Dec. 13, 1949 D. W. JOHNSON 2,491,315

MEANS TO HOLD ELECTRIC SWITCH SPINDLES IN DIFFERENT AXIAL POSITIONS

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FIG. 1

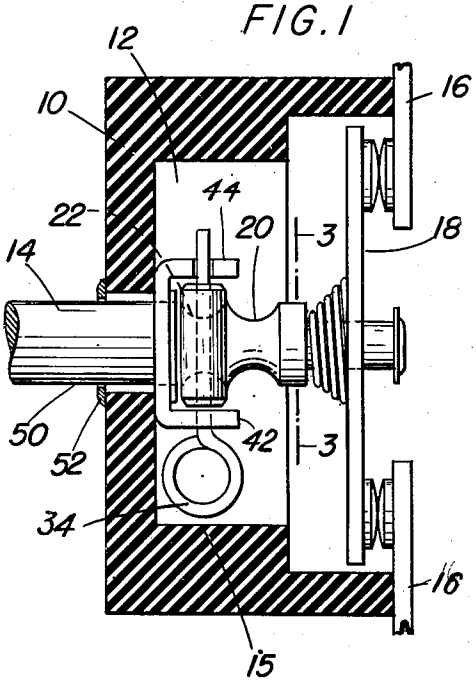
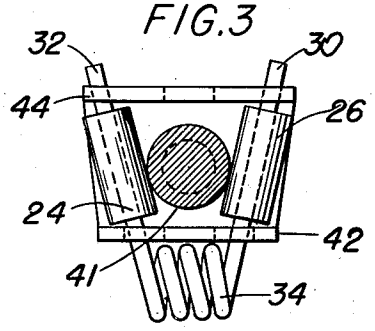


FIG. 3



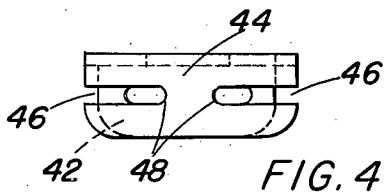


FIG. 4

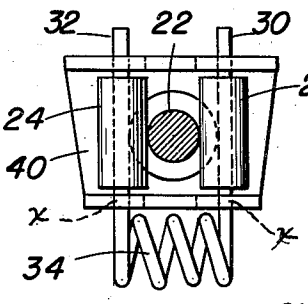
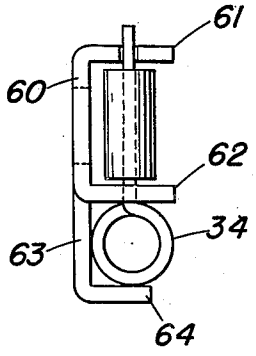


FIG. 2

FIG. 5



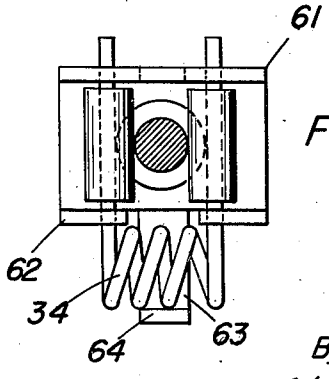


FIG. 6

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MEANS TO HOLD AN ELECTRIC SWITCH SPINDLE IN DIFFERENT AXIAL POSITIONS

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14 Claims. (Cl. 74—527)

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This invention relates to means for holding an electric switch spindle in different axial positions, and more particularly to means for that purpose which will allow the shaft or spindle to be moved axially to and from its several positions.

For the aforesaid purpose it has heretofore been a common practice to have ball bearings backed up by coiled springs which press the balls into indentations in the spindle. Such structure takes up a considerable amount of space. Also, the seating of the spring upon the ball tends to retard its rotation, which in turn causes wear on the high point between the indentations in the spindle.

Another disadvantage of the spring and ball type of holding means is that when the spindle is removed for any reason, the ball and springs will fall into the switch mechanism, from which they can be retrieved, in many cases, only with considerable difficulty.

Another disadvantage of the spring and ball type of holding means is that when the length of a break between switch contacts is dependent upon the amount of movement of the shaft, it is necessary to use large balls and at the same time heavier and deeper springs, which require much more space than the requirement for economical design would normally permit in an efficient and compact switch structure.

