Oct. 16, 1962 M. J. DOBES 3,059,071

MULTI-POSITION SWITCH

Filed June 5, 1959 3 Sheets-Sheet 1

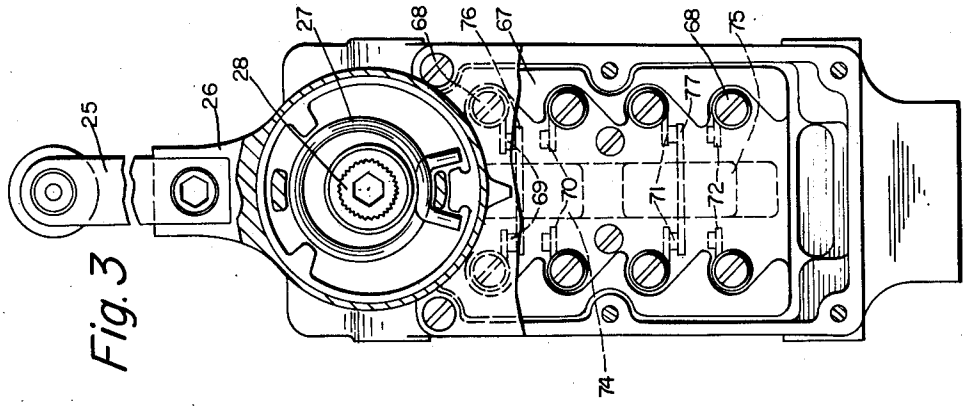


Fig. 3

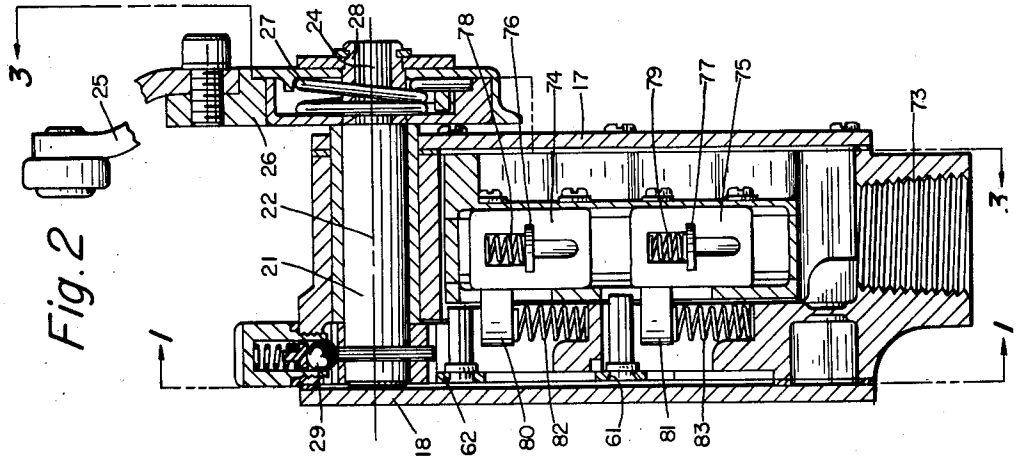


Fig. 2

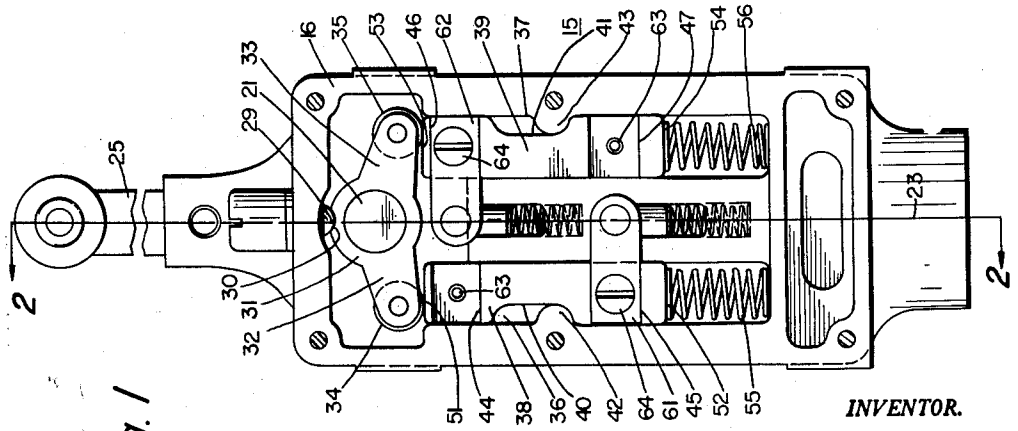


Fig. 1

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MULTI-POSITION SWITCH

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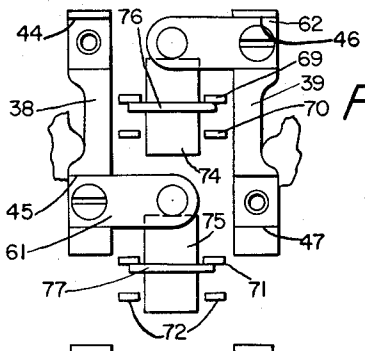


