April 25, 1939. C. THUMIM 2,156,072

OPERATING MECHANISM

Filed Sept. 30, 1936 3 Sheets-Sheet 1

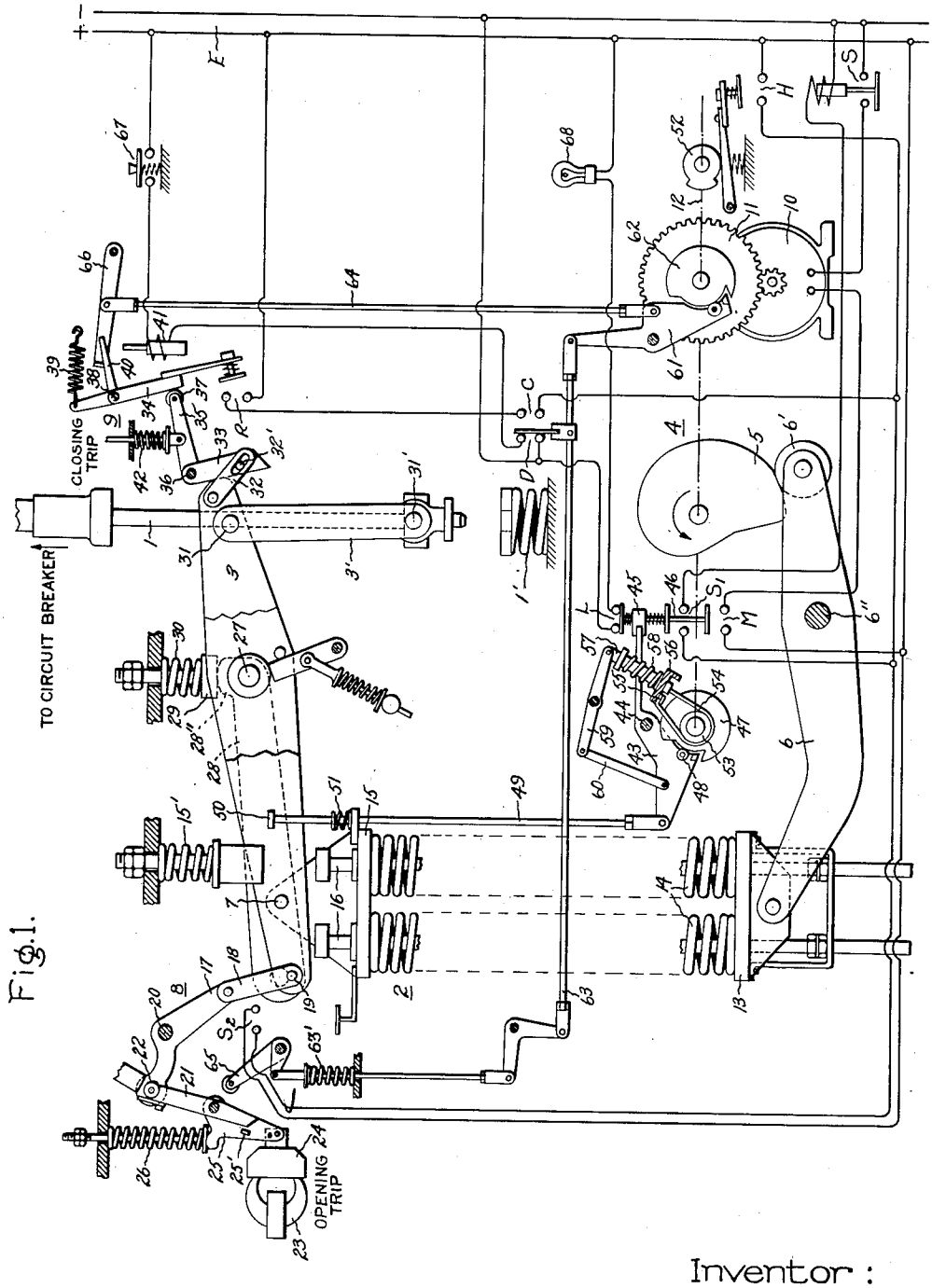


Fig. 1.

