

Oct. 12, 1948.

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2,451,225

SELECTOR SWITCH

Filed Jan. 14, 1946

2 Sheets-Sheet 1

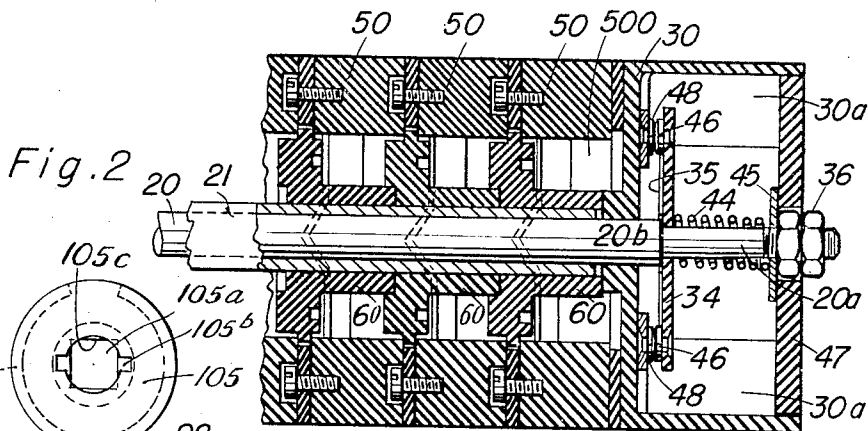
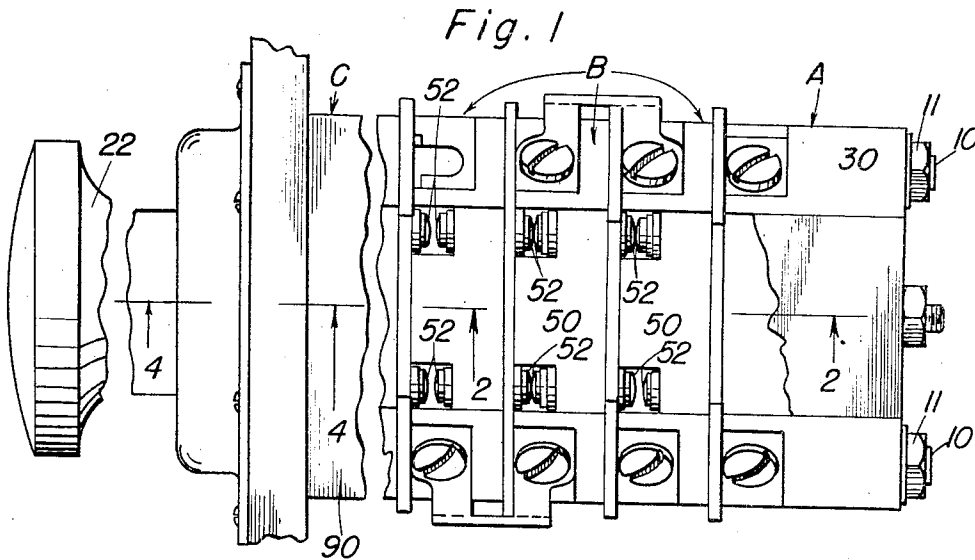


Fig. 8

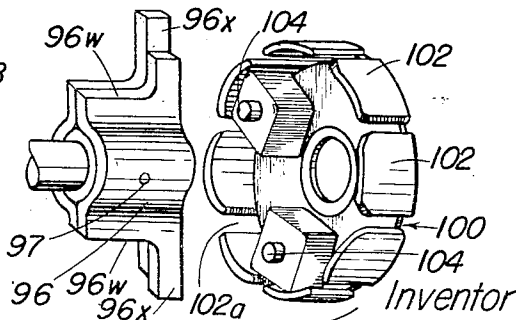
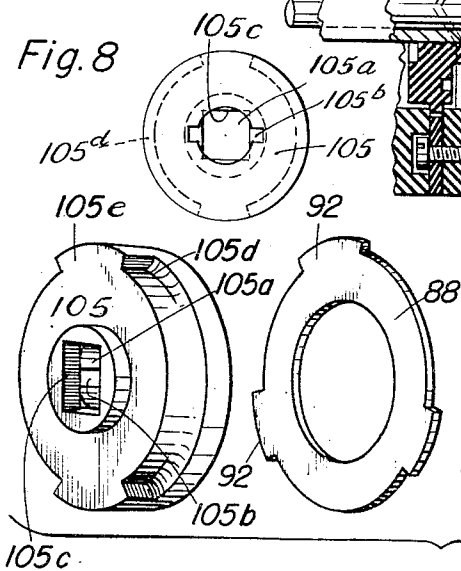


Fig. 3

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Filed Jan. 14, 1946

SELECTOR SWITCH

2 Sheets-Sheet 2

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2,451,225

SELECTOR SWITCH

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Application January 14, 1946, Serial No. 641,070

14 Claims. (Cl. 200—4)

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This invention relates to selector switches of a type which is rotatable manually to select a desired set of contacts for controlling the desired circuit and which may be pushed or pulled to open or to vary the power line arrangements.

