

[54] **MICROSWITCH UNIVERSALLY
PIVOTED HANDLE ASSEMBLY WITH
IMPROVED X-Y DIRECTIONAL
PROGRAMMING PLATE**

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[58] Field of Search **200/6 A, 166 SD, 17 R;
74/471 XY**

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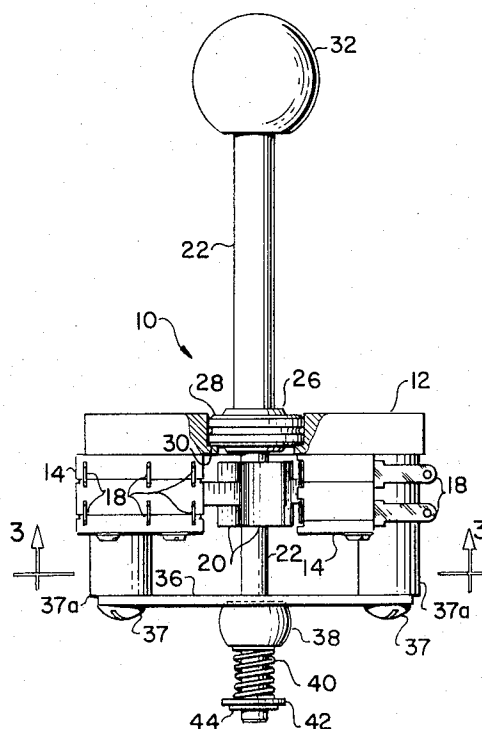
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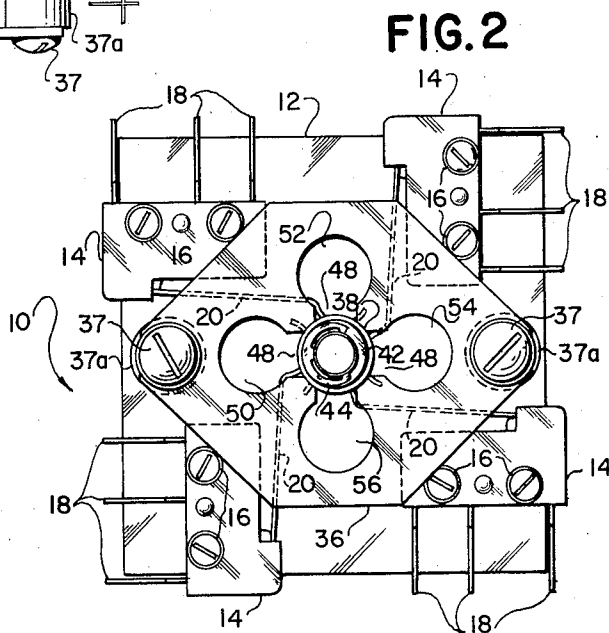
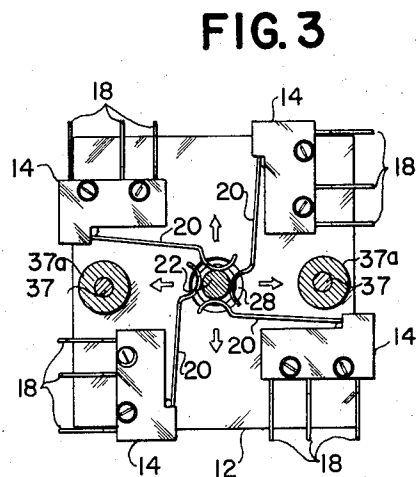
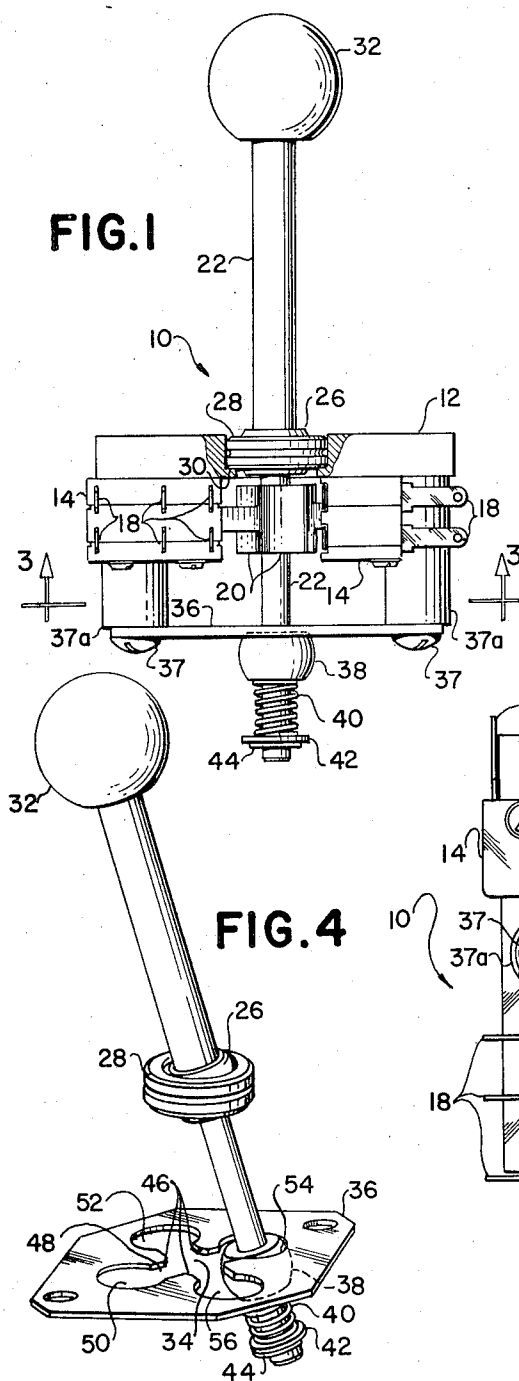
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[57] **ABSTRACT**

