May 11, 1965 J. O. ROESER 3,183,316

DOUBLE BREAK ROTARY SELECTOR SWITCH CONSTRUCTION WITH CONTACT SEPARATION MEANS

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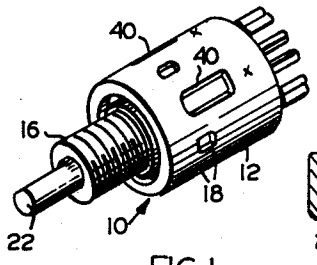


FIG.1

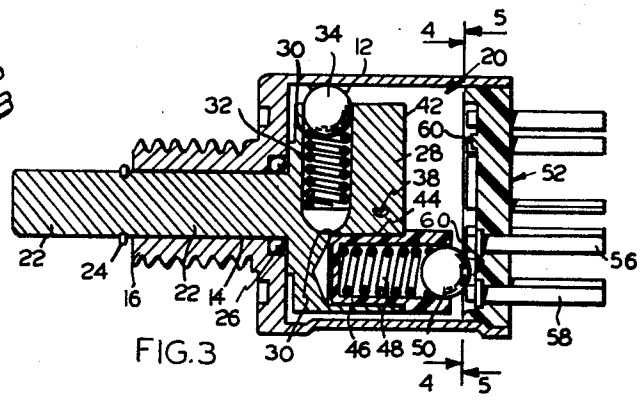


FIG.3

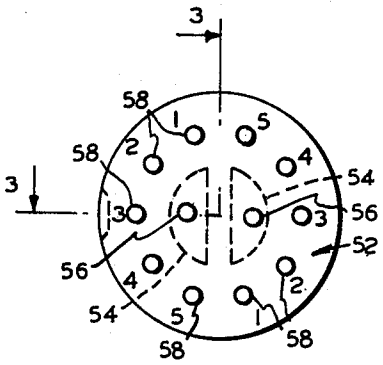


FIG.2

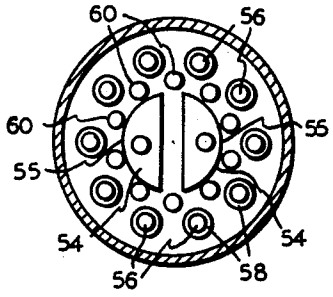


FIG.4

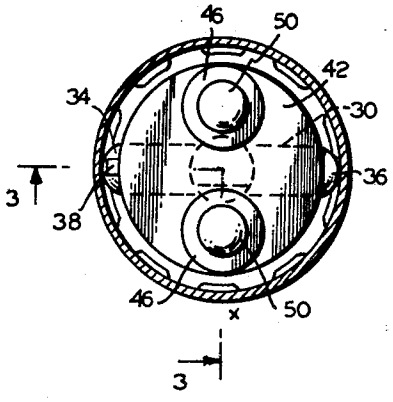


FIG.5

INVENTOR.
JOHN O. ROESER
BY
ATTORNEY

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DOUBLE BREAK ROTARY SELECTOR SWITCH CONSTRUCTION WITH CONTACT SEPARATION MEANS

John O. Roeser, Park Ridge, Ill.
(8611 Lincoln Ave., Morton Grove, Ill.)

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This invention relates generally to a switch structure and more particularly relates to a single or multipole-multiposition switch which is particularly adapted to be built in relatively small sizes.

Military and commercial needs in the fields of electronics and other instrumentation are now requiring greater and greater sophistication in miniaturized equipment. Miniature switches of the type known to applicant with which this invention is concerned have suffered certain disabilities, one disability being that they are not "double break" switches. Thus the current carrying and interrupting capabilities of the miniature switches proposed heretofore have limitations in their field of use.

The present invention is concerned with a miniature rotary selector switch of simple and elegant construction having large current carrying capabilities.

It is an object of this invention to provide a small rotary switch wherein the movable contact which normally bridges a common fixed contact and any one of a plurality of spaced other fixed contacts has a movement of such a nature as to produce a "double break" upon movement of the movable contact from any one to any other preselected position.

It is another object of this invention to provide a miniature switch adapted to provide optimum efficiency and reliability for the conditions under which it is required to operate.

It is another object of the present invention to provide a miniature multiposition switch which has a minimum number of parts, is easy to fabricate, and is otherwise well adapted for the purposes for which it was designed.

