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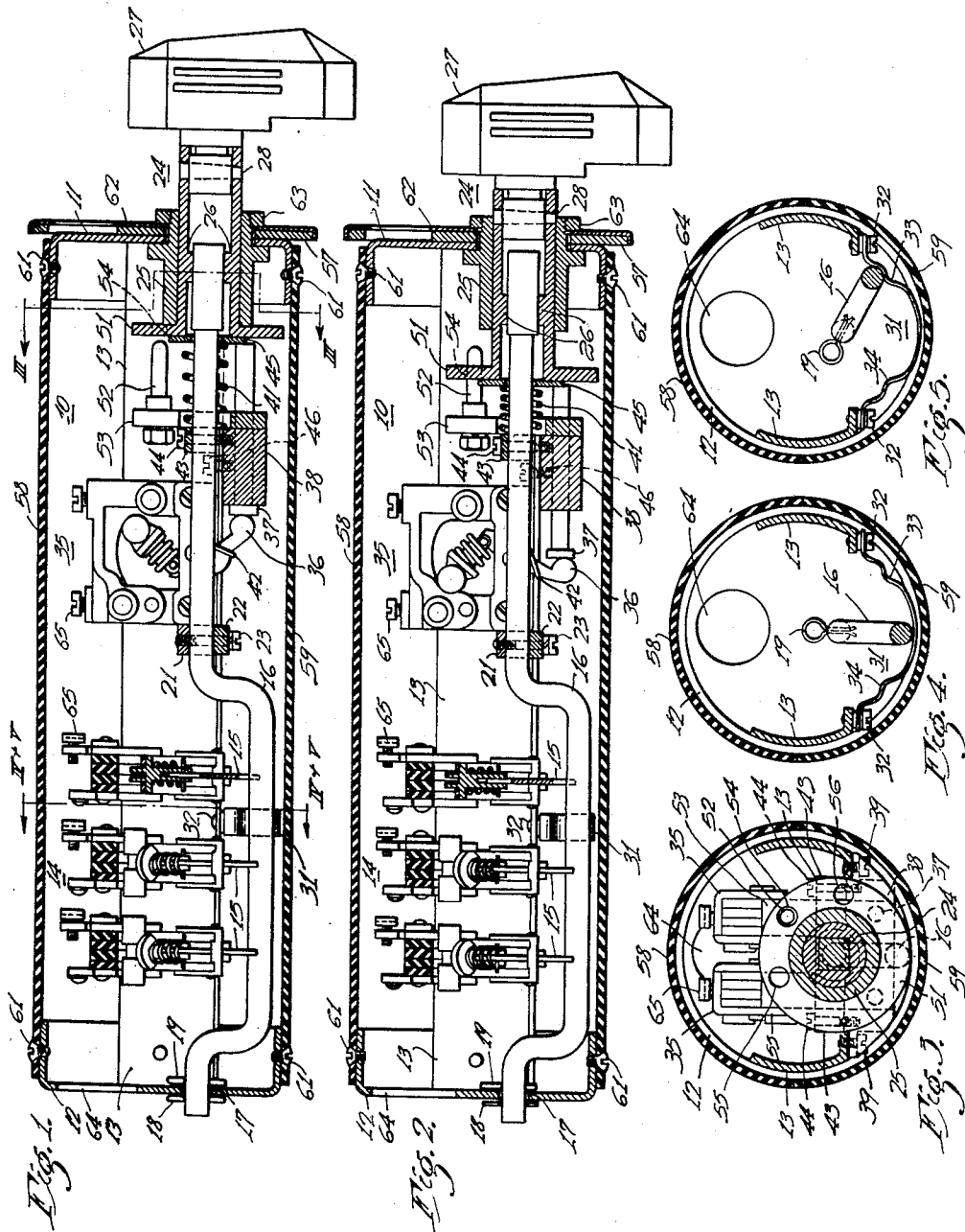
A. J. A. PETERSON ET AL

2,103,792

CONTROL SWITCH

Filed Feb. 28, 1935

2 Sheets-Sheet 1



WITNESSES:

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W. B. Chikoff

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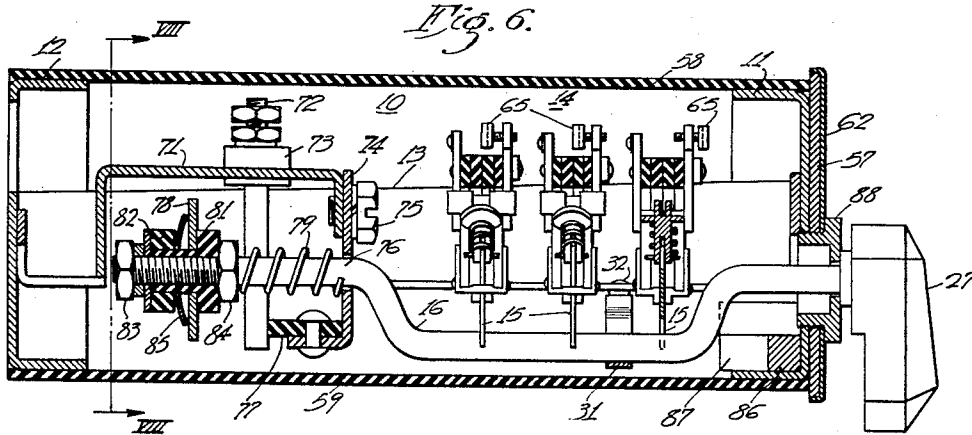
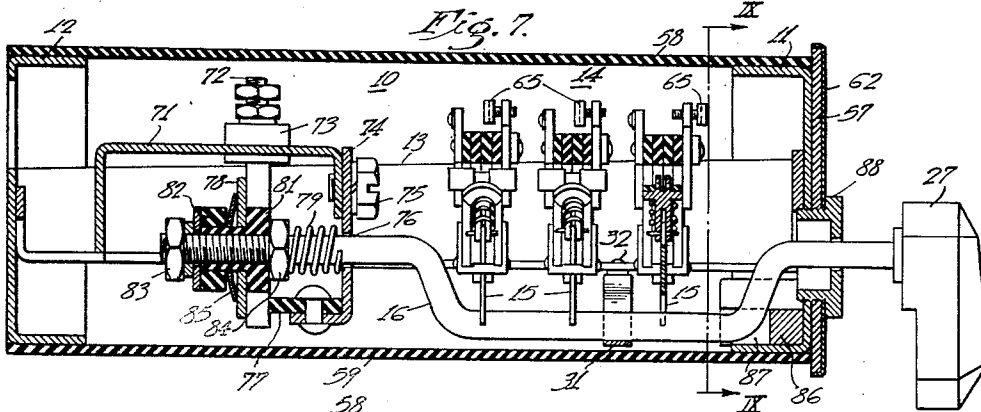
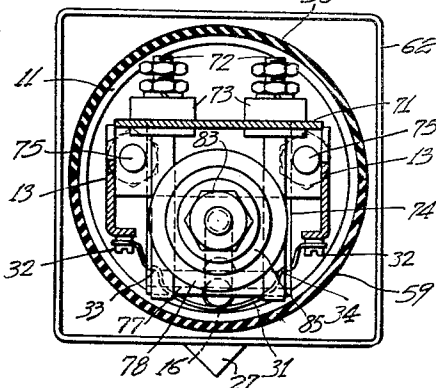
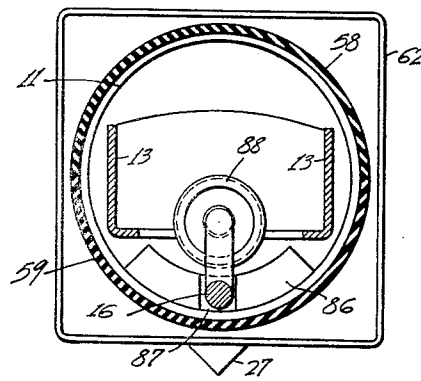
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CONTROL SWITCH

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2 Sheets-Sheet 2



WITNESSES:

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2,103,792

CONTROL SWITCH

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5 Claims. (Cl. 200—4)

Our invention relates, generally, to control switches and particularly to switches suitable for mounting on switchboard panels to control the operation of circuit breakers, motors and other electrical apparatus.

