March 12, 1957 J. H. SPROW 2,784,602

SNAP ACTION OPERATING MECHANISM FOR SWITCHES

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Fig. 1.

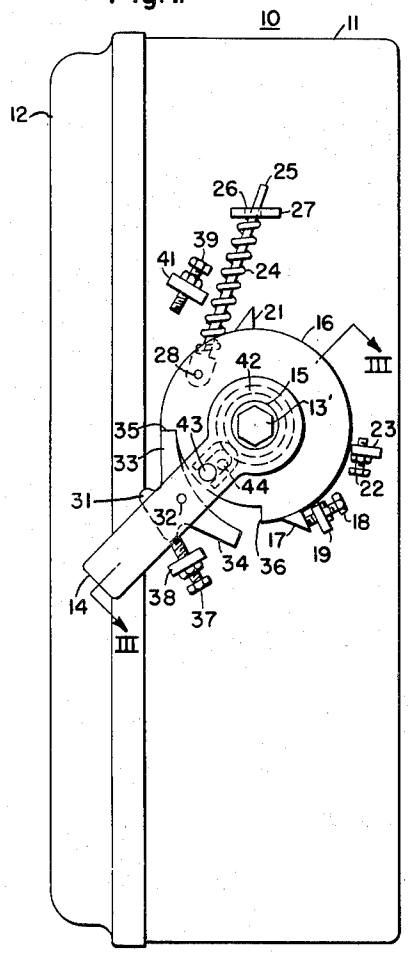
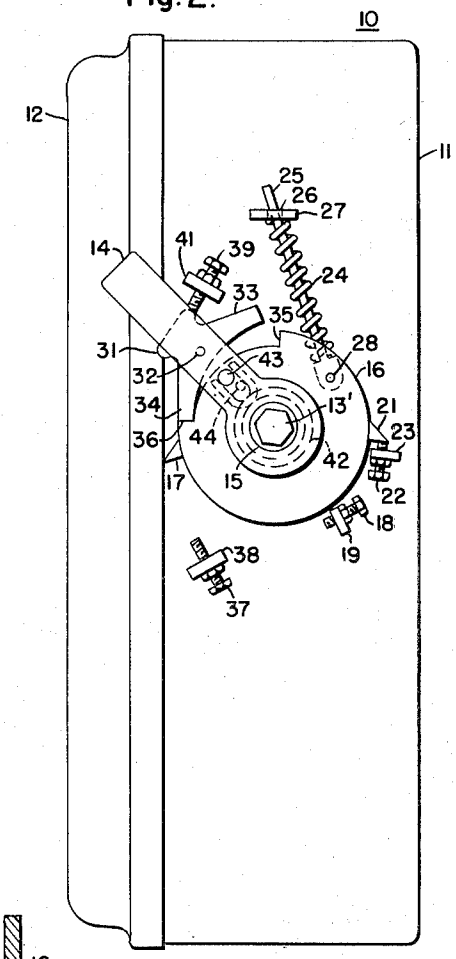


Fig. 2.



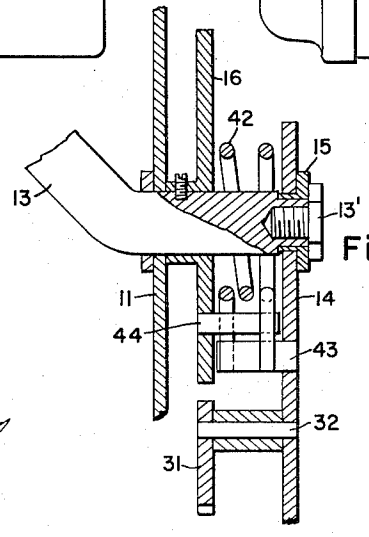


Fig. 3.

WITNESSES:

John C. Hensley

Wm. B. Sellers

INVENTOR

James H. Sprow

BY

ATTORNEY

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SNAP ACTION OPERATING MECHANISM FOR SWITCHES

James H. Sprow, East McKeesport, Pa., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

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2 Claims. (Cl. 74—97)

My invention relates, generally, to operating mechanisms and, more particularly, to quick-make and quick-break mechanisms for operating electric switches and the like.