The following specification describes a multi-position switch control assembly in which a rod is mounted for universal pivoting movement, with the movement being guided by a guide plate, to operate any one of a plurality of switches selected in correspondence with the pivot direction. An axially movable detent carried by the rod is spring biased for engagement with either a central opening or recess in the guide plate when the rod is in the home position to hold the rod in that position, or with another guide plate opening or recess when the rod is operated to hold the rod and selected switch in an operated position until a positive force is applied to return the rod.

1 Claim, 8 Drawing Figures

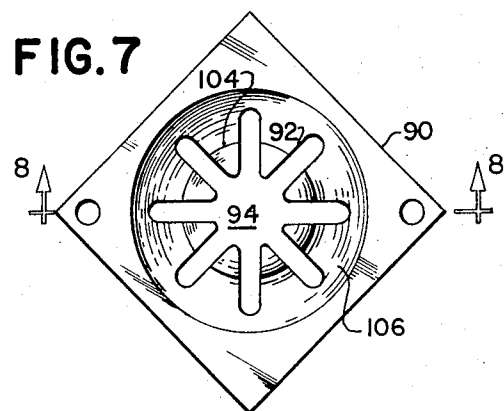
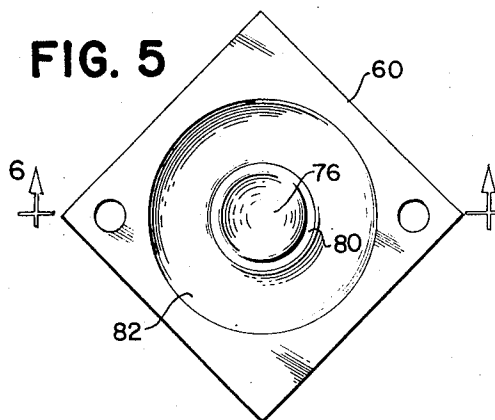
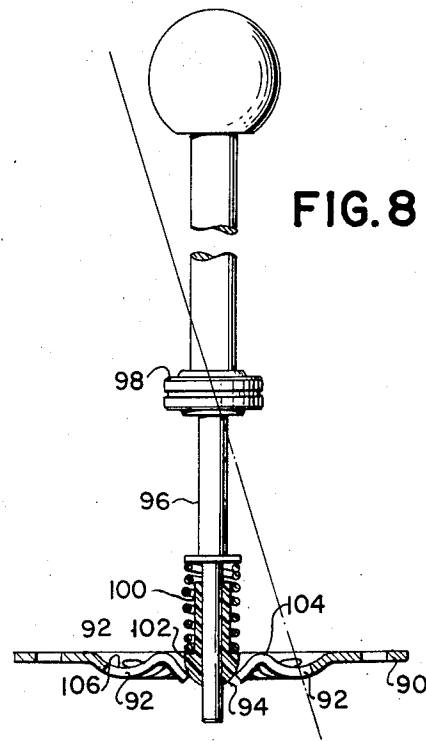
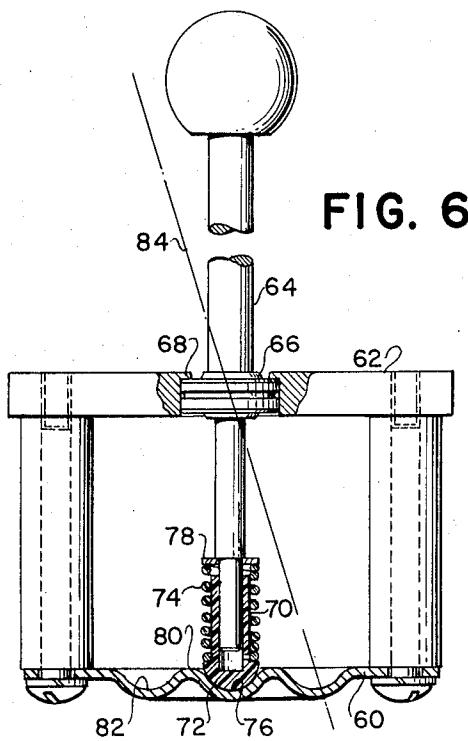