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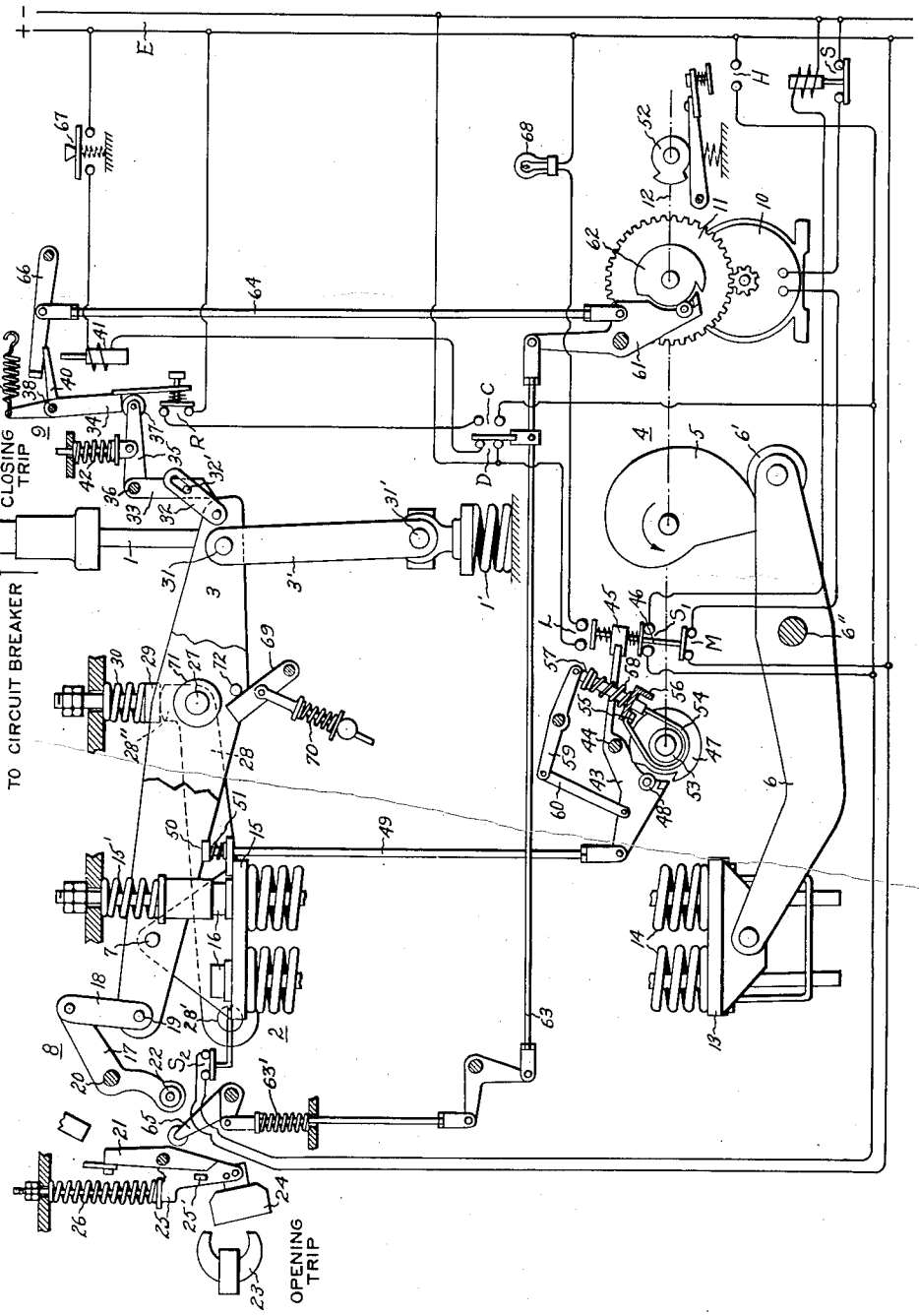


Fig. 2.