It is the usual practice to operate the movable members of electric switches of certain types by means of a rotatable shaft which projects through the switch housing and is driven by a manually operable handle. For the most satisfactory operation of a load interrupter switch, it is desirable that the switch be closed and opened at a high speed and at a speed substantially independent of the speed with which the handle is moved. Many mechanisms of the overcenter spring type have been devised to accomplish this purpose. Some of the prior mechanisms are complicated in structure and subject to excessive wear. Others have the disadvantage that in the event of spring breakage it is impossible to operate the switch.

An object of my invention, generally stated, is to provide a switch operating mechanism which is simple in construction, efficient in operation, and which may be economically manufactured and installed.

A more specific object of my invention is to provide a quick-make and quick-break operating mechanism which provides for positive driving of the operating shaft under emergency conditions.

Another object of my invention is to provide a quick-make and quick-break operating mechanism in which initial movement of the operating handle in either direction moves the operating shaft in the same direction.

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

In accordance with one embodiment of my invention, the operating handle of a quick-make and quick-break mechanism of the overcenter spring type is connected to an actuating plate through a pawl which is disengaged from the plate when the spring passes overcenter and is automatically reset for the return operation.

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

Figure 1 is a view, in side elevation, of a switch operating mechanism embodying the principal features of the invention, the operating handle being in the open position of the switch;

Fig. 2 is a view, similar to Fig. 1, with the operating handle in the closed position of the switch, and

Fig. 3 is an enlarged view, in section, taken along the line III—III in Fig. 1.

Referring to the drawing, the apparatus shown therein comprises a housing 10 which may be of a type suitable for enclosing the contact members of an electrical switch as well as fuses or other devices associated with the switch. The switch may be of the type disclosed in Jennings Patent No. 1,801,866, issued April 21, 1931, and assigned to the same assignee as this application, or

if desired, the switch may be of the load break disconnect type, such as is disclosed in Rawlins Patent No. 2,308,026, issued January 12, 1943, and assigned to the same assignee as this application. As shown, the housing 10 comprises a sheet metal box 11 having an openable cover 12.

As explained hereinbefore, it is the usual practice to operate the movable contact members of enclosed electric switches by means of a shaft rotatably mounted in the housing which encloses the contact members. Furthermore, it is the usual practice to provide a quick-make and quick-break mechanism for actuating the operating shaft.

In the structure shown, a switch operating shaft 13 is rotatably mounted in the housing 10, with one end of the shaft extending through the side of the housing. An actuating handle 14 is rotatably mounted on the one end of the shaft 13 by means of a bearing 15 for rotation relative to the shaft. The bearing 15 may be retained on the shaft 13 by a screw 13'. An actuating plate 16 is secured to the shaft 13 for driving the shaft through a predetermined number of degrees. The angular motion of the plate 16 and the shaft 13 in one direction is limited by a projection 17 on the plate 16 which engages an adjustable stop screw 18 threaded through a lug 19 on the side of the box 11. The motion of the plate 16 in the other direction is limited by a projection 21 which engages an adjustable stop screw 22 threaded through a lug 23 on the side of the box 11.

An over-center spring 24 is disposed on a guide 25, one end of which is inserted through an opening 26 in a lug 27 on the side of the box 11 and the other end of which is pivotally connected to the plate 16 by a pin 23. The spring 24 functions to drive the plate 16 and the shaft 13 after the spring has been compressed and the pin 28 has passed over the center line through the shaft 13 and the opening 26 in the lug 27 for the guide 25.

In order to drive the plate 16 to compress the spring 24, a pawl 31 is pivotally attached to the handle 14 by means of a pin 32 and has arms 33 and 34 which are disposed to engage shoulders 35 and 36, respectively, on the plate 16. An adjustable stop screw 37 is threaded into a lug 38 on the side of the box 11 to engage the pawl 31 at the end of the stroke of the handle 14 in one direction. A similar stop screw 39 is threaded into a lug 41 to engage the pawl 31 at the end of the handle stroke in the other direction. The stop screws 37 and 39 function to reset the pawl 31 into engagement with the plate 16 in a manner which will be more fully described hereinafter.

A torsion spring 42 surrounds the shaft 13 and engages pins 43 and 44 in the handle 14 and the plate 16, respectively, to bias the handle 14 in the direction in which the plate 16 is being driven by the overcenter spring 24. The spring 42 may be of a type well known in the art.

