

[54] **CENTER BIASED JOYSTICK TYPE
ACTUATOR IN A FOUR-WAY SWITCH
ASSEMBLY**

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200/293-296, 329, 335, 339, 153 K**

[56] **References Cited**

UNITED STATES PATENTS

2,984,720	5/1961	Fisher	200/6 A X
3,193,628	7/1965	Wanlass	200/153 K X
3,277,248	10/1966	Melvin, Jr.	200/6 A

3,639,705	2/1972	Rayner.....	200/6 A
3,679,846	7/1972	Dillon et al.	200/6 A
3,708,636	1/1973	Sobchak	200/6 A
3,731,013	5/1973	Nightengale.....	200/6 A
3,828,148	8/1974	Roeser.....	200/6 A

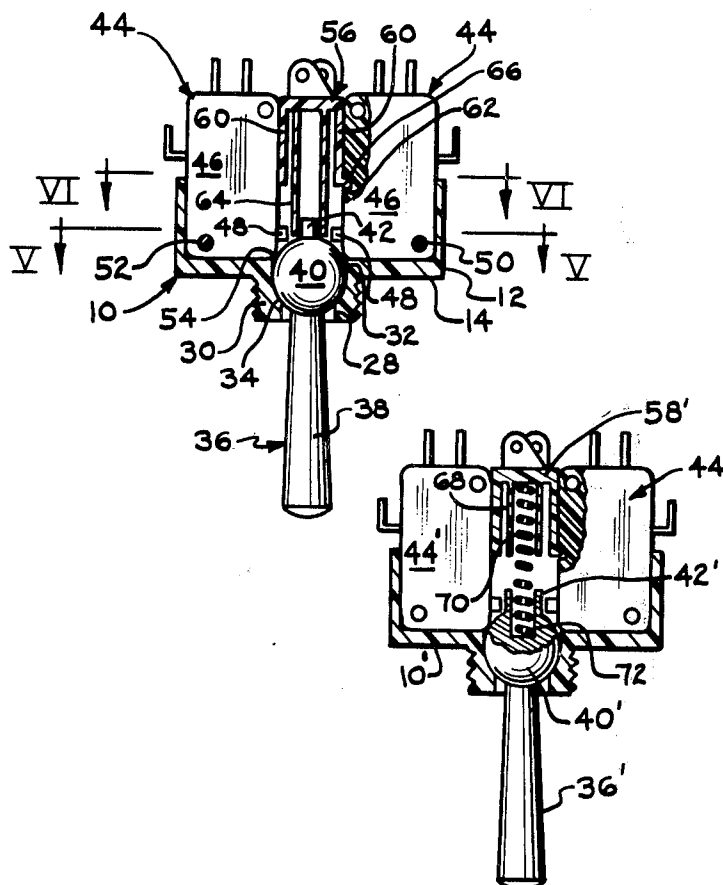
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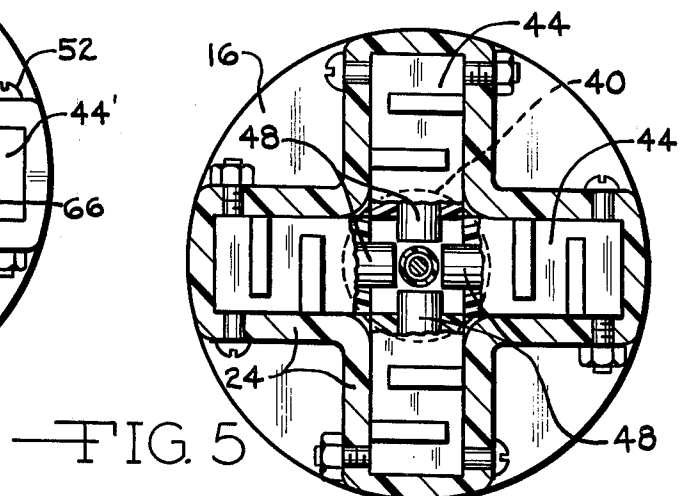
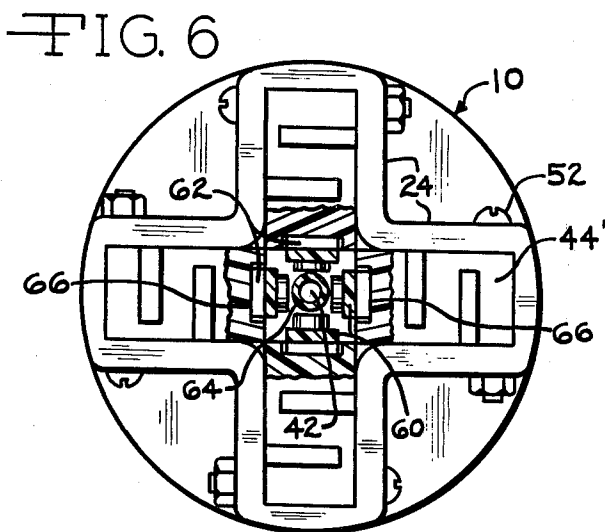
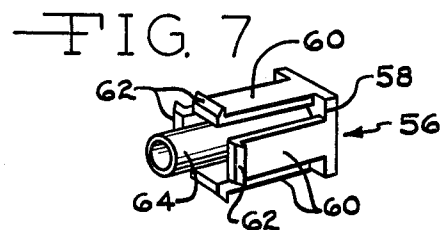
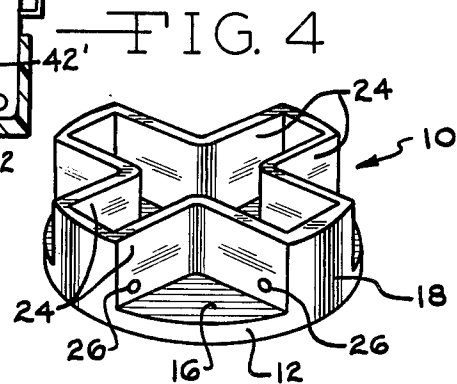
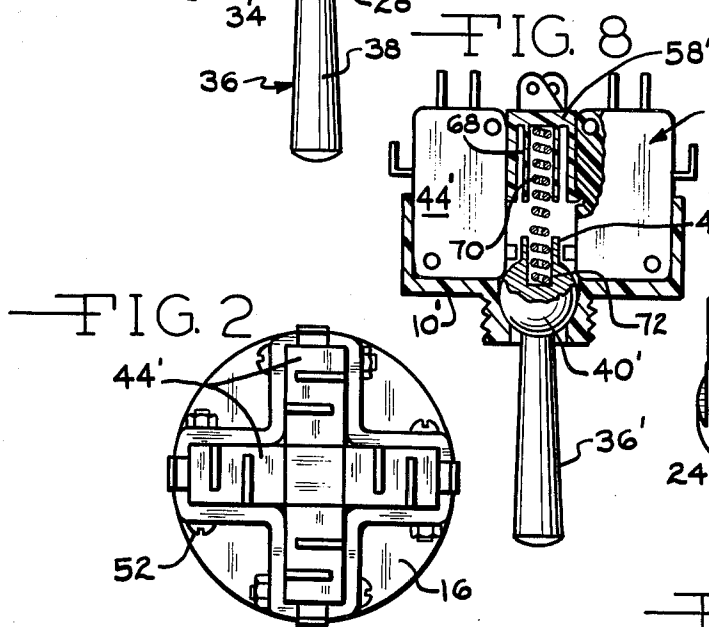
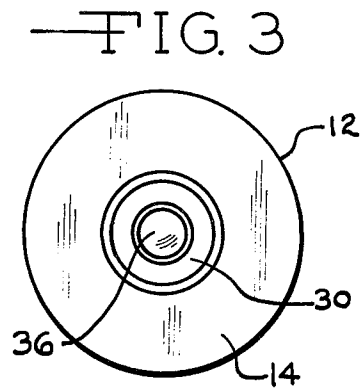
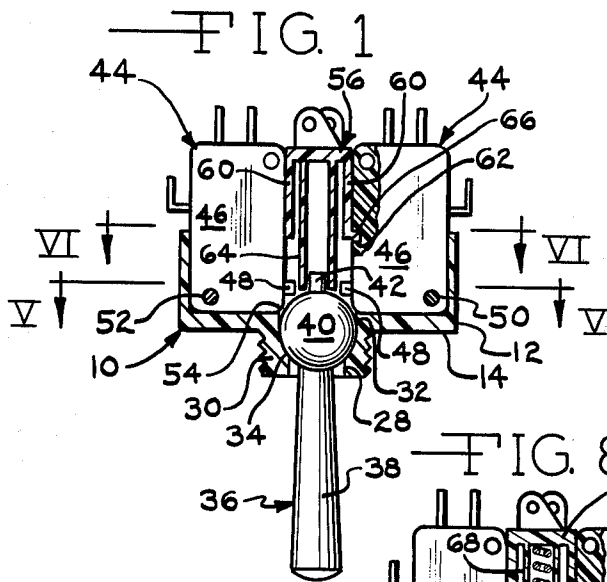
Attorney, Agent, or Firm—Beaman & Beaman