Fig. 4

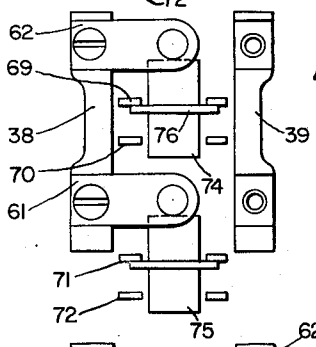


Fig. 5

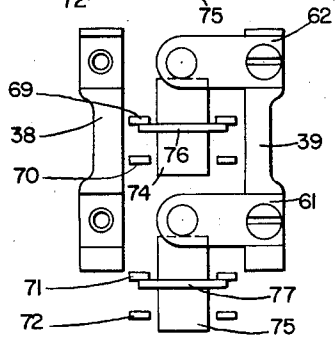


Fig. 6

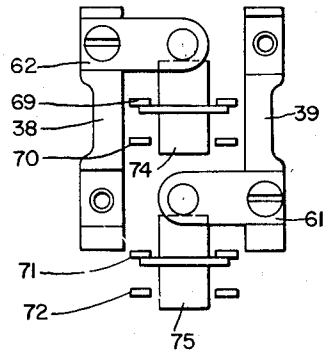


Fig. 7

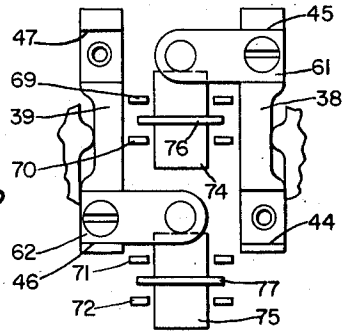


Fig. 8

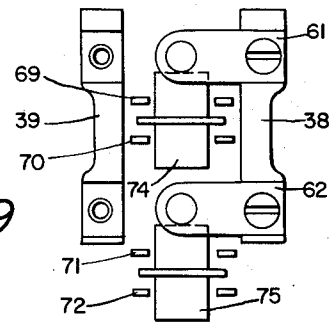


Fig. 9

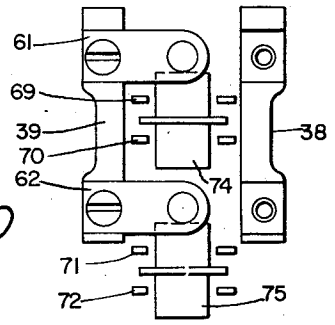


Fig. 10

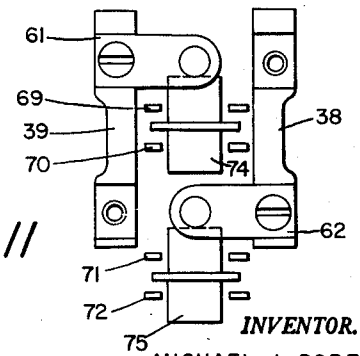


Fig. 11

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MULTI-POSITION SWITCH

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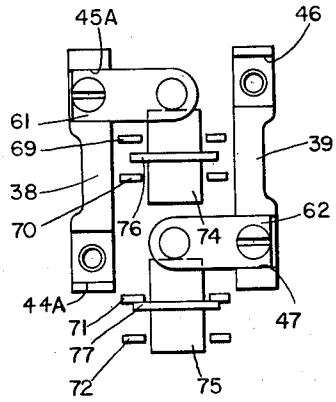


Fig. 12

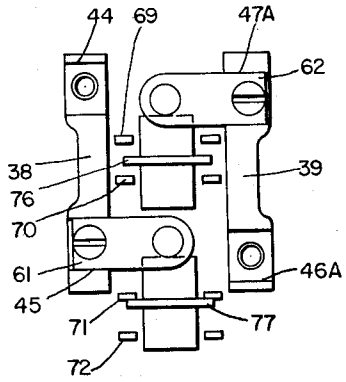


Fig. 13

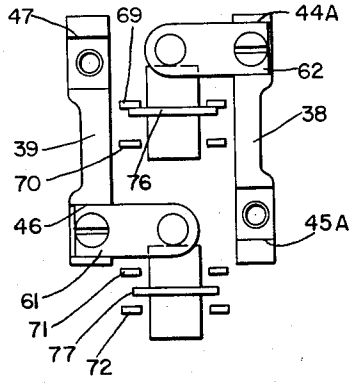


Fig. 14

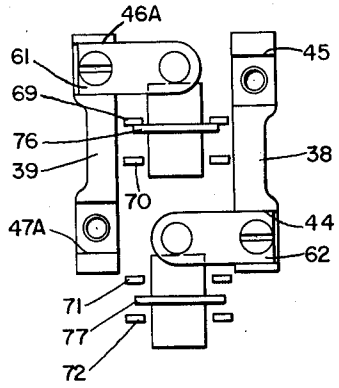


Fig. 15

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United States Patent Office

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MULTI-POSITION SWITCH

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Filed June 5, 1959, Ser. No. 818,294
14 Claims. (Cl. 200—47)

The invention relates in general to multiple position electrical switches and more particularly to electrical switches having two or more positions in which a multitude of different electrical switching conditions can be effected.

The electrical switching art is continuously becoming more complex and more and more switches are desired which have a plurality of switching functions actuated in accordance with several different mechanical switch actuating movements. According to the customers' requirements many different switch functions are desirable and this, in the past, has necessitated many different switch structures. This increases the manufacturing cost and complexity, increases the sales and distribution complexity and increases the number of switches which must be kept in stock either at the manufacturing or distribution level in order to satisfy the requirements of many different customers.

Accordingly, an object of the invention is to provide a multiple position switch which may be readily changed into any of a multiple of switch combinations for a plurality of mechanical switch actuated movements.

Another object of the invention is to provide a multiposition switch having two double-throw switches which selectively may have a neutral off position or which selectively may be normally open or normally closed and which selectively may be actuated from one condition to another in either of two positions of the mechanical switch actuator.

Another object of the invention is to provide a multiposition switch which may readily be adjusted to provide any of eight different switching combinations, which adjustment may readily be made either during manufacture or in the field.

Another object of the invention is to provide a multiposition double throw switch having a plurality of switching functions with an adjustment of a part of the switch mechanism approximately equal to half the distance between the contacts of the double-throw switch.

Other objects and a fuller understanding of this invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a bottom view with cover removed of a multiple position switch embodying the invention;

FIGURE 2 is a sectional view on line 2—2 of the FIGURE 1;

FIGURE 3 is a top view with the cover removed of the switch of FIGURE 1; and

FIGURES 4–15 are diagrammatic representations of twelve different switch conditions of the switch mechanism of the invention.

FIGURES 1, 2, and 3 generally show the switch mechanism 15 which includes an enclosing housing 16 having a top cover 17 and a bottom cover 18. These covers are removed in FIGURES 1 and 3 for clarity. A rocker shaft 21 is journalled in one end of the housing 16 on the axis 22 perpendicular to the longitudinal axis 23 of the housing 16. A splined portion 24 of the shaft 21 extends externally of the housing 16 and is used to attach an external lever 25. The lever 25 is attached to a spring housing 26 connected by an overtravel spring 27 to a hub 28 which is splined to the splines 24. The overtravel spring 27 permits the lever 25 to move arcuately more than the permitted movement of the rocker shaft 21. This external lever 25 may be directly connected to the shaft 21 if desired; however, the overtravel spring 27 permits additional uses of the switch mechanism 15.

