

Nov. 27, 1951

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2,576,836

SWITCH

Filed Aug. 7, 1947

2 SHEETS—SHEET 1

FIG. 1

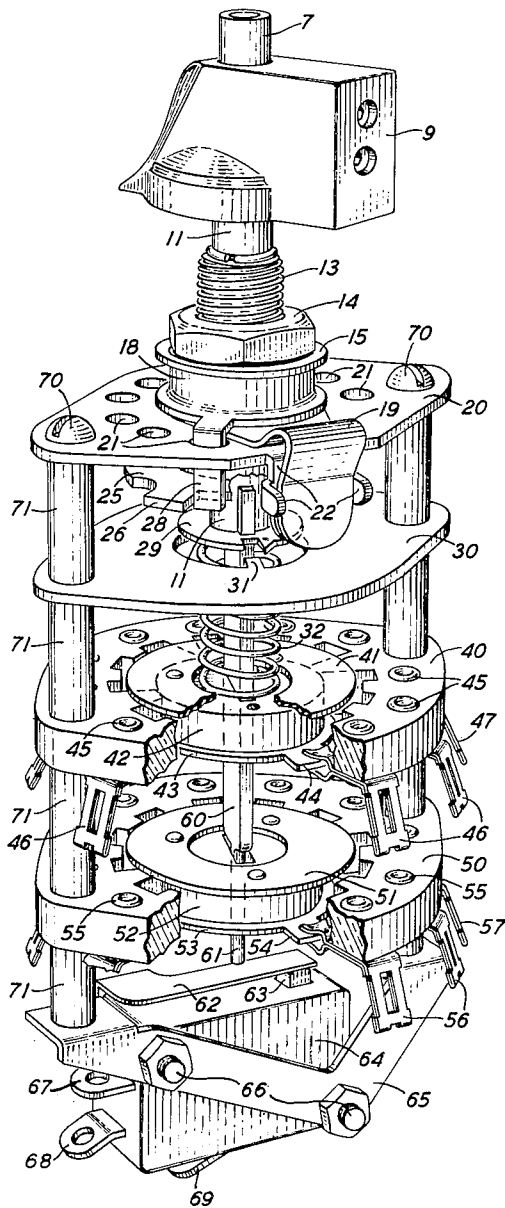
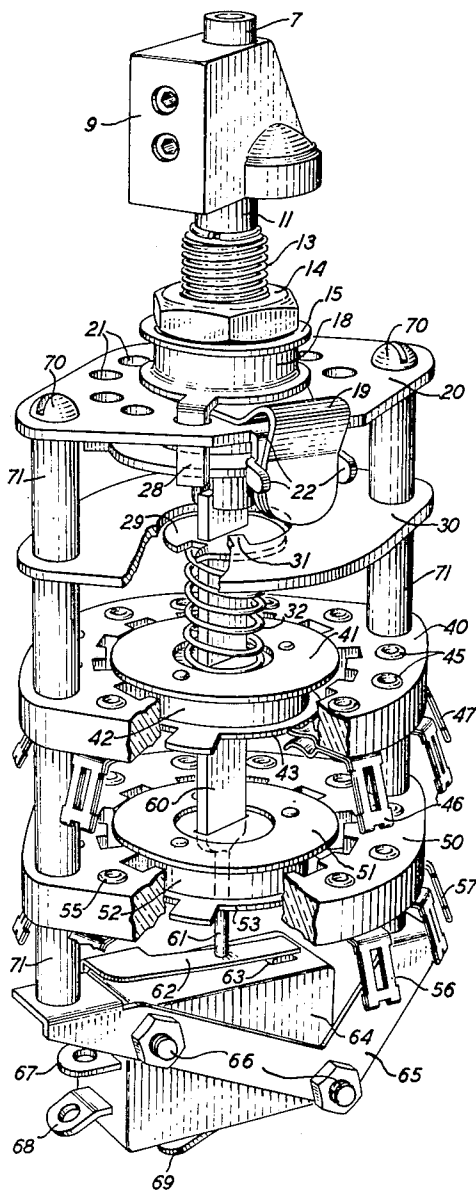


