

[54] **MULTITURN ROTARY SWITCH**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 163,626, July 19, 1971, abandoned.

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[51] Int. Cl..... **H01h 19/58, H01h 3/32**

[58] Field of Search..... **200/6 A, 11 R, 11 D, 200/14, 18, 153 LA, 156, 166 SD, 168 S, 17 R; 64/15, 23.5**

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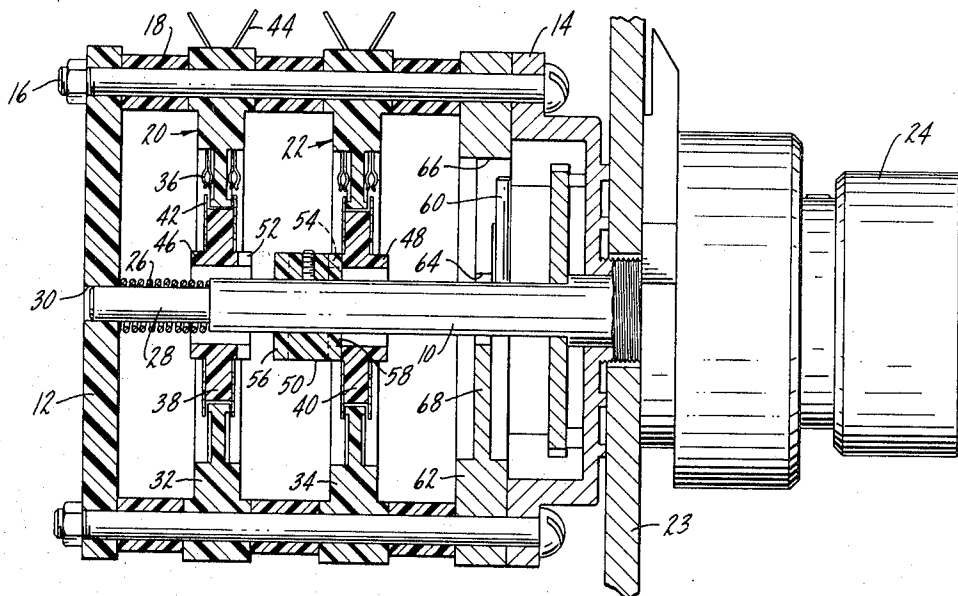
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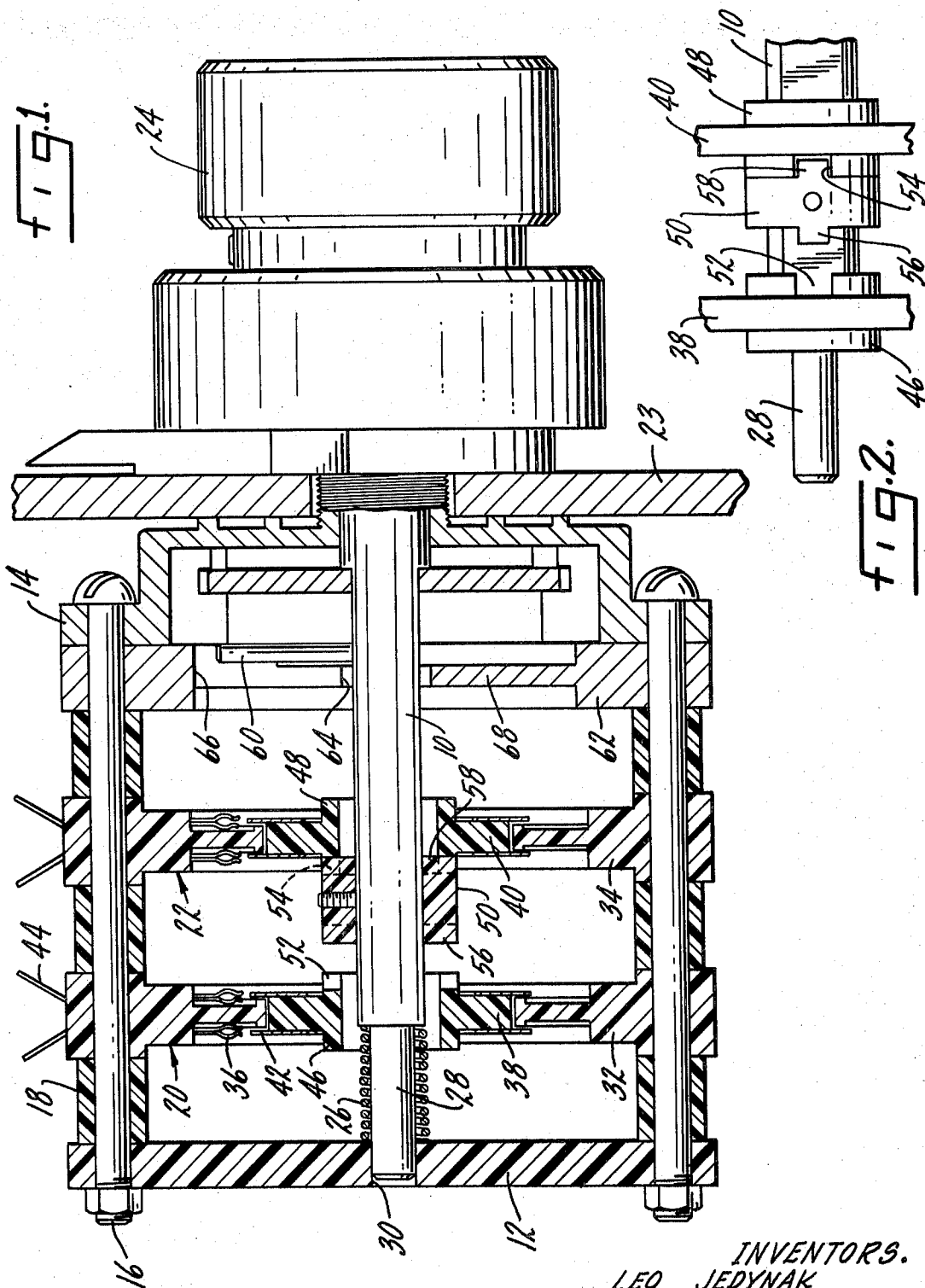
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ABSTRACT