The invention further relates to provision in this type of selector switch whereby the selection can take place only after the power circuit contacts have been opened.

It is an object of this invention to provide an improved switch structure of the type described wherein selection and momentary contact can be made of either one of a pair of control circuits while the power circuit contacts are held in open position and which, when released, is automatically returned to a mid or central position in which the control circuit contacts are permitted to return to a normal condition, the power circuit contacts are automatically closed and the switch structure is locked in the mid position against further rotative movement until the power contacts are again opened.

In the drawings—

Fig. 1 is a broken view in side elevation of a selector switch in accordance with this invention;

Fig. 2 is a longitudinal sectional view of a portion of the switch structure taken as on line 2—2 of Fig. 1;

Fig. 3 is an exploded perspective view of certain parts of the switch operating mechanism;

Fig. 4 is a longitudinal sectional view of a portion of the switch structure, at the left in Fig. 1, taken as on line 4—4 of Fig. 1;

Fig. 5 is a plan view of the face of the casing member as seen looking from the right in Fig. 4, the casing member being shown as detached from the switch structure;

Figs. 6 and 7 are plan views looking from the right in Fig. 4 showing the cooperating parts which effect the return of the switch parts to a normal position, Fig. 6 showing the parts in normal position, one spring being removed to show the spring recess and Fig. 7 showing the parts when operated to effect a control circuit operation; and

Fig. 8 is an inverted plan view drawn to a smaller scale of the element shown at the left in Fig. 3.

The invention is shown in the drawings in connection with a switch of the push-pull type having the general construction of the switch shown in my co-pending application, Serial No. 576,270, filed February 5, 1945. A switch as disclosed in my co-pending application comprises sections such as A, B and C, formed as molded insulating base members which carry various conductive or functional parts and are secured together by bolts 10 which extend through all the sections and have nuts 11 thereon. Operation of the device is by rotation of a shaft 20 which passes through all

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the sections and carries a handle 22 at one end. Of the various sections, section A may contain fixed and movable contacts and is shown as a rectangular insulating body or base member 30 having a chamber in which are mounted spaced contacts 48 having extensions leading to outer faces of the member 30 for the usual circuit connections (not shown). The circuit through the contacts 48 is arranged to be completed by contacts 46 mounted on a nonconductive bridging member 34 and connected by a metallic strip 35. The bridging member 34 is freely mounted on a portion 20a of the shaft 20 of reduced diameter and is held in engagement with the shoulder 20b by a spring 44 which surrounds the shaft portion 20a and is held confined by a washer 45 secured on the shaft 20 by nuts 36. The washer 45 bears against a removable end piece 47 secured in the end of the member 30 and provided with an opening through which the shaft 20 and nuts 36 project. The chamber in the member 30 is shaped to provide abutments 30a which prevent rotation of the bridging member 34 and insure engagement of the contacts 46, 48.

A switch structure in accordance with this invention may comprise a plurality of B sections, each section comprising a substantially square body member 50 of molded insulation with flat top and bottom faces and centrally apertured, as at 50a, to receive the operating shaft 20, a rectangular sleeve 21 mounted on the shaft 20 and a cam member 60 having a rectangular opening so as to be operated by rotation of the sleeve 21. Each section also comprises electrical contacts 52, one of each pair of said contacts being spring biased to engaging position and arranged to be operated by the cam member 60 to a position in which the contacts are separated. The cams 60 and sleeve 21 are positioned on the shaft 20 so that rotation of the shaft in one direction will permit some contacts to engage while separating others and operation of the shaft in the opposite direction will cause a different arrangement of the closed and open contacts as shown in my prior application.

The section C also comprises a rectangular block 90 of molded insulation and having a central opening for the reception of the shaft 20. At the outer end of the block 90, the shaft opening is enlarged for a short distance to receive the handle 22 fixed on the end of shaft 20. At the other end of the block 90 the central opening is enlarged for an appreciable depth leaving a relatively thin perforated wall 90a to which is secured a locking member 100 having an annular flange slotted to form locking fingers 102 extending parallel to the axis of the shaft 20. A fabricated key member 96 affixed to the shaft 20 by a pin 97 has wings 96w, one or both of which has an ex-

tension 96x adapted to engage in a slot between fingers 102 when the shaft 20 is in its normal position. The shaft 20 may be pushed to remove the extensions 96x from the slots and rotated in either direction but rotation of the shaft 20 is limited by stops 104 secured to the locking member 100.