FIG. 2



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2 SHEETS—SHEET 2

FIG. 3

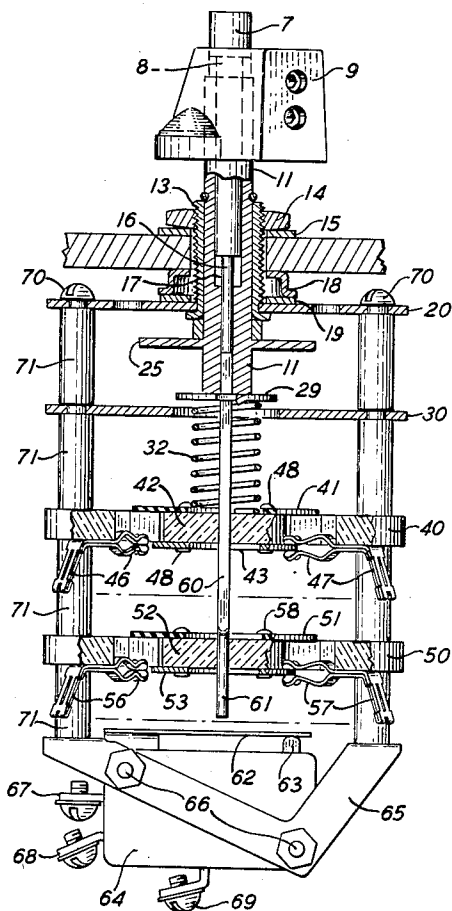


FIG. 4

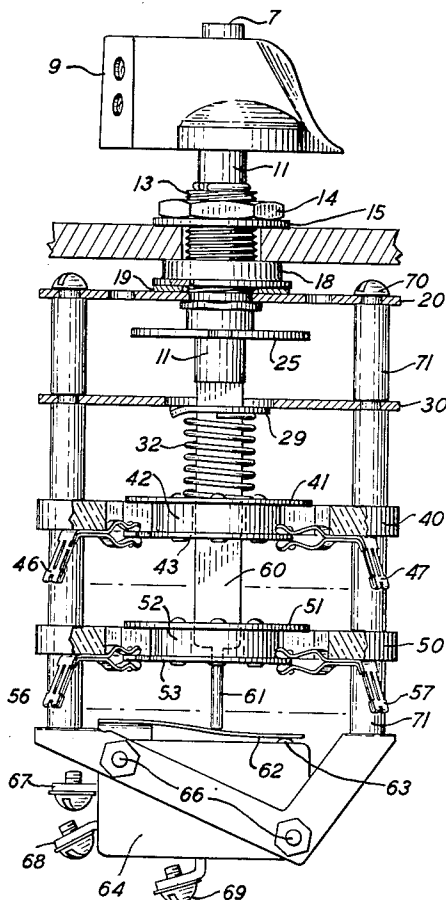
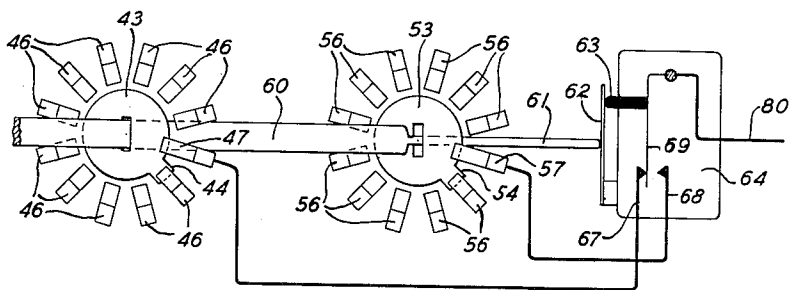


FIG. 5



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SWITCH

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6 Claims. (Cl. 200-4)

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This invention relates to electrical switches and particularly to multiple multithrow switches of the rotary type.

Objects of the invention are to increase the number of different switching arrangements available in a rotary multiposition switch and to increase the utility of such a switch structure by making it adaptable to a larger number of different switching conditions than has heretofore been possible.

This invention is a multiposition rotary switch comprising a plurality of switching wipers, each wiper having associated therewith a plurality of contact terminals fixed in an arc for successive engagement by the wiper and a feed terminal arranged to be continuously engaged by the wiper, one of the wipers being mounted on a shaft for rotation from one switching position to the next whenever the shaft is rotated from one position to the next and another of the wipers being normally disengaged from the shaft, the shaft being longitudinally movable to engage the normally disengaged wiper whereby rotation of the shaft moves both wipers simultaneously, the shaft being locked in engagement with the second wiper to continue the control of both wipers after it is rotated out of normal position until it is restored to its normal rotary position.

A feature of the invention is a switch as described in the preceding paragraph having an auxiliary switch fixed to the supporting structure of the rotary switch and arranged to be actuated by the end of the shaft when longitudinally moved to control the movement of both of said wipers. The auxiliary switch comprises switching contacts which may be utilized to connect the feed terminals of both sections of the rotary switch in parallel, to open a normally closed connection to one of the feed terminals or to close a normally open connection to one of the feed terminals.