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MICROSWITCH UNIVERSALLY PIVOTED HANDLE ASSEMBLY WITH IMPROVED X-Y DIRECTIONAL PROGRAMMING PLATE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to switch controls and more particularly to an improved, more economical and versatile switch control having a universally pivotable member for operating or selecting any one of a plurality of circuits or switches.

2. Brief Description of the Prior Art

Multi-position switch control assemblies employing a single control member are utilized in a wide variety of situations such as machine tool line tracing equipment for manually selecting and operating respective servo motors in selected directions. In this type of assembly a single rod commonly known as a joy stick is pivoted about a universal pivot in a direction corresponding to the location of the switch to be operated for selecting one or more servo motors for operation and the direction of motor operation. In the conventional switch control assembly of the type described, the joy stick may operate a crank arm and through appropriate linkage, a selected cam to in turn operate the desired switch. This arrangement is both complicated and expensive and, due to the large number of operating components, subject to failure, while also being difficult to alter or service.

SUMMARY OF THE INVENTION

The present invention simplifies the described structure by providing a spring biased ball or detent on the joy stick for engaging respective spaced guide plate openings or recesses to hold the joy stick in either its unoperated or operated position so that the appropriate circuits are correspondingly controlled. The joy stick is mounted in a universal pivot on a support plate carrying switches in respective positions, and the spring biased detent is normally seated in a central opening or recess in the guide plate when the stick is in the normal or home position. A series of guide slots or openings radiating in respective directions from the central opening, serve to guide the joy stick in a respective direction when the stick is pivoted to operate a respective switch while the spring is compressed to accommodate the joy stick movement. The ball then seats in an appropriately located guide plate opening or recess to partially relieve the spring pressure and hold the joy stick and switch operated until the stick is again positively moved. By selecting the size of the openings or recesses and/or their number, both the force required for movement and the number of circuits may be controlled. Also, by selecting the configuration of the guide plate, which may be readily changed, a wide variety of joy stick movements may be accommodated.

It is therefore among the objects of the present invention to provide an improved and more economical multi-position switch control of the type utilizing a single control member to operate one among a plurality of switches.

Other objects and features of the present invention will become apparent on examination of the following specification and claims together with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the multi-position switch control assembly embodying the principles of the present invention;

FIG. 2 is a bottom elevational view of the multi-position switch control assembly shown in FIG. 1;

FIG. 3 is a sectional view taken through the lines 3—3 in FIG. 2;

FIG. 4 is an isometric view illustrating the joy stick in one operated position together with the guide plate;

FIG. 5 is a top elevational view of another guide plate;

FIG. 6 is a sectional view of the guide plate shown in FIG. 5, together with a support plate and joy stick for operation therewith;

FIG. 7 is a top elevational view of another guide plate; and

FIG. 8 is a sectional view of the guide plate shown in FIG. 7 together with a support plate and joy stick for operation therewith.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIGS. 1 and 2 a multi-position switch control assembly is indicated by the reference character 10. The switch control assembly 10 comprises a generally square or rectangular metal support plate 12 carrying a plurality of single pole double throw switches 14 of conventional design. Each switch 14 is secured to the plate 12 by means of respective screws 16 or the like and a plurality of terminals 18 extend therefrom for controlling one or more respective servo motors, for example, to operate in a respective direction in response to operation of a conventional cantilever supported spring biased lever arm 20 on each switch. The lever arms 20 project toward the central axis of the plate 12 and are biased for engagement with a respective portion of the periphery of an elongate joy stick or rod 22.