The novel features that are characteristic of this invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof will best be understood by the following description of a specific embodiment when read in connection with the accompanying drawings in which:

FIGURE 1 is a perspective view of my miniature rotary switch assembly;

FIGURE 2 is an end view taken from the right hand end of FIGURE 1;

FIGURE 3 is a quarter sectional view taken along lines 3—3 of FIGURES 2 and 5;

FIGURE 4 is a sectional view taken along lines 4—4 of FIGURE 3; and

FIGURE 5 is a sectional view along lines 5—5 of FIGURE 3.

The rotary switch mechanism 10 comprises a cup-shaped housing 12 having an aperture 14 in the closed end thereof and a boss portion 16 which is threaded for attachment to a panel or like support. The side walls of the housing 12 are formed with the indentations 18 suitably spaced to provide a ratcheting coaction with ratcheting means as shall become apparent.

A rotary contact carrying member 20 is mounted in the bore 14 and has an integral elongated shaft 22 which extends exteriorly of the boss 16 for manual or other suitable actuation of the rotary member 20. The rotary member is mounted on suitable bearings 26 so that the

rotation of the end of shaft 22 will rotate the enlarged portion 28 which is totally within the confines of the housing means or casing 12. The enlarged cylindrical portion 28 of rotary member 20 is formed with a cross bore 30 which is located in a diametrical plane transverse to the axis of the rotary member 20. A suitable compression spring 32 is disposed in the bore 30 and biases a pair of ball members 34 and 36 outwardly for ratcheting engagement with the indentations 18 in the side walls of the housing.

An outwardly projecting pin 38 is positioned on a peripheral wall of the cylindrical portion 28 in axially spaced position from the bore 30. The pin 38 projects outwardly a sufficient distance for coaction with elongated indentations 40 in the housing side walls which serve as "stops" to limit movement of the rotary member 20. It will be realized that the elongated indentations 40 may be suitably positioned as desired depending upon the contact actuation limits desired. It will be further realized that the lower portion of the long indentations 40 have a width similar to indentations 18 and also serve as "ratcheting indentations" for cooperation with the balls 34 and 36. The pin 38 is so placed on the enlarged portion 28 that it clears the shorter indentations 18.

The cylindrical portion 28 has an end surface 42 which is transverse to the axis of the rotary member 20. A pair of cylindrical bores 44 which are parallel to, but offset from, the axis of the member 20 extend inwardly from the end surface 42 a predetermined distance. An insulating insert member 46 which is cup-shaped in configuration, is fixedly mounted in each of the bores 44. While the bores 44 are shown symmetrically arranged, other design variations are possible and of course only a single bore 44 is necessary in certain designs as shall be apparent. The cup-shaped members 46 serve to insulatingly mount spring members 48 which in turn each urge a metallic ball 50 outwardly from the surface 42 of the cylindrical portion 28. The balls 50 serve as the movable electrical contacts of the assembly. It will be appreciated that the cup-shaped insulating members 46 serve to electrically isolate the movable contacts 50 from the metallic cylindrical portion 28. It will further be appreciated that if the rotary member 20 is formed of plastic, the insert members 46 are not needed.

A plug means 52 closes the open end of the housing and is formed of suitable insulating material. The fixed contacts are mounted on the plug member for cooperation with the movable contacts 50. More particularly, the first fixed contacts comprise common contacts 54 which are symmetrically spacedly arranged relative to each other and each having a substantial extent to present a curvilinear radial surface 55. Each common contact 54 is shaped approximately like one half of a small disk. It will be appreciated that in certain designs, the common contacts 54 could be a single disk with a circular periphery when a single movable contact 50 is used or more than two segments could be provided if more than two common contacts are desired. Conventional terminals 56 connect the individual common fixed contacts 54 and extend outwardly through the plug 52 for connection to other apparatus as suitable and desired.

A plurality of separate spaced second fixed contacts 56 are disposed radially outwardly of surfaces 55 and also are fixedly mounted on the plug member. It will be noted that the contacts 56 are equally spaced from each other and are all symmetrically arranged around the fixed common contacts 54. It will be realized that the exact number and location of the contacts 54 and 56 can be varied to suit various applications as suitable and desired for a specific application.

Of particular note in the instant construction are the

projections 60 which are integrally formed (or by some other suitable means formed) in the plug 52 to provide positive abutments in a circular plane intermediate the circular ring of individual second fixed contacts 56 and surfaces 55. Projections 60, of course, must be formed of insulating material and project sufficiently to serve the function of causing positive movement of the ball members 50 away from bridging contact with any individual fixed contact 56 and the common contact 54 upon rotary movement of member 20.

