April 3, 1934. C. THUMIM 1,953,789

OPERATING MECHANISM

Filed Sept. 20, 1932

Fig. 1.

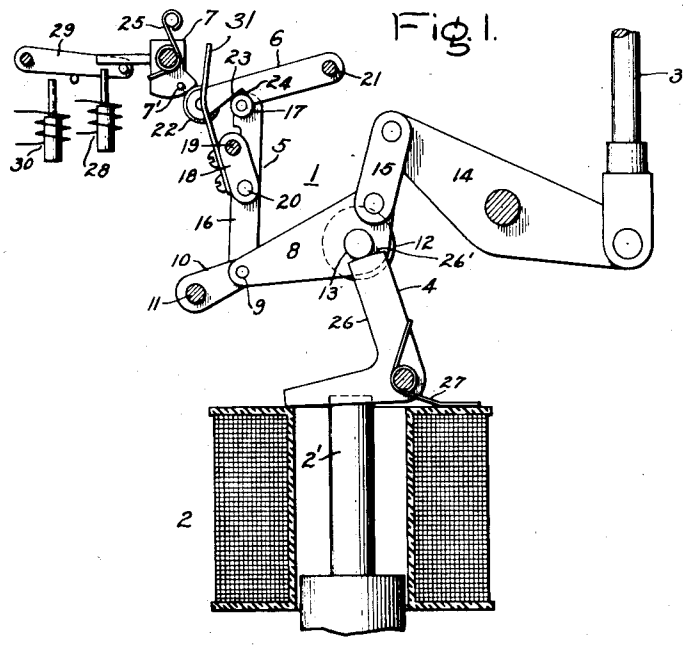


Fig. 2.

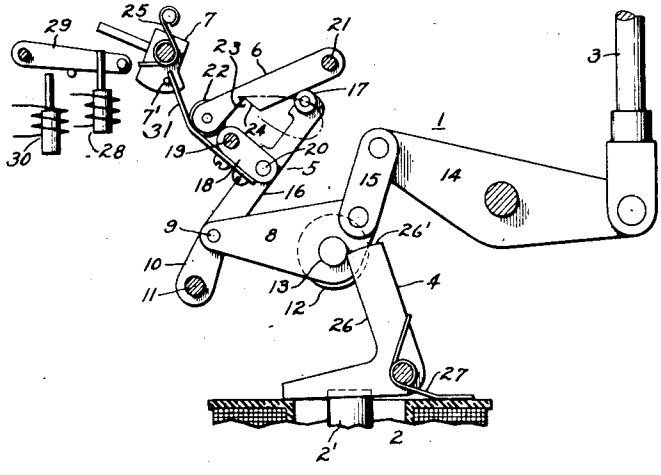
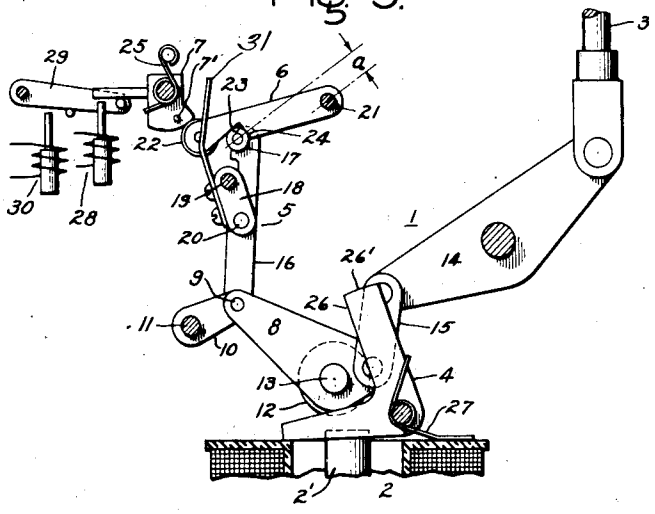


Fig. 3.



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OPERATING MECHANISM

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7 Claims. (Cl. 200—109)

My invention relates to operating mechanisms, more particularly to tripping or releasing means for controlling thrust transmitting structure of operating mechanism which is operatively connected to means to be actuated, as a circuit breaker for example.

The use of operating mechanisms as direct current, solenoid operating mechanisms having direct current tripping means is well known. Since the power input for the direct current tripping means is often of the order of 200 watts, a sensitive tripping latch is not required. However, in the case of alternating current tripping means the input due to power limitations, may be only of the order of 30 volt-amperes so that a comparatively small tripping force is available and a sensitive tripping latch is required.

The principal object of the present invention is the provision of improved tripping and releasing means for operating mechanisms which shall be simple and rugged in construction and sensitive and positive in response to comparatively small tripping forces.