The object of our invention, generally stated, is to provide a control switch which shall be simple and efficient in operation and which may be readily and economically manufactured and installed.

Another object of the invention is to provide a control switch having a greater number of operating positions than switches of the same general type which have been used heretofore.

A further object of our invention is to provide a control switch having an oscillatory operating element for actuating the switching elements with means for releasably retaining the operating element in predetermined positions.

Another object of our invention is to provide selective interlocking between certain of the switching members of a control switch having a plurality of switching members actuated by a common operating handle.

A still further object of our invention is to provide for selectively actuating a plurality of individual switch elements by both the oscillatory and the longitudinal movements of a single operating element.

Other objects of our invention will be explained fully hereinafter or will be apparent to those skilled in the art.

For a fuller understanding of the nature and objects of our invention reference may be had to the following detailed description, taken in conjunction with the accompanying drawings in which:

Figure 1 is a view, in longitudinal section, of a control switch embodying our invention;

Fig. 2 is a view, similar to Fig. 1, showing certain of the switching members of the control switch actuated to the closed position;

Fig. 3 is a view, in transverse section, taken along the line III—III of Fig. 1;

Fig. 4 is a view, in transverse section, taken along the line IV—IV of Fig. 1, certain of the switching members being omitted for clarity;

Fig. 5 is a view, similar to Fig. 4, showing the operating bail of the control switch in one of the operating positions;

Fig. 6 is a view, in longitudinal section, of a modification of the control switch illustrated in Figs. 1 to 5, inclusive;

Fig. 7 is a view, similar to Fig. 6, showing the

switch mechanism in one of its operating positions;

Fig. 8 is a view, in transverse section, taken along the line VIII—VIII of Fig. 6; and

Fig. 9 is also a view, in transverse section, taken along the line IX—IX of Fig. 7.

Referring to the drawings, and particularly to Figs. 1 to 5, inclusive, the switch illustrated therein includes a supporting frame 10 that comprises a pair of end members 11 and 12 which are joined by side-frame members 13. A plurality of tumbler switches 14 are mounted upon the frame members 13 transversely of the frame. In order to simplify the drawings and description, only three tumbler switches have been shown, however, it will be understood that the length of the frame 10 may be increased to accommodate additional switches if desired.

The tumbler switches 14 are of the type shown and described in the patent to A. J. A. Peterson No. 1,982,321, dated November 27, 1934, and therefore, it is believed to be unnecessary to describe their construction in detail in the present application. Each one of the switches 14 is provided with an operating arm 15 which is actuated by means of a bail 16, having a lost motion connection to the operating arm, as is fully described in the aforementioned patent to Peterson.

The switches 14 may be of the single throw type and two or more of them may be so positioned on the frame members 13 that they are moved to either their closed or their open positions, respectively, by movement of their respective operating arms in opposite directions. Thus, a part of the switches 14 may be closed by actuating the bail 16 in a clockwise direction from its intermediate or off position and the remaining switches may be closed by actuating the bail 16 in a counterclockwise direction.

One end of the bail 16 is rotatively journaled in a bearing opening 17 in the end plate 12. The bail 16 is prevented from moving longitudinally by cotter keys 18 and 19 which are inserted through the bail on opposite sides of the end plate 12. An additional bearing support is provided for the bail 16 by cross members 21 and 22 which are respectively disposed above and below the bail 16 and are secured to the frame members 13 by screws 23.