[57] **ABSTRACT**

An electric control switch having a single "joy stick" control lever employed to actuate four identical switch members of standard construction. The control lever utilizes a spherical bearing for permitting universal movement, and the switch members are located at 90° intervals about the lever neutral axis. A resilient spring element imposes a centering force on the lever and the switch is characterized by its economy and simplicity of construction, dependability of operation, and concise construction.

8 Claims, 8 Drawing Figures





CENTER BIASED JOYSTICK TYPE ACTUATOR IN A FOUR-WAY SWITCH ASSEMBLY

BACKGROUND OF THE INVENTION

The invention pertains to multiple circuit electric switches operated by a common actuating lever.

The control of electrical devices utilizing a plurality of circuits, motors, or the like, may be accomplished through a plurality of switches each having its own actuating lever, button, or other control member, and it is also well known to control a multiplicity of circuits through a plurality of switches having a common actuator. Multiple circuit switches utilizing a common actuator are commonly employed in the control of members utilizing a plurality of motors, for instance, in electrically adjustable hospital beds, in electrical adjustable automobile seats capable of forward and rear and up and down movement, and in electrically operated remote controlled searchlights capable of reversibly traveling in both the horizontal and vertical directions.

The dependability of an electric switch is largely determined by the construction of the contact supporting members, size, and other physical characteristics. Multiple circuit switches controlled by a common actuator are known wherein a plurality of commercially available switch members are used and assembled and held in such a manner as to be operated by a common actuator and U.S. Pat. Nos. 2,622,161 and 2,754,411 are typical of switches constructed in this manner.

While known plural circuit switches, such as four-way switches, using commercially available switching members are known, such devices, if they are to be sufficiently rugged to withstand extended service, are unduly expensive, and if the switches are constructed to permit a minimum selling price, switch life and dependability are sacrificed and a low cost switch which is rugged and longlasting is needed.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a four-way electric switch utilizing conventional switch members operated by a common control lever wherein the components of the switch are economical to manufacture and assemble, yet the switch is of a rugged and concise character capable of providing dependable service over long periods of time with a minimum of maintenance.

A further object of the invention is to provide a four-way electrical switch which is spring biased to automatically return the control lever to a neutral position, and wherein spring means of an economical nature are employed to augment biasing forces imposed upon the control lever by the individual switch members.

Another feature of the invention is the use of a supporting base member in an environment of a four-way switch using four separate switch members capable of firmly supporting and holding the switch members in the desired relationship to each other without sacrificing accessibility to the switch members, and permitting a concise assembled relationship between the switch members.

In practice of the invention the base or support member is preferably formed of a synthetic plastic material and includes switch member recesses related to each other at 90° intervals about a central axis. Switch members of a commercially available type, such as commonly known as "micro" switches, are mounted within the base member, each switch having an actuating but-

ton disposed toward the central axis of the base. An actuating lever is mounted in the base upon a spherical bearing having an actuating portion in radial alignment with the switch member buttons. A resilient member comprising a coil spring or of a tubular form is affixed to the switch members and engages the lever actuating member to bias the actuating member to the neutral position when the switch is being used and in "neutral" position. The utilization of the elongated spring member provides the actuating member with a positive and firm biasing action to the neutral position, and permits a low cost spring member to be utilized which does not necessarily have a strongly spring-biased actuating button.

BRIEF DESCRIPTION OF THE DRAWINGS

The aforementioned objects and advantages of the invention will be appreciated from the following description and accompanying drawings wherein:

FIG. 1 is a diametrical, sectional view through a four-way switch in accord with the invention, the actuating control lever being shown in the neutral position,

FIG. 2 is a view of the switch taken from the top of FIG. 1,

FIG. 3 is a view of the switch as taken from the bottom of FIG. 1,

FIG. 4 is a perspective view of the base member, per se,

FIG. 5 is a sectional view taken through the switch of the invention along section V—V of FIG. 1, the switches being shown in plan view and a broken detail shown,

FIG. 6 is a partial sectional view taken through the switch of FIG. 1 along section VI—VI thereof,

