May 24, 1966 J. C. BENSON 3,252,344

OPERATING MECHANISM

Filed May 20, 1964

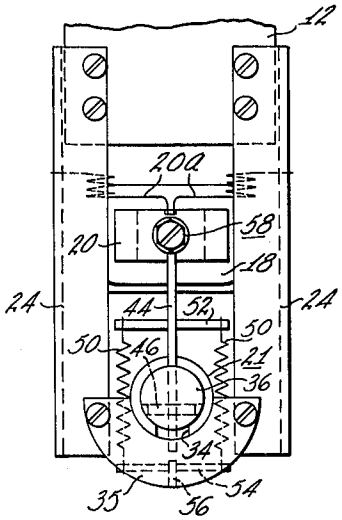


Fig. 3

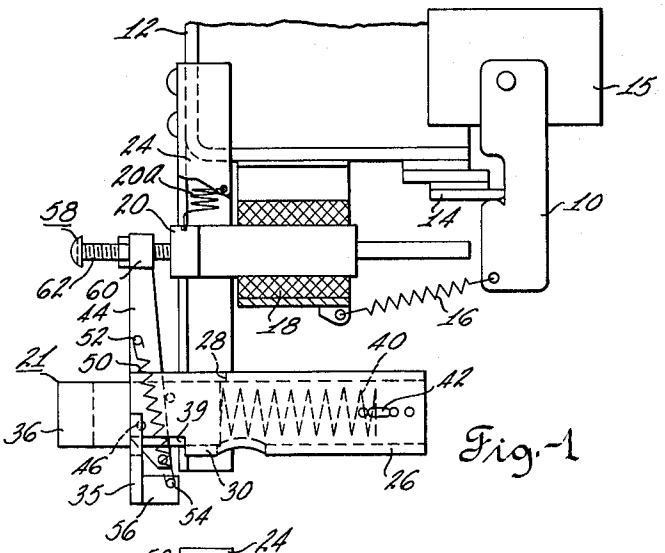


Fig. 1

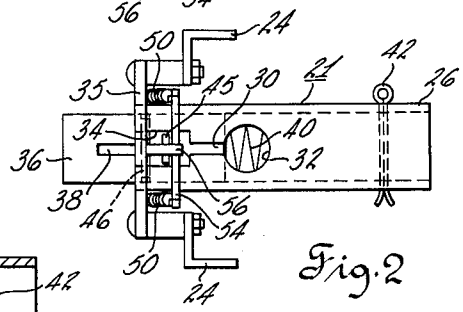


Fig. 2

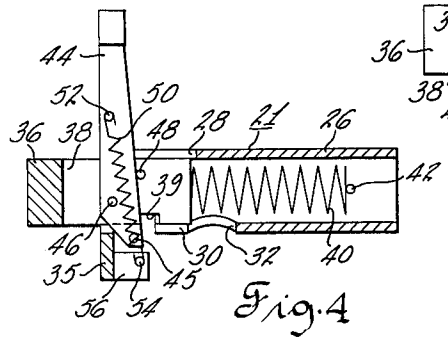


Fig. 4

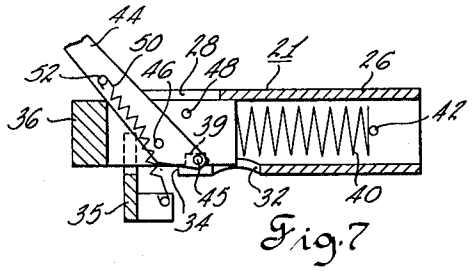


Fig. 7

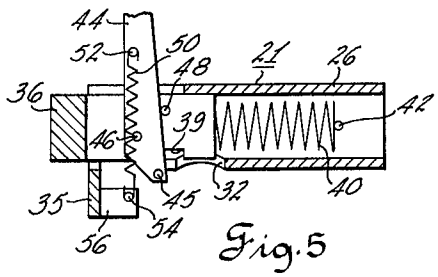


Fig. 5

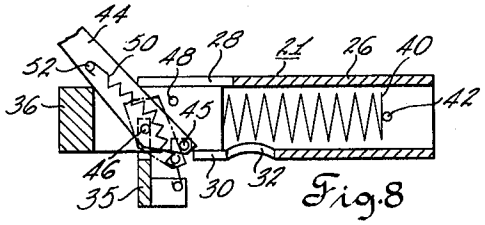


Fig. 8

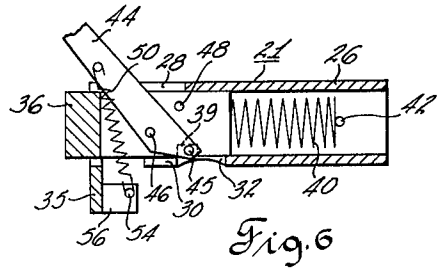


Fig. 6

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3,252,344
OPERATING MECHANISM

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This invention relates generally to operating means or mechanisms for moving a device, such as a latch, from an initial position to another position so that the operating mechanism does not interfere with the immediate return of the device to its initial position.