Mounted in the enlarged opening at the inner end of the block 90 is a substantially circular metal plate 88 having an opening to receive the shaft 20 and the fabricated key 96. Plate 88 has radial extensions 92 which engage in recesses 93 in the wall of the opening in the block 90 and prevent rotation of the plate 88. Seated on the plate 88 is a spring operating member 105 having a central opening which, for part of its depth, is circular as at 105a with radially extending slots 105b to receive the key 96 and its wings 96w. For the remainder of its depth the central opening is rectangular as at 105c to receive the end of the rectangular sleeve 21 which operates the cams 60. Along the edge of one face, the member 105 is formed with spaced recesses as at 105d, the recesses being symmetrically disposed upon opposite sides of a diameter and each being less than 180° in extent so as to provide radially extending abutments 105e at each end of the recesses. The block 90 is recessed in its end face (the right end face in Fig. 4) to provide a flat face which will lie in a common plane with the face of the member 105. Block 90 is further recessed to provide recesses 99 complementary to the recesses 105d in the member 105, a recess in the member 105 and a recess in the block 90 together forming a niche for the reception of a spring 107 which lies partly in each of the complementary recesses. The springs 107 are provided with flat end pieces 108 which, when the switch is in its normal position, abut the ends of the niches. When the shaft 20 is rotated, carrying with it the member 105, the abutments 105e engage an end of each spring and compress the springs 107 between the abutments 105e and the ends of the recesses in the block 90.

When in use the switch, except when operated, occupies its normal position with the shaft 20 pressed by spring 44 to engage a wing extension 96x in slot 102a between fingers 102. In this position some contacts in sections A and B may be engaged while other contacts are held separated and rotation of shaft 20 is prevented. To operate the switch, the shaft 20 is pushed inwardly by pressure on the handle 22, forcing key member 96 from its engagement with the lock member 100 and operating the contacts 46 in section A to break the circuit through the contacts 48 and compressing spring 44. With key member 96 clear of the lock member 100, the shaft 20 may be rotated in either direction. Rotating the shaft 20 does not rotate the bridging member 34 mounted on the shaft 20 in section A but rotates the key member 96 until it engages one of the stop members 104. The key member 96, through the engagement of its wings 96w in recesses 105b in the member 105, rotates the member 105 causing the abutments 105e to compress springs 107 and, through the engagement of rectangular sleeve 21, in the rectangular opening 105c in member 105, to rotate sleeve 21 and cams 60 to operate the contacts 52. After the shaft has been pushed in and turned manually until the key member 96 abuts one or the other of the stops 104, it cannot, while in that rotated position, move axially outward because the key would come to rest on the surface of the blocks 104b on which

the stops are mounted. Thus when the handle 22 is released, the springs 107 return the member 105 and key member 96 to a position in which the spring 44 operates shaft 20 to carry a wing 96w of the key member 96 into slot 102a of the lock member 100, the member 105 also operating sleeve 21 and cams 60 to their normal positions. Operation of the shaft 20 by the spring 44 restores the contacts of section A to their normally closed condition.

From the foregoing it will be understood that the contacts 46, 48 are separated when the shaft 20 is pushed, and other selector contacts in the selector sections 50 are operated as the shaft is then turned. The selection is momentary in the respect that as soon as the operator lets go of the handle the shaft returns to its normal rotary and axial position as described, the selection not being maintained and the contacts 46, 48 again reengaging automatically.

Many modifications within the scope of the invention will occur to those skilled in the art.

What is claimed is:

1. In combination, a shaft, means mounting said shaft for axial and rotational movements, a member mounted on said shaft, means for rotating said member with said shaft, means yieldingly opposing axial movement of said shaft from a predetermined position in one direction, a fixed block having an opening receiving said member, and spring means opposing rotation of said member, said member and fixed block having co-operating recesses receiving said spring means and providing abutments therefor.

2. In a push-pull switch, a manually operable shaft, means mounting said shaft for axial movement and for rotational movements in clockwise or counterclockwise direction from a predetermined position, electrical contacts operated by movement of said shaft, means limiting rotational movements of said shaft, yielding means for rotating and yielding means for axially moving said shaft, said yielding means cooperatively acting to return said shaft to said predetermined position automatically on release of manual pressure.

3. In a push-pull switch, a manually operable shaft, means mounting said shaft for axial movement and for rotational movements in clockwise or counterclockwise direction from a predetermined position, electrical contacts operated by said movements of said shaft, means limiting rotational movements of said shaft, yielding means for rotating and yielding means for axially moving said shaft, said yielding means cooperatively acting to return said shaft to said predetermined position automatically on release of manual control, and means for stopping and locking said shaft in said predetermined position.