One object of my invention is to provide an economical, sturdy and reliable spindle locating means for an electrical switch which may be economically manufactured and easily assembled and which will not possess the disadvantages of the spring-and-ball type of spindle locating means.

Another object of my invention is to provide a spindle locating means for electric switches which can be assembled and removed as a unit in electric switch structures.

Another object of my invention is to provide a novel form of spindle locating means having simplified structure for supporting the holding members requiring a less number of springs than heretofore, while at the same time improving both reliability of operation and ease of action.

Other objects and advantages of my invention will become apparent as it is described in connection with the accompanying drawings.

In the drawings:

Figure 1 is a side elevational view, partly in section, showing a portion of an electric switch in which my invention is embodied;

Figure 2 is a plan view illustrating the spindle locating unit when removed from the switch;

Figure 3 is a view similar to Figure 2 but with the parts of the unit in the position they occupy when the spindle is passing from one axial position to another;

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Figure 4 is an end elevation view of the structure illustrated in Figure 3;

Figure 5 is a side elevation view of a modified form of the invention; while

Figure 6 is a plan view of the spring and roller supporting bracket used in the form of invention illustrated in Figure 5.

Referring to the drawings, the invention is illustrated in Fig. 1 as being mounted in a hollow switch base 10 of insulating material having a recess 12 in which is located the means for positioning the spindle or shaft 14 of the switch. For the purpose of illustration, stationary contacts 16, of conventional form, are shown as being bridged by a movable contact 18, also of conventional form which is mounted upon the end of the switch spindle 14 in any convenient or suitable fashion.

Upon the switch spindle, at any suitable point, are formed two or more cylindrical grooves 20 and 22. If desired, the grooves 20 and 22 may be formed in a separate collar or sleeve member which may be affixed to the spindle. The grooves 20 and 22 are adapted to receive, on opposite sides thereof, a pair of cylindrical rollers 24 and 26, which are rotatably mounted upon parallel extension or extending ends 30 and 32 of a coiled spring 34. The spring and rollers are mounted upon and supported by a U-shaped frame or bracket stamped conveniently from sheet metal. The frame or bracket 40 has parallel side plates 42 and 44, the plate 44 having slots 46 in alignment extending in from opposite edges thereof to receive the end portions of the spring extensions 30 and 32 and to permit those ends to have limited lateral movement. In the plate 42 there are a pair of elongated apertures 48, through which pass the inner portions of the spring extensions and allowing only limited lateral movement thereof. Between the parallel side plates 42 and 44 and on the mid-portions of the spring extensions are mounted the rollers 24 and 26. These mid portions thus afford axles on which the rollers may rotate.

The coil portion 34 of the spring tends at all times to expand. This causes the points x on the extending spring ends to press against the outer ends of the elongated apertures 48 so that those outer ends provide fulcrum points. Thus the axle portions exert a constant pressure toward the shaft 14 and press the rollers into the grooves 20 and 22.

Although the foregoing is preferred, it is within the scope of my invention to use a spring whose coil tends always to contract. In such case the spring may be inserted into the bracket 40 from the opposite side from that illustrated whereupon the ends of the spring extensions may engage the side of the holes 48 and fulcrum thereabout.

From the foregoing it may be seen that the

springs, rollers and frame form a unit which may be inserted in its proper place within the switch housing or base 10.

For the purpose of securing this unit to the switch base, a bushing 50 having a flange 52 may fit within a passage in the base. The bushing may fit within a central circular opening 41 of the spring-supporting bracket 40, and the inner end of the bushing may be peened over to secure the supporting bracket in position. The bushing thus provides a passageway and bearing for the switch spindle 14.

To overcome any tendency of the spring 34 to move out from the supporting bracket 40, the spiral or coiled portion of the spring may abut against a wall 15 of the switch base 10.

From the foregoing it may be readily understood that with the parts as shown in the position of Fig. 1, the switch spindle may be pulled, whereupon the rollers will ride up from the bottom of the groove 22, taking the position illustrated in Fig. 3, and thereafter the rollers will roll down into the groove 20 and thus hold the spindle 14 in its new axial position. With equal facility the spindle may be pushed from the new position back to its orignial position.