A rocker 31 is pinned to the rocker shaft 21 near the bottom cover 18. A spring urged ball detent 29 acts on a groove 30 in the rocker 31 to maintain a neutral central position of this rocker and of the rocker shaft, in the position shown in FIGURES 1–3. This rocker 31 has opposite extensions 32 and 33 carrying rollers 34 and 35. The housing 16 has first and second longitudinally extending grooves 36 and 37 which are spaced and parallel to the axis 23. First and second actuator slides 38 and 39 are positionable in either of these grooves for longitudinal sliding movements. Side notches 40 and 41 are provided in the slides 38 and 39, respectively, and cooperate with stops 42 and 43 in the housing 16 to limit the sliding movement of the slides 38 and 39. Also, the cooperation of the stops 42 and 43 with the side notches 40 and 41 permits only two positions of a particular slide in either groove, one right side up and the other upside down. The slides 38 and 39 also may be turned end-for-end and placed in the other groove.

Each slide 38 and 39 has first and second ends, and the first slide 38 has first and second transverse slots 44 and 45 near the first and second ends, respectively, on one side, called the top, and similarly placed slots 44A and 45A on the bottom side. Similarly, the second slide 39 has first and second transverse slots 46 and 47 on the top side near the first and second ends thereof, respectively, and similarly placed slots 46A and 47A on the bottom side.

The first slide 38 has first and second bearing surfaces 51 and 52 at the first and second ends thereof and the second slide 39 similarly has first and second bearing surfaces 53 and 54. With the slides 38 and 39 positioned as shown in FIGURE 1, the roller 34 bears against the bearing surface 51 and the roller 35 bears against bearing surface 53. Compression springs 55 and 56 are positionable in the grooves 36 and 37 to urge the slides against the rocker arm extensions.

The switch mechanism 15 also includes first and second L-shaped arms 61 and 62. The slides 38 and 39 contain tapped holes 63 at the center of each of the transverse slots 44—47, and screws 64 may fasten an end of any of the arms in any of the slots 44—47, in which they closely fit. The other ends of the arms 61 and 62 are cylindrical and lie on the axis 23.

An insulated terminal block 67 is accessible from the top of the switch 15 when the top cover 17 is removed. Terminals 68 of any desired type such as the screw terminals shown are mounted on the terminal block 67. First and second pairs of fixed contacts 69 and 70 are mounted on the terminal block 67 and are positioned near one end of the housing 16. Third and fourth pairs of fixed contacts 71 and 72 are also mounted on the terminal block and are positioned near the other end of the housing 16. These fixed contacts are connected to different pairs of the terminals 68. Conductor wires, not shown, may be brought in through an aperture 73 in the housing 16 for connection to the terminals 68. The aperture 73 is threaded for connection to a conduit for physical protection of the conductors. First and second insulated blade carriers 74 and 75 are slidable in the housing 16 generally in the same linear path on the axis 23. The first and second blade carriers 74 and 75 resiliently mount first and second bridging contact blades 76 and 77, respectively. The first contact 76 may alternatively bridge the first or second pairs of fixed contacts 69 and 70, and the second contact blade 77 may alternatively bridge the third and fourth pairs of fixed contacts 71 and 72, so that each blade 76 and 77 is a double throw con-

tact means. The resilient mounting of the contact blades 76 and 77 is effected by compression springs 78 and 79 contained within the blade carriers 74 and 75 and permits overtravel of the blade carriers relative to the fixed contacts 70 and 72.

The blade carriers 74 and 75 have extensions 80 and 81 which may be engaged and actuated by the arms 62 and 61, and also compression springs 82 and 83 bear against the housing 16 and against these extensions 80 and 81 to urge them toward the arms 61 and 62.

It will be noticed that the longitudinal spacing of the first slots 44 and 46 relative to the first ends of the slides 38 and 39 is less than the spacing of the second slots 45—47 relative to the second ends of the slides 38 and 39. Similarly, the longitudinal spacing of the first slots 44A and 46A, on the bottom of the slides 38 and 39, relative to the first ends of the slides 38 and 39 is less than the spacing of the second slots 45A and 47A relative to the second ends of the slides 38 and 39. This construction has purposely been made with this spacing of the slots so that the switching function may readily be changed by turning the slides 38 and 39 end-for-end and either upside down or in the other groove. The arms 61 and 62 are shown in the slots 45 and 46, respectively; however, each arm will fit in any one of the eight slots 44–47 and 44A–47A. The screws 64 may be used to fasten the arms to the slides at any particular slot by means of the tapped holes 63. With the arms 61 and 62 in the positions shown in FIGURES 1–3, FIGURE 3 shows that the contact blade 76 bridges the pair of fixed contacts 69 and the contact blade 77 bridges the pair of fixed contacts 71. The compression springs 55 and 56 urge the slides 38 and 39 upwardly so that the bearing surfaces 51 and 53 are in engagement with the roller extensions 34 and 35. Also, the side notches 40 and 41 are in engagement with the stops 42 and 43. FIGURE 4 diagrammatically shows the switch 15 with the parts adjusted in the same position as shown in FIGURES 1–3. Many parts are omitted in the FIGURE 4 which only diagrammatically indicate the slides 38 and 39, the arms 51 and 52, the blade carriers 74 and 75 and the contact blades and fixed contacts. When the rocker shaft 21 is rotated counter-clockwise, as viewed in FIGURE 1, the roller extension 34 will bear on the bearing surface 51 to longitudinally move the slide 38 until the other end of the side notch 40 bears against the stop 42. This will cause the arm 61 to move the blade carrier 75 longitudinally and carry with it the bridging contact blade 77 so that it open circuits the fixed contacts 71 and bridges the fixed contacts 72. Conversely, when the rocker shaft 21 is moved clockwise from center, as viewed in FIGURE 1, this will longitudinally move the slide 39 and; hence, the arm 62 will longitudinally move the blade carrier 74. This causes the bridging contact 76 to open circuit the contacts 69 and bridge the contacts 70. It will thus be understood that the switching function, whether normally open or normally closed, is accomplished by connecting a circuit to any one of the four pairs of fixed contacts 69–72.