The joy stick 22 is pivotally supported in plate 12 for universal pivoting movement by a ball 26 and a ball socket 28 in turn rotatably supported in the plate 12. A shoulder 30 on plate 12 prevents axial movement of the socket 28 and ball 26 in one axial direction, and a ball 32 is secured at the upper end of stick 22 to facilitate manual handling of the stick. The other or lower end of the stick 22 projects in the home position through a central opening 34 in a guide plate 36 and perpendicular to the general plane of plate 36. Plate 36 is secured to plate 12 by screws 37 and spaced therefrom by metal spacers 37a. A detent in the form of a ball 38 through which the rod 22 projects is biased upwardly against the lower side of the plate 36 under the influence of a coil spring 40 held in position by a washer 42 and a C-ring 44 located in a groove adjacent the lower end of the shaft or rod 22.

The ball 38 has a flattened upper portion as best seen in FIG. 4, encircling rod 22, and in the home position of the rod 22, the ball is seated in opening 34, which is defined by four edge walls 46. The edge walls 46 are spaced to seat the ball 38 relatively deeply and are separated by four guide slots 48 extending radially from opening 34 along mutually perpendicular axes at substantially 45° to the edge walls 46. The edges of each

slot 48 are spaced by a distance greater than the diameter of rod 22 and less than the diameter of ball 38 with each slot 48 terminating in a respective circularly shaped opening 50, 52, 54 and 56 of smaller diameter than the ball 38 and the central opening 34.

In operation, the joy stick 22 is simply pivoted about any one of a plurality of axes parallel to the general plane of plate 12 in the desired direction to engage the rod 22 in the selected slot 48 with the adjacent 45° edge walls 46 serving to guide the movement in the event the initial direction of movement does not exactly correspond to the selected slot axis. As the joy stick pivots the guide plate 36 engages the flattened surface at the upper end of ball 38 to force the ball 38 downward against the bias of spring 40, since the radial length between the ball 26 and plate 36 along rod 22 lengthens as the rod pivots. The force required to move the ball depends on how deeply it is seated in opening 34 and the spring pressure.

Simultaneously, the lever arm 20 of the selected switch 14 is moved into its operated position to energize one or more servo motors to operate the desired direction, for example. As the ball 38 becomes aligned with the respective circular opening 50, 52, 54 or 56, the pressure of spring 40 is partially relieved and the ball 38 seats in the respective opening to prevent further movement and hold the switch operated until positive pressure is applied to move the joy stick 22 back to its home position. Since the respective opening 50, 52, 54 or 56 is slightly smaller than opening 34, the ball 38 does not enter as far into the respective opening as it enters the central opening so that less force is required to move it therefrom, and the operator may determine tactilely whether the stick is in an operated or unoperated position.

Thus, a pivoting movement of rod 22 toward the home position forces the ball 38 from the circularly shaped opening 50, 52, 54 or 56 while the rod 22 moved into the respective slot 48. As the stick 22 aligns with the central opening 34, the pressure on the coil spring 40 is again partially relieved to seat the ball 38 in the central opening with a relatively forceful movement provided as a result of the side spacing of the edge walls 46 to inform the operator that the stick is in its home or neutral position. The biased lever arm 20 of the operated switch 14 follows the joy stick 22 under the lever bias to return the switch to its unoperated or neutral condition.

It will be appreciated that although the arrangement shown in FIGS. 1-4 shows four switch operating positions, that the guide plate may provide a different or greater number of operating positions with different circumferential locations and that the guide plate is easily changed and may utilize recesses instead of openings as, for example, shown in FIGS. 5-8.