The individual contacts 56 are connected to terminals 58 which extend through the plastic plug member 52 for suitable connection to other electrical apparatus as suitable and desired.

It will be perceived that as the end 22 of the rotary member is rotated, the movable contact balls 50, in traveling in the circular plane about the axis of member 20 will be caused to move in a direction parallel to the axis of member 20 every time the ball member meets a projection 60 formed on the plug. This movement of the balls 50 causes positive disengagement with both the contacts 54 and any individual contact 56 so as to provide a "double break" mechanism. It will be further perceived that the projections 60 cause a complete "break before make" relationship between any bridging relationship between the contacts. It will also be observed that the balls 50, being able to rotate as they are moved from position to position will provide a minimum of contact corrosion and pitting to provide high reliability over repeated operations of the switch.

Although a single embodiment of the invention has been shown and described, it is with full awareness that many modifications thereof are possible. The invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

What is claimed as the invention is:

1. In a miniature rotary switch, first fixed contact means having a curvilinear contact surface of substantial extent, a plurality of second fixed contact means each radially spaced from said curvilinear contact surface a similar fixed dimension, each of said second fixed contact means being spaced from each other, movable contact means having a substantially spherical shape adapted to selectively bridge said first fixed contact means and any individual one of said pluralty of second fixed contact means, and insulating projection means located in a cylindrical plane intermediate said curvilinear surface of said first fixed contact means and said plurality of second fixed contact means, said projection means being operable to cause positive movement of said movable contact means away from physical and electrical contact with said first fixed contact means and any individual one of said second fixed contact means upon movement of said movable contact means from one to another bridging relationship with individual second fixed contact means and first fixed contact means.

2. A rotary switch comprising housing means having ratcheting indentations in the side walls thereof, a cylindrical member manually and selectively rotatable in said housing means and having an end surface transverse to the axis thereof, means associated with said cylindrical member for ratcheting engagement with the indentations of the side walls of said housing means, movable contact means mounted in insulated relation on said end surface of said cylindrical member, said movable contact means being offset from and movable in a direction parallel to the axis of said cylindrical member, biasing means biasing said movable contact means outwardly from said end surface of said cylindrical member, end means for closing said housing means coaxial with said cylindrical member and formed of insulating material,

fixed contact means mounted on said end means of said housing, said fixed contact means comprising common contact means and a plurality of second fixed contact means mounted in concentric relation to said common contact means and coaxial with the axis of said cylindrical member, and means associated with said end means causing positive disengagement of said movable contact means from said common contact means and any individual one of said plurality of second fixed contact means prior to reengagement with any other individual second fixed contact means upon manual rotation of said cylindrical member whereby a double break rotary switch is provided.

3. A ratcheting movable contact mechanism for a rotary switch comprising a shaft having an enlarged cylindrical portion at one end, transverse bore means in said cylindrical portion for receipt of a pair of ratcheting ball members biased outwardly by suitable spring means, a second bore means disposed in a transverse end surface of said cylindrical portion parallel to and offset from said axis thereof, and movable contact means mounted in said second bore means, said movable contact means comprising a cup-shaped insulating member disposed in said second bore means, spring means disposed in said insulating member and a metallic ball member aligned with said second bore means in engagement with said spring means for rotary movement therewith, said spring means permitting movement of said ball member in a direction parallel with the axis of said cylindrical member as a concomitant of rotary movement of said cylindrical member.

4. The movable contact mechanism set forth in claim 3 comprising third bore means in the end surface of said cylindrical member, said third bore means being symmetrically offset from the axis similar to said second bore means, and containing second movable contact means identical to the first movable contact means.

5. In a miniature rotary switch, first fixed contact means having a contact surface of substantial extent, a plurality of second fixed contact means each radially spaced from said first contact surface a similar fixed dimension, each of said second fixed contact means being spaced from each other, movable contact means adapted to selectively bridge said first fixed contact means and any individual one of said plurality of second fixed contact means, and insulating projection means located in a cylindrical plane intermediate said first fixed contact means and said plurality of second fixed contact means, said projection means being operable to cause positive movement of said movable contact means away from physical and electrical contact with said first fixed contact means and any individual one of said second fixed contact means upon movement of said movable contact means from one to another bridging relationship with individual second fixed contact means and first fixed contact means.

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BERNARD A. GILHEANY, *Primary Examiner.*