The other end of the bail 16 is made square in shape and is slidably supported in a cylindrical plunger 24 which is journaled in a bushing 25, disposed in an opening in the end plate 11. The plunger 24 is provided with square shoulders 26

for supporting the square end of the bail 16 and for causing the bail to rotate with the plunger 24 when it is rotated by an operating handle 27, which is secured in one end of the plunger by a pin 28. Thus, the bail 16 may be actuated either clockwise or counter-clockwise by means of the operating handle 27, thereby operating the switches 14. As shown in Fig. 5, the bail 16 may be actuated approximately 45° in either direction from its intermediate or off position.

In order that the bail 16 may be retained in either one of its operating positions in which the tumbler switches 14 are closed, a semi-circular band 31 of spring steel, or other suitable material, is disposed to engage the bottom of the crank part of the bail 16. As shown in Figs. 4 and 5, each end of the band 31 is secured to one of the frame members 13 by a screw 32. The band 31 is provided with a raised portion or shoulder 33 which is so disposed that the bail 16 passes over it when the bail is actuated in the counter-clockwise direction. The shoulder 33 thereby functions as a stop or keeper for retaining the bail in its uppermost position after the operating handle 27 is released.

In this manner those of the switches 14 which are operated to a predetermined position when the bail 16 is rotated counter-clockwise will be kept in that position until the bail 16 is returned to its central position by means of the operating handle 27. A similar shoulder 34 may be provided to retain the bail 16 in its uppermost position when it is rotated clockwise. If desired, one of the shoulders, for example the shoulder 34, may be omitted from the spring 31, thereby making it necessary for the operator of the switch to keep hold of the handle 27 in order to retain the bail 16 in its uppermost clockwise position and to keep certain of the switches 14 in the position to which they were actuated by the bail.

In order to increase the number of operating positions of a switch of the type herein described, one or more tumbler switches 35 may be mounted lengthwise of the switch frame instead of transversely, as are the switches 14. The switches 35, a pair of which are shown in the drawings, are of the same type as the switches 14. Each switch is provided with an operating lever 36 for actuating the movable contact members of the switch. The levers 36 are individually operated by push rods 37 which are slidably mounted in a supporting block 38 that is secured to the frame members 13 by screws 39. The push rods 37 extend through the block 38 and are actuated by the plunger 24 which may be pushed inwardly as shown in Fig. 2, by means of the operating handle 27.

In this manner the switches 35 may be operated independently of the switches 14, as the bail 16 is not moved by the longitudinal movement of the plunger 24 which slides along the square end of the shaft of the bail 16. A helical spring 41 is provided for returning the plunger 24 and the handle 27 to their normal position when the handle is released, thereby permitting the tumbler switches 35 to be actuated to their normal position by springs 42 on the levers 36. The spring 41 surrounds the shaft of the bail 16 and is disposed between the plunger 24 and a bearing member 43 for the bail 16. The bearing 43 rests on top the bail and is secured to the supporting block 38 by screws 44. A washer 45 is interposed between one end of the spring 41 and the plunger 24.

As stated hereinbefore, the tumbler switches 35 are mounted lengthwise of the frame members 13.

One end of each of the switches 35 rests on the supporting block 38 and is secured thereto by a screw 46. The other ends of the switches are clamped between the bearing members 21 and 22 which are secured to the frame members 13. The switches 35 are, therefore, rigidly supported between the frame members 13.

In order that the operation of the switches 35 may be governed by the position of the operating handle 27, and consequently, the positions of the switches 14, a disc 51 is provided on the end of the plunger 24 for operating the push-rods 37. An interlocking pin 52 is mounted on an upright plate 53, disposed at the end of the block 38 and secured thereto by welding or other means. The disc 51 is provided with a hole 54 which is in alignment with the pin 52 when the bail 16 and the handle 27 are in their intermediate or off position, thereby permitting the plunger 24 to be pushed inwardly to operate the switches 35 when the switches 14 are in their normal position. The pin 52 prevents the handle 27 from being turned to operate the switches 14 while the switches 35 are being operated, thereby mechanically interlocking the switches 14 and 35.

As shown in Fig. 3, additional holes 55 and 56 may be so located in the disc 51 that they will be in alignment with the pin 52 when the handle 27 is turned the maximum distance in the clockwise and counterclockwise directions, respectively. It will be seen that by providing the holes 55 and 56 in addition to the hole 54, the switches 35 may both be operated when the handle 27 is rotated to either one of its operating positions as well as when it is in the off position.