4. In a push-pull switch, a manually operable shaft, means mounting said shaft for axial movement and for rotational movements in clockwise or counterclockwise direction from a predetermined position, an electrical contact member slidably mounted on and operated by axial movements of said shaft, a fixed contact engageable by said contact member, a member mounted on said shaft, means for rotating said member by said shaft, springs arranged to be compressed by movements of said member and acting when freed of manual control to rotate and return said shaft to a predetermined position, and other electrical contacts operated by rotation of said member.

5. In a push-pull switch, a shaft, means mounting said shaft for axial and rotational movements, electrical contacts operated by axial move-

ments of said shaft, a member mounted on said shaft, means for rotating said member by said shaft, springs having ends thereof engaged by said member, stops co-operating with said member to compress said springs, and electrical contacts operated by rotation of said member.

6. In a push-pull switch, a shaft, means mounting said shaft for axial and rotational movements, electrical contacts operated by axial movements of said shaft, a member mounted on said shaft, means for rotating said member by said shaft, springs having ends thereof engaged by said member, fixed stops co-operating with said member to compress said springs, a sleeve on said shaft and engaging said member to be rotated thereby, cams operated by said sleeve, and electrical contacts operated by said cams upon rotation of said member.

7. In a push-pull switch, a shaft, means mounting said shaft for axial and rotational movements, means compelling an axial movement of said shaft prior to a rotational movement of said shaft from a predetermined position, electrical contacts operated upon axial and rotational movements of said shaft from said predetermined position, and spring means for returning said shaft through said rotational and axial movements to said predetermined position.

8. In a push-pull switch, a shaft, means mounting said shaft for axial and rotational movements, lock means compelling an axial movement of said shaft prior to a rotational movement of said shaft from a predetermined position, means limiting rotational movements of said shaft, electrical contacts operated upon axial and rotational movements of said shaft from said predetermined position, and spring means for returning said shaft through said rotational and axial movements to said predetermined position, said lock means serving to determine said predetermined position.

9. In a push-pull switch, a shaft, means mounting said shaft for axial and rotational movements, lock means compelling an axial movement of said shaft prior to a rotational movement of said shaft from a predetermined position, stop means limiting rotational movement of said shaft, electrical contacts operated upon axial and rotational movements of said shaft from said predetermined position, spring means opposing said axial movement and said rotational movement in either direction from said predetermined position.

10. In a push-pull switch, a shaft, casing means mounting said shaft for axial and rotational movements, lock means compelling an axial movement of said shaft prior to a rotational movement of said shaft from a predetermined position, stop means limiting rotational movements of said shaft, a member mounted on said shaft, means for rotating said member with said shaft, electrical contacts in said casing operated upon axial and rotational movements of said shaft, and springs engaged by said member opposing rotational movements thereof, said member and casing means having co-operating recesses receiving said springs and providing abutments therefor.

11. In an electric switch, a shaft, means manually to move said shaft axially and rotatively, contacts operated by the axial movement and

other contacts operated by the rotative movement of said shaft, means preventing rotative movement of the shaft while the axially operated contacts are in a certain position, in combination with means automatically to return said shaft to its initial position when said manual means is released comprising a fixed housing member having a recess, a rotatively movable member having a recess complementary to said first-mentioned recess to form a niche therewith for a spring, a connection between said shaft and said rotative member for rotation of said member with said shaft and permitting axial movement of said shaft relative to said member, a spring in said niche normally biasing said shaft into a predetermined position.

12. In an electric switch, a shaft, means manually to move said shaft axially and rotatively, contacts operated by the axial movement and other contacts operated by the rotative movement of said shaft, means preventing rotative movement of the shaft while the axially operated contacts are in a certain position, in combination with means automatically to return said shaft to its initial position when said manual means is released comprising an abutment member, a rotatively movable member, a connection between said shaft and said rotative member causing rotation of said member with said shaft and permitting axial movement of said shaft relative to said rotative member, spring means co-operating with said abutment member and said rotative member to return said shaft to a predetermined position.

13. In an electric switch, a shaft, means manually to move said shaft axially and rotatively, contacts operated by the axial movement and other contacts operated by the rotative movement of said shaft, means preventing rotative movement of the shaft while the axially operated contacts are in a certain position, in combination with means automatically to return said shaft to its initial position when said manual means is released comprising an abutment member, a rotatively movable member, a connection between said shaft and said rotative member causing rotation of said member with said shaft and permitting axial movement of said shaft relative to said rotative member, spring means cooperating with said abutment member and said rotative member to return said shaft to a predetermined position and a second spring means biasing said shaft axially into position wherein it is locked by said rotation-preventing means.

14. A switch as claimed in claim 13 wherein the shaft is rotatable in clockwise and counterclockwise directions from a mid-position, and wherein said second spring means holds said shaft locked against rotation while in mid-position.

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