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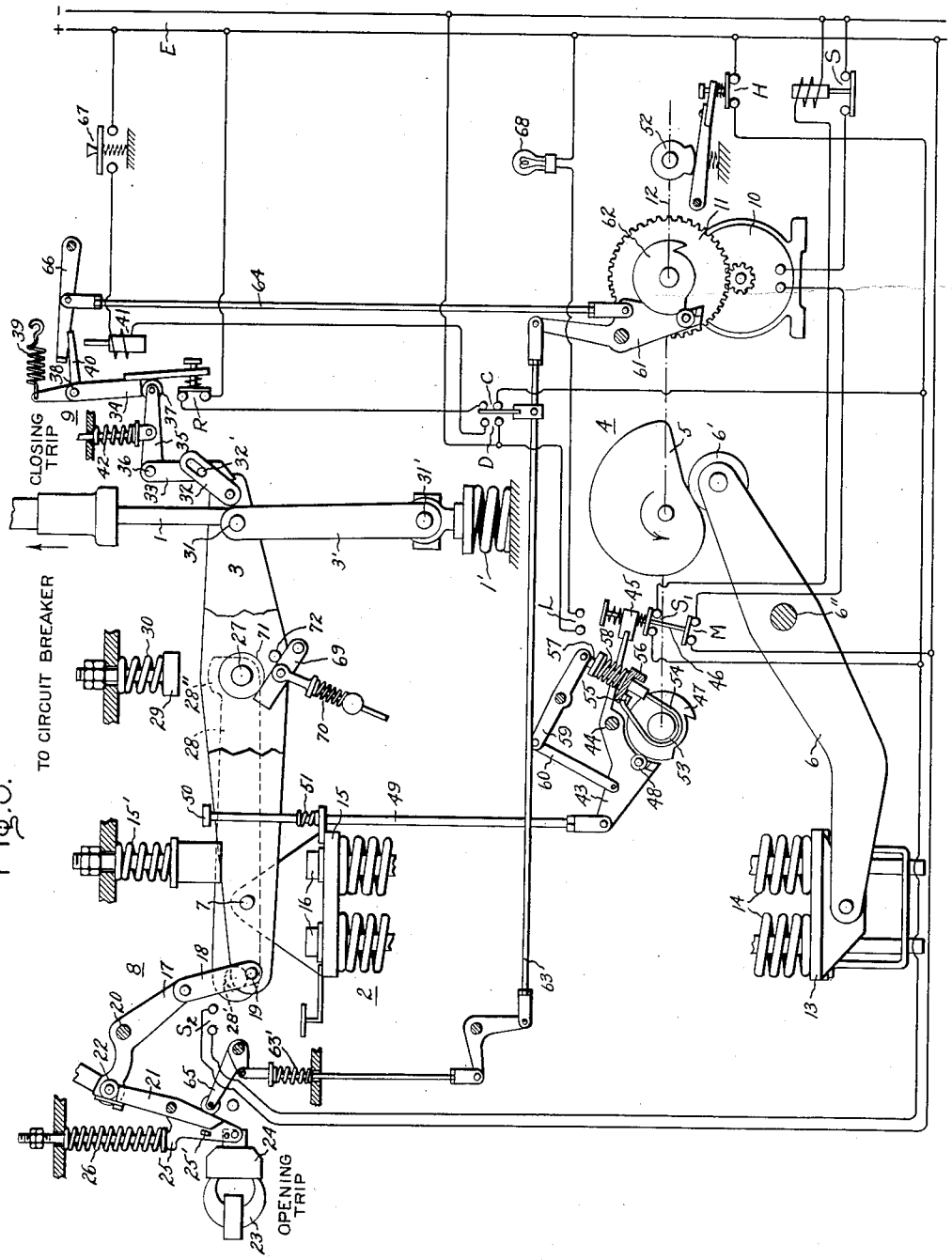


Fig. 3.

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UNITED STATES PATENT OFFICE

2,156,072

OPERATING MECHANISM

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Application September 30, 1936, Serial No. 103,317

14 Claims. (Cl. 175—375)

My invention relates to operating mechanisms, particularly to spring operating mechanisms, and has special application to reciprocally movable devices, such as contact structure of large oil circuit breakers, for example.

The design of operating mechanisms for large high voltage electric circuit breakers has been increasingly difficult due to the inertia of the movable contact structure and associated mechanism, and the requirements for higher operating speed. Where but several cycles are allowed for opening of a circuit, the operating mechanism must be exceedingly fast and powerful, and at the same time sensitive to the releasing force. Also where such large forces are involved, proper control of the release of these forces is essential, particularly in the case of charged heavy springs, in order to prevent damage to, or destruction of the mechanism.

The principal object of my invention is the provision of an improved operating mechanism of the aforesaid type, which is efficient and fast in operation, compact and rugged in construction, and which is operable only in predetermined sequence and under predetermined conditions for charging the spring structure and releasing the same.

My invention will be more fully set forth in the following description referring to the accompanying drawings, 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 drawings, Fig. 1 is an illustration, diagrammatic in part, of a spring operating mechanism for an electric circuit breaker in a partly released or closed circuit position, embodying this invention; Fig. 2 is a similar illustration showing the mechanism in the discharged or open circuit position prior to resetting thereof, and Fig. 3 illustrates the mechanism in the reset position prior to charging of the spring structure.

Referring more particularly to Fig. 1, the mechanism operates a reciprocally movable device, such as the movable contact structure of a high voltage electric circuit breaker, the operating rod of which is indicated at 1. As shown, the operating rod 1, which is reciprocally movable in a vertical direction, is in the closed circuit position, lowering of the operating rod against its spring buffer 1' causing opening of the circuit breaker.