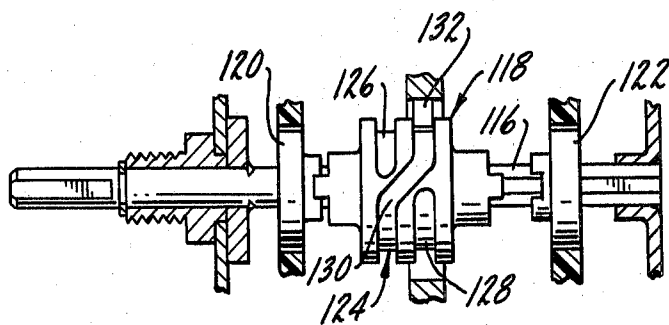
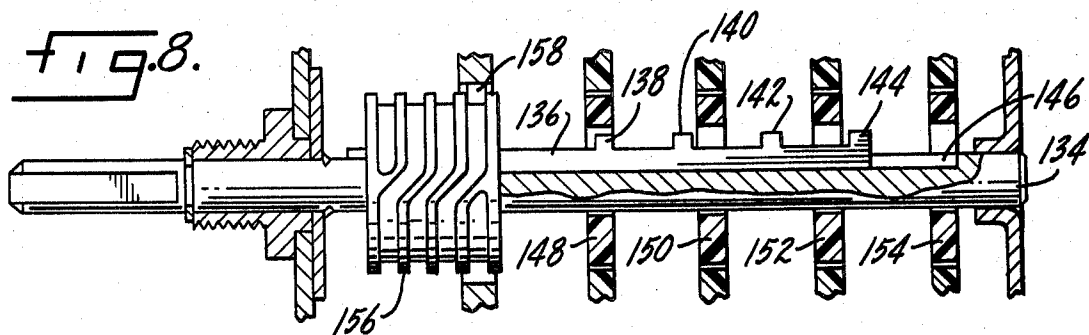
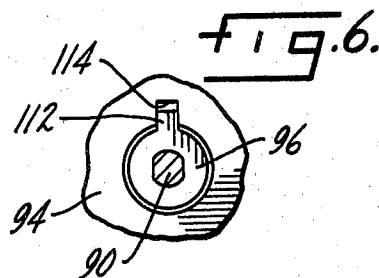
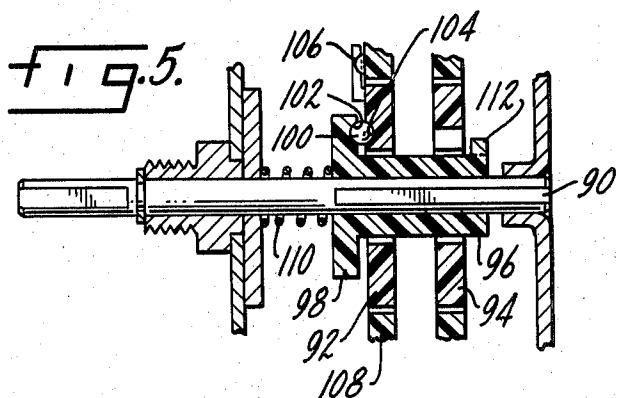
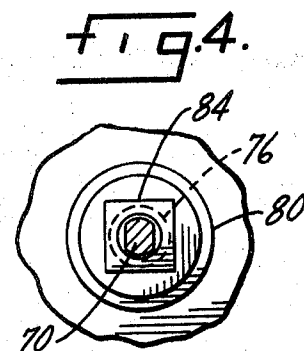
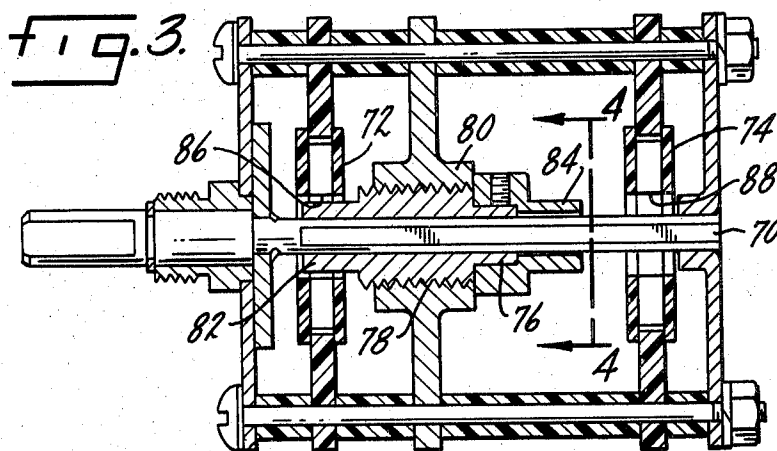
A switch in which rotational movement of the switch shaft is effective to move a selected switch rotor relative to its corresponding stator with axial motion of the shaft or a portion thereof being used for selection of a particular switch rotor. Axial movement of the shaft may be manual, by the operator of the switch, or it may be automatic when the switch has reached a predetermined angular position.