Thus, in FIGS. 5 and 6 a guide plate 60 is shown. The guide plate 60 is secured to and spaced from a metal support plate 62. A rod 64 is mounted in a universal pivot 66 of the type described which is prevented from moving axially in upward direction from the guide plate 60 by a shoulder 68.

A plastic sleeve 70 having a semi-spherical head 72 is fitted over the end of a rod 64 and is biased from the plate 62 and the rod end by a spring 74 to hold the head 72 in a central recess 76 in plate 60 when the stick 64 is

in its normal or home position. A C-ring 78 engaged against a shoulder on the rod serves to hold the spring 74 against a flat surface on the back of the head 72 with a small vent hole in the sleeve serving to relieve pressure in the space between the rod and head when the sleeve moves axially of the rod 64. A rib 80 encircles the central recess 76 and defines the inner side of a second recess 82 encircling the rib 80.

When the operator pivots the joy stick 64 about an axis parallel to plate 62, the sleeve 70 is moved radially of rod 64 against the bias of spring 74 to enable passage over the rib 80, and as the head 72 passes over the rib 80, the pressure of spring 74 is relieved to drive the head into the annular recess 82 while the joy stick assumes a position relative the central axis indicated by broken line 84. The stick is now held in a tilted position until manually returned; however, the stick may be rotated along a path corresponding to recess 82 for controlling appropriately positioned switches.

In FIG. 7 a guide plate 90 is shown having a series of radial slots 92 each extending from a central recess having an opening 94 with the number of said slots being double the number shown in FIGS. 1-4 to enable the control of twice the number of circuits as shown in FIGS. 1-4. The joy stick 96, as seen in FIG. 8, is similar to stick 64 in that it has a universal pivot 98 mounted in a support plate such as 62 and carrying a spring biased plastic sleeve 100 having a spherical plastic head 102 through which the rod 96 extends. The rod 96 also extends through the central opening 94 and may be moved into any of the radial slots 92. A peripheral rib or ridge 104 on guide plate 90, interrupted by slots 92, encircles the central opening 94 and the ridge 104 is in turn encircled by a peripheral recess 106 partially interrupted by slots 92.

When the joy stick 96 is operated in a desired direction, the rod 96 extending through the selected one of the slots 92 serves to guide the rod while the sleeve 100 is caused to move axially of rod 96 by the ridge 104 and against the spring bias. As soon as the sleeve is aligned with the peripheral recess 106, the spring pressure is partially relieved to drive the sleeve into the recess 106. The joy stick is then held by the spring bias in the selected position to hold the selected circuit operated until the stick is moved back to its normal position against the spring bias.

The foregoing constitutes a description of an improved multi-circuit control assembly whose inventive concepts are believed described in the specification and accompanying claims.

What is claimed is:

1. A switch control assembly for use in selecting one circuit among a plurality of circuits, the improvement comprising a support plate, a guide plate secured parallel to and spaced from said support plate with said guide plate having a central opening of one diameter communicating through respective guide slots with a plurality of circular openings of smaller diameter spaced circumferentially about said central opening, a rod extending through any one of said guide plate openings and slots, pivot means mounting said rod on said support plate for universal pivoting movement about any one of a plurality of axes lying in a plane parallel to said support plate for movement into any one of said openings and slots, a plurality of switches

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each individual to one of said circuits and carried on said support plate at spaced positions individual to each spaced guide plate circular opening, an actuating arm individual to said switch arranged for movement in a plane parallel to said support plate with each arm biased for tangentially engaging said rod in said central opening and moved individually by said rod against said bias in response to said rod being pivoted through a respective slot to a respective position in a respective spaced circular opening for selecting a respective circuit, a spherically shaped member of larger diameter than any of said openings and slots carried by said rod for movement therewith and arranged to move axially of said rod into partial engagement with said openings only, means biasing said member axially of said rod toward said guide plate for partial engagement in any

one of said openings to hold said rod in any one of said openings against pivoting movement whereby said rod is held in said central opening in response to pivoting movement of said rod into said central opening and a selected switch arm and switch are operated and held operated in response to pivoting movement of said rod from said central opening to a respective one of said spaced openings with said one diameter central opening engaging a greater portion of said member than said smaller diameter spaced openings to require a greater force to move said rod from said central opening than from said spaced openings, and a pair of guide edges in said central opening for each slot for guiding said rod into the respective slot in response to pivoting movement of said rod in a corresponding direction.

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