Some electrical circuit breakers, for example, are hydraulically operated and employ a valve in the hydraulic system which must be momentarily actuated to effect circuit breaker operation. In some cases the valve is actuated in response to movement of a pilot valve latch from its latched to unlatched or released position and movement of the latch is accomplished either by means of a solenoid or manually. It is important that the pilot valve latch be relatched or reset almost immediately after it is released in order to prevent the hydraulic fluid from being drained from the hydraulic system into the sump tank. In some prior art apparatus, the pilot valve latch is reset by means of a biasing spring which can act to overcome the force of the solenoid armature as soon as the latch has been released in response to operation of the solenoid. However, if the pilot valve latch is released manually by a human operator depressing the solenoid armature against the pilot valve latch, he cannot ordinarily respond quickly enough to withdraw his hand from the armature to permit timely resetting of the latch before the hydraulic fluid has drained from the system.

It is desirable, therefore, to provide an operating mechanism for use with a device, such as a solenoid armature and pilot valve latch of the aforesaid character, which permits manual movement of the device from one position to another position but does not interfere with immediate return of the device to its one position.

In accordance with the present invention there is provided a new and improved operating mechanism comprising a push button member which can be moved from one position to another and is biased for return to its one position. The pushbutton carries a lever which is pivotally mounted thereon. One end of the lever is adapted to bear against a device to be moved, such as a solenoid armature, as the push button is depressed. Overcenter spring means are provided to effect pivotal movement of the lever away from the device as soon as the movement of the push button member toward the device causes overcenter movement of the spring and lever, i.e., as soon as the device is ready to return to its initial position. Means are provided to hold the lever out of the path of return movement of the solenoid armature while the push button is further advanced toward the device and while the push button is being returned to its normal position. Means are also provided to place the lever in position for its next cycle of operation.

It is an object of the present invention to provide an improved operating mechanism which permits manual movement of a device such as a latch or the like, from one position to another yet does not interfere with immediate return of said device to its one position.

Another object is to provide an operating mechanism of the aforesaid character which is economically fabricated of readily available materials and which has a long life and is trouble free in operation.

Another object is to provide an operating mechanism of the aforesaid character which is easy to install on a wide variety of existing equipment and lends itself to accurate adjustment in the field.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate a preferred embodiment of the invention but it is to be understood that the embodiment illustrated is susceptible of modification with respect to details thereof without departing from the scope of the appended claims.

In the drawings:

FIG. 1 is a side elevational view partly in section of an operating mechanism incorporating the present invention showing it associated with a portion of a hydraulically operated electric circuit breaker;

FIG. 2 is an elevational view of the bottom of the mechanism of FIG. 1;

FIG. 3 is an end elevational view of the mechanism shown in FIGS. 1 and 2; and

FIGS. 4 through 8 are cross sectional views of the operating mechanism of FIG. 1 showing it in various positions during operation.

Referring to FIG. 1 of the drawing, the numeral **10** designates a device such as a pilot valve latch for a hydraulically operated electric circuit breaker. Pilot valve latch **10** is pivotally mounted on a framework **12** which is understood to be a part of the electric circuit breaker. Pilot valve latch **10** has, for example, one position wherein it is adapted to engage a latch plate **14** which is rigidly mounted on framework **12**. As will be understood, when pilot valve latch **10** engages latch plate **14**, as shown in FIG. 1, the pilot valve **15** is closed. However, when pilot valve latch **10** is moved, for example, to another position wherein it is off the plate (counterclockwise with respect to FIG. 1), the pilot valve is open. Pilot valve latch **10** is adapted to return to its one position by biasing means such as a spring **16** which causes the pilot valve latch to reset or reengage latch plate **14** (by moving clockwise with respect to FIG. 1) as soon as the latch is free to do so. It is to be understood that if pilot valve latch **10** does not reset immediately and the pilot valve is allowed to stay open even for a very short time, the hydraulic fluid drains from the system and it requires a considerable length of time, about 20 minutes, for example, to pump it into the system.

