the bracket and they have their other ends hooked around axle 67. With one end of spring 155 engaging tab 151 of each detent lever, the upward biasing force of each spring 155 is transmitted from each lever to the other lever by means of the engagement of tab 151 of each lever with the outstretched arm 147 of the other lever. (See FIG. 9.) The inter-linking engagement thus achieved by the physical engagement of the outstretched arms of detent lever 129 with the outstretched arms of detent lever 131 provides an upwardly directed biasing force at each finger 143 of the levers for controlling one of the overlying detent segments.

Each spring 155 exerts a slight upward biasing force upon its associated tab 151 when all of the rockers 7 are in their neutral or non-actuating positions. When one of rockers 7 is rotated to one of its primary actuating positions, such as the position shown in FIG. 5, a pair of co-operating operating and detent segments such as operating segment 103 and detent segment 113 move downwardly. As operating segment 103 begins to depress pushbutton 29 downwardly, at the same time rounded edge 123 of detent segment 113 brushes against the base portion 139 of lever 129 near its associated finger 143. As the detent segment 113 brushes against the base portion of the one lever, a slight downward pivoting

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motion of both detent levers occurs due to their interlinked relationship. As operating segment 103 continues to rotate to its actuating position, as shown in FIG. 5, detent segment 113 seats itself in slot 149 of the associated finger 143. Segment 113 is then restrained in that position by the upward biasing force of springs 155.

To provide a means for physically actuating each rocker 7 of my switch 1, I have provided the aforementioned actuating handles 5. The handles 5 have been selected because they are attractive in appearance, but it will be understood by those skilled in the art that various other configurations and types of actuating handles could be utilized to provide equivalent functional results in my switch. Each handle 5 includes a pair of sloped actuating surfaces 157, as shown in FIGS. 5 and 6, which are connected to a central recessed surface 159. Handle 5 has a hollow inner cavity 161 and a pair of outwardly curved opposite sides 163. The end walls 165 of each handle 5, which may be seen in FIG. 8, have a vertical slot 167 which is formed upwardly from lower edge 169. (See FIG. 5.) Slot 167 includes a pair of arcuate bearing surfaces 171, and a pair of inwardly convex surfaces 173. The inwardly convex surfaces 173 are opposite to each other and are spaced apart by a distance slightly less than the diameter of axle 67 so that end walls 165 of each handle 5 may be conveniently snapped into position upon the axle 67. For mechanically linking each handle 5 to one of my rockers 7, when the slots 167 of end walls 165 of the handle have been snapped into position upon axle 67, prolongations 91 of plate 73 of each rocker are received by the hollow inner cavity 161 of one of the handles. The relatively sharp points 101 of the innermost tines 97 of each prolongation then engage the bottoms of the sloped actuating surfaces 157 so that each rocker 7 is controlled by one of the handles 5 due to its engagement therewith. (See FIG. 5.)

When all three of my actuating handles 5 have been properly positioned upon axle 67, as shown in FIG. 3, they are disposed in side-by-side relationship with struts 125 separating the handles from each other. With each rocker 7 mounted upon axle 67 in the manner shown in FIG. 3, it will be noted that the shorter plate 75 of each outermost rocker lies underneath the center handle. Rotary movement of the outermost rockers, however, in no way interferes with the rotary movement of the central handle, due to the fact that the inner surface of each plate 75 which is disposed underneath the center handle is spaced slightly inwardly from the end walls 165 of the center handle. This spacing precludes any frictional engagement of plates 75 of the outermost rockers with the end walls of the center handle.

For attaching bracket 53 of motion transfer mechanism 8 to supporting arch 39, I have formed a pair of threaded apertures 175 in base panel 55 thereof. Screws 50 are extended through the apertures 52 in the flanged ends 47 of the arch and then threaded into engagement with the threaded apertures 175 of the bracket, to securely attach the motion transfer mechanism to the pushbutton switch in the manner shown in FIG. 3.