FIG. 7 is a perspective view of the biasing element, and

FIG. 8 is a view similar to FIG. 1 illustrating another embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The basic member of the four-way switch is the base 10, FIG. 4, which is preferably constructed of a synthetic plastic material, but could be cast of a metal or ceramic, if desired. The base 10 is of a generally circular configuration having a circular periphery 12, a flat front face surface 14, and a rear surface 16. A plurality of switch member supporting and orientating walls are defined on the base extending from the surface 16 and define an X-shaped recess 20. The walls include peripheral wall portions 18 constituting axial extensions of the periphery 12, and the walls also consist of four sets of spaced parallel walls 24 intersecting an adjacent wall at a right angle intersection.

The walls 24 are each provided with a hole 26 which receive a switch casing mounting screw, as later described.

The base 10 is further provided with a concentric axially extending bore 28, FIG. 1, defined in the threaded boss 30 extending from the front surface 14. A socket 32 is formed in the base rear surface 16 concentric with the bore 28 and includes a spherical surface 34 of a diameter corresponding to the diameter of the actuating lever bearing.

The control lever 36 include a handle 38 extending through the bore 28, and the lever also includes a spherical bearing 40 received within the base socket

32. The switch member actuating stud 42 defined on the bearing 40 is coaxial with the handle 38, and extends rearwardly of the bearing, as apparent in FIG. 1.

The control of the electric circuits operated by the four-way switch is accomplished through four switch members 44 mounted upon the base 10. Each of the switch members is of an identical construction and is of a conventional readily available form. In one embodiment of the invention a Model V3-1 switch, manufactured by Microswitch Company of Freeport, Illinois, is used. This switch member includes a synthetic plastic casing 46 having three terminals defined thereon. The internal switch contacts, not shown, are operated by a control button 48 defined upon the "inner" side of the casing and adjacent the base side 16. Internal spring means, not shown, are incorporated into the switch members tending to bias the buttons 48 outwardly to the switch normally closed or open position, depending upon the type of switch used.

Each switch member is provided with mounting holes 50 formed in the casing, and the spacing between the base walls 24 is such as to closely receive a switch member 44 therebetween wherein a mounting screw 52 mounted in the lowermost switch member hold 50, FIG. 1, may be received within the holes 26 and tightening of the screw firmly affixes the switch members to the base 10.

When the switch members 44 are assembled to the base in the manner apparent from the drawings, the buttons 48 will be disposed adjacent the control lever projection stud 42 but spaced therefrom such a distance that the buttons will only be operated when the handle 38 is tilted about the center of the bearing 40.

One of the features of the invention lies in the fact that the switch members 44 are oriented upon the base 10 and are of such radial dimension that the edge 52 of the switch member casings overlaps the base socket 32 wherein the switch members maintain the control lever spherical bearing 40 within the socket 32. Thus, during assembly, the lever 36 is first dropped into position through the bore 28 so the bearing 40 is received in socket 32. Assembly of the switches 44 to the base causes the switch member edges 54 to overlap the bearing and prevent the bearing from being withdrawn from the socket.

In order to augment the biasing forces imposed upon the lever 36 by the switch member button springs, and to provide a firm force for orienting the control lever in the central or neutral position, a spring retainer member 56, of an elastic synthetic plastic material is employed. The member 56 has a configuration which will be apparent from FIGS. 1, 6 and 7. The member 56 includes a rectangular base 58 from which depend four fingers 60 each having an outwardly extending lip 62 defined thereon. Centrally, the member is formed with a tubular projection 64 having an inner diameter adapted to closely receive the switch lever projection 42.

Each of the switch members 44 is conventionally provided with a recess 66 such that when the member 56 is inserted into the rectangular void intermediate the switch members 44 the lips 62 will snap into the switch member recesses 66 and the member 56 is held in the position shown in the drawings. In its assembled position the projection 64 is closely received within the projection 42 and the resilient nature of the projection

will maintain the actuating lever in the central or neutral position wherein none of the switch member actuating buttons 48 is engaged.

In operation, the switch is assembled to its supporting panel by inserting the threaded boss 30 through a hole, and a threaded ring or nut, not shown, is applied to the boss in the well known manner. The terminals of the switch members 44 are connected to the appropriate control circuits, not shown, and the lever 36 is tilted in that direction desired to cause the appropriate switch member button 48 to be depressed to open or close the associated switch contacts, not shown. As the lever 36 is supported upon the spherical bearing 40 the lever may be rotated in any desired direction, and this universal mounting of the switch lever permits two buttons 48 to be simultaneously depressed, if the lever is tilted in a direction intermediate a pair of switch members.