In some cases it may be undesirable to provide a wall 15 for abutment by the coil of the spring 34. For such conditions I provide a modified form of the structure as illustrated in Figs. 5 and 6. In this form a U-shaped bracket 60, somewhat similar to the bracket 40 hereinbefore described, is provided with parallel side walls 61 and 62. The wall 62 is broken at its center point to form an extension 63 from the base portion of the bracket, the end of the extension being bent up, as at 64, parallel to the walls 61 and 62. The distance between the walls 62 and 64 may conveniently be made of approximately the outside diameter, or slightly larger, of the coil of the spring 34 so that the end of the extension 64 provides an abutment for the coiled portion of the spring and prevents its movement out of the bracket 60.

The operation of the form of invention illustrated in Figs. 5 and 6 is identical with that of the form illustrated in Figs. 1 to 4.

Both forms of the invention enable a considerable saving in space over the conventional spring-pressed ball type of spindle locating means, because it is not necessary to back up the rollers with springs, as it is when spring-pressed balls are used. Furthermore, it is possible to insert as a unit the rollers, spring and their supporting bracket 40 or 60. Also, if it should become necessary to remove the switch spindle, none of the parts of the locating means will leave their functional position. Hence, the spindle may be reinserted easily, with a considerable saving in reassembly time. The same saving is, of course, present in the original assembly of the switch.

The size of the rollers determine the length of movement of the spindle. A variation in this length of break is much more easily accomplished in the present invention than in the spring-pressed ball type of locating means, for the reason that the latter requires the use of heavier and deeper springs when larger balls are used and, incidentally, a re-design of the switch base to accommodate the larger balls and springs.

When the invention is used with a switch in the manner illustrated in Fig. 1, the spindle moves a distance greater than one-half the diameter of the grooves 20, 22 and rollers 24, 26 before the bridging contact 18 is caused to separate from the fixed contacts 16. After the spindle has been moved a distance equal to said one-half diameter, or in other words, when it has reached the peak of the rise between grooves 20 and 22 the rollers will tend to move down into the groove toward which they had been moving, thus imparting an axial thrust to the spindle and imparting a snap or quick break separation of the contacts.

In some switches the spindles are made of molded insulating material. In such instance, the use of spring-pressed ball type positioning means required the designer to look forward to wearing away of the ridge between the grooves 20, 22. In an attempt (not heretofore entirely successful) to avoid the balls coming to rest on the blunted ridge, whereby the switch movement would become "hung up" as on a dead center, generally a larger diameter or more gradual slope in the grooves was required. The present invention avoids the aforementioned difficulty because the cylindrical form of rollers causes less wear on the spindle ridges.

From the foregoing the operation and advantages of my invention will be apparent. Many modifications within the scope of my invention will occur to those skilled in the art. Therefore, I do not limit the invention to the specific embodiments herein illustrated and described.

What I claim is:

1. In combination with an axially movable shaft having axially spaced indentations thereon, the means for locating said shaft in different axial positions comprising a pair of rollers engageable in one or another of said indentations, spring means having extended ends affording axles for said rollers, said axle portions exerting constant pressure toward said shaft in opposite directions.

2. In combination with an axially movable shaft having axially spaced indentations thereon, the means for locating said shaft in different axial positions comprising a pair of rollers engageable in one or another of said indentations, spring means having extending ends affording axles for said rollers, said axle portions exerting constant pressure in opposite directions toward said shaft, a bracket member on which said spring and roller means are mounted to enable assembly and removel of said locating means as a unit.

3. In combination with an axially movable shaft having axially spaced indentations thereon, the means for locating said shaft in different axial positions comprising a pair of rollers engageable in one or another of said indentations, spring means having extending ends affording axles for said rollers, said axle portions exerting constant pressure in opposite directions toward said shaft, and a bracket having portions through which the spring ends extend and between which said rollers are located.

4. In combination with an axially movable shaft having axially spaced indentations thereon, the means for locating said shaft in different axial positions comprising a pair of substantially cylindrical rollers engageable in one or another of said indentations, a coiled spring having end extensions extending on opposite sides of said shaft and affording axles for mounting said roller means, said axle portions exerting a constant pressure in opposite directions toward said shaft, and a bracket having parallel arms through which pass said spring extensions and between which said roller means are located to enable assembly and removal of said locating means as a unit.

