May 27, 1930. F. E. FISHER 1,760,547

OPERATING MECHANISM FOR ELECTRIC SWITCHES

Filed April 20, 1928

Fig. 1.

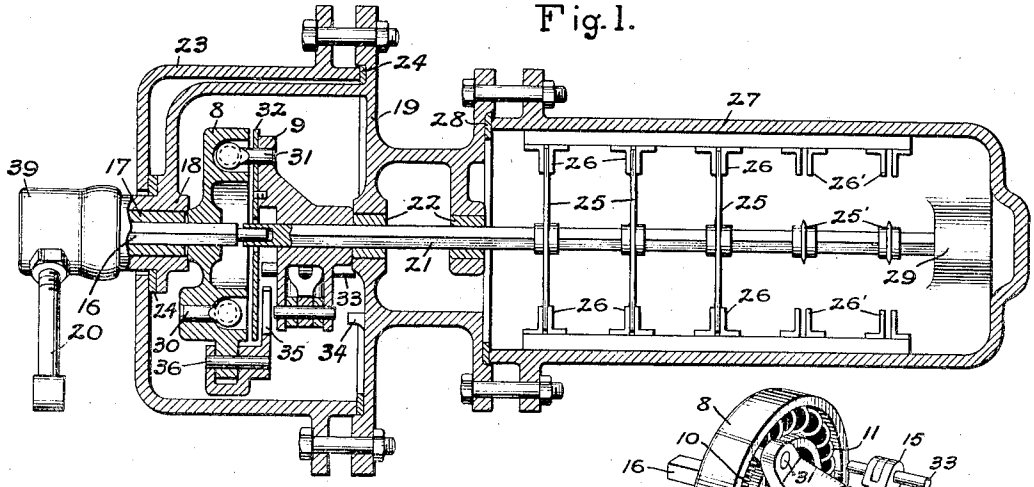


Fig. 5.

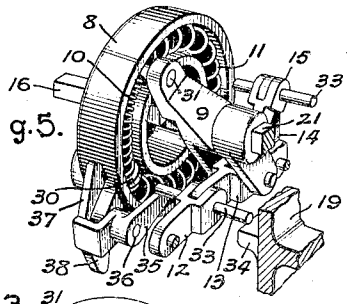


Fig. 2.

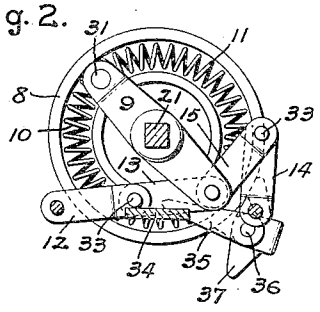


Fig. 3.

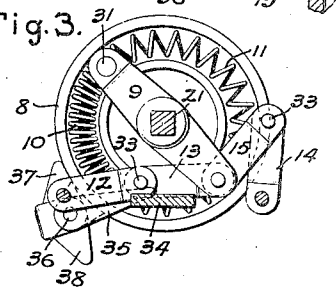


Fig. 4.

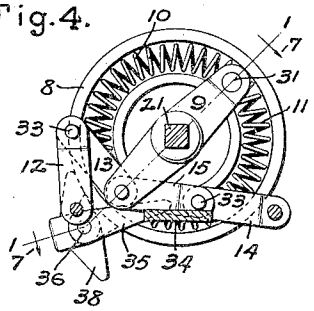
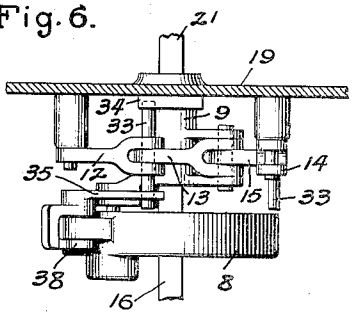


Fig. 6.



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UNITED STATES PATENT OFFICE

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OPERATING MECHANISM FOR ELECTRIC SWITCHES

Application filed April 20, 1928. Serial No. 271,574.

My invention relates to improvements in operating mechanisms for electric switches and more particularly for auxiliary electric switches which may be employed in the remote control of electric switches adapted for motor operation, such for example as disconnecting switches of the type disclosed in United States Letters Patent 1,640,456 and Re. 15,838 to F. P. Lawler.

Where motor operated mechanisms are used to control switches particularly such as include movable members of relatively great weight and/or subject to a relatively heavy friction drag, the motor has to be energized substantially to the end of travel of the parts for there is practically no inertia effect to continue movement after the motor is deenergized. Moreover where both switch opening and closing operations are to be performed, a reversal of drive or motoring direction is desirable. In accordance with requirements of this character, it is an object of my invention to provide an improved switch operating mechanism whereby a switching operation is quickly performed only in response to a definite travel of a part to be controlled and whereby the control is automatically changed to provide for the reverse movement of the controlled part.