Means such as an electrically operated solenoid **18** mounted on framework **12** is provided to move pilot valve latch **10** from latched to unlatched position. Solenoid **18** is provided with an armature **20**, biased to the left or open-gap position by double torsion springs **20***a*, and which moves to the right with respect to FIG. 1 when the solenoid is energized and strikes pilot valve latch **10** to move the latter off latch plate **14**. The movement of latch **10** operates a relay switch, not shown, which immediately deenergizes solenoid **18** and allows pilot valve latch **10** to reset.

As will be understood, pilot valve latch **10** can be moved manually from latched to unlatched position by pushing armature **20** of solenoid **18** so that it strikes the pilot valve latch. However, in order for pilot valve latch **10** to be able to reset in time, the human operator must remove his hand from armature **20** immediately after pilot valve latch **10** is released. This requires a great deal of skill and precision and, if not done properly, can have serious consequences.

In accordance with the present invention, an operating mechanism **21** is provided to facilitate manual pushing of armature **20** of solenoid **18** and pilot valve latch **10** so that pilot valve latch **10** can reset immediately regardless of whether or not the human operator continues to maintain the operating means depressed. If desired, of course, operating means **21** could be arranged to act directly on pilot valve latch **10** but it is more convenient in the em-

bodiment illustrated to have it act through armature 20 of solenoid 18.

FIGS. 1, 2 and 3 show that operating mechanism 21 comprises a support in the form of a hollow cylindrical tube 26. Tube 26 is adapted to be rigidly mounted on framework 12 in a position to cooperate with armature 20 of solenoid 18 by means of a mounting plate 35 which, for example, is welded to tube 26. Plate 35 is adapted for connection to a pair of mounting brackets 24 which are rigidly secured to framework 12. Tube 26 is provided with an upper slot 28 and a lower slot 30 which extends inwardly from one end to accommodate a lever 44 hereinafter described. Lower slot 30 is enlarged or provided with openings 32 and 34 at its inner and outer ends, respectively, to accommodate movement therethrough of a stop pin 45 on lever 44, as hereinafter described.

A movable push button member 36 in the form of a cylinder is mounted in tube 26 and is movable from an initial position shown in FIGS. 1, 2, 3 and 4 to another position shown in FIG. 6. Biasing means, such as compression spring 40 mounted within tube 26 between a fixed pin 42 and the push button, is provided to return push button to its initial position. Push button 36 is adapted to have lever 44 pivotally mounted thereon and is, therefore, provided with a slot 38 and with a pivot pin 46.

Lever 46 is pivotable on pin 46 from an initial position shown in FIGS. 1 through 5 to another position shown in FIGS. 6 through 8. When lever 44 is in its initial position it is adapted to engage armature 20 of solenoid 18 and when it is in its other position it is swung out of engagement therewith. In practice, lever 44 is preferably provided with adjustable striker means 58 for engaging armature 20 and such means make take the form of a threaded member such as a screw 62 which is movable inwardly or outwardly of a threaded portion 60 on the end of lever 44.

Overcenter biasing means are provided to pivot lever 44 from its initial position, to its other position, and back to its initial position as hereinafter described. The overcenter biasing means take the form of a pair of tension springs 50 which are disposed on opposite sides of lever 44, as FIGS. 2 and 3 show. One end of each spring 50 is attached to tube 26 on one side of pivot pin 46 by means of bar 54 mounted on a bracket 56 which in turn is secured as by welding to plate 35 on the tube. The other end of each spring 50 is attached to a pin 52 located in lever 44 on the other side of pivot pin 46.

First stop means are provided to prevent lever 44 from moving beyond its initial position and such means take the form of a stop pin 48 mounted on push button 36 in slot 38 thereof.

Second stop means are provided to permit lever 44 to pivot from its initial position to its other position and to maintain it there when push button 36 is depresesd a predetermined distance. Such second stop means comprise a pin 45 mounted on the lower end of lever 44 and of such dimensions as to prevent the lever from rotating counterclockwise, as shown in FIG. 6, until pin 45 has moved to the end of slot 30 in tube 26 and up through opening 32. The second stop means further comprise a depression or slot 39 in the bottom of push button 36 which is adapted to receive pin 45 as lever 44 swings it up thereinto. Depression 39 cooperates with pin 45 to maintain lever 44 in its other position (out of engagement and clear of armature 20 of solenoid 18) until push button 36 returns to its initial position, regardless of whether the push button is depressed even further, held depressed, or partially returned toward its initial position. When push button 36 returns to its initial position, opening 34 at the end of slot 30 in tube 26 affords clearance for pin 45 so that lever 44 can return to its initial position.