5. In combination with an axially movable shaft having axially spaced circumferential grooves

thereon, the means for locating said shaft in different axial positions comprising roller means engageable in one or another of said grooves, spring means having a portion affording an axle for said roller means, said spring having a coiled portion and an extending end portion affording an axle for said roller means, said axle portion exerting a constant pressure toward said shaft, a bracket affording a support for said spring having parallel side plates through which said extending portion of the spring passes, the coiled portion of said spring being outside said bracket, and means on said bracket extending beyond said coiled portion and engaging the back of said coiled portion to hold said spring in assembly upon said bracket.

6. In combination with an axially movable shaft having axially spaced indentations thereon, the means for locating said shaft in different axial positions comprising roller means engageable in one or another of said indentations, spring means having a portion affording an axle for said roller means, and means providing a fulcrum point for a portion of said spring to cause said axle portion to exert a constant pressure toward said shaft.

7. In combination with an axially movable shaft having circumferential grooves axially spaced thereon, the means for locating said shaft in different axial positions comprising substantially cylindrical roller means engageable in one or another of said grooves, spring means having a portion affording an axle for said roller means, and means providing a fulcrum point for a portion of said spring to cause said axle portion to exert a constant pressure toward said shaft.

8. In combination with an axially movable shaft having axially spaced indentations thereon, the means for locating said shaft in different axial positions comprising a pair of rollers engageable in one or another of said indentations, spring means having extending ends affording axles for said rollers, and means providing fulcrum points engaging said extending spring ends to cause said axle portions to exert constant pressure toward said shaft in opposite directions.

9. In combination with an axially movable shaft having axially spaced indentations thereon, the means for locating said shaft in different axial positions comprising roller means engageable in one or another of said indentations, spring means having a portion affording an axle for said roller means, and a bracket member on which said spring and roller means are mounted to enable assembly and removal of said locating means as a unit, said bracket member having fulcrum points engaging said spring adjacent said axle portion to cause said axle portion to exert a constant pressure toward said shaft.

10. In combination with an axially movable shaft having axially spaced indentations thereon, the means for locating said shaft in different axial positions comprising a pair of rollers engageable in one or another of said indentations, spring means have extending ends affording axles for said rollers, and a bracket member on which said spring and roller means are mounted to enable assembly and removal of said locating means as a unit, said bracket member having fulcrum points engaging said extending ends to cause said axle portions to exert constant pressure in opposite directions toward said shaft.

11. In combination with an axially movable shaft having axially spaced indentations thereon, the means for locating said shaft in different axial positions comprising a pair of rollers engageable in one or another of said indentations, spring means having extending ends affording axles for said rollers, and a bracket having portions through which the spring ends extend and between which said rollers are located, certain of said bracket portions providing fulcrum points for said extending ends to cause said axle portions to exert constant pressure in opposite directions toward said shaft.

12. In combination with an axially movable shaft having axially spaced indentations thereon, the means for locating said shaft in different axial positions comprising a pair of substantially cylindrical rollers engageable in one or another of said indentations, a coiled spring having end extensions extending on opposite sides of said shaft and affording axles for mounting said roller means, and a bracket having parallel arms through which pass said spring extensions and between which said roller means are located to enable assembly and removal of said locating means as a unit, one of said arms providing fulcrum points for said spring extensions to cause said axle portions to exert a constant pressure in opposite directions toward said shaft.

13. In combination with an axially movable shaft having axially spaced indentations thereon, the means for locating said shaft in different axial positions comprising roller means engageable in one or another of said indentations, spring means having a portion passing through and affording an axle for said roller means, said axle portion exerting a constant pressure toward said shaft, a bracket member on which said spring and roller means are mounted to enable assembly and removal of said locating means as a unit, said spring being a coiled spring and said brackets having means thereon engaging the coiled portion of said spring to hold said spring on said bracket.

14. In combination with an axially movable shaft having axially spaced indentations thereon, the means for locating said shaft in different axial positions comprising a pair of rollers engageable in one or another of said indentations, spring means having extending ends affording axles for said rollers, said axle portions exerting constant pressure in opposite directions toward said shaft, a bracket member on which said spring and roller means are mounted to enable assembly and removal of said locating means as a unit, said spring being a coiled spring and said bracket having an extension engaging the coiled portion of the spring to hold said spring on the bracket.

DAVID W. JOHNSON.

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