27 Claims, 15 Drawing Figures





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fig. 9.

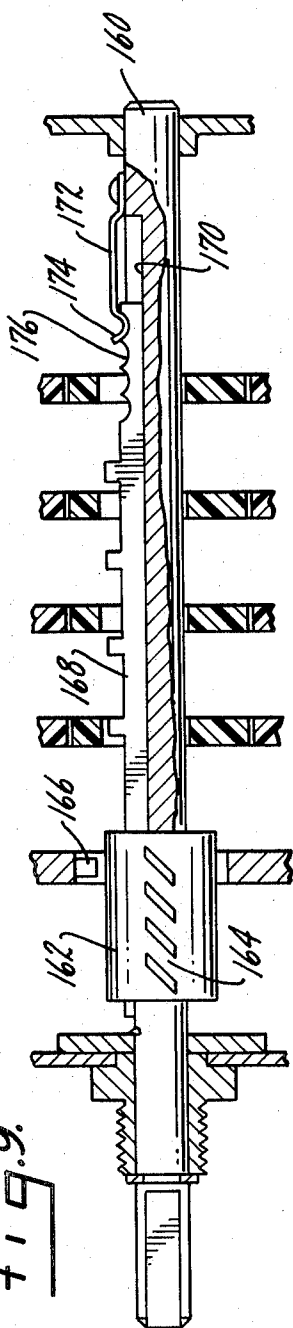


fig. 10.

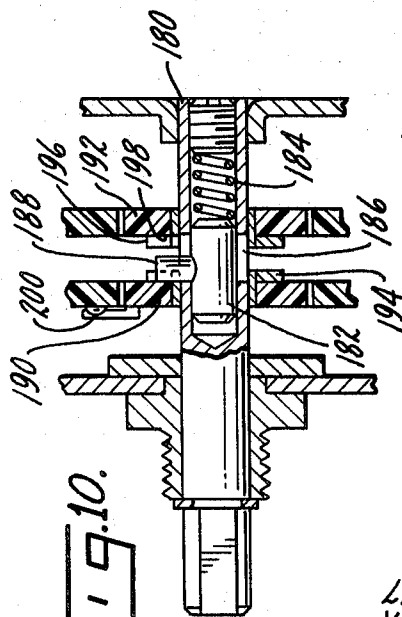


fig. 12.

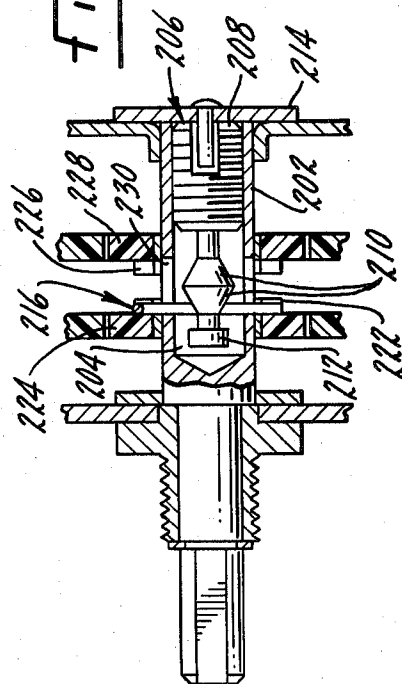


fig. 13.

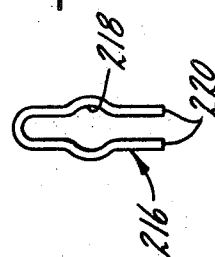
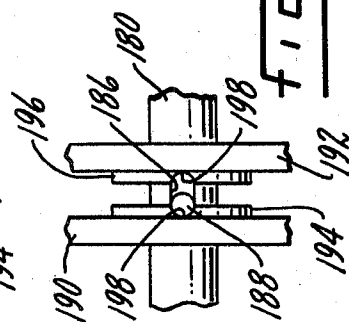


fig. 11.



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MULTITURN ROTARY SWITCH

The application is a continuation in-part of our co-pending application Ser. No. 163,626 filed July 19, 1971, now abandoned.

SUMMARY OF THE INVENTION

The present invention relates to a rotary switch in which rotation of the switch shaft operates a selected section of the switch with axial movement of the switch shaft being used for selection of a particular switch section.

Another purpose of the invention is a rotary switch of the type described in which manual axial movement of the shaft or a portion thereof is effective to select one or more switch sections.