In the particular pushbutton switch 3 which I have illustrated, each pushrod has two depressed positions rather than the usual one position. The outermost of these depressed positions is the one shown in FIG. 5 and it is the primary switch actuating position for the pushrod. The innermost depressed position for the pushbutton of each pushrod is represented in dotted lines in FIG. 6. This innermost position, in my particular switch, provides a momentary position for each pushrod. To achieve this momentary position for each pushrod, as shown in FIG. 4, one of the sliders 21a has an extension 177 formed there on which extends outwardly through a slot 178 of insulating back plate 181. Extension 177 is notched to retain the hooked end of a coiled spring 179 around it, and the other end of spring 179 is attached to plate 181 at slot 183 thereof. Spring 179 runs in tension

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between the extension 177 and slot 183 to continuously bias the slider 21a to the right of its position as shown in FIG. 4. Each pushrod 9 of the switch co-operates with a working surface 17 of the slider 21a to provide a momentary action position for each pushrod when it is in its innermost depressed position.

It will thus be seen by those skilled in the art that the structure of each of my rockers 7 conveniently provides for the efficient actuation of two adjacent pushrods by selective rotary engagement of the rocker operating segments 103 and 105 with the extensions of pushbuttons 29 of a pair of adjacent pushrods. At the same time, each of my rockers 7 also provides an efficient means for controlling the rotary movement by co-operation between its detent segments 111 and 113 and my specially arranged spring biased detent levers 129 and 131.

Turning now to a detailed explanation of the operation of my new and improved switch 1, let us assume that the actuating handle 5 which is shown in FIG. 5 is rotated in a counterclockwise direction from its central or neutral position (as viewed in FIG. 1), to the position in which it appears in FIG. 5. The rotary movement of handle 5 causes the rotary movement of operating segment 103 downwardly against the pushbutton 29 which it overlies. Pushbutton 29 in turn moves downwardly against the upward biasing force of compression spring 35. As the pushbutton 29, which is shown in the foreground of FIG. 5, is depressed downwardly by the operating segment 103, pushrod 9 to which it is attached forces its actuating portion 15 into engagement with certain inclined upper working surfaces 17 of sliders 21. (See also FIG. 3). The coaction between the actuating portion 15 of the depressed pushrod 9 and the working surfaces 17 of sliders 21 caused the reciprocating motion of certain of the sliders to move movable contact supporting arm 23 to a contacts open position. More particularly, the reciprocating motion of one or more of the sliders 21 causes certain cam surfaces 25 thereof (such as those shown in FIG. 3) to engage the movable contact arm 23 and thus move the pair of contacts 185 from their closed to their open position.

At the same time that operating segment 103 of rocker 7 moves to its initial depressed position, in which it is shown in FIG. 5, detent segment 113 which is axially spaced from operating segment 103, but lies directly behind it, enters into slot 149 of detent lever 131 of the finger 143 which it overlies. (See also FIGS. 8 and 9). Before detent segment 113 of FIG. 5 enters slot 149 it causes a slight pivoting motion of detent lever 131 downwardly against the biasing force of springs 155. This slight downward movement of lever 131 causes a similar downward movement of lever 129, and thus releases any previously engaged detent segment from its actuating position. The interlinking relationship of levers 129 and 131, of course, provides this similar movement of the one detent lever in response to the movement of the other detent lever. With detent segment 113 received by slot 149 as shown in FIG. 5, the upward biasing force of springs 155 which is exerted upon detent lever 131 serves to restrain operating segment 103 in its actuated primary depressed position. With operating segment 103 in the position shown in FIG. 5, it may be rotated further in a counterclockwise direction to force pushbutton 29 to its extreme or innermost depressed position. Pushrod 9 would then perform some appropriate momentary function against the biasing force of momentary spring 179.