It will also be seen that if the hole 55 is omitted from the disc 51, the plunger 24 cannot be pushed inwardly to operate the switches 35 when the handle 27 has been turned in a clockwise direction. Likewise, if the hole 56 is omitted, the switches 35 cannot be operated if the handle 27 is turned in a counterclockwise direction.

Furthermore, by providing an additional hole in the disc 51 in alignment with one of the push rods 37 when the handle 27 is in a predetermined position, the push rod will pass through the hole and only one of the switches 35 will be operated. Thus the design of the disc 51 governs the operation of the switches 35 and determines the position to which the handle 27 must be turned to operate either one or both of the switches 35.

The control switch may be mounted on a switchboard panel (not shown) by means of a mounting plate 57 that is secured to the end plate 11. The switchboard panel may be provided with an opening of sufficient diameter to permit the cylindrical housing of the switch to be inserted through the opening and the switch secured to the panel by means of the mounting plate 57. A cylindrical cover comprising two sections 58 and 59 is secured to the end plates 11 and 12 by screws 61 for enclosing the switch structure. A face plate 62 covers the mounting plate 57 and the screws for mounting the switch on the panel. The face plate 62 is retained in position by a collar 63, threaded onto the bushing 25. An opening 64 is provided in the end plate 12 for electrical conductors which may be connected to the terminals of the switches 14 and 35 by screws 65.

A simplified form of the control switch is illustrated in Figs. 6 to 9, inclusive, in which like parts are designated by the same reference characters as in Figs. 1 to 5. The tumbler switches 14 are operated by the bail 16 in the same manner as in the switch structure shown in Figs. 75

1 to 5. The bail 16 may be turned either clockwise or counter-clockwise from its intermediate position by means of the operating handle 27 to operate certain of the switches 14 which are movable in opposite directions to either the closed or the open position, depending upon their normal position. The switches 14 are each provided with an operating lever 15 which is connected to the bail 16 by a lost-motion connection, as disclosed in the aforementioned patent to Peterson No. 1,982,321.

The switch frame 10 comprises the end members 11 and 12 and side frame members 13 to which the end members are secured. A supporting bracket 71 may be secured to the side frame members 13 by welding or other satisfactory means. The bracket 71 serves as a support for a pair of contact studs 72 which are insulated from the bracket by insulating bushings 73.

An L-shaped member 74 is attached to the bracket 71 by screws 75 and serves as a bearing support for the bail 16 which extends through an opening 76 in the bracket 74. An insulating member 77 is riveted to the base of the L-bracket 74 and extends horizontally to engage the bottom ends of the contact studs 72, thereby preventing an excessive strain being placed on the studs when they are engaged by a bridging contact member 78, carried by the operating bail 16.

As shown in Fig. 7, the bridging contact disc 78 is mounted near the end of the bail 16 and engages the contact studs 72 when the bail 16 is moved longitudinally by pulling out the operating handle 27. A helical spring 79 functions to facilitate disengaging the bridging contact member 78 from the studs 72 and to return the bail 16 to its normal position when the operating handle 27 is released.

The contact disc 78 is insulated from the bail 16 by bushings 81 and 82 which are assembled on the shaft between two nuts 83 and 84. A spring washer 85 resiliently supports the contact disc between the bushings 81 and 82. Thus, an electrical circuit is completed between the contact studs 72 when they are bridged by the contact disc 78, as shown in Fig. 7, by pulling out the operating handle 27.

It will be understood that an additional independent circuit may be established by merely lengthening the shaft of the bail 16 and so mounting another contact disc 78 thereon that it will bridge another pair of contact studs 72 when the operating handle is pulled out to actuate the bail 16 longitudinally. It will also be understood that additional contact studs 72 and the disc 78 may be so disposed that one electrical circuit is completed when the operating handle is in its normal position and another circuit is made when the handle is pulled out.