If the bottom cover 18 is removed from the switch, then the slides 38 and 39 may be removed from the grooves 36 and 37, turned end-for-end and replaced in the opposite groove. This will be the arrangement as shown diagrammatically in FIGURE 8. In this case the extra spacing of the second slots 45 and 47 from the second ends of the respective slides is used to cause all switches to be open circuited in the neutral central position of the rocker shaft, as determined by the ball detent 29. FIGURE 8 diagrammatically shows that the bridging contact blades 76 and 77 are out of contact with all the fixed contacts. To effect this, the longitudinal spacing of the second slot 45 relative to the second bearing surface 53 is greater than the longitudinal spacing of the first slot 44 relative to the first bearing surface 51 by a predetermined distance. This predetermined distance is approximately half the longitudinal spacing between the fixed contacts such as contacts 69 and 70. More specifically, the thickness of the bridging contact blade 76 is taken into account; hence, twice the aforesaid predetermined distance is equal to the longitudinal spacing between the contacts 69 and 70 minus the thickness of the contact blade 76. The same relationship holds true with respect to the second slide 39 and the spacing of the transverse slots thereon and also the spacing of the fixed contacts 71 and 72 is the same as the spacing of the contacts 69 and 70. This permits the end-for-end turning of the slides 38 and 39 and the placement in the opposite groove and also permits fastening of the arms 61 and 62 in any of four combinations of slots 44–47, in order to obtain eight different switching combinations. These eight different switching combinations are shown diagrammatically in FIGURES 4–11. Also, the slides may be turned upside down, to use one slide upside down and the other right side up, with the arms 61 and 62 in appropriate slots, to achieve four additional different switching combinations, for a total of twelve different switching combinations.

In the FIGURE 8, with the slides turned end-for-end and in the opposite slot from that shown in FIGURE 4, it has been stated previously that all the switches are open circuited in the neutral position. If the shaft 21 is rotated clockwise from neutral, as viewed in FIGURE 1, this moves the slide 38 longitudinally and moves the blade carrier 74 longitudinally to bridge the contacts 70. At the same time the slide 39 moves upwardly under urging of the spring 55 so that the blade carrier 75 moves upwardly and hence, the contact blade 77 bridges the fixed contacts 71. Conversely, if the rocker shaft 21 is moved counter-clockwise from the neutral position, slide 38 moves upwardly and hence contact blade 76 bridges fixed contacts 69 and concurrently slide 39 moves downwardly so that contact blade 77 bridges fixed contacts 72.

FIGURE 5 shows the switch 15 adjusted so that the slide 38 is on the left and it will be noted that slide 38 is on the left in all FIGURES 4–7. In this FIGURE 5 the neutral position establishes a closed circuit condition of the fixed contacts 69 and 71. If the rocker shaft 21 is moved clockwise from neutral, slide 39 is moved longitudinally, but the switch function remains unchanged. If the rocker shaft 21 is moved counter-clockwise from neutral, slide 38 is moved downwardly and this opens the normally closed contacts 69 and 71 and closes contacts 70 and 72. This is because both arms 61 and 62 are fastened on the slide 38.

FIGURE 6 shows both arms 61 and 62 fastened on the slide 39, which is on the right. In the neutral position fixed contacts 69 and 71 are closed. If the shaft 21 is rotated clockwise this moves slide 39 downwardly to open circuit the contacts 69 and 71 and close contacts 70 and 72. If the rocker shaft 21 is moved counter-clockwise from center, the slide 38 is actuated but this does not change the switching function of the normally closed contacts 69 and 71.

FIGURE 7 again shows slide 38 on the left so that the neutral position of the switch closes contacts 69 and 71. If the rocker shaft 21 is moved clockwise from neutral this moves the slide 39 downwardly to open circuit the contacts 71 and close the contacts 72; however, the contacts 69 remain closed. If the rocker shaft 21 is moved counter-clockwise from center, this moves slide 38 downwardly to open contacts 69 and bridge the contacts 70; however, during this movement contacts 71 remain closed.

The FIGURES 8–11 all show the slide 38 on the right; and therefore, in all these figures, because of the spacing of the slots 45 and 47 from the bearing surfaces 52 and 54, see FIGURE 1, the neutral position of the switch 15 establishes that all switches are open circuited.

FIGURE 8 has previously been described and FIGURE 9 differs therefrom by mounting arm 62 on the slide 38. Thus, when the rocker shaft 21 is rotated clockwise, the

slide 38 moves downwardly to bridge both contacts 70 and 72. Conversely, when the rocker shaft 21 is moved counter-clockwise from center the slide 39 moves downwardly, but accomplishes no change in switch function; however, the slide 38 moves upwardly and thus contacts 69 and 71 are bridged.

FIGURE 10 shows both arms mounted on the slide 39; hence, when the rocker shaft 21 is moved clockwise to move the slide 38, there is no change in switch function. However, concurrently the slide 39 moves upwardly so that contacts 69 and 71 are bridged. When the rocker shaft 21 is moved counter-clockwise from center, both contacts 70 and 72 are bridged.

In FIGURE 11 one arm is mounted on slide 38 and the other on slide 39; hence, when the rocker shaft 21 is moved clockwise slide 38 moves downwardly to cause contacts 72 to be bridged and concurrently slide 39 moves upwardly to cause contacts 69 to be bridged. Conversely, when the rocker shaft 21 is moved counter-clockwise from center, slide 39 moves downwardly to bridge contacts 70 and slide 38 moves upwardly to bridge contacts 71.

The FIGURES 12–15 show four additional switch combinations wherein one, but not both, of the slides has been turned end-for-end and upside down and placed in the same slot. FIGURE 12 shows the slide 38 so turned upside down. This reverses the slots 44A and 45A. The slide 39 remains right side up and carries arm 62 whereas arm 61 is carried in slot 45A. With this adjustment of the switch the carrier 74 is moved down half-way so that the bridging contact 76 is in the neutral or open circuit position; however carrier 75 is in the position whereat the bridging contact 77 bridges the contacts 71. If the rocker shaft 21 is rotated clockwise from center this will move the slide 39 downwardly so that the bridging contact blade 77 open circuits the contacts 71 and bridges the contacts 72. Concurrently, the slide 38 moves upwardly so that the contact blade 76 bridges the contacts 69. If the rocker shaft 21 is rotated counter-clockwise from center, the slide 38 is moved downwardly to cause blade 76 to bridge contacts 70.