My invention will be better understood from the following description when considered in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

In the accompanying drawing, Fig. 1 is a sectional elevation of a switch operating mechanism embodying my invention, the section of the left hand portion of this figure being taken on the line 1—1 of Fig. 4 looking in the direction indicated by the arrows 7, 7; Figs. 2, 3 and 4 are elevations illustrating parts of the mechanism of Fig. 1 shown in different switching positions, as they would appear looking at Fig. 1 from right to left; Fig. 5 is a perspective view of the operating mechanism with the parts positioned as shown in Fig. 3 and Fig. 6 is a plan view looking up with the parts positioned as shown in Fig. 3.

The illustrated embodiment of my invention includes between two relatively movable members 8 and 9, means such as springs 10 and 11 which are arranged to have energy stored therein on movement of one of the members such as the operating member 8 relatively to the other or controlled member 9 whereby to tend to move the member 9 from one position to another. In order to hold the member 9 against movement in each of said positions, I provide a toggle mechanism. As shown this mechanism includes two toggles 12—13 and 14—15, which have their links 13, 15 connected to the controlled member 9 and which are arranged to be set in response to the movement thereof, one toggle being rigid and the other collapsed in either of the positions of the member 9.

As shown the member 8 is arranged to be rotated and for this purpose it is secured to a rock shaft 16. This shaft is mounted in a bushing 17 journaled in a bearing 18 which may be a part of the housing or switch frame 19. For actuating or rocking the shaft 16 in accordance with the direction of movement of the switch to be controlled, the shaft 16 is preferably provided with an adjustable lever arm or crank 20 which may be connected to the operating mechanism of the main switch to be controlled so as to partake of the movement thereof in a manner well known to the art.

The controlled or actuating member 9 is also arranged to be rotated and for this purpose it is secured to a shaft 21 which is mounted in bushings 22 journaled in the frame 19. The left hand end of the shaft 21 which extends through the hub of the actuating member 9 may be drilled to receive the cylindrical right hand end of the rock shaft 16 as shown so as to provide an end bearing therefor. In order to provide a dust-proof structure for the operating mechanism the frame 19 may be provided with a cover 23 arranged to be secured to the frame against suitable gaskets 24.

The actuating member 9 through the movement of its control shaft 21 is arranged to control one or more circuits which may include the circuit of the operating motor of the main electric switch to be controlled.

For this purpose the shaft 21 may carry a plurality of contact controlling members 25, 25′ which are arranged to engage cooperating contacts 26, 26′ respectively in a manner dependent on the angular spacing of the members 25, 25′ and the position of the shaft 21. The cooperating contacts 25 and 26 and 25′ and 26′ are preferably housed in a structure 27 which is suitably secured to the mechanism frame 19 preferably against a gasket 28, and which may also carry a suitable end bearing 29 for the control shaft 21.

As shown the springs 10 and 11, which comprise the energy storing or resilient means between the operating and actuating members 8 and 9, are mounted in an annular recess or slot in the operating member 8 between suitable abutments such as pins 30 and 31 which have enlarged flattened ends and which are respectively secured to the members 8 and 9. In order to eliminate any possibility of the springs 10 and 11 working out of their recess while under stress for example, a retaining shield or plate 32 may be secured to the actuating member 9 as shown in Fig. 1. For the sake of clearness, this plate has not been shown in any of the other figures.

The toggles 12—13 and 14—15 are so arranged that one toggle is rigid and the other collapsed in either of the extreme positions of the actuating member 9. The toggle links 12 and 14 are pivotally secured to the frame 19 as shown in Fig. 6. Each of these toggles is provided with a center pin 33 which is arranged in the rigid position of the toggle to rest upon or abut against a shelf or projection 34 on the frame 19. When one of these pins is resting on the shelf the toggle of which it forms a part is overset so that the pin must be raised above the line joining the end pivots of the toggle before the toggle can be collapsed.

In order to collapse either of the toggles, I provide means associated with the operating member 8 and arranged on a predetermined movement thereof to engage and raise one or the other of the center pins 33 depending upon which toggle is in the set or rigid condition so as to permit movement of the actuating member 9 from one position to the other and the subsequent setting of the other toggle. As shown this means includes a tripping arm 35 which may be pivotally secured to the operating member 8 on the pivot 36 and which has the pin 33 of the rigid toggle extending into its path of movement. In order to be able to trip either of these toggles by a single tripping member, the tripping member 35 may be provided with shoes 37 and 38 so as to prevent movement thereof relatively to the operating member 8 at the point where tripping is desired, that is to say, after a predetermined angular movement of the operating member 8. It is, of course, understood that this predetermined movement is dependent upon the movement of the lever 20 which, as shown, is secured to the rock shaft 16 through a suitable dust-proof cover 39.