As tilting of the lever 36 causes a radial displacement of the stud projection 42 against the resiliency of the material of the projection 64, release of the lever, or a lessening of the displacement forces thereon, will permit the lever to return to the central neutral position.

FIG. 8 illustrates another embodiment of the invention and identical components to those previously described are identified by primed reference numerals.

The projection 68 is shorter than projection 64 and receives a coil spring 70. A blind hole 72 is formed in stud 42' and bearing 40' concentric with the stud receives the other end of the spring 70. Thus, tilting of the control lever 36' will deflect spring 70 producing a biasing force tending to realign the control lever with projection 68, and this form of the invention also imposes a supplemental biasing force on the control lever which will return the lever to the neutral position.

It will therefore be appreciated that the four-way switch of the invention is of an economical construction, dependable in operation, easy to manufacture and assemble, and concise in configuration. It is appreciated that various modifications to the disclosed embodiment may be apparent to those skilled in the art without departing from the spirit of the invention.

We claim:

1. A four-way electrical switch comprising, in combination, a support base having a first side and a second side, a threaded mounting boss defined on said base extending from said first side, a control lever receiving bore defined in said base concentrically extending through said boss and base, a spherical bearing-receiving socket defined in said base concentric with said bore and intersecting said second side, a control lever having a spherical bearing received within said socket, a handle affixed to said bearing extending through said bore and extending from said first side and a switch actuator defined on said bearing in substantially diametrically opposed relation to said handle and extending from said bearing adjacent said base second side, four similar electric switches mounted upon said base engaging said second side, each switch having a casing, an actuating button, mounting means, and terminals, and base mounting means defined on said base extending from said second side engaging said switch mounting means positioning said casings upon said second side at 90° with respect to each other about said socket, said casings partially overlying and engaging said bearing maintaining said bearing in said socket and said buttons being disposed adjacent said switch actuator at 90° with respect to each other about said switch actuator for engagement thereby upon pivoting said lever, and resilient means engaging said control lever and biasing said

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control lever to a neutral position coincident with the axis of said bore.

2. In a four-way switch as in claim 1 wherein said switch mounting means includes a hole defined in said casing and said base mounting means includes side walls extending normal from said base second side and threaded fasteners mounted on said side walls each extending through a casing hole.

3. In a four-way switch as in claim 1 wherein said resilient means comprises a coil spring supported at one end by said switch casings and received at the other end within a recess defined in said switch actuator.

4. In a four-way switch as in claim 1 wherein said resilient means comprises an elongated resilient tubular member mounted on said switch casings engaging said switch actuator.

5. A four-way electrical switch comprising, in combination, a support base having a first side and a second side, mounting means defined on said base, a spherical bearing-receiving socket having an axis and defined in said base having a large diameter intersecting said second side and a small diameter communicating with said first side, a control lever having a spherical bearing received within said socket, a handle affixed to said bearing extending through said socket small diameter and extending from said first side and a switch actuator defined on said bearing in substantially diametrically opposed relation to said handle and extending from said bearing adjacent said second side, four similar electric

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switches mounted upon said base adjacent said second side, each switch having a casing, an actuating button, mounting means, and terminals, spaced wall members defined on said base perpendicularly extending from said second side, said wall members defining an X-shaped recess having four portions symmetrically related at 90° intervals about the axis of said socket, the walls of each portion of said recess closely receiving a switch casing whereby adjacent switches are located at 90° with respect to each other about said socket axis, and a spring retainer mounted upon said switch casings supporting resilient means engaging said control lever biasing said lever to a neutral position coincident with the axis of said socket.

6. In a four-way switch as in claim 5 wherein said resilient means comprises a coil spring having an end mounted upon said retainer and an end received within a recess defined in said switch actuator.

7. In a four-way switch as in claim 5 wherein said resilient means comprises an elongated resilient tubular member defined on said retainer engaging said switch actuator.

8. In a four-way switch as in claim 5 wherein said retainer comprises a synthetic plastic member having a plurality of resilient fingers defined thereon, each finger having a lip defined thereon, and lip-receiving recesses defined in said switch casings receiving said lips whereby said retainer is affixed to said casings.

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