FIGURE 13 shows slide 38 right side up and carrying arm 61 in the slot 45 whereas slide 39 has been turned upside down and end-for-end in the same slot and carries arm 62 in the slot 47A. In this position contact blade 76 is in the open circuit neutral position and contact blade 77 is bridging the contacts 71. If the rocker shaft 21 is now rotated clockwise the slide 39 moves downwardly and the contact blade 76 bridges the contacts 70. If the rocker shaft 21 is rotated counter-clockwise from neutral the slide 38 is moved downwardly to cause the bridging contact blade 77 to open circuit the contacts 71 and to bridge the contacts 72, and concurrently slide 39 moves upwardly so that the contact blade 76 bridges the fixed contacts 69.

FIGURE 14 shows slide 39 right side up but in the left hand groove and slide 38 is turned upside down and carries arm 62 in the slot 44A. Arm 61 is carried in the slot 46. Because of the spacing of the slots 44A and 47, the contact blade 76 bridges the contacts 69 and the contact blade 77 is in the open circuit or neutral position. When the rocker shaft 21 is rotated clockwise slide 38 moves downwardly to cause the bridging contact blade 76 to open circuit the contacts 69 and close the contacts 70. Concurrently, slide 39 moves upwardly so that the contact blade 77 bridges the contacts 71. If the rocker shaft 21 is rotated counter-clockwise from neutral, the slide 39 moves downwardly so that the contact blade 77 bridges the contacts 72.

FIGURE 15 shows slide 38 right side up and carrying arm 62 in slot 44, and slide 39 is upside down and carrying arm 61 in slot 46A. In this switch condition the contact blade 76 bridges the contacts 69 in the neutral position of the rocker shaft 21, and contact blade 77 is in the open circuit neutral position. When the rocker shaft 21 is rotated clockwise from center slide 38 moves downwardly and the contact blade 77 closes the contacts 72. When the rocker shaft 21 is rotated counter-clockwise from center slide 39 moves downwardly so that contact blade 76 open circuits the contacts 69 and closes the contacts 70, and concurrently slide 38 moves upwardly so that contact blade 77 closes contacts 71.

It will thus been seen that the switch 15 is so constructed and arranged that the arms 61 and 62 may be readily and quickly inter-changed into any of eight different positions, and also, slides 38 and 39 easily may be removed, turned end-for-end and either turned upside down in the same groove or placed in the opposite groove for establishing total of twelve different switching combinations. The inter-engaged side notches 40 and 41 and stops 42 and 43 establish not only the limits of travel of the slides 38 and 39, but also permit only two positions of each slide in each groove. Also, the fact that the slots 45 and 47, and 45A and 47A, are spaced a greater distance from the bearing surfaces 52 and 54 than the spacing of the slots 44, 44A, 46 and 46A relative to the bearing surfaces 51 and 53, is a means to longitudinally adjust the relative longitudinal spacing of the contact blades relative to the pairs of fixed contacts so that the bridging contact blades 76 and 77 may be placed in open circuit condition in the neutral position of the switch 15. This is as diagrammatically shown in FIGURES 8–11. This is a longitudinal adjustment of the spacing between the axis of the rocker shaft 21 and the contact blades 76 and 77.

The ball detent 29 has been shown as engaging a groove 30 to establish a definite neutral position of the rocker shaft 21. For many switch functions it may be desired to have the rocker shaft 21 have definite detent positions in either the clockwise or counter-clockwise limit positions and if so, appropriate detent grooves similar to groove 30 may be placed in the rocker 31 to cooperate with the ball detent 29.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

What is claimed is:

1. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, surfaces defining first and second longitudinal grooves in said housing, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, first and second ends and first and second bearing surfaces on each said actuator slide, surfaces defining first and second transverse slots in each slide near said first and second ends, respectively, first and second arms alternatively positioned in each of said slots, a rocker shaft journalled in said housing on a transverse axis, a rocker centrally fixed on said shaft and having opposite extensions positioned to bear on one of the bearing surfaces of each of said slides, contact blades movable by said arms, contact means in said housing for cooperation with said contact blades, adjustment means to adjust the relative longitudinal position of said contact blades and said contact means, means establishing a neutral central position of said rocker shaft, an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, and means to permit said slides to be positioned end-for-end being positionable end-for-end in said grooves to change the relative longitudinal position of said contact blades and said contact means for different switch actuating combinations.

2. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, first and second movable contact blades mounted in said housing for reciprocating spaced movements substantially parallel to

said axis, first and second double throw contact means mounted in said housing and positioned to be alternatively engaged by said first contact blade, third and fourth double throw contact means mounted in said housing and positioned to be alternatively engaged by said second contact blade, surfaces defining first and second grooves in said housing, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, first and second ends and first and second bearing surfaces on each said actuator slide, surfaces defining first and second transverse slots in each slide near said first and second ends, respectively, first and second arms alternatively positioned in each of said slots and acting on said first and second contact blades, respectively, a rocker shaft journalled in said housing on a transverse axis, a rocker centrally fixed on said shaft and having opposite extensions positioned to bear on one of the bearing surfaces of each of said slides, adjustment means to change the longitudinal position of one of said rocker, rocker shaft, rocker extensions, slides, arms and contact blades a predetermined distance to adjust the relative longitudinal position of said contact blades and said contact means, means establishing a neutral central position of said rocker shaft, and an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, and means to permit said slides to be positioned end-for-end for different switch actuating combinations and said two arms may be attached in any of four combinations of pairs of slots for different switch actuating combinations.

3. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, a movable blade carrier mounted in said housing for reciprocating movements substantially parallel to said axis, a transverse contact blade in said carrier, a terminal block mounted in said housing, first and second double throw contact means mounted on said terminal block and positioned to be alternatively engaged by said contact blade, surfaces defining first and second grooves in said housing each substantially parallel to said axis, an actuator slide positionable in either said first and second grooves for reciprocal sliding movements, stop means cooperating with said housing and said slide to limit the sliding travel of said slide, first and second ends and first and second bearing surfaces on said actuator slide, surfaces defining first and second transverse slots in said slide near said first and second ends, respectively, an arm alternatively positioned in each of said slots, means to fasten said arm in any one of said slots, a spring acting on said housing and on said blade carrier, said arm acting on said blade carrier to establish actuation thereof, a rocker shaft journalled in said housing on a transverse axis, a rocker centrally fixed on said shaft and having opposite extensions positioned to bear on one of the bearing surfaces of said slide, adjustment means to change the longitudinal position of one of said rocker, rocker shaft, rocker extensions, slide, arm, blade carrier, contact blade, and terminal block a predetermined distance approximately equal to half the longitudinal distance between said first and second contact means, a spring acting between said housing and said slide and urging said slide into engagement with one of said rocker extensions and establishing a neutral central position of said rocker shaft, and an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, whereby said slide may be positioned in either groove and said arm may be attached in any of said two slots for different switch actuating combinations.

4. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, first and second movable blade carriers mounted in said housing for reciprocating spaced movements substantially parallel to said axis, first and second contact blades transversely mounted in said first and second carriers, respectively, terminal block means mounted in said housing, first and second double throw contact means mounted on said terminal block means and positioned to be alternatively engaged by said first contact blade, third and fourth double throw contact means mounted on said terminal block means and positioned to be alternatively engaged by said second contact blade, surfaces defining first and second grooves in said housing each substantially parallel to said axis, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, stop means cooperating with said housing and said first and second slides to limit the sliding travel of said slides, first and second ends and first and second bearing surfaces on each said actuator slide, surfaces defining first and second transverse slots on each of two sides of each slide near said first and second ends, respectively, first and second arms alternatively positioned in said slots and acting on said first and second blade carriers to establish actuation thereof, a rocking actuator positioned to bear on one of the bearing surfaces of each of said slides, adjustment means to change the longitudinal position of one of said rocking actuator, slides, arms, blade carriers, contact blades, and terminal block means a predetermined distance to adjust the relative longitudinal position of said contact blades and said contact means, means establishing a neutral central position of said rocking actuator, and an external lever connected to actuate said rocking actuator into first and second actuated positions on each side of center, whereby said slides may be positioned in either groove and said two arms may be attached in any of eight combinations of pairs of slots for a total of twelve different switch actuating combinations.

5. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, a movable blade carrier mounted in said housing for reciprocating movements substantially parallel to said axis, a transverse contact blade in said carrier, a terminal block mounted in said housing, first and second double throw contact means mounted on said terminal block and positioned to be alternatively engaged by said contact blade, surfaces defining first and second grooves in said housing each substantially parallel to said axis, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, stop means cooperating with said housing and said first and second slides to limit the sliding travel of said slides, first and second ends and first and second bearing surfaces on each said actuator slide, surfaces defining first and second transverse slots in each slide near said first and second ends, respectively, an arm alternatively positioned in each of said slots, means to fasten said arm in any one of said slots, a spring acting on said housing and on said blade carrier, said arm acting on said blade carrier to establish actuation thereof, a rocker shaft journalled in said housing on a transverse axis, a rocker centrally fixed on said shaft and having opposite extensions positioned to bear on one of the bearing surfaces of each of said slides, adjustment means to change the longitudinal position of one of said rockers, rocker shaft, rocker extensions, slides, arm, blade carrier, contact blade and terminal block a predetermined distance approximately equal to half the longitudinal distance between said first and second contact means, a spring in each of said grooves acting between said housing and said slides and urging said slides into engagement with said rocker extensions and establishing a neutral central position of said rocker shaft, and an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, whereby said slides may be positioned in either groove and said arm may be attached in any of said four slots for a total of four different switch actuating combinations.

6. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, first and second movable blade carriers mounted in said housing for reciprocating spaced movements substantially parallel to said axis,

first and second contact blades transversely mounted in said first and second carriers, respectively, a terminal block mounted in said housing, first and second double throw contact means mounted on said terminal block and positioned to be alternatively engaged by said first contact blade, third and fourth double throw contact means mounted on said terminal block and positioned to be alternatively engaged by said second contact blade, surfaces defining first and second grooves in said housing each substantially parallel to said axis, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, stop means cooperating with said housing and said first and second slides to limit the sliding travel of said slides, first and second ends and first and second bearing surfaces on each said actuator slide, surfaces defining first and second transverse slots in each slide near said first and second ends, respectively, first and second arms alternatively positioned in each of said slots, means to fasten an arm in any one of said slots, springs acting on said housing and on said first and second blade carriers, said first and second arms acting on said first and second blade carriers, respectively, to establish actuation of said carriers by said arms, a rocker shaft journaled in said housing on a transverse axis, a rocker centrally fixed on said shaft and having opposite extensions positioned to bear on one of the bearing surfaces of each of said slides, adjustment means to change the longitudinal position of one of said rocker, rocker shaft, rocker extensions, slides, arms, blade carriers, contact blades, and terminal block a predetermined distance approximately equal to half the longitudinal distance between said first and second contact means, a spring in each of said grooves acting between said housing and said slides and urging said slides into engagement with said rocker extensions and establishing a neutral central position of said rocker shaft, and an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, whereby said slides may be positioned in either groove and said two arms may be attached in any of four combinations of pairs of slots for a total of eight different switch actuating combinations.

7. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, first and second movable blade carriers mounted in said housing for spaced reciprocating movements substantially parallel to said axis, first and second contact blades mounted transversely in said first and second carriers, respectively, a terminal block mounted in said housing, first and second double throw contact means mounted on said terminal block and positioned to be alternatively engaged by said first contact blade, third and fourth double throw contact means mounted on said terminal block and positioned to be alternatively engaged by said second contact blade, surfaces defining first and second grooves in said housing each substantially parallel to said axis, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, stop means cooperating with said housing and said first and second slides to limit the sliding travel of said slides, said stop means establishing only two positions of each slide in each groove, first and second ends and first and second bearing surfaces on each said actuator slide, surfaces defining first and second transverse slots on each of two sides of each slide near said first and second ends, respectively, first and second arms alternatively positioned in each of said slots, means to fasten an arm in any one of said slots, compression springs acting on said housing and on said first and second blade carriers, said first and second arms acting on said first and second blade carriers, respectively, to establish actuation of said carriers by said arms, adjustment means for moving one of said slides, arms, blade carriers, contact blades and terminal block a predetermined distance approximately equal to half the longitudinal distance between said first and second contact means, a rocker shaft journalled in said housing on a transverse axis, a rocker centrally fixed on said shaft and having opposite extensions positioned to bear on one of the bearing surfaces of each of said slides, a compression spring in each of said grooves acting between said housing and said slides and urging said slides into engagement with said rocker extensions and establishing a neutral central position of said rocker shaft, and an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, whereby said slides may have four positions in the two grooves and said two arms may be attached in various paired combinations of the eight slots for a total of twelve different switch actuating combinations.

8. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, a contact blade mounted in said housing for reciprocating movement substantially parallel to said axis, first and second double throw contact means mounted on said housing and positioned to be alternatively engaged by said contact blade, surfaces defining first and second grooves in said housing each substantially parallel to said axis, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, stop means cooperating with said housing and in said first and second slides to limit the sliding travel of said slides, first and second ends and first and second bearing surfaces on each said actuator slide, surfaces defining first and second transverse slots in each slide near said first and second ends, respectively, an arm alternatively positioned in each of said slots, means to fasten said arm in any one of said slots, a compression spring acting on said housing and on said contact blade, said arm acting on said contact blade to establish actuation thereof, a rocker shaft journalled in said housing on a transverse axis, a rocker centrally fixed on said shaft and having opposite extensions positioned to bear on one of the bearing surfaces of each of said slides, means to change the longitudinal spacing between said rocker shaft and said contact blade, a compression spring in each of said grooves acting between said housing and said slides and urging said slides into engagement with said rocker extensions and establishing a neutral central position of said rocker shaft, and an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, whereby said slides may be positioned in either groove and said arm may be attached in any of said four slots for a total of four different switch actuating combinations.

9. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, first and second contact blades mounted in said housing for reciprocating spaced movements substantially parallel to said axis, first and second double throw contact means mounted on said housing and positioned to be alternatively engaged by said first contact blade, third and fourth double throw contact means mounted on said housing and positioned to be alternatively engaged by said second contact blade, surfaces defining first and second grooves in said housing each substantially parallel to said axis, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, stop means cooperating with said housing and said first and second slides to limit the sliding travel of said slides, first and second ends and first and second bearing surfaces on each said actuator slide, surfaces defining first and second transverse slots in each slide near said first and second ends, respectively, first and second arms alternatively positioned in each of said slots, means to fasten an arm in any one of said slots, compression springs acting on said housing and on said first and second contact blades, said first and second arms acting on said first and second blades, respectively, to establish actuation of said blades by said arms, a rocker shaft journalled in said housing on a transverse axis, a rocker centrally fixed on said shaft and having opposite extensions positioned to bear on one of the

bearing surfaces of each of said slides, means to change the longitudinal spacing between said rocker shaft and said first and second contact blades, a compression spring in each of said grooves acting between said housing and said slides and urging said slides into engagement with said rocker extensions and establishing a neutral central position of said rocker shaft, and an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, whereby said slides may be positioned in either groove and said two arms may be attached in any of four combinations of pairs of slots for a total of eight different switch actuating combinations.

10. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, first and second contact blades mounted in said housing for reciprocating spaced movements substantially parallel to said axis, first and second double throw contact means mounted on said housing and positioned to be alternatively engaged by said first contact blade, third and fourth double throw contact means mounted on said housing and positioned to be alternatively engaged by said second contact blade, surfaces defining first and second grooves in said housing each substantially parallel to said axis, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, stop means cooperating with said housing and said first and second slides to limit the sliding travel of said slides, first and second ends and first and second bearing surfaces on each said actuator slide, surfaces defining first and second transverse slots in each slide near said first and second ends, respectively, with said second slots spaced from said second bearing surfaces a predetermined distance more than the spacing of said first slots from said first bearing surfaces, twice said predetermined distance being substantially equal to the longitudinal distance between said first and second contact means minus the thickness of said first contact blade, first and second arms alternatively positioned in each of said slots, means to fasten an arm in any one of said slots, compression springs acting on said housing and on said first and second contact blades, said first and second arms acting on said first and second blades, respectively, to establish actuation of said blades by said arms, a rocker shaft journalled in said housing on a transverse axis, a rocker centrally fixed on said shaft and having opposite extensions positioned to bear on one of the bearing surfaces of each of said slides, a compression spring in each of said grooves acting between said housing and said slides and urging said slides into abutting engagement with said rocker extensions and establishing a neutral central position of said rocker shaft, and an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, whereby said slides may be turned end-for-end and in the other groove and said two arms may be attached in any of four combinations of pairs of slots for a total of eight different switch actuating combinations.

11. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, first and second contact blades mounted in said housing for reciprocating spaced movements substantially parallel to said axis, first and second pairs of fixed contacts mounted on said housing with each pair positioned to be bridged by said first contact blade, third and fourth pairs of fixed contacts mounted on said housing with each pair positioned to be bridged by said second contact blade, surfaces defining first and second grooves in said housing each substantially parallel to said axis, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, a side notch in each said slide, first and second stops fixed on said housing for cooperating with said notches in said first and second slides to limit the sliding travel of said slides, said notches and stops establishing two positions of each slide in each groove, first and second ends and first and second bearing surfaces on each said actuator slide, surfaces defining first and second transverse slots on each of two sides of each slide near said first and second ends, respectively, with said second slots spaced from said second bearing surfaces a predetermined distance more than the spacing of said first slots from said first bearing surfaces, twice said predetermined distance being substantially equal to the longitudinal distance between said first and second fixed contacts minus the thickness of said first contact blade, first and second arms alternatively positioned in each of said slots, means to fasten an arm in any one of said slots, compression springs acting on said housing and on said first and second contact blades, said first and second arms acting on said first and second blades, respectively, to establish actuation of said blades by said arms, a rocker shaft journalled in said housing on a transverse axis, a rocker centrally fixed on said shaft and having opposite extensions positioned to bear on one of the bearing surfaces of each of said slides, a compression spring in each of said grooves acting between said housing and said slides and urging said slides into abutting engagement with said rocker extensions and establishing a neutral central position of said rocker shaft, and an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, whereby said slides may be turned end-for-end and either upside down or in the other groove and said two arms may be attached in any of twelve combinations of pairs of slots for a total of twelve different switch actuating combinations.

12. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, first and second slidable blade carriers mounted in said housing for reciprocating spaced movements substantially parallel to said axis, first and second contact blades mounted transversely in said first and second carriers, respectively, a terminal block mounted in said housing, first and second pairs of fixed contacts mounted on said terminal block with each pair positioned to be bridge by said first contact blade, third and fourth pairs of fixed contacts mounted on said terminal block with each pair positioned to be bridged by said second contact blade, surfaces defining first and second grooves in said housing each parallel to said axis, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, a side notch in each said slide, first and second stops fixed on said housing for cooperating with said notches in said first and second slides to limit the sliding travel of said slides, first and second ends on each said actuator slide, surfaces defining first and second transverse slots in each said slide at said first and second ends, respectively, tapped holes in each slide at the center of each of said slots, first and second arms alternatively positioned in each of said slots, screws passing through apertures in each arm into a tapped hole to fasten an arm in any one of said slots, said first and second arms acting on said first and second blade carriers, respectively, compression springs bearing against said housing and against said first and second blade carriers to urge said carriers into abutting engagement with said arms to establish actuation of said carriers by said arms, adjustment means for moving one of said slides, arms, blade carriers, contact blades and terminal block a predetermined distance, twice said predetermined distance being substantially equal to the longitudinal distance between said first and second fixed contacts minus the thickness of said first contact blade, a rocker shaft journalled in said housing on a transverse axis perpendicular to said longitudinal axis and perpendicular to a plane passing through said first and second grooves, a rocker centrally fixed on said shaft and having roller carrying opposite extensions positioned to bear on one of the ends of each of said slides, a compression spring in each of said grooves bearing against said housing and against the other end of each of

said slides and urging said slides into abutting engagement with said roller extensions and establishing a neutral central position of said rocker shaft, and an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, whereby said slides may be turned end-for-end and in the other groove and said two arms may be attached in any of four combinations of pairs of slots for a total of eight different switch actuating combinations.

13. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, first and second slidable blade carriers mounted in said housing for reciprocating spaced movements substantially parallel to said axis, first and second contact blades mounted transversely in said first and second carriers, respectively, first and second pairs of fixed contacts mounted on said housing with each pair positioned to be bridged by said first contact blade, third and fourth pairs of fixed contacts mounted on said housing with each pair positioned to be bridged by said second contact blade, surfaces defining first and second grooves in said housing each parallel to said axis, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, a side notch in each said slide, first and second stops fixed on said housing for cooperating with said notches in said first and second slides to limit the sliding travel of said slides, first and second ends on each said actuator slide, surfaces defining first and second transverse slots in each said slide at said first and second ends, respectively, with said second slots spaced from said second ends a predetermined distance more than the spacing of said first slots from said first ends, twice said predetermined distance being equal to the longitudinal distance between said first and second fixed contacts minus the thickness of said first contact blade, tapped holes in each slide at the center of each of said slots, first and second arms alternatively positioned in each of said slots, screws passing through apertures in each arm into a tapped hole to fasten an arm in any one of said slots, said first and second arms acting on said first and second blade carriers, respectively, compression springs bearing against said housing and against said first and second blade carriers to urge said carriers into abutting engagement with said arms to establish actuation of said carriers by said arms, a rocker shaft journalled in said housing on a transverse axis perpendicular to said longitudinal axis and perpendicular to a plane passing through said first and second grooves, a rocker centrally fixed on said shaft and having roller carrying opposite extension positioned to bear on one of the ends of each of said slides, a compression spring in each of said grooves bearing against said housing and against the other end of each of said slides and urging said slides into abutting engagement with said roller extensions and establishing a neutral central position of said rocker shaft, and an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, whereby said slides may be turned end-for-end and in the other groove and said two arms may be attached in any of four combinations of pairs of slots for a total of eight different switch actuating combinations.

14. A multi-position switch, comprising, in combination, a housing having a longitudinal axis, first and second slidable blade carriers mounted in said housing for reciprocating spaced movements along a first linear path substantially parallel to said axis, first and second contact blades mounted transversely in said first and second carriers, respectively, first and second pairs of fixed contacts mounted on said housing with each pair positioned to be bridged by said first contact blade, third and fourth pairs of fixed contacts mounted on said housing with each pair positioned to be bridged by said second contact blade, surfaces defining first and second grooves in said housing each parallel to said first path, first and second actuator slides mounted in said first and second grooves for reciprocal sliding movements, a side notch in each said slide, first and second stops fixed on said housing for cooperating with said notches in said first and second slides to limit the sliding travel of said slides, said notches and stops establishing only two positions of each slide in each groove, first and second ends on each said actuator slide, surfaces defining first and second transverse slots on each of the two opposite sides of each said slide at said first and second ends, respectively, with said second slots spaced from said second ends a predetermined distance more than the spacing of said first slots from said first ends, twice said predetermined distance being equal to the longitudinal distance between said first and second fixed contacts minus the thickness of said first contact blade, tapped holes in each slide at the center of each of said slots, first and second L-shaped arms alternatively positioned in each of said slots, screws passing through apertures in each arm into a tapped hole to fasten an arm in any one of said slots, said first and second arms bearing against one end of said first and second blade carriess, respectively, compression springs bearing against said housing and against the other end of said first and second blade carriers to urge said carriers into abutting engagement with said arms to establish actuation of said carriers by said arms, a rocker shaft journalled in said housing on a transverse axis perpendicular to said longitudinal axis and perpendicular to a plane passing through said first and second grooves, a rocker centrally fixed on said shaft and having roller carrying opposite extensions positioned to bear on one of the ends of each of said slides, a compression spring in each of said grooves bearing against said housing and against the other end of each of said slides and urging said slides into abutting engagement with said roller extensions and establishing a neutral central position of said rocker shaft, an external lever connected to said rocker shaft to actuate said rocker shaft into first and second actuated positions on each side of center, the longitudinal distance from a roller extension to said first contact carrier with said rocker shaft in said neutral position and engaging said first end of said first slide and with an arm in the first slot of said first slide establishing said first contact blade in engagement with said first pair of fixed contacts, and the longitudinal distance from a roller extension to said first contact carrier with said rocker shaft in said neutral position and engaging said second end of said first slide and with an arm in the second slot of said first slide establishing said first contact blade out of engagement with both said first and second pairs of fixed contacts, whereby said slides may be turned end-for-end and either upside down or in the other groove and said two arms may be attached in any of twelve combinations of pairs of the eight slots for a total of twelve different switch actuating combinations.

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