A switch arranged in accordance with this invention and embodying its features is shown in the drawing which consists of five figures. Referring to the drawing:

Figs. 1 and 2 are perspective views of the switch partly broken away to more clearly show the rotor elements and terminal structure;

Figs. 3 and 4 are elevations partly in section to more clearly show the rotor and terminal structure;

Fig. 5 is a schematic representation of two rotor and stator terminal assemblies and the auxiliary switch which is actuated by longitudinal movement of the shaft.

Referring to Figs. 1 and 3, the switch comprises an end or index assembly plate 20, an intermediate plate 30, terminal bank mounting plates 40 and 50 and a mounting bracket 65 for

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an auxiliary switch 64, all of which are held in assembled and spaced positions by the bolts 70 and spacers 71. The end plate 20 has staked thereto a bushing 13 which constitutes a bearing for a rotatable shaft 11. The shaft 11 has a knob 9 fixed thereto and has an index wheel 25 of the hill and dale type integral therewith or fixed thereon. The end plate 20 has a bent over section 22 formed to constitute a ball holder which together with spring 19 holds a steel ball (not shown) in engagement with the periphery of the index wheel. Thus the plate 20, bushing 13, shaft 11, wheel 25, spring 19 and ball held in engagement with the periphery of wheel 25 constitutes an index assembly of known design which assures proper rotary positioning of the shaft 11. The end plate 20 has a succession of holes 21 therethrough; and an adjustable stop 18 is positioned so that the lug or post 28 extends through any desired one of the holes 21 to engage the tooth 26 of the index wheel 25 and thereby limit the rotary movement of the shaft 11 as desired. The bushing 13 is threaded on the outside and a nut 14 and lock washer 15 are provided to mount the switch assembly on a panel as shown in Figs. 3 and 4.

Each of the terminal bank mounting plates 40, 50 has attached thereto by metal eyelets 45, 55 a plurality of terminals 46, 47 or 56, 57. The mounting plates may be porcelain or some other suitable insulating material. The outer extension of each of terminals 46, 47, 56, 57 may be soldered to any desired one of a plurality of electrical conductors and the inner end is a double armed wiper adapted to engage the wiper disc of an associated rotor unit. The rotor unit associated with terminal bank 40 consists of a thin circular insulating disc 41 and a circular metal disc 43 spaced apart by a circular insulator 42 of the same thickness as plate 40, all fastened together by rivets 48 so that the disc 41 and disc 43 engage opposite sides of the inwardly projecting teeth of terminal plate 40 to form a floating rotor unit. The rotor unit associated with terminal bank 50 comprises the circular insulating disc 51 and circular metal disc 53 spaced apart by insulator 52, all fastened together by rivets 58 so that the disc 51 and disc 53 engage opposite sides of terminal plate 50 to form another floating rotor unit. Each of the metal discs 43 and 53 has an extending lug or wiper 44 or 54 adapted to engage the bank terminals 46 or 56 one at a time in succession when the rotor element is rotated. The terminals 47 and 57 are feed terminals which extend inwardly to make continuous contact with the associated wiper disc 43 or 53; whereas the inwardly projecting wiper arms of terminals 46 and 56 are shorter so as to engage the associated wiper

disc 43 or 53 only when the wiper lug 44 or 54 is in corresponding rotary position.