Another purpose is a rotary switch of the type described in which automatic axial movement of the shaft or a portion thereof is effective to select one or more switch sections.

Another purpose is a rotary switch in which the shaft or a portion thereof can be moved axially at a given angular position of the shaft to couple the shaft to different switch sections.

Another purpose is a rotary switch of the type described having a pair of switch sections and a shaft which is axially movable to couple the shaft to either one of the switch sections.

Another purpose is a rotary switch of the type described having a plurality of switch sections and coupling means arranged to connect any one or more of said switch sections to the shaft for movement thereof.

Another purpose is a rotary switch of the type described including index means effective to control the position of all of the individual switch sections.

Other purposes will appear in the ensuing specification, drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated diagrammatically in the following drawings wherein:

FIG. 1 is an axial section through a switch of the type described;

FIG. 2 is a partial detail view of the shaft structure of FIG. 1;

FIG. 3 is an axial section, similar to FIG. 1, of a modified form of switch, but on a reduced scale;

FIG. 4 is a section along plane 4—4 of FIG. 3;

FIG. 5 is an axial section, similar to FIG. 3, showing a modified form of the invention;

FIG. 6 is a detail of the structure shown in FIG. 5;

FIG. 7 is an axial section, similar to FIGS. 3 and 5, showing a modified form of the invention;

FIG. 8 is an axial section, similar to FIG. 7, showing a modified form of the invention;

FIG. 9 is an axial section of a further modified form of the invention;

FIG. 10 is an axial section showing a modified form of the invention;

FIG. 11 is a detail of the structure shown in FIG. 10;

FIG. 12 is an axial section, similar to FIG. 10, showing a modified form of the invention;

FIG. 13 is a detail of the structure shown in FIG. 12;

FIG. 14 is a partial axial section illustrating an index mechanism for use with the switch structure disclosed; and

FIG. 15 is a section along plane 15—15 of FIG. 14.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the structure of FIGS. 1 and 2, a shaft 10 is mounted within a frame consisting of an insulating bearing plate 12 and a housing member 14, with the bearing plate and housing member being fastened together by studs or the like 16. A plurality of insulating spacers 18 are effective to position switch sections 20 and 22 within the frame. A knob 24 fastened to the outer end of the shaft 10 adjacent a panel 23 is effective for rotating and axially moving the shaft as described hereinafter. A shaft return spring 26 is positioned about a reduced portion of the shaft 28 at its inner end, with the reduced portion extending through an opening 30 in the bearing plate 12. The spring 26 will normally maintain the shaft in the position shown in FIG. 1.

The switch sections 20 and 22 may be conventional and they may include stators 32 and 34 made of insulating material, each of which mount a plurality of circumferentially positioned clips 36. Each of the switch sections include rotors 38 and 40, made of insulating material, which are in alignment with their corresponding stators, with each of the rotors mounting blades 42, as is conventional. Contact terminals 44 may be positioned at the outside of the stators 20 and 22 for connection into electrical circuits. The rotors and stators shown are conventional and have not been described in detail.

Each of the rotors 38 and 40 have collars 46 and 48 which are concentric with the shaft 10 and spaced slightly outwardly therefrom. The collars may be integral with their respective rotors. Mounted on the shaft 10 and fixed for rotation and axial movement therewith is a coupling 50 formed of insulating material. Each of the rotors 46 and 48 may have notches 52 and 54 which face toward the coupling 50. There may be two or more such notches on each of the rotor collars. The coupling 50 may have a pair of oppositely directed projections 56 and 58 which extend toward the notches 52 and 54 in the rotors. Thus, the coupling 50 may connect the shaft to either one of the rotors.

Certain components have been described as being formed of an insulating material. Like components in the following structures will be made of similar material, but will not be specifically so designated, although they are shown with appropriate cross hatching in the drawings.

A radially extending pin 60 may be fixed to the shaft for movement therewith. A pin stop 62, in the form of a plate, is positioned within the frame and has an opening 64 for passage of the shaft 10 and a pin opening 66. At a particular angular position of the shaft the pin 60 will be in alignment with the pin opening 66 to thus permit the shaft to axially move from the position of FIG. 1, toward a position in which the shaft 50 is coupled to rotor 38. At this position, the pin 60 will be on the opposite side of the central web 68 forming a part of the pin stop 62.

In operation, and assuming that the switch is in the position of FIG. 1, rotation of the knob 24 is effective, as in a conventional switch, to move the rotor 40 relative to its stator 22 through a full 360° and thus form various electrical circuit connections between the clips and the blades on the rotor and the stator. After 360° of shaft rotation, pin 60 will be in alignment with open-

ing 66 and the shaft may be manually moved axially, such that the coupling 50 will move from the position in which it is coupled with the rotor 40 to a position in which it is coupled, through the projection 56 and notches 52 to rotor 38. Pin 60 will have moved to the opposite side of web 68. In this position of the switch, it again may be rotated through a full 360° and rotor 38 will cooperate with stator 22 to again effect a variety of electrical connections. When the shaft is returned to the angular position in which pin 60 is in alignment with opening 66, spring 26 will return the shaft to the position of FIG. 1.