The energy for actuating the operating rod 1 is derived from spring structure generally indicated at 2, and connected to the operating rod 1 through a floating lever 3 and a link 3'. The spring structure 2 is charged, that is, tensioned, by motor operated means generally indicated at 4, the said means including a cam 5 and a lever 6 arranged to coact with the lower part of the spring structure for compressing the same. The upper part of the spring structure, which is pivotally connected to the floating lever 3 at 7, is restrained during the spring charging operation by releasing devices generally indicated at 8 and 9 at opposite ends of the floating lever respectively.

The functioning of the mechanism in general, therefore, may be understood with the additional explanation that upon tripping of one of said releasing devices, namely device 9, a part of the stored energy in said spring structure is released to cause rotation of the floating lever in one direction about the other device to close the breaker, and tripping of the other releasing device, namely device 8, releases the remainder of the stored energy in the spring structure for rotating the floating lever in the opposite direction about a relatively fixed abutment to open the circuit breaker.

Referring now more particularly to the structure used in the present case for carrying out the functions above generally described, and for insuring operation of the mechanism in the proper sequence, and under predetermined conditions, the motor operated means 4 for charging the spring structure comprises an electric motor 10 suitably connected through speed reducing means, such as the gearing 11, to a main operating shaft diagrammatically indicated at 12, on which the spring charging cam 5 is mounted. The cam 5, which is driven in a counterclockwise direction as illustrated, coacts with a roller 6', carried at one end of the lever 6.

During the spring charging operation, cam 5 rotates the lever 6 about its pivot 6'' in clockwise direction, so as to raise the lower spring carriage 13 on which a set of heavy coil springs 14 are seated. The upper spring carriage 15, which is connected to the floating lever at 7 is provided with a set of spring guide rods 16, which are slidably mounted in both of the spring carriages. It will, therefore, be apparent that control of the spring carriages 13 and 15, between which the springs 14 are mounted, determines both the charging and release of the spring structure.

The releasing devices 8 and 9, which effect release of the spring carriage 15 in successive stages for closing and opening the circuit break-

er, comprise toggle mechanisms each coacting with electromagnetic tripping devices. Referring first to the releasing device 8, which may be termed the opening trip, and which is shown (Fig. 1) in the restrained position, the toggle linkage 17—18 is connected at 19 to the corresponding end of the lever 3. The toggle, which is provided with a fixed pivot at 20 coacts with a pivoted latch 21, which in turn engages when latched a roller 22 carried by an extension of the toggle link 17 for holding the toggle in the underset position shown.

Tripping of the latch 21 is effected by a high speed tripping magnet which forms no part of the present invention, and which comprises a permanent magnet 23, and a coacting movable armature 24, pivotally connected to and carried by a link 25. The link 25 is spring biased at 26 in a counterclockwise direction, tending to pull the armature 24 away from the magnet.

The tripping magnet, which is of the flux shifting type, is provided with electromagnetic means (not shown) for opposing the magnetic flux of the permanent magnet in case of a short circuit or overload in the circuit to be protected. Under bias of the spring 26, the armature 24 is thereupon quickly moved away from the magnet with the result that an extension 25' carried by the arm 25 strikes an overhanging portion of the link 21, rotating the link 21 in a counterclockwise direction. The toggle 17—18 is accordingly released with respect to its restraining position, and the carriage 15 under influence of the springs 14 is also released to move that end of the floating lever upward. This operation causes clockwise rotation of lever 3 and opening of the breaker as illustrated by Fig. 2.

For the purpose of guiding the floating lever 3, it is pivotally connected at a point 27 intermediate its ends, to a link 28, which is in turn pivotally mounted at 28' (Fig. 2). The link 28 is provided with an off-set portion at 28'' for engaging a relatively fixed abutment at 29. The abutment 29, which is resiliently mounted, such as by a spring 30, functions both as a buffer and a pivot for the floating lever. That is, in its function as a pivot or fulcrum, the floating lever during the spring releasing operation above described is rotated in clockwise direction about the abutment 29 so as to actuate through the link 3' the operating rod 1. The link 3' which is connected at 31 to the floating lever and at 31' to the operating rod 1 holds said rod in its lower open circuit position. The opening impact is dissipated by the spring buffer at 15' coacting with the spring carriage 15, and by the buffer at 1'.

It will be noted that during the opening operation the springs act on the operating rod through a lever having a mechanical advantage greater than unity. That is, the spring lever arm between pivot 7 and the fulcrum pivot 27 is greater than the lever arm between the fulcrum point 27 and the breaker application pivot 31. Accordingly, a considerable amount of power can be applied during the opening operation in the present case.

At this point in the cycle of operation, the motor operated mechanism is automatically energized, the springs and latches reset and the springs recharged by the cam for a subsequent closing and opening operation.

