

June 21, 1949.

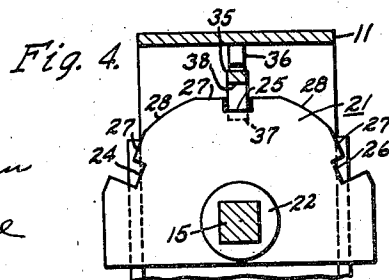
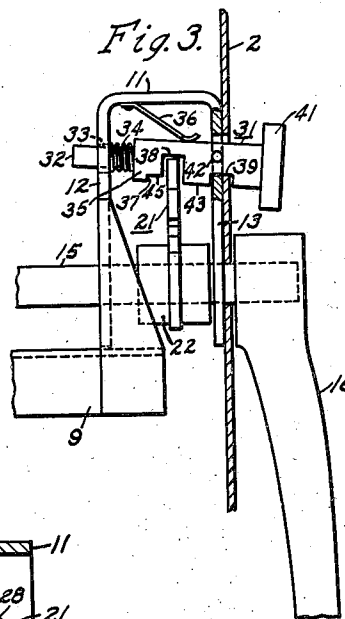
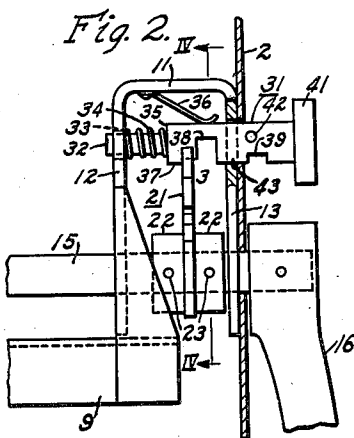
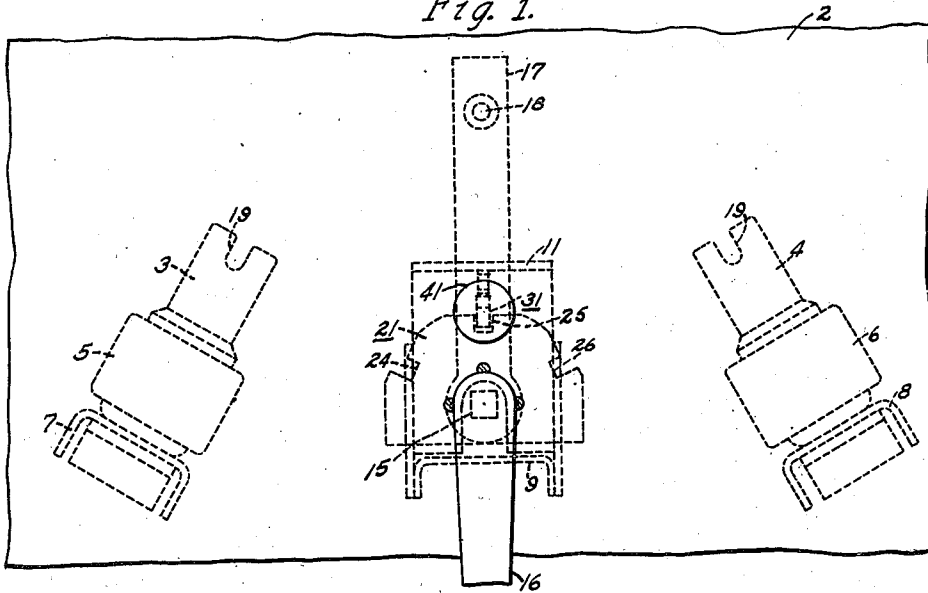
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CONTROL APPARATUS

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2 Sheets-Sheet 1

Fig. 1.



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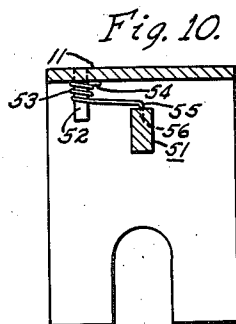
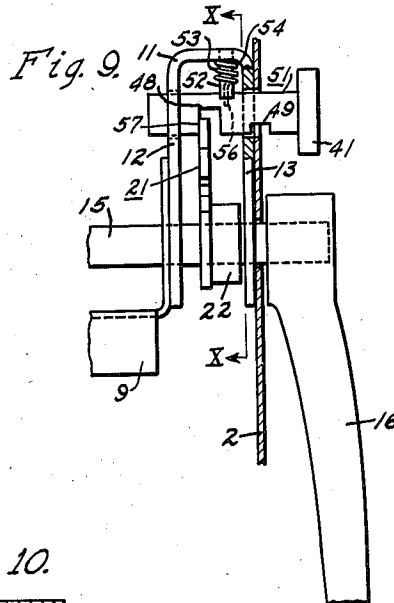
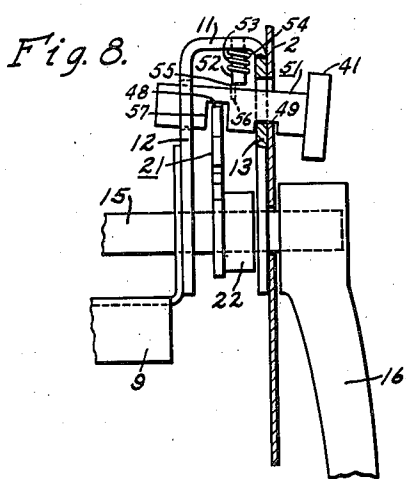
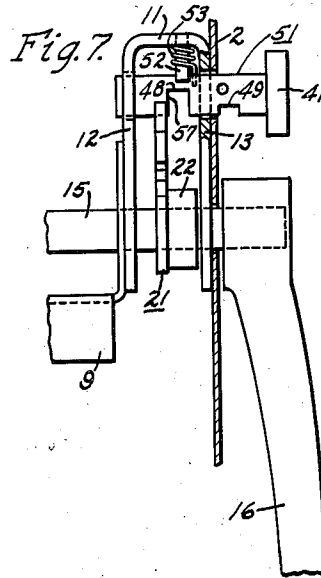
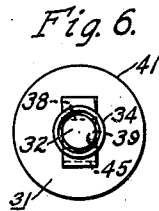
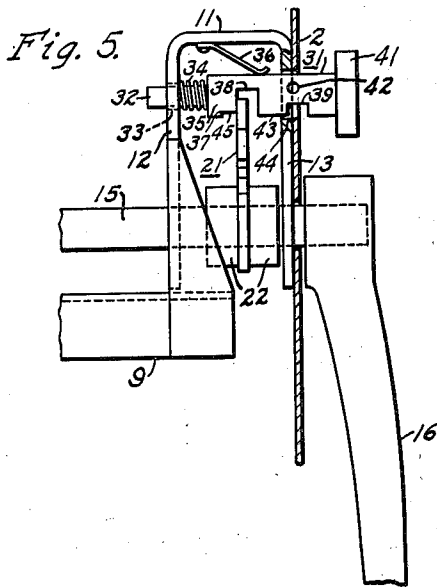
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CONTROL APPARATUS

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6 Claims. (Cl. 74-540)

1

This invention relates to electrical circuit controlling switch devices, and, particularly, to safety mechanism associated therewith to prevent unauthorized or unintended operation of the switch device.

In many types of apparatus where it is necessary to operate internal equipment from an operating handle on the outside of the case, it is often necessary to locate and lock the operating equipment in preferred positions. An example of this is the load center power transformer where an externally operated handle is used to control a disconnect switch inside the case.

For this application, it has been conventional practice to use a spring-biased stop pin which gives positive engagement with two or three holes in a stop plate, depending upon the number of positions in which it is desired to lock the switch device. At present, to operate such a switch it is necessary to pull the pin against the spring pressure until it is disengaged from the hole, and then while still holding the pin in the free position, to operate the switch by the handle. As this procedure is awkward and often difficult, a mechanism in accordance with the present invention is provided which will be an improvement from the operating standpoint and which still retains the positive stopping feature when one of the switch operative positions is reached.

One object of the invention is to provide a concealed switch device and latching mechanism therefor, having a plurality of operative positions and provided with novel means for automatically and positively locating an operative position of the switch device and holding the operating handle in any one of said plurality of switch operative positions, which is efficient in operation and simple in construction.

A more specific object of the invention is to provide a switch device positioned within an apparatus housing with an operative handle outside of the housing and, in which locking means is provided within the housing for locking the device in any one of a plurality of operative positions, the locking means being provided with manually operable means extending outside the housing for positioning the locking means in an unlocking position while the switch device is in one of its operative positions. Means is also provided for automatically releasing the locking means during movement of the switch device from one switch operative position to another so that it will again be in a position to locate and lock the switch device upon reaching a switch operative position.

2

Other objects and advantages of the invention will be apparent from the following description of a preferred embodiment of the invention, reference being had to the accompanying drawings in which:

Figure 1 is a fragmentary elevational view of an electrical apparatus including a switch device and locking mechanism therefor, organized in accordance with the invention with certain parts behind the housing wall shown in dotted lines.

Fig. 2 is a view in sectional elevation showing the latching mechanism of Fig. 1 with the locking pin in its switch locking position.

Fig. 3 is a view similar to Fig. 2 with the locking pin latched in its switch operating position.

Fig. 4 is a sectional view of the cam taken along the line IV-IV of Fig. 2.

Fig. 5 is a view similar to Fig. 2 with the latching pin in its released or locating position.

Fig. 6 is an end view of the docking pin shown in Figs. 1, 3 and 4.

Fig. 7 is a view in sectional elevation showing another modification of the invention with the locking pin in its locating position.

Fig. 8 is a view in sectional elevation similar to Fig. 7 with the latch pin in its released or locating position.

Fig. 9 is a view in sectional elevation similar to Fig. 7 with the latch pin in its released or locking position, and

Fig. 10 is a sectional view taken along the line X-X of Fig. 9.

Referring to Fig. 1 of the drawing, a portion of one wall 2 of a housing is illustrated which is preferably formed of sheet steel. Within the housing there is mounted a pair of stationary contact tongues 3 and 4, each mounted on separate insulators 5 and 6 supported within the housing on transversely extending spaced channel supports 7 and 8. A bracket stop pin supporting member 11, as best shown in Figs. 2 and 3, is attached to a transversely extending channel support 9 by suitable means, such as by welding, or by means of screws. Said member 11 may similarly be attached to the said wall 2 of the housing to assure keeping said wall 2 and said member 11 in close contact. The bracket member is provided with two downwardly extending portions 12 and 13 which are bifurcated to accommodate a shaft 15 extending through an opening in the housing wall 2 and carrying an operating handle 16 on the outer end thereof. A switch blade 17 is provided on the inner end of the shaft 15 and insulated therefrom, the switch blade being adapted to be operated to any one of three switch opera-

3

tive positions. In Fig. 1, the blade 17 is shown in its middle operative position, out of contact with both contact tongues 3 and 4 and is adapted to be operated to engage either the contact tongue 3 or the contact tongue 4. The switch blade 17 may be of a type having spaced sides secured against relative movement at their outer ends by a bolt 18 so that when the blade is pivotally moved about the axis of the shaft 15, the bolt 18 will engage the slot 19 in one of the contact tongues 3 or 4. The particular structure of the switch contact elements forms no part of the present invention and, therefore, need not be further described.

A cam 21 having hubs 22 is attached by any suitable means, such as pins 23, to rotate with the shaft 15. The cam 21, as best shown in Figs. 1 or 4, is provided with three slots 24, 25 and 26, corresponding to the three switch operative positions existing in the illustrated embodiment of the invention. Adjacent the slots, relatively low flat surfaces 27 are provided with higher surfaces 28 therebetween.

A locking member 31, shown as a stop-pin or latch pin, is provided extending through openings in the leg members 12 and 13 of the bracket 11. As best shown in Figs. 2 and 3, the inner end 32 of the stop-pin 31 is smaller than the outer end and extends through an opening 33 of suitable size in the leg 12 of the bracket 11. A spring member 34 is shown about the smaller end of the stop-pin 31 positioned between the leg 12 of the bracket and an abutment 35 of the stop-pin for forcing the pin toward the right as viewed in Figs. 2 and 3. A spring 36 is illustrated mounted on the upper portion of the bracket for engaging the pin 31, biasing it downwardly. In the position illustrated in Figs. 1 and 2, a portion of the pin 31 is engaged within the middle notch 25 of the cam 21, and the stop-pin 31 is biased toward the right by the spring 34 until a surface 37 engages the inner surface of the cam 21. In this position of the stop-pin 31, the shaft 15, carrying the cam 21 and the switch blade 17, cannot be moved from the operative position in which the switch device is positioned.

Two notches 38 and 39 are shown in the under side of the stop-pin 31. An operating knob 41 is provided on the outer end of the stop-pin 31 and a hole 42 is provided through the body of the stop-pin adjacent the outer surface of the wall 2 when the stop pin is in its locking position shown in Fig. 2. The hole 42 is to accommodate a pad-lock or other suitable locking means to prevent inward movement of the stop-pin 31 necessary to place the mechanism in an unlocked or switch operating position when it is desired to effect operation of the switch. When no such locking means is inserted through the hole 42, the knob 41 may be pushed inwardly manually compressing the spring 34 as shown in Fig. 3. The spring 36 will bias the locking pin 31 downwardly to the position shown in Fig. 3 so that the notch 39 engages the lower edge of the opening through the bracket 11, latching the pin 31 in this position. It will be noted, by reference to Fig. 3, that in this position of the stop-pin 31, the notch 38 registers with the cam 21, thus allowing it to move freely if actuated by the handle 16. This is the "switch operating position" of the stop-pin 31. When the handle 16, together with the shaft 15, switch blade 17 and cam 21 are moved to the next adjacent switch operative position, the surface 28 of the cam 21 will engage the upper edge of the notch 38 raising it from its latched position and allowing it to assume the position

4

shown in Fig. 5 in which the lower surface 43 is shown as having entered a certain distance within the opening 44 in the leg 13 of the bracket 11. This position of the stop-pin 31 is termed the "locating position," because the pin is in a position to locate and lock the mechanism when it reaches the next switch operative position. In the position of the pin 31, illustrated in Fig. 5, the spring 34 biases the pin 31 toward the right until the surface 35 adjacent the notch 38 rides on one side of the cam 21 until one of the notches 24, 25 or 26 in the cam comes adjacent this surface at which time the pin 31 will be forced by the spring 34 to the locking position shown in Fig. 2.

The form of the invention shown in Figs. 7, 8, 9 and 10 is generally similar to that shown in Figs. 1 to 5, with the exception that only two notches 48 and 49, corresponding to the notches 38 and 39 of Figs. 2, 3 and 5, are provided, the surfaces 45 and 37 shown on the stop-pin 31 in Figs. 1 to 5 being omitted in the stop-pin 51 shown in Figs. 7, 8, 9 and 10. A further difference consists of the manner in which the stop-pin 51 is biased to its several illustrated positions. In Figs. 7, 8, 9 and 10, a pin 52 extends downwardly from the upper part of the bracket 11, accommodating a single spring 53 having one end 54 adapted to extend along the surface of the bracket 11 and the other end 55 adapted to engage an opening 56 in the pin 51. This spring is so arranged as to perform the duties resulting from both the spring 34 and the spring 36 in Figs. 1 to 5. That is, the outer end 55 of the spring 53 is biased both downwardly to cause the stop-pin 51 to latch in a switch operating position shown in Fig. 8 when the notch 49 is in latching position and also the end of the spring 55 is biased in a direction to urge the stop-pin 51 outwardly as viewed in Figs. 7, 8 and 9, so that after the stop-pin 51 has been raised from its latched position, as shown in Fig. 8, it will be biased to the position shown in Fig. 9 with the surface 57 forming one side of the notch 48 will ride along the inner surface of the cam 21 until the device reaches its next switch operative position, in which position the spring 53 will cause the pin 51 to be moved outwardly to the position shown in Fig. 7, the body of the pin engaging within one of the notches 24, 25 or 26 corresponding to the switch operative position.

It will be noted that in both illustrated embodiments of the invention, the latching mechanism is so arranged that it is concealed entirely within the switch housing except for the end of the stop-pin carrying the operating knob which projects through the side of the housing. The stop-pin or locking member 31 or 51 is easily operated by the knob 41 by one hand and latched in the switch operating position. Both hands are then free, if desired, for operating the switch handle 16 to operate the switch device to its next operative position. If the switch operating lever 16 is so operated, the cam 21 unlatches the stop-pin allowing it to assume the locating position to stop the switch at the next switch operative position. The switch device remains in this locking position until the stop-pin or locking member is manually reset to the switch operating position.

It will be understood by those skilled in the art that modifications may be made in the details of the structure illustrated and described without departing from the spirit of my invention, and I do not wish to be otherwise limited than by the scope of the appended claims.

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5

I claim as my invention:

1. In a circuit controlling device, a manually operable switch actuating member having a plurality of switch operative positions, a locking member operative upon movement of the switch actuating member to any one of said plurality of positions for locking said switch actuating member in said switch operative position, said locking member being manually operable to a switch operating position to permit operation of the switch member, means automatically operable for latching said locking member in its switch operating position, and cam means actuated upon movement of said switch actuating member from one switch operative position to another and operative to release said locking member from its switch operating position to a released position to adapt it to lock the switch actuating member upon movement thereof to one of said switch operative positions.

2. Switch operating mechanism comprising a housing, a switch operating shaft extending through an opening in a wall of the housing and having a plurality of switch operative positions, a switch actuating member attached to said shaft and positioned outside of said housing for operating said shaft to any selected one of said plurality of switch operative positions, a cam within the housing operatively connected to said shaft and having a plurality of notches corresponding to the number of switch operative positions, a stop-pin within the housing and operative to engage within a notch in said cam upon movement of the switch to any one of said plurality of switch operative positions for locking said shaft in said switch operative position, means within the casing for supporting said stop-pin, and means for biasing said stop-pin to a switch locking position, said stop-pin extending through an opening in said housing and having means exterior of the housing for manually moving said stop-pin from its switch locking position to its switch operating position when the shaft is in a switch operative position, latch means for retaining said stop-pin in its switch operating position and means for biasing said stop-pin to latch the stop-pin in its switch operating position, said cam being operative upon movement of the shaft from one switch operative position to another switch operative position to unlatch said stop-pin from its switch operating position, and biasing means effective upon the unlatching of the stop-pin from its switch operating position for returning it to a locating position in which position it will be effective to engage a notch in said cam and lock the shaft in the next one of its operative positions to which it is moved.

3. Switch operating mechanism including a housing, a switch operating shaft extending through an opening in a wall of the housing and having a plurality of switch operative positions, a switch actuating member attached to said shaft and positioned outside of said housing for operating said shaft to any selected one of said plurality of switch operative positions, a cam within the casing operatively connected to said shaft and having a plurality of notches corresponding to the number of switch operative positions, a supporting frame within the housing having a pair of leg members on opposite sides of the cam, a stop-pin extending through openings in the pair of legs of the supporting frame and having a portion positioned for engaging within a notch in said cam upon movement of the shaft to any one of said plurality of switch operative positions

6

for locking said shaft in said switch operative position, biasing means for causing movement of the stop-pin to a switch locking position, said stop-pin being arranged for manual operation from its switch locking position to a position out of engagement with the cam for permitting operation of the shaft from one switch operative position to another, latch means for retaining said stop-pin in its switch operating position, and means for biasing said stop-pin to latch the stop-pin in its switch operating position, said cam being operative upon movement of the shaft from one switch operative position to another switch operative position to unlatch said stop-pin from its switch operating position, and biasing means effective upon the unlatching of the stop-pin from its switch operating position for returning it to a locating position in which position it will be effective to engage a notch in said cam and lock the shaft in the next one of its switch operative positions to which it is moved.

4. In a circuit controlling device, a manually operable switch actuating member having a plurality of switch operating positions, a locking member operative upon movement of the switch actuating member to any one of said plurality of positions for locking said switch actuating member in said switch operative position, said locking member having a pair of notches therein and being manually operable to a switch operating position in which position one of said notches provides a space for movement of the cam to permit operation of the switch operating member and the other of said notches provides for latching the locking member in a switch operating position, and cam means actuated upon movement of said switch actuating member from one switch operative position to another and operative to engage said locking member for unlatching the locking member to permit it to move from its switch operating position to a released position to adapt it to again lock the switch actuating member upon movement thereof to one of its switch operative positions.

5. Switch operating mechanism comprising a housing, a switch operating shaft mounted thereon and extending through an opening in a wall of the housing and having a plurality of switch operative positions, a switch operating handle attached to said shaft and positioned outside of said housing for operating said shaft to a plurality of switch operative positions, a cam within the housing operatively connected to said shaft and having a plurality of notches corresponding to the number of switch operative positions, a stop-pin operative to engage within a notch in said cam upon movement of the switch to any one of said plurality of switch operative positions for locking said shaft in said switch operative position, means for supporting said stop-pin, and means for biasing said stop-pin to a switch locking position, said stop-pin having means for manually moving said stop-pin from its switch locking position to its switch operating position when the shaft is in a switch operative position, latch means for retaining said stop-pin in its switch operative position and means for biasing said stop-pin to latch the stop-pin in its switch operative position, said cam being operative upon movement of the shaft from one switch operative position to another switch operative position to engage said stop-pin and unlatch the stop-pin from its switch operative position, and biasing means effective upon the unlatching of the stop-pin from its switch operative position for returning it to a locating

position in which position it will be effective to engage a notch in said cam and lock the shaft in the next one of the switch operative positions to which it is moved.

6. Switch operating mechanism comprising a switch operating shaft, a switch operating handle attached to said shaft for operating said shaft to a plurality of switch operative positions, a cam operatively connected to said shaft and having a plurality of notches corresponding to the number of switch operative positions, a supporting frame having a pair of leg members on opposite sides of the cam, a stop-pin extending through openings in the pair of legs of the supporting frame and having a portion positioned for engaging within a notch in said cam upon movement of the shaft to any one of said plurality of switch operative positions for locking said shaft in said switch operative position, biasing means for causing movement of the stop-pin to a switch locking position, said stop-pin being arranged for manual operation from its switch locking position to a position out of engagement with the cam for permitting operation of the shaft from one switch operative position to another, latch means for retaining said stop-pin in its switch operative position comprising a notch in the side pin ar-

5 ranged for engaging the side of one of the openings in the pair of legs of the supporting frame and means for biasing said stop-pin to cause the notch in the stop-pin to latch with the stop-pin in its switch operative position, said cam being operative upon movement of the shaft from one switch operative position to another switch operative position to unlatch said stop-pin from its switch operative position, and biasing means effective upon the unlatching of the stop-pin from its switch operative position for returning it to a locating position in which position it will be effective to engage a notch in said cam and lock the shaft in the next one of its operative positions 15 to which it is moved.

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