The switch may be rotated through 360° to the various detented switch positions for a particular switch section. After rotation through 360°, the switch may be moved axially so that the first rotor is uncoupled and the second rotor is coupled to the shaft. The switch may then again be rotated through 360° for operation of the second switch section. Thus, axial motion of the shaft is used for rotor selection and rotational motion of the shaft is used for operation of a selected rotary section. Axial movement of the shaft is only permitted at a particular angular location.

The frame and other supporting members will not be described or shown in some of the remaining forms of the invention and only those portions of the switch which are essential for its operation will be covered in detail.

In FIGS. 3 and 4 a shaft 70 is arranged to operate one of two rotors, indicated at 72 and 74. A spool 76 rotates with shaft 70, but may move axially relative thereto. The exterior of a portion of the spool 76 may be threaded, as at 78, and is in threaded engagement with a stationary nut 80 fixed to the frame. The opposite ends of the spool, indicated at 82 and 84, may have a square cross section, shown in FIG. 4. The openings 86 and 88 in the rotors 72 and 74 will have the same cross section such that the spool ends may be positioned within the rotors and rotation of the spool will be effective to turn the rotors.

In operation, as the shaft 70 and spool 76 are rotated, the spool 76 will be moved axially because of the threaded mount described above. The spool will move axially from the position shown in FIG. 3 in which rotor 72 is coupled to a position in which rotor 74 will be coupled. The transition from one rotor to another will take place at a predetermined angular area of the shaft. However, due to the nature of the threaded arrangement mounting the spool 76, the transfer from one rotor to another will take place in an angle of about 10°. The transfer will not be instantaneous, however, the transfer will be automatic.

In the construction of FIG. 1 a manual effort was necessary to transfer the shaft from one rotor to another. However, in the construction of FIGS. 3 and 4 the transfer is automatic after the shaft is moved through a predetermined portion of its rotation, for example 350°. Subsequent rotation of the shaft 70 will move rotor 74. In like manner, rotation in the reverse direction will move spool 76 back toward the position of FIG. 3. Thus, the shaft 70 may have two essentially complete circular rotations, with each rotation controlling one of the two rotors.

In the construction of FIGS. 5 and 6, a shaft 90 is positioned to operate either rotor 92 or rotor 94. A spool 96, axially movable on shaft 90, has an outwardly extending flange 98 positioned adjacent rotor 92. A de-

tent arrangement comprising a ball 100 which fits within a pocket 102 in the flange 98 and a mating pocket 104 in the rotor 92 is effective to couple rotor 92 to the shaft 90. A stop is indicated at 106, and may take a variety of forms, for example a projection on rotor 92 overlying a portion of the stator 108 and arranged for contact with a portion of the stator. After the shaft 90 has moved through a given angle of rotation, for example 360°, the stop 106 will prevent further rotation of rotor 92. Continued rotation of the shaft 90 will move the spool 96 away from rotor 92 as there will no longer be a pocket to receive the ball 100. Thus the spool will be moved out of the coupled arrangement with rotor 92. A coil spring 110 positioned about the shaft normally maintains spool 96 in the position shown in which it is coupled to rotor 92. However, when the spool 96 moves out of a coupled relationship with rotor 92 a projection 112 on the opposite end of spool 96 will be received within an opening 114 on rotor 94 so that the spool can then be coupled to that rotor.

In operation, rotation of shaft 90 is effective to move rotor 92 through the coupling arrangement made up of the ball 100 and the mating pockets 102 and 104. After the shaft has moved through a predetermined angular rotation, determined by the position of stop 106, further movement of the shaft will effectively uncouple the shaft from rotor 92. Spool 96 will move away from rotor 92 and will move into a coupling arrangement with rotor 94. Thus, the transfer from one rotor to another is automatic, after a predetermined angular rotation of the shaft and will take place at a given position on the shaft. The shaft may rotate through generally a full turn when coupled to each rotor. Rotation in the opposite direction will reverse the sequence of operation.

In the construction of FIG. 7, a shaft 116 has a cam 118 keyed thereto for simultaneous rotational movement. The cam 118 may move axially relative to the shaft. Rotors 120 and 122 may each have collars and notches similar to the construction of FIG. 1. In like manner, the opposite ends of cam 118 may have projections which are the same or similar to the projections on the coupling 50 in FIG. 1. A cam track indicated at 124 is formed about the periphery of the cam 118. There are two parallel tracks 126 and 128 and a diagonal gate 130 connecting the parallel tracks. A cam follower 132 is positioned in a fixed relationship on the frame.

As shaft 116 is rotated, there will be a substantially full turn of rotation in which the shaft is coupled to rotor 120. When the cam follower 132 reaches gate 130 it will move the cam 118 away from rotor 120 to a position in which the cam is coupled to rotor 122. Further rotation of the shaft in the same direction will cause rotor 122 to move relative to its stator. When the shaft is rotated in the reverse direction, there again will be approximately a full turn in which rotor 122 is controlled, after which when the gate 130 is reached, the cam 118 will move back to the position of FIG. 7 for control of rotor 120. As was the case in the construction of FIGS. 3 and 4 and 5 and 6, shifting of the shaft from one rotor to another is automatic at a predetermined position of the shaft.