Turning now to FIG. 6, it will there be seen that the operator of my switch has rotated actuating handle 5 from the position which it assumes in FIG. 5, in a clockwise direction so that operating segment 105, which lies behind detent segment 111 in FIG. 6, has depressed its associated pushbutton 29 (not shown) downwardly. By this manipulation, the pushrod 9 which is attached to the pushbutton 29 depressed by operating segment 105 causes the actuation of another movable contact arm of the

switch, which is not shown, by the same operation as was described for FIG. 5. At the same time that operating segment 105 is moved to its downward actuating position, the compression spring 35 which underlies pushbutton 29 of the previously depressed pushrod urges this pushrod to its uppermost position, where it is shown in FIG. 6. The biasing force of springs 35 in the illustrated embodiment supplements the pushrod return force which is achieved in the well-known manner by the coaction between certain of the slider working surfaces 17 and the pushrod actuating portions 15.

FIG. 6 shows by dotted lines the rotary positions which rocker 7 assumes when the operating segments thereof are in their momentary or extreme rotary positions. For example, when operating segment 105 has been rotated to its momentary position, it is behind detent segment 111a. Detent segment 111a then forces pushbutton 29 to its dotted position 29a. As previously discussed, slider 21a is then moved to its momentary position (not shown) against spring 179, and levers 129 and 131 are moved to positions 129a and 131a respectively against the biasing forces of springs 155. The pushrod 9 (not shown) which is then urged to its innermost position performs some appropriate momentary function in the switch. After the momentary function of the depressed pushrod 9 has been completed, it immediately returns to its primary switch actuating position due to coaction between the momentary slider 21a and the depressed pushrod, and the biasing force of pushbutton spring 35. Detent lever 129 urges a biasing force upon detent segment 111 to return it from position 111a to the position where it is shown in full in FIG. 6.

It will therefore be seen that my new and improved rocker-operated switch as herein illustrated provides an efficient and advantageous means for providing rocker-operated control of a multiple pushbutton switch. It should be realized that such rockers as I have disclosed may be used to control but one pair of pushrods of a multiple pushbutton switch, while the other pushrods may operate in their normal pushbutton actuated capacity. Further, it may be preferable to utilize any number of combinations of rocker control and pushbutton control in a particular switch. It should therefore be realized that certain aspects of my invention may be incorporated efficiently and beneficially in other various types of pushbutton switch applications.

While in accordance with the patent statutes, I have described what at present is considered to be the preferred embodiment of my invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from my invention, and I therefore aim in the following claims to cover all such equivalent variations as fall within the true spirit and scope of this invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A rocker-operated electric switch comprising a multiple pushbutton type switch mechanism having a plurality of contacts and means including at least one pair of parallel pushrods for operating said contacts, and means for operating said pushrods comprising a rocker pivotally mounted above the outer ends of each of said pushrods, said rocker including a pair of axially and angularly spaced operating segments and a pair of detent segments, each one of said detent segments angularly adjacent to and associated with one of said operating segments, each of said operating segments disposed adjacent one of said pushrods and engageable therewith for selective depression of the associated pushrod, and a spring biased pivotally mounted lever means, each of said detent segments selectively co-operating with said lever means upon engagement of its associated operating segment with an associated pushrod to control the rotary motion of the rocker of said switch.

2. A rocker-operated electric switch comprising a multi-

ple pushbutton type switch having a plurality of contacts and means including a plurality of linearly arranged parallel pushrods for operating said contacts, a support for said pushbutton type switch, a means for operating said pushrods including a lateral extension formed on the outer end of each pushrod of at least one pair of adjacent pushrods, the extensions of said pair of pushrods extending in opposite directions and being coplanar when each pushrod of said pair is in its outermost position, and a rocker pivotally mounted above the outer ends of said pair of pushrods, said rocker including a pair of axially and angularly spaced operating segments and a pair of detent segments associated respectively with each of said operating segments, each of said operating segments substantially overlying an extension of one of said pushrods and engageable therewith for selective depression of the pushrod associated with said extension, and a spring biased lever means pivotally mounted on said support, said detent segments selectively co-operating with said lever means to control the rotary motion of the rocker of said switch.