The releasing means at 9, tripping of which after the spring charging operation causes closing of the circuit breaker, also comprises a toggle 32—33, coacting with a pivoted latch 34. The toggle link 33 comprises one arm of a bell crank 35, pivotally mounted at 36 and provided with a roller 37 adapted to be engaged by the latch 34. The latch 34, which is pivotally mounted at 38 is spring biased at 39 in a clockwise or resetting direction, and is provided with an extension 40, which is adapted to cooperate with the plunger of a tripping solenoid 41. The bell crank 35 is also biased towards its reset position by a spring 42. In order to prevent doubling-up of the toggle 32, 33 when the corresponding end of the floating lever is raised in response to tripping so that the crank 35 is again latched by member 34, thereby locking the breaker in closed position, that end of the floating lever is plow shaped and engages the link 33 so as to hold it in the unlatched position shown by Fig. 1.

In this position shown, the releasing device 9 is in the collapsed or inoperative position which it assumes immediately after releasing of the latch 34, i. e. closing of the circuit breaker. The releasing device is reset in a manner presently described, simply by lowering of the corresponding end of the floating lever 3. This action stretches and opens the toggle 32—33 so that the spring 42, by reason of the pin and slot connection 32' at the toggle joint, rotates the bell crank 35 slightly in a clockwise direction, and the latch 34 under bias of its spring 39 slides over the roller 37, thereby locking the toggle as illustrated by Fig. 2.

The tripping operation resulting in closing of the breaker is initiated by actuation of solenoid 41 and consequent collapse of the holding toggle. The floating lever 3 is then rotated counterclockwise about the restrained pivot 19 by the springs acting at 7. In this case it will be noted that the mechanical advantage is comparatively small.

When the breaker is in this position it is also restrained independently of the springs by a pivoted prop 69 which is biased at 70, so as to ride under and engage a roller 71 secured to the lever 3. This prevents accidental reopening of the breaker due to rebound or other mechanical vibrations such as earthquakes, for example. When the breaker is tripped open, as shown by Fig. 2, a pin 72 on the lever 3 rocks the prop from beneath the roller.

The lower spring carriage 13 in the charged condition of the spring structure is maintained fixed through the lever 6, the roller 6' of which engages the high point of the cam 5. That is, the motor 10 is controlled so that the cam 5 is stopped upon completion of the spring charging operation, and is not moved from its high-point position until the spring structure is completely discharged.

To this end, the energizing circuit of the motor 10, which is connected to a suitable source of current indicated at E includes an electromagnetically or solenoid operated switch at S, and a mechanically operated switch at M. These switches are connected in series as illustrated, and when closed, the motor is energized from the source E. The mechanical control, therefore serves to back up the electrical control, such as for example, in the case of sticking of the solenoid switch contacts.

The mechanically controlled switch M is actuated by a lever 43 pivotally mounted at 44, the lever including an extension 45, on which is mounted a rod 46, serving as a multiple switch

carrier. As shown, the rod 46 is resiliently secured to the extension 45 and three switch elements for the switches indicated at M, S_1 and L respectively, are carried thereby. In the position shown (Fig. 2) the switches S_1 and M are closed, and L is open. When the lever 43 is rotated counterclockwise a slight extent, switches M and S_1 are opened, and L is closed.

Operation of the mechanically operated switches above described is partly controlled by the position of the operating cam 5, i. e., shaft 12. Secured to the shaft 12 is a second cam 47 termed a brake and interlock cam which is designed to coact with a roller 48, carried by the switch lever 43. When the roller engages the high face of the cam (Fig. 3) the lever 43 is held against counterclockwise rotation for sealing closed the switches M and S_1.

As illustrated by Figs. 1 and 2 it will be seen that the lever 43 can be actuated independently of the cam 47 under certain conditions to close switches M and S_1 through a link 49, loosely connected to the upper spring carriage 15. As shown, the link 49 is simply guided for limited vertical movement with respect to the spring carriage 15, and is provided with a head-portion 50 and buffer spring 51 for cooperating with the spring carriage, so that in response to complete discharge of the spring structure, the rod 49 is lifted a slight extent, and the switches M and S_1 closed (Fig. 2).

When the spring structure is completely discharged, and the circuit breaker is open as illustrated by Fig. 2, the motor 10 is automatically energized for restarting the cycle of operation through the switches S and M, above described, for resetting and recharging the spring structure, provided, however, certain conditions obtain in the mechanism. These conditions are that the releasing device at 9 be reset, and that the spring structure be discharged, and in the position illustrated by Fig. 2. In this position, a switch S_2, which is connected in series with the switch S_1 for