The construction of FIG. 8 is substantially the same as that for FIG. 7, except that instead of only having a pair of rotors, four rotors may be driven by a single

shaft. A shaft 134 mounts an axially movable key 136 having a plurality of projections 138, 140, 142 and 144. The key 136 is movable in a keyway 146 and will move axially with a cam as described hereinafter. Rotors 148, 150, 152 and 154 are positioned within the frame and are concentric with the shaft. A cam 156 having a plurality of cam tracks, one for each rotor, and a plurality of gates, is positioned adjacent a cam follower 158 which is attached to the frame. Cam 156 rotates with shaft 134, but may move axially relative thereto.

As the shaft 134 rotates, there will be generally a full rotation of the shaft for control of each rotor. In the position shown, rotor 148 will be moved as the shaft is first rotated as projection 138 will be coupled with a mating notch in the interior of the rotor. When the first gate is reached, cam 156 will shift the key 136 such that projection 140 is coupled to rotor 150 and rotor 138 is uncoupled. Again, there will be generally a full rotation of the shaft in the same direction for controlling rotor 150. Continued rotation of the shaft in the same direction will successively couple rotors 152 and 154 to the shaft and at the same time the other rotors will be uncoupled. When the shaft is rotated in the reverse direction, the key will move in the opposite direction and the sequence of coupling and uncoupling will be the reverse of that described above. In essence, there is generally a complete rotation of the shaft for each of the rotors with coupling and uncoupling of a particular rotor depending upon the direction of rotation of the shaft.

In the construction of FIG. 9, a shaft 160 mounts a cam 162. The cam 162 is similar to that shown in FIG. 8, except that all of the tracks, with the exception of the gates 164, have been removed from the cam. Thus, the cam follower 166 will only be in engagement with the cam when one of the gates is positioned at the cam follower. There are four rotors and four projections on the key 168 which is axially movable in a keyway 170 formed in the shaft 160. Again the key is attached to the cam to move axially therewith. A detent spring 172 is fixed to the shaft 160 and has an end 174 formed to seat in one of a series of recesses 176 in the surface of the key 168.

As the shaft 160 rotates, cam 162 will rotate with it. When one of the gates 164 is adjacent the cam follower 166, the cam and the key 168 will be axially shifted to uncouple one rotor and couple the next rotor. As the key is axially shifted, the detent spring 172 will have its end 174 moved from one recess to the next. The purpose of the detent spring 172 is to insure that there will be no axial movement of the key except at that time as the cam follower 166 is positioned in a gate 164. Axial stability in the construction of FIG. 8 is provided by the tracks of the cam, whereas in FIG. 9 axial latching or locking is effected by the spring 172. Otherwise the operation of the structure of FIG. 9 is substantially the same as that in FIG. 8.

In FIGS. 10 and 11 a shaft 180 has an interior chamber mounting a movable pin 182 and a spring 184. There is an opening 186 in the periphery of the shaft and a portion 188 of the pin extends outwardly therefrom. Rotors 190 and 192 each have coupling members 194 and 196 which extend toward the projection 188 on the pin. Each of the coupling members 194 and 196 may have pockets or the like 198 to receive the rounded projection 188 of the pin. In the position of FIG. 10, pin 182 and its projection 188, through the

force of spring 184 are coupled to rotor 190. Thus, rotation of the shaft is effective to move rotor 190. There is a stop 200 which prevents further movement of rotor 190 relative to its stator after the shaft is turned through a given angle. Further movement of the shaft is effective to move the projection 188 out of the pocket 198 on coupling member 194, such an axial movement moving the projection 188 into a seating arrangement with the mating pocket on coupling member 196. Further rotation of the shaft will move rotor 192 to which it is now coupled.

As was true in other forms of the invention, axial movement of the shaft to uncouple one rotor and couple another rotor is accomplished at a predetermined angular position of the shaft and is performed automatically. There may be generally full rotation of the shaft to control each rotor. Rotation of the shaft in one direction is effective to move the shaft to uncouple one rotor and couple a second, with rotation of the shaft in the opposite direction reversing the coupling sequence.

In FIGS. 12 and 13, a shaft 202 has an interior chamber 204. Positioned within the chamber 204 is a plunger 206 having a threaded portion 208, a double conical portion 210 and a head 212. A back plate 214 is attached to the plunger. The interior of chamber 204 adjacent the plunger 206 is threaded to mate with the threads on the plunger. A spring 216 having an enlarged center area 218 has opposite ends 220 which couple with projections 222 on rotor 224 and projections 226 on rotor 228. In the position of FIG. 12 the shaft and the plunger are coupled to rotor 224. There are openings 230 in the wall of the shaft so that the spring may pass through it to be in coupling relationship with the projections on the rotors described above. As the shaft is rotated, the plunger 210 will move, as shown in FIG. 12, toward rotor 224. The spring 216 will move up on the left side of the double cone arrangement 210 and will have its center spread apart. When the plunger has moved to a point where the spring is slightly to the left of the center of the double cone arrangement, the spring will snap over from one side of the double cone arrangement to the other. The snapping over of the spring will uncouple rotor 224 and couple rotor 228 to the shaft.

As was true in the other forms of the invention, the uncoupling and coupling of the rotors is automatic and takes place at a given angular position of the shaft and generally after a full turn of the shaft for use in controlling each rotor.