3. A rocker-operated electric switch comprising a multiple pushbutton type switch having a plurality of contacts and a means including a plurality of linearly arranged parallel pushrods for operating said contacts, a support for said pushbutton type switch, a means for operating said pushrods including a lateral extension formed on the outer end of each pushrod of at least one pair of adjacent pushrods, the extensions of said pair of pushrods extending in opposite directions and being coplanar when each pushrod of said pair is in its outermost position, and a rocker pivotally mounted above the outer ends of said pair of pushrods, said rocker including a pair of axially and angularly spaced operating segments and a pair of detent segments, each one of said detent segments axially spaced from and angularly coincident with one of said operating segments, each of said operating segments substantially overlying an extension of one of said pushrods and engageable therewith for selective depression of the pushrod associated with said extension, and a spring biased lever means pivotally mounted on said support, said detent segments selectively co-operating with said lever means to control the rotary motion of the rocker of said switch.

4. The switch of claim 2 wherein the spring biased lever means includes a pair of oppositely disposed levers pivotally mounted upon said support, said levers extending inwardly toward each other and interlinked to move in unison, and spring means for biasing said levers upwardly, one of said detent segments arranged to selectively co-operate with one of said levers upon depression of the operating segment adjacent to said one detent segment, and the other of said detent segments arranged to selectively co-operate with the other of said levers upon depression of the operating segment adjacent to said other detent segment, thereby to control the rotary motion of said rocker of said switch.

5. A rocker-operated electric switch comprising a multiple pushbutton type switch having a plurality of contacts and a means including a plurality of linearly arranged parallel pushrods for operating said contacts, a bracket for supporting said pushbutton type switch, a means for operating said pushrods including a lateral extension formed on the outer end of each pushrod of a plurality of pairs of adjacent pushrods, the extensions of each pair of said pushrods extending in opposite directions and being coplanar when each pushrod of said pair is in its outermost position, and a plurality of rockers one of which is pivotally mounted above the outer ends of each pair of said pushrods, each said rocker including a pair of axially spaced parallel plates, each of said plates having an operating segment and a detent segment formed thereon, said detent segment of each plate being axially spaced from and angularly coincident with an adjacent operating segment of the other plate, each of said operating segments substantially overlying an extension of one

of said pushrods and engageable therewith for selective depression of the pushrod associated with said extension, a pair of oppositely disposed levers pivotally mounted upon said bracket, said levers extending inwardly toward each other and being interlinked to move in unison, and spring means for biasing said levers upwardly, the detent segment of each of said parallel plates selectively co-operating with one of said levers upon the depression of the adjacent operating segment to control the rotary motion of the rocker of said switch.

6. A rocker-operated electric switch comprising a multiple bushbutton type switch having a plurality of contacts and a means including a plurality of linearly arranged parallel pushrods for operating said contacts, a bracket for supporting said bushbutton type switch, a means for operating said pushrods including a lateral extension formed on the outer end of each pushrod of a plurality of pairs of adjacent pushrods, the extensions of each pair of said pushrods extending in opposite directions and being coplanar when each pushrod of said pair is in its outermost position, and a plurality of rockers one of which is mounted above the outer ends of each pair of said pushrods, each said rocker including a pair of axially spaced parallel plates, each of said plates having an operating segment and a detent segment formed thereon, said detent segment of each plate being axially spaced from and angularly coincident with an adjacent operating segment of the other plate, each of said operating segments substantially overlying an extension of one of said pair of pushrods and engageable therewith for selective depression of the pushrod associated with said extension, and a pair of oppositely disposed levers pivotally mounted upon said bracket, each of said levers having a pair of outstretched arms and a plurality of fingers separate therefrom extending inwardly from said bracket, each of the arms of one of said levers directed generally towards and adjacent to one of the outstretched arms of said other lever, one of said arms of each lever having a longitudinally directed tab formed at its free inner end, said tab of the one arm of each lever engaging the underside of the adjacent outstretched arm of the other lever, spring means connected to each of said tabs to interlink said levers and bias them upwardly about their pivots, said fingers extending inwardly from said bracket, each of said fingers of said spring biased levers disposed underneath one of said detent segments, the surface contour of each of said fingers formed to resiliently co-operate with the detent segment overlying said finger to thereby control the rotary motion of said rocker.