There is a rectangular hole through the middle of each of the rotor units for engagement by a flat shaft 60. One end of the flat shaft 60 extends into a slot in the inner end of the rotor operating shaft 11 so that the round shaft 11 and the flat shaft 60 are both rotatably controlled by the knob 9. At the inner end of the slot, the flat shaft 60 becomes a circular shaft having sections 16 and 8 of different diameters extending through a lengthwise hole in the rotor operating shaft 11. The section 16 of this circular shaft has a diameter equal to the thickness of the flat shaft 60 and the section 8 of the circular shaft is of increased diameter so that the hole 17 constitutes a bearing which permits a limited longitudinal movement of the flat shaft 60 within the shaft 11. The circular section 8 extends beyond the knob 9 and a push button 7 is mounted on its free end. The other end of the flat shaft 60 passes through the rectangular hole in the first rotor unit and does not normally extend into the rectangular hole in the last rotor unit; but a circular extension 61 of the shaft 60 does extend through the hole in the last rotor unit and terminates just short of the operating spring 62 of the auxiliary switch 64. The flat shaft 60 with its circular sections 8, 16 and 61 is held in normal longitudinal position by the spiral spring 32 which extends through a circular hole in plate 30 with one end seated on the insulator 42 of the rotor unit associated with terminal bank 40 and the other end in engagement with a metal latching disc 29 which is keyed or otherwise fastened to the flat shaft 60 adjacent the slotted end of the round operating shaft 11. Thus the spring 32 normally holds the latching disc 29 against the end of shaft 11, so that the lower end of the flat shaft 60 does not normally engage the hole through the last rotor unit and the end of the extension 61 does not normally engage the operating spring 62 of the auxiliary switch. When the push button 7 is depressed against the pressure of spring 32, the shaft consisting of sections 8, 16, 60 and 61 is moved longitudinally until the inner end of section 8 engages the shoulder 17 of the shaft 11; whereby the lower end of the flat shaft section 60 is positioned to engage the last rotor unit and the latching disc 29 is moved away from the end of shaft 11, through the plate 30, into position for engagement with the lug 31 of plate 30 in case the knob 9 is rotated while the push button 7 is depressed. If the knob 9 is rotated while the push button 7 is depressed, the flat shaft 60 rotates both rotor units, and the latching disc 29 engages the lug 31 of plate 30 to latch the longitudinally movable shaft, as shown in Figs. 2 and 4. The shaft 60 is thereby locked in operative engagement with the rotor unit of terminal bank 50 until the knob 9 is restored to normal rotary position; at which time, the slot in disc 29 coincides with lug 31 so that spring 32 restores shaft 8-16-60-61 and push button 7 to normal longitudinal position. It is to be noted that depression of the push button is prevented while the switch is out of normal rotary position by engagement of disc 29 with the lug 31; and it is only when the knob is in normal position and the slot in disc 29 coincides in rotary position with projection 31 of plate 30 that push button 7 may be depressed sufficiently to position latching disc 29 on the other side of plate 30 so as to lock shaft 60 in engagement with the rotor unit associated with terminal bank

50. It is thus apparent that rotation of knob 9, while push button 7 is not depressed, effects the rotation of the rotor unit associated with terminal bank 40 and does not effect the rotation of the rotor unit associated with terminal bank 50; and that rotation of knob 9, while the switch is in normal rotary position and while push button 7 is depressed, effects the rotation of both of the rotor units.

A further result of the depression of the push button 7 is that the end of shaft section 61 engages and depresses the operating spring 62 of the auxiliary switch 64, which is mounted by bracket 65 and screws 66 at the end of the rotary switch assembly. The switch 64 is of known design and spring 62 engages the button 63 thereby to actuate the switch whereby a transfer spring breaks one contact and makes another contact as shown in Fig. 5. The feed terminal 47 of terminal bank 40 may be connected to the back contact and the feed terminal 57 of terminal bank 50 to the front contact as shown in Fig. 5 in which case the turning of knob 9 while the push button 7 is not depressed connects conductor 80 to any desired one of terminals 46; and the turning of knob 9 while the push button 7 is depressed connects conductor 80 to any desired one of terminals 57.

In an alternative arrangement, the feed terminals 47 and 57 may be electrically connected independent of any auxiliary switch so that every time the knob 9 is turned, a circuit connection is established through feed terminal 47 and a selected one of terminals 46; and if the push button 7 is depressed when the knob 9 is turned, a parallel circuit is established through feed brush 57 and the corresponding selected one of terminals 56.

What is claimed is:

1. A rotary switch comprising a plurality of floating rotary wiper units, a like plurality of terminal banks, one for each wiper unit, each bank comprising a terminal plate of insulating material and a plurality of metal electrical contact terminals fixed in spaced relation in the arc of a circle on the surface of the insulator for successive engagement by the associated wiper unit, each of said wiper units comprising a non-conductive circular disc and a conductive circular disc fixed to each other and movably disposed on opposite sides of the associated insulator to rotate as a unit with respect to the insulator, said metal disc having an extending portion which constitutes a wiper for successively engaging the associated terminals one at a time, the inner end of one of the terminals in each bank being extended to make continuous contact with the metal disc of the associated rotor unit, the inner end of each of the other terminals in each bank being shorter than said one terminal so as to be normally out of engagement with said metal disc and to be engaged by the extending wiper of said disc only while in corresponding rotary position, a rotary shaft, a chassis including a bushing for supporting said shaft and means for mounting said terminal banks in parallel spaced relation, another shaft extending through and longitudinally movable to a limited extent with respect to said rotary shaft, said other shaft being rotatable as a unit with said rotary shaft and having an extension of rectangular cross-section passing through corresponding openings in a plurality of said rotor units and a further extending portion of circular cross-section normally extending through the rectangular open-