Although the invention has been described with two or more rotors, each of which may be coupled to a shaft after a given portion of shaft rotation, the invention is equally applicable to a situation in which there are a plurality of rotors and several may be coupled at different intervals to the shaft. For example, there may be a switch construction in which it is desirable to couple two rotors at a time to a shaft, or a plurality of rotors to a shaft in which they are successively uncoupled. What is important in the invention is that rotation of the shaft is effective to control one or more rotors and axial movement of the shaft or a portion thereof, either automatically or by manual means, is effective for rotor selection. The uncoupling and coupling of the rotors takes place upon movement of the shaft or shaft means in an axial direction.

In some applications of the invention, rather than having a full turn of shaft rotation before rotor selec-

tion takes place, there may be a partial turn of a shaft after which the shaft will move axially to uncouple one rotor and couple another or more rotors. However, in general, as it is desirable to have as many detented positions on a single shaft as possible, the more usual application of the invention will be to have as close to a full turn for each rotor as possible.

FIGS. 14 and 15 illustrate the application of an index mechanism to a switch construction having a plurality of individual rotors which may be coupled and uncoupled to the switch shaft. Of importance in such an index mechanism is to insure that the mechanism is applicable and usable at all axial positions of the switch shaft.

A switch shaft is indicated at 240 and a housing is indicated at 242. The housing member 242 may have a threaded bushing section 244 which may be used in mounting the switch mechanism to an instrument panel. A star wheel 246 is staked in a conventional manner to the shaft 244 for rotation therewith. The star wheel 246 may have a plurality of notches 248 uniformly spaced about its periphery to define a plurality of angular shaft positions which are coincident with the relationship between the various rotors and their associated stators. As is common, there will be a given number of index positions for use by the rotor and stator. The front of the housing 242 may have an outwardly extending projection 250 which will be used to properly radially position the switch mechanism with the instruction panel and with a knob or the like which will be used on the front of the panel to operate the switch.

The housing 242 defines a chamber 252, with the bottom of the chamber being closed by a stop plate 254. The housing 242 has peripherally extending openings 256 on opposite sides thereof. Adjacent the openings 256 housing portions 258, as shown in FIG. 14, have the appearance of inwardly extending arms which are effective to contain the opposite end of springs 260 to position the springs 260 within the openings 256. Rollers 262 are held by the springs 260 against the star wheel 246 with the rollers functioning as detent members. The star wheel can be held at any angular position by the rollers 262 which are biased in an inward direction by the springs 260. The rollers 262 are held by the housing in an axial direction, but are permitted to move radially outwardly relative to the star wheel by the springs 260. The length of the rollers 262 is of a sufficient extent to effectively provide an indexing function at all axial positions of the shaft 240. Thus, the indexing mechanism shown can function with any one of the switch constructions disclosed in FIGS. 1-13 with the axial length of the rollers 262 depending upon the degree of axial movement of the shaft 240, to move from one switch section to another.

Whereas the preferred form of the invention has been shown and described herein, it should be realized that there may be many modifications, substitutions and alterations thereto.

We claim:

1. A rotary switch including a frame, shaft means mounted for rotation in said frame, a plurality of insulative planar switch sections mounted to said frame and concentric with said shaft means, each switch section including a rotatable switching element, cooperating means on each rotatable element and said shaft means for coupling each of said rotatable elements to said shaft means at only one predetermined angular position of said shaft means, axial movement of at least a por-

tion of said shaft means relative to said rotatable elements coupling and uncoupling said rotatable elements to said shaft means at said predetermined position.

2. The structure of claim 1 further characterized by and including detent means carried by the shaft means and positioned to cooperate with means on the frame for positioning the shaft at any one of a predetermined number of angular locations.

3. The structure of claim 2 further characterized in that said detent means on the shaft is effective at all axial positions of the shaft.

4. The structure of claim 3 further characterized in that the means on the frame cooperating with the detent means on the shaft includes a plurality of rollers positioned to be in contact with said detent means, and spring means biasing said rollers toward said shaft means.

5. A rotary switch including a frame, shaft means mounted for rotation in said frame, a plurality of insulative planar switch sections mounted to said frame, each switch section including a rotatable switching element, cooperating means on each rotatable element and said shaft means for coupling each of said rotatable elements to said shaft means for rotation therewith, axial movement of at least a portion of said shaft means relative to said rotatable elements coupling and uncoupling said rotatable elements to said shaft means, and spring means normally biasing said shaft means toward a position in which one of said rotatable elements is coupled to the shaft means.

6. The structure of claim 5 further characterized in that said shaft means is movable, against the biasing force of the spring means, to a position such that the shaft means is uncoupled from said one rotatable element and is coupled to a second rotatable element.

7. The structure of claim 6 further characterized by and including a latch for holding said shaft means in a coupled position with said second rotatable element.

8. The structure of claim 7 further characterized in that said latch is manually axially movable.

9. The structure of claim 7 further characterized in that said shaft means is axially movable from a position in which it is coupled with said one rotatable element to a position in which it is coupled with said second rotatable element at a predetermined angular position of said shaft means.

10. The structure of claim 7 further characterized in that said shaft means is uncoupled and coupled to said rotatable element at a predetermined angular position thereof.