7. A rocker-operated electric switch comprising a multiple pushbutton type switch having a plurality of contacts and a means including a plurality of linearly arranged parallel pushrods for operating said contacts, a bracket for supporting said pushbutton type switch, a means for operating said pushrods including a lateral extension formed on the outer end of each pushrod of a plurality of pairs of adjacent pushrods, the extensions of each pair of said pushrods extending in opposite directions and being coplanar when each pushrod of said pair is in its outermost position, and a plurality of rockers one of which is mounted above the outer ends of each pair of said pushrods, said rockers coaxially supported by said bracket by means of a shaft mounted thereupon, said shaft disposed directly above said pushrods and extending through bearing portions of each of said rockers a plurality of switch actuating handles one of which at least partially overlies each of said rockers and is attached thereto, each said rocker including a pair of axially spaced parallel plates, each of said plates hav-

ing an operating segment and a detent segment formed thereon, said detent segment of each plate being axially spaced from and angularly coincident with an adjacent operating segment of the other plate, each of said operating segments substantially overlying an extension of one of said pair of pushrods and engageable therewith for selective depression of the pushrod associated with said extension, and a pair of oppositely disposed levers pivotally mounted upon said bracket, each of said levers having a pair of outstretched arms and a plurality of fingers separate therefrom extending inwardly from said bracket, each of the arms of one of said levers directed generally towards and adjacent to one of the outstretched arms of said other lever, one of said arms of each lever having a longitudinally directed tab formed at its free inner end, said tab of the one arm of each lever engaging the underside of the adjacent outstretched arm of the other lever, spring means connected to each of said tabs to interlink said levers and bias them upwardly about their pivots, said fingers extending inwardly from said bracket, each of said fingers of said spring biased levers disposed underneath one of said detent segments, the surface contour of each of said fingers formed to resiliently co-operate with the detent segment overlying said finger to thereby control the rotary motion of said rocker.

8. The switch of claim 7 wherein the lateral extension formed on the outer end of each pushrod comprises an elongated button selectively engageable by said detent segment, one side of each said button affixed to the outer end of one of said pushrods and the other side of each said button arranged to be engaged by a coil spring, said spring running in compression between said bracket and said buttons and exerting an upward biasing force upon said buttons adjacent the portion of said button acted upon by the operating segment of said rocker thereby to bias each of said pushrods to its outermost position.

9. As an article of manufacture, a rocker for operating the contacts of a switch by rotation thereof, said rocker having a pair of axially and angularly spaced actuating segments and a pair of axially and angularly spaced detent segments; each one of said detent segments being adjacent to, axially spaced from, and angularly coincident with one of said operating segments, each detent segment serving to control the rotary movement of the rocker when said rocker is mounted in a switch and the operating segment adjacent to said detent segment is rotated into or out of an actuating position.

10. As an article of manufacture, a rocker for operating the contacts of a switch by rotation thereof, said rocker including a pair of axially spaced parallel plates connected together, each of said plates having an operating segment and a detent segment formed thereon, said detent segment of each plate being axially spaced from and angularly coincident with an adjacent operating segment of the other plate, each detent segment serving to control the rotary movement of the rocker when said rocker is mounted in a switch and the operating segment adjacent to said detent segment is rotated into or out of an actuating position.

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