ing in the last of said rotor unit, a circular latching disc fixed on said other shaft adjacent the end of said rotary shaft, said latching disc having a slot in its periphery, a latching plate fixed to said chassis, said plate having an extending lug opposite the slot of said latch when said latching disc is in normal rotary position, a spiral spring bearing against the first rotor unit and said latch to maintain said shaft and extending portions in normal longitudinal position, push-button means for moving said shaft longitudinally against said spring while said shaft and rotor units and latching disc are in normal rotary position so as to position said latch on the other side of said latching plate and to extend the rectangular portion of said shaft into engagement with the rectangular opening in the said last rotor unit, a knob fixed to the end of said rotary shaft for turning said shaft so that the wiper of each engaged rotor unit makes contact with a corresponding terminal of the associated bank, said latch and latching plate being effective to prevent longitudinal movement of the shaft while in off-normal rotary position and to prevent return of the shaft to normal longitudinal position while the shaft is in off-normal rotary position after having been moved from normal rotary position while also in longitudinal off-normal position.

2. A switch according to claim 1 having an auxiliary switch fastened to said chassis and having an actuating element positioned for operative engagement by the circular extension of said shaft when said shaft and extending portion are in longitudinal off-normal position, said switch comprising electrical contacts for controlling the electrical connections through said wipers and terminals.

3. A multilevel switch comprising a plurality of terminals in each of a plurality of levels, rotary wipers, one for each level for engaging the terminals of the associated level one terminal at a time in succession, means comprising a shaft for rotating said wipers in either direction between two limiting positions to selectively position each of said wipers in engagement with any desired terminal of the associated plurality, one of said two limiting positions constituting a normal position, spring means normally holding said shaft out of engagement with one of said wipers, manually operated means for effecting operative engagement of said shaft and said one of the wipers while maintaining engagement with the other wipers, and means for preventing operation of said manually operated means in any position other than said normal rotary position of said shaft.

4. A multilevel switch comprising a plurality of terminals in each of a plurality of levels, rotary wipers, one for each level for engaging the terminals of the associated level one terminal at a time in succession, means comprising a shaft for rotating said wipers in either direction between two limiting positions to selectively position each of said wipers in engagement with any desired terminal of the associated plurality, one of said two limiting positions constituting a normal position, spring means normally holding said shaft out of engagement with one of said wipers, manually operated means for effecting operative engagement of said shaft and said one of the wipers while maintaining engagement with the other wipers, means for preventing operation of said manually operated means in any position other than said normal rotary position of said shaft, and latching means rendered effective by rotary

movement of said shaft from normal rotary position while said manually operated means is operated for locking said shaft in engagement with said one wiper and for preventing disengagement of said shaft until said shaft is restored to said normal rotary position.

5. A multilevel switch comprising a plurality of terminals in each of a plurality of levels, rotary wipers, one for each level for engaging the terminals of the associated level one terminal at a time in succession, means comprising a shaft for rotating said wipers in either direction between two limiting positions to selectively position each of said wipers in engagement with any desired terminal of the associated plurality, one of said two limiting positions constituting a normal position, spring means normally holding said shaft out of engagement with one of said wipers, manually operated means for effecting operative engagement of said shaft and said one of the wipers while maintaining engagement with the other wipers, means for preventing operation of said manually operated means in any position other than said normal rotary position of said shaft, an input conductor, an auxiliary set of contacts for connecting said input conductor to said one wiper or to a particular one of the other wipers, and means actuating said set of contacts only while said shaft is in engagement with said one wiper.

6. A multilevel switch comprising a plurality of terminals in each of a plurality of levels, rotary wipers, one for each level for engaging the terminals of the associated level one terminal at a time in succession, means comprising a shaft for rotating said wipers in either direction between two limiting positions to selectively position each of said wipers in engagement with any desired terminal of the associated plurality, one of said two limiting positions constituting a normal position, spring means normally holding said shaft out of engagement with one of said wipers, manually operated means for effecting operative engagement of said shaft and said one of the wipers while maintaining engagement with the other wipers, means for preventing operation of said manually operated means in any position other than said normal rotary position of said shaft, latching means rendered effective by rotary movement of said shaft from normal rotary position while said manually operated means is operated for locking said shaft in engagement with said one wiper and for preventing disengagement of said shaft until said shaft is restored to said normal rotary position, an input conductor, an auxiliary set of contacts for connecting said input conductor to said one wiper or to a particular one of the other wipers, and means actuating said set of contacts only while said shaft is in engagement with said one wiper.

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