In order that the operation of the switching member 78 may be controlled by the position of the switches 14, a curved block 86 is disposed at the bottom of the end member 11 to prevent longitudinal movement of the bail 16 except when the bail is in its intermediate position. The block 86 is provided with a recess 87 which is in alignment with the bail 16 when it is in its intermediate position, thereby permitting the handle 27 to be pulled out to close the disc 78 against the contact studs 72.

Therefore, the switching member 78 can be operated only when the switches 14 are in the normal position and, furthermore, the switches 14 cannot be operated while the disc 78 bridges

the studs 72 since the block 86 prevents the handle 27 and the bail 16 from being turned in either direction. In this manner the switches 14 and the switching member 78 are mechanically interlocked.

It will be understood that various combinations of interlocking may be obtained by changing the location of the recess 87 in the block 86 and by providing additional recesses or by removing, or omitting, a portion of the block from the switch structure. Thus, if it is desired to permit the switching member 78 to be operated only when the bail 16 has been moved in a clockwise direction to its uppermost position, the recess 87 may be located in the block 86 accordingly.

If desired, the spring band 31 may be provided for retaining the bail 16 in predetermined positions, as described hereinbefore, or the band may be omitted from the switch structure, which will permit the bail 16 to be returned to its intermediate position by springs provided on the switches 14.

The control switch may be mounted on a switchboard panel by means of the mounting plate 57, as previously described. The face plate 62 is retained in position by a flanged bushing 88, threaded into the mounting plate 57 and end plate 11. The bushing 88 also serves as a bearing support for the operating bail 16.

From the foregoing description, it is apparent that we have provided an improved control switch which is suitable for controlling the operation of circuit breakers, electric motors and other apparatus wherein a predetermined sequence of operation of the switching members is necessary for proper operation of the apparatus. It is also evident that the control switch herein described is simple and rugged in construction and will, therefore, operate satisfactorily over a long period of time. Furthermore, it is apparent that the interlocking mechanisms herein described may be used for numerous applications other than in switch mechanisms. They are suitable for the interlocking of rotary and longitudinal motions according to a predetermined sequence.

Since many modifications may be made in the apparatus and arrangement of parts without departing from the spirit of our invention, we do not wish to be limited other than by the scope of the appended claims.

We claim as our invention:

1. A switch mechanism comprising a switch actuating bail rotatably movable in opposite directions from an intermediate position to a plurality of operative positions, a pair of switches movable in opposite directions to an operative position by the actuating bail, additional switching means operable by longitudinal movement of the actuating bail, spring means disposed on the bail for opposing longitudinal movement thereof, and interlocking means disposed to engage the bail for governing the rotative and longitudinal movements of said bail.

2. A switch mechanism comprising an operating member rotatably movable in opposite directions from an intermediate position to a plurality of operative positions, a plurality of switches movable in opposite directions to an operative position by the operating member, additional switching means operable by longitudinal movement of the operating member, and interlocking means for preventing longitudinal movement of the operating member except when it is in the intermediate position.

3. A switch mechanism comprising an operating member rotatably movable in opposite directions from an intermediate position to a plurality of operative positions, a plurality of
5 switches movable in opposite directions to an operative position by the operating member, additional switching means operable by longitudinal movement of the operating member, and interlocking means for preventing rotative movement of the operating member while it is actuated longitudinally from its normal position.
10
4. A switch mechanism comprising an operating member rotatably movable to a plurality of operative positions, switching means operable
15 by rotative movement of the operating member, additional switching means operable by longitudinal movement of the operating member, and interlocking means for preventing longitudinal movement of the operating member while it is in predetermined positions.

tudinal movement of the operating member, and interlocking means for permitting longitudinal movement of the operating member when it is in predetermined positions.

5. A switch mechanism comprising an operating member rotatably movable to a plurality of operative positions, switching means operable by rotative movement of the operating member, additional switching means operable by longitudinal movement of the operating member, and
10 interlocking means permitting rotative movement of the operating member when it is in predetermined positions.

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