Referring to Fig. 1 in which the actuating mechanism is shown in the open position of the switch contact members, the switch may be closed by moving the handle 14 in a clockwise direction. When the handle 14 is moved clockwise, the arm 33 of the pawl 31 which is in engagement with the shoulder 35 on the plate 16 drives the plate 16 to rotate the shaft 13 and compress the spring 24. When the spring 24 passes overcenter, it causes the plate 16 to rotate rapidly, leaving the pawl 31 and the handle 14 behind until the rotation of the plate is stopped by the stop screw 22. This action closes the contact members of the switch quickly in the desired manner.

When the handle 14 is released, it is actuated by means of the torsion spring 42 in a clockwise direction until the pawl 31 engages the stop screw 39, thereby actuating the pawl 31 to reset the arm 34 into engagement with

the shoulder 36 on the plate 16. This completes the closing operation of the switch and the actuating mechanism is in the position shown in Fig. 2.

If it is desired to open the contact members of the switch, the handle 14 is moved in a counterclockwise direction. Since the arm 34 of the pawl 31 engages the shoulder 36, the plate 16 and the shaft 13 are driven directly by the handle 14 and the spring 24 is compressed. When the spring 24 passes overcenter, it causes the plate 16 to rotate rapidly, thereby leaving the pawl 31 and the handle 14 behind. The travel of the plate 16 in a counterclockwise direction is stopped by the stop screw 18.

When the handle 14 is released, it is actuated in a counterclockwise direction by the torsion spring 42 until the pawl 31 engages the stop screw 37, thereby causing the arm 33 of the pawl to engage the shoulder 35 and resetting the mechanism for a closing operation of the switch. Thus, the mechanism is automatically reset at the end of the handle stroke in either direction.

From the foregoing description, it is apparent that the mechanism herein described has the advantage of forcing the operating shaft 13 to rotate during the first part of the handle motion in either direction since the handle 14, the pawl 31 and the plate 16 are locked together and move as a unit while the spring 24 is being compressed. The mechanism is not subject to excessive wear since there is no lost motion between the actuating parts.

Furthermore, the shaft 13 may be forced through its total travel by means of the handle 14 in the event that the overcenter spring 24 breaks or fails to function properly because of excess friction which tends to prevent rotation of the shaft 13. In the event that the spring 24 breaks, the pawl 31 will remain in engagement with the plate 16 throughout the complete travel of the plate, thereby providing a direct drive for the shaft 13.

It is evident that I have provided a quick-make and quick-break operating mechanism suitable for operating an electric switch or other apparatus actuated by a rotatable shaft. The mechanism is simple in construction and provides a direct drive for the operating shaft throughout the range of the rotation of the shaft under emergency conditions.

Since numerous changes may be made in the above-described construction and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In a switch operating mechanism, in combination, an operating shaft rotatable in either direction, an actuating member secured to the shaft, stop means for limiting the travel of the member and the shaft in either direction, an overcenter spring acting on said member,

an operating handle rotatably mounted on the shaft, spring means interconnected between the handle and the member, a pawl pivotally attached to the handle and engaging the member to drive the shaft and store energy in the overcenter spring when the handle is actuated, said overcenter spring being disposed to cause disengagement of the member from the pawl and drive the member against said stop means independently of the handle after the spring has been energized and passed over dead center, said spring means being disposed to bias the handle to the end of its travel in the same direction as the member and the shaft are driven by the overcenter spring, said overcenter spring being stronger than said spring means to energize the spring means as the member is driven ahead of the handle by the overcenter spring, and additional stop means disposed on opposite sides of the handle for engaging the pawl to actuate the pawl into engagement with the member at the end of the handle stroke, thereby resetting the mechanism for rotation of the shaft in the other direction.

2. In a switch, in combination, an enclosure for the switch, an operating shaft extending into the enclosure and rotatable in either direction, an actuating member secured to the shaft, stop means for limiting the travel of the member and the shaft in either direction, an operating handle rotatably mounted on the shaft outside of the enclosure, a torsion spring interconnected between the handle and the actuating member, an overcenter spring acting on the member, a pivotally mounted pawl interconnecting said handle and said actuating member to drive said shaft in one direction when the handle is actuated in that direction, said overcenter spring being disposed to drive the actuating member ahead of the pawl against said stop means after the spring has been compressed and passed over dead center, said torsion spring biasing said handle in the same direction as the actuating member is driven to complete the handle stroke after the handle is released, and additional stop means for engaging the pawl to actuate the pawl into engagement with the actuating member at the end of the handle stroke, thereby resetting the pawl for rotation of the shaft in the other direction.

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