My invention will be more fully set forth in the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Referring to the drawing, Fig. 1 is a view, partly in section, illustrating operating mechanism embodying my invention in the operated or closed position; Fig. 2 is a view of the operating mechanism shortly after the tripping or releasing operation; and Fig. 3 is a view illustrating the mechanism in the reset position prior to the closing operation.

The operating mechanism illustrated is of the solenoid actuated type wherein collapsible thrust transmitting structure 1 is interposed between the solenoid 2 and the means to be actuated, which in the present case may be a circuit breaker (not shown) operatively connected to the actuating rod 3. In the position shown in Fig. 1 the circuit breaker is in the closed position and the operating mechanism is held in such position by a pivoted prop 4 and the tripping linkage or toggle 5 which is in turn restrained by the pivoted member 6 and the locking member 7.

Referring more particularly to Fig. 3, the closing operation will be described. The solenoid 2 which is provided with a plunger having an operating extension 2' is shown in the deenergized position, the thrust transmitting structure 1 in the collapsed position and the tripping toggle 5 and restraining and locking means in the reset position. The thrust transmitting structure 1 comprises a main link or lever 8 pivotally connected at 9 to one end of the tripping toggle 5 and to a link 10 having a fixed pivot 11. The main lever 8 is provided with a roller 12 mounted on an overhanging pin 13, the function of which will be presently described. The lever 8 is likewise connected to the lever 14 by an intermediate link 15, the lever 14 being suitably connected to the rod 3 or means to be actuated.

The pivot pin 9 of the lever 8 is normally held fixed by the tripping toggle 5 so that rotation of the lever 8 in counterclockwise direction is effective to cause downward or closing movement of the rod 3.

The tripping toggle 5 comprises an elongated link 16 connected at one end to the pivot pin 9 and having at its other end a roller 17. The other link 18 of the toggle is provided with a fixed pivot 19 and is connected to the link 16 at 20 substantially intermediate its ends. The restraining member 6 pivoted at 21 and provided with a roller 22 at its opposite end has a notched recess 23 at one side thereof forming a surface 24 adapted to have cam engagement with the toggle roller 17. The toggle roller force acting normally on the surface 24 tends to cause clockwise rotation of the restraining member 6, the force acting through a lever arm as illustrated. The restraining member is, however, normally locked against clockwise rotation by the pivoted locking lug 7 which is suitably biased towards locking position as by a spring 25.

When the solenoid 2 is energized the plunger including the extension 2' is projected upwardly so as to engage the roller 12 of the main lever 8 and moves the same to the closed position shown in Fig. 1. During the latter part of this operation the overhanging pin 13 rides against the inner edge 26 of the pivoted prop 4 which is biased, as by a spring 27, towards the position illustrated. Accordingly, the pin 13 in riding along the edge of the prop rotates the same a small extent against the bias of spring 27 in clockwise direction, the upper edge 26' of the prop snapping back under the pin 13 when the solenoid has raised the pin above the edge of the prop. This position is clearly shown in Fig. 1, the mechanism being locked closed and the solenoid now being free to be deenergized. During the above described operation the pivot pin 9 of the lever 8 is maintained in fixed position by the toggle 5, restraining member 6, and locking member 7.

The releasing means for actuating the locking

member 7 may be operated in any suitable manner, as by manual or electromagnetic means. In the present instance the locking lug 7 is provided with an extension 7' which may be engaged either directly by the plunger of the current coil 28 or indirectly through a lever 29 by a voltage coil 30. The voltage coil having considerably more power acts on the locking member through a lever having a low mechanical advantage. Accordingly, the current and voltage coils are arranged selectively to actuate the locking member 7 in response to separate energization of either of them.

The actual tripping operation is best illustrated in Fig. 2 wherein the current coil 28 is energized so as to actuate the locking member. The mechanism is shown shortly after the tripping impulse and prior to complete collapse of the thrust transmitting structure. Upon rotation of the locking lug 7 so as to release the roller 22 of the restraining member, the toggle roller 17 rides out of the notch 23 and forces the restraining member upwardly due to the reacting force acting on the toggle. Upon release of the tripping toggle the pivot 9 becomes a floating pivot so that the main lever 8 is no longer supported in position. As the pivot 9 moves to the left under the influence of the reacting force, the pin 13 rides off the edge 26' of the prop 4 so that complete collapse of the thrust transmitting structure and opening position of the mechanism is permitted.