11. The structure of claim further characterized in that said latch is axially movable only at said predetermined angular position.

12. The structure of claim 7 further characterized in that said latch includes a pin extending outwardly from said shaft means and a plate attached to the frame, a slot in said plate, said pin being of the size and shape to pass through said slot, positioning of said pin on one side of said plate positions the shaft means for coupling with one of said rotatable elements, positioning of the pin on the opposite side of the plate positions the shaft means for coupling with another of said rotatable elements.

13. A rotary switch including a frame, shaft means mounted for rotation in said frame, a plurality of insulative planar switch sections mounted to said frame and concentric with said shaft means, each switch section

including a rotatable switching element, cooperating means on each rotatable element and said shaft means for coupling each of said rotatable elements to said shaft means for rotation therewith, including a collar on said shaft means positioned between a pair of rotatable elements, said collar and rotatable elements having mating clutch surfaces, axial movement of at least a portion of said shaft means relative to said rotatable elements coupling and uncoupling said rotatable elements to said shaft means.

14. The structure of claim 13 further characterized in that there are two switch sections, said collar being positioned between said switch sections and arranged to be coupled to either one of said rotatable elements.

15. A rotary switch including a frame, shaft means mounted for rotation in said frame, a plurality of insulative planar switch sections mounted to said frame, each switch section including a rotatable switching element, cooperating means on each rotatable element and said shaft means for coupling each of said rotatable elements to said shaft means for rotation therewith, said shaft means including a threaded collar, threaded means on said frame in engagement with said threaded collar, rotation of said shaft means causing the threaded means on the frame and said threaded collar to shift said shaft means axially relative to said rotatable elements to couple and uncouple said rotatable elements to said shaft means.

16. The structure of claim 15 further characterized in that said shaft means is uncoupled from one of said rotatable members and coupled to another of said rotatable members as said shaft passes through a given angular area of rotation.

17. A rotary switch including a frame, shaft means mounted for rotation in said frame, a plurality of insulative planar switch sections mounted to said frame, each switch section including a rotatable switching element, said shaft means including an axially movable collar, spring means biasing said collar in one direction, detent means effective between said collar and one of said rotatable elements, said spring means biasing said collar and detent means into a position such that rotation of said shaft means moves said one rotatable element, and second detent means positioned to engage said collar with another of said rotatable elements, axial movement of at least a portion of said shaft means relative to said rotatable elements coupling and uncoupling said rotatable elements to said shaft means.

18. The structure of claim 17 further characterized in that movement of said shaft means to a predetermined angular position releases said first detent member.

19. A rotary switch including a frame, shaft means mounted for rotation in said frame, a plurality of insulative planar switch sections mounted to said frame, each switch section including a rotatable switching element, cooperating means on each rotatable element and said shaft means for coupling each of said rotatable elements to said shaft means for rotation therewith, said shaft means including an axially slidable cam shaft, a cam follower positioned on said frame, rotation of said cam being effective to shift a portion of said shaft

means to couple and uncouple said rotatable elements.

20. The structure of claim 19 further characterized in that said cooperating means form a portion of said cam.

21. A rotary switch including a frame, shaft means mounted for rotation in said frame, a plurality of insulative planar switch sections mounted to said frame and concentric with said shaft means, each switch section including a rotatable switching element, cooperating means on each rotatable element and said shaft means for coupling each of said rotatable elements to said shaft means for rotation therewith, including a spring-biased pin positioned within said shaft means, axial movement of at least a portion of said shaft means relative to said rotatable elements coupling and uncoupling said rotatable elements to said shaft means.

22. The structure of claim 21 further characterized in that said spring-biased pin has a projection extending outwardly from said shaft and positioned for engagement with said rotatable elements.

23. A rotary switch including a frame, shaft means mounted for rotation in said frame, a plurality of insulative planar switch sections mounted to said frame, each switch section including a rotatable switching element, cooperating means on each rotatable element and said shaft means for coupling each of said rotatable elements and said shaft means for rotation therewith, said shaft means including a shaft and a movable cam on said shaft, a cam follower attached to said frame and positioned for movement in said cam, rotation of said shaft axially shifting a portion of said shaft means to couple and uncouple said rotatable elements to said shaft means.

24. The structure of claim 23 further characterized by and including a keyway in said shaft and a movable key positioned in said keyway, with portions of said key being positioned for engagement with said rotatable elements.

25. The structure of claim 24 further characterized by and including spring means effective between said key and shaft.

26. A rotary switch including a frame, shaft means mounted for rotation in said frame, a plurality of insulative planar switch sections mounted to said frame, each switch section including a rotatable switching element, cooperating means on each rotatable element and said shaft means for coupling each of said rotatable elements to said shaft means for rotation therewith including a plunger movable within said shaft means, a spring positioned by said plunger and arranged to cooperate with said rotatable elements, axial movement of at least a portion of said shaft means relative to said rotatable elements coupling and uncoupling said rotatable elements to said shaft means.

27. The structure of claim 26 further characterized in that said plunger is threadedly engaged with said shaft means, such that rotation of said shaft means is effective to axially move said plunger, movement of said plunger being effective to shift said spring from one rotatable element to another.

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