The invention disclosed herein operates as follows.

Assume, first, as shown in FIGS. 1 through 4 that operating mechanism 21 is in readiness to be operated, that solenoid 18 is deenergized and that its armature 20 is in a retracted position wherein it makes physical contact with striker means 58 on lever 44 of operating mechanism 21 and that pilot valve latch 10 is in latched position on latch plate 14.

When a human operator depresses push button 36, the latter moves from the position shown in FIGS. 1 through 4 into tube 26 carrying lever 44 along with it and causing striker means 58 to move armature 20 of solenoid 18 to the right (with respect to the drawings). Movement of armature 20 of solenoid 18 in turn causes pivoting of pilot valve latch 10 counterclockwise and causes the latter to disengage from latch plate 14 and cause opening of pilot valve 15.

Operating mechanism 21 is proportioned and positioned with respect to the required travel of armature 20 of solenoid 18 and of pilot valve latch 10 so that lever 44 reaches its overcenter position (shown in FIG. 5) with respect to spring 50 just prior to the time that pin 45 reaches opening 32 in the bottom of tube 26.

As push button 36 is further depressed, overcenter spring 50 tends to rotate lever arm 44 counterclockwise about its pivot pin 46 but such rotation is limited by stop pin 45 which bears against the exterior surface of the bottom of tube 26. However, when push button member 36 is depressed sufficiently far, stop pin 45 swings up through opening 32 in the bottom of tube 26 and into depression 39 on the bottom of the push button. As this occurs, lever 44 rapidly moves counterclockwise to the position shown in FIG. 6 and is thus swung clear of armature 20 of solenoid 18 and is no longer in a position to interfere with the intermediate return of the armature and the resetting of pilot valve latch 10.

As the human operator releases his hand pressure on push button 36, spring 40 moves the latter to the left and outwardly of tube 26. As FIG. 7 shows, lever arm 44 remains in retracted position during return movement of push button member 36 because stop pin 45 is entrapped in depression 39 and inside the wall of tube 26.

When spring 40 moves push button 36 to the left to the position shown in FIG. 8 wherein depression 39 registers with opening 34 in tube 26, overcenter spring 50 causes lever arm 44 to pivot clockwise about its pivot pin 46, stop pin 45 withdraws from depression 39 and the lower end of lever arm 44 comes to rest against mounting plate 35.

Since this movement is accomplished with a snap action, stop pin 48 prevents lever 44 from moving beyond its initial position as it returns thereto. In this manner operating means 21 is returned to its initial position and is in readiness for the next operation.

While the operating mechanism incorporating the present invention has been shown as employed in connection with the solenoid operator of a pilot valve latch of a hydraulically operated electric circuit breaker, it will be understood that it could have other utility.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In an operating mechanism for use with a movable device adapted to move from a first position to a second position and to return to its first position, in combination, a support adapted for fixed mounting with respect to said movable device, a member mounted on said support and movable from a first position toward a second position with respect to said support, biasing means for returning said member to its first position, a lever pivotally mounted on said member and pivotable from a first position toward a second position, said lever when in its first position being adapted to engage said device, overcenter biasing means connected between said support

and said lever for pivoting said lever out of engagement with said device as said member moves a predetermined distance from its first position toward its second position, said overcenter biasing means being further adapted to pivot said lever back to its first position when said member has returned to its first position, means on said support for preventing said lever from pivoting out of engagement with said device until said member has moved a predetermined distance toward its second position, said last recited means being further adapted to permit said lever to return to its first position when said member returns to its first position, first stop means on said member to maintain said lever in its second position when the lever has pivoted thereto, and second stop means on said lever to limit pivotal travel of said lever as it returns to its first position from its second position.

2. In an operating mechanism for use with a movable device adapted to move from one position to another and to return to its one position, in combination, a push button, a lever pivotally mounted on said push button, a tube in which said push button is mounted, said tube having a pair of slots for accommodating passage of said

lever, one of said slots having enlarged openings at each end, a biasing spring within said tube for biasing said push button, overcenter spring means connected between said lever and said tube, first stop means on said push button for limiting travel of said lever, and second stop means for limiting travel of said lever, said second stop means comprising a projection on said lever and a recess in said push button member for accommodating said projection, said projection being adapted to pass through the said openings at the ends of said one slot in said tube.

References Cited by the Examiner

UNITED STATES PATENTS

905,426	12/1908	Haywood	74—100 X
1,518,701	12/1924	Penn.	
2,905,017	9/1959	Randolph	74—100 X

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