In operating mechanism of the aforesaid type it is desirable to be able to effect a reclosing operation immediately after tripping or opening of the mechanism. It follows, therefore, that the tripping mechanism must be reset before starting of the next reclosing operation. In accordance with my invention, this is accomplished by securing a member or strip to one of the toggle links, as the link 18, so as to move the locking member 7 to a non-locking position for permitting resetting of the tripping toggle, etc. Immediately after release of the tripping toggle, the roller 17 tends to ride underneath the restraining member 6 lifting the same above the locking face of the member 7. However, after collapse of the thrust transmitting structure and lowering of the pivot pin 9 the roller 17 drops a certain distance. This is indicated by the dotted line in Fig. 2 illustrating the path of the toggle roller 17 during the tripping operation. The restraining member 6, which is normally biased so as to be in following engagement with the roller 17, therefore rotates counterclockwise so that its roller 22 is lower than the locking surface of the member 7. If, now, no means are provided for moving the locking member 7 to a non-locking position the roller 17 cannot re-enter the notch 23 for resetting the tripping mechanism, but simply rides along the lower edge of member 6 if the solenoid 2 is energized. To avoid this difficulty, the extension member 31 which in the present instance is connected to the tripping toggle link 18 is arranged to engage a pin 7', or the like, fixed to the locking member 7 so as to hold said member in a non-locking position until the roller 17 has re-entered the notch 23. When the tripping toggle is so straightened out, as illustrated in Fig. 3, the member 31 no longer engages the locking lug which is again biased by its spring over the roller 22, locking the restraining member in position.

Fig. 2 likewise clearly discloses how the mechanism is trip-free in operation, that is, free to trip not withstanding continued energization of the solenoid. Regardless of the position of the thrust transmitting structure, unlocking of the restraining member causes the tripping toggle and other mechanism to collapse so that the lever 8 is ineffective to transmit force to the means to be actuated.

It should be understood that my invention is not limited to specific details of construction and arrangement thereof herein illustrated, and that changes and modifications may occur to one skilled in the art without departing from the spirit of my invention.

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

1. In operating mechanism including collapsible thrust transmitting structure and a tripping linkage controlling said structure, means rendering said linkage sensitive to comparatively small tripping forces comprising a restraining member engaging said linkage, a locking member for said restraining member, tripping means for actuating said locking member and means responsive to the position of said tripping linkage for positively holding said locking member in a non-locking position during resetting of said linkage and restraining member.

2. Operating mechanism comprising thrust transmitting structure and tripping means controlling said thrust transmitting structure comprising a linkage, a pivoted restraining member having a cam surface adapted to have cam engagement with a roller carried by said linkage, a locking member for preventing rotation of said restraining member and release of said roller, means for actuating said locking member, and means carried by said linkage for holding said locking member in a non-locking position during resetting of said linkage.

3. In operating mechanism including thrust transmitting structure and a tripping toggle connected to and controlling said structure, one link of said toggle carrying a roller, a pivoted restraining member having a surface adapted to have cam engagement with said roller preventing collapse of said toggle, a locking member for preventing rotation of said restraining member, a tripping magnet actuating said locking member, and a member carried by another of said toggle links for holding said locking member in a non-locking position during resetting of said toggle and restraining member.

4. In operating mechanism including thrust transmitting structure and a tripping toggle connected to and controlling said structure, one end of said toggle carrying a roller, a pivoted restraining member having a notched recess for receiving said roller so as to prevent collapse of said toggle, a locking member for said restraining member, tripping means for actuating said locking member, unlocking of said restraining member causing said roller to ride out of said notched recess and subsequent collapse of said toggle, and a member forming an extension of another of said toggle links for moving said locking member to a non-locking position with respect to said restraining member during resetting of said toggle and restraining member.

5. In trip-free operating mechanism for circuit breakers including collapsible thrust transmitting structure, tripping means for controlling said structure comprising a toggle having a link connected at one end to said structure, a roller carried at the other end of said link, a pivoted restraining member having a surface adapted to have cam engagement with said roller for holding said toggle in opposite position, a second roller carried by said restraining member, a pivoted

locking member adapted to engage said second roller, tripping means for actuating said locking member, actuation of said locking member and release of said second roller permitting rotation of said restraining member and collapse of said toggle, and a member carried by another link of said toggle for engaging said locking member and holding it in a non-locking position with respect to said restraining member during resetting of said toggle.

6. In operating mechanism including thrust transmitting structure, tripping means controlling said structure comprising a linkage, a member for restraining said linkage in thrust transmitting position, a locking member normally biased to engage and lock said restraining member, means for actuating said locking member, actuation of said locking member causing collapse of said linkage, and means controlled by said linkage for holding said locking member in a non-locking positio with respect to said restraining member after tripping of said linkage and during resetting of the same and said restraining member.

7. In operating mechanism for circuit breakers including thrust transmitting structure and a tripping linkage for controlling said structure, means controlling said tripping linkage comprising a locking member and tripping means for actuating said locking member comprising a pair of electromagnets each actuated separately in response to current and voltage conditions respectively so as to actuate selectively said locking member for releasing said tripping linkage, the current electromagnet acting directly on said locking member, and a lever operatively connecting the voltage electromagnet with said locking member.

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