For the operation of my invention reference will be more particularly had to Figs. 2 to 5 inclusive. In Fig. 2 the parts are shown in the position which they would occupy if the operating lever 20 were turned backward through the plane of the drawing. In this case the contacts 25, 26 would be separated and the contacts 25′, 26′ would be in engagement, the toggle 12—13 would be rigid and the springs 10 and 11 would be only under the stress given to them when they are mounted in the recess of the operating member 8. The tripping member 35 will be in the position shown in Fig. 2. If now the main switch, which is to be controlled and which as will be understood to those familiar with the art will have its mechanism connected to the crank 20, has its operating mechanism energized by the usual opening or closing switch, the crank 20 will be pulled forward through the plane of the paper into the position shown in Fig. 1. Consequently, the operating member 8 will be rotated clockwise with reference to Fig. 2 into the position shown in Figs. 3 and 5. During this movement the spring 10 will be compressed since the pin 30 against which one end of the spring abuts moves with the operating member 8 but the pin 31 against which the other end of the spring abuts cannot move so long as the toggle 12, 13 remains set. Also during this movement the tripping member 35 will partake of the movement of the operating member 8 and rotate relatively thereto by reason of the end of the tripping arm engaging and rolling around the center toggle pin 33. This relative rotary movement will continue until the shoe 37 abuts the operating member 8 whereupon further relative movement ceases and the tripping pin 33 of the toggle 12—13 is raised above or through the center of the end pivots of this toggle as shown in Fig. 3. When this occurs the toggle can collapse and the release of the energy stored in the spring 10 quickly moves the actuating member 8 clockwise and the parts into the position shown in Figs. 1 and 4. This, of course, effects the actuation of the auxiliary switches 25, 25′ so that those which were formerly open are closed and vice versa. These switches as will readily be obvious to those skilled in the art may be arranged so as to effect the deenergization of the circuit of the motor controlling the operating mechanism of the main switch and to place the motor circuit in condition for a reversing operation, but as this forms no part of my invention it is not illustrated.

With the collapse of the toggle 12—13 following a predetermined movement of the operating member 8, the clockwise movement

of the actuating member 9 from one position to another that is to say from the position shown in Figs. 3 to the position shown in Fig. 4 sets the toggle 14—15 in its rigid condition with its center pin 33 overset and resting on the shelf 34 so as to hold the actuating member 9 against movement for the reverse operation. In this reverse operation the crank 20 is turned backward through the plane of the paper carrying with it the operating member 8 in a counter-clockwise direction with reference to Fig. 4 and compressing the spring 11. As the operating member 8 is turned, the tripping member 35 moves therewith and rotates relatively thereto engaging the center pin 33 of the toggle 15—14 to trip the toggle when further relative movement of the tripping member 35 and the operating member 8 is prevented by the shoe 38 engaging the operating member. When the toggle 15—14 is tripped and the energy stored in the spring 11 released, the parts again occupy the position shown in Fig. 2.

The particular construction of the auxiliary switches comprising the contacts 25, 26 and 25′, 26′ forms no part of my invention, the construction shown being chosen merely for the sake of simple illustration. It is, of course, to be understood that the parts of the operating mechanism including the springs 10 and 11 are so designed that the energy stored therein on movement of the operating member 8 is sufficient when released to effect the movement of the movable contacts 25, 25′.

While I have shown and described my invention in considerable detail, I do not desire to be limited to the exact arrangement shown, but seek to cover in the appended claims all those modifications that fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. Switch operating mechanism including two relatively rotatable members, resilient means between said members arranged to have energy stored therein on movement of one of the members relatively to the other and thereby to tend to move the other member from one position to another, means for holding the other member against movement in each of said positions including two toggles one being rigid and the other collapsed, an abutment for the center pins of said toggles for holding the toggles in the rigid condition, and means for collapsing the rigid toggle including a tripping arm pivotally mounted on said one member and arranged on a predetermined movement of the member to engage and move the center pin of the rigid toggle away from said abutment whereby to permit the movement of said other member under the bias of the energy stored in said resilient means.

2. Switch operating mechanism comprising a rotatable operating member and a co-operating rotatable member controlled thereby, resilient means between said members arranged to have energy stored therein on movement of the operating member relatively to the controlled member and thereby to tend to move the controlled member from one position to another, means for holding the controlled member in each of said positions including two toggles one being rigid and the other collapsed, a common abutment for the center pins of said toggles for holding the toggles in the rigid position, and means associated with said operating member for moving the center pin of the rigid toggle away from said abutment after a predetermined movement of the operating member to permit movement of the controlled member from one position to the other.

3. Switch operating mechanism comprising a rotatable operating member and a co-operating rotatable switch actuating member controlled thereby, resilient means between said members arranged to have energy stored therein on movement of the operating member relatively to the actuating member and thereby to tend to move the actuating member from one position to another, means for holding the actuating member in each of said positions including two toggles connected to the actuating member and arranged to be set in response to the movement thereof, one toggle being rigid and the other collapsed in either of said positions of the actuating member, a common abutment for the center pins of said toggles for holding the toggles in the rigid position and means associated with the operating member and arranged on a predetermined movement thereof to move the center pin of the rigid toggle away from said abutment and thereby to permit movement of said actuating member from one position to the other and the movement of the center pin of the other toggle onto said abutment.

In witness whereof, I have hereunto set my hand this 16th day of April, 1928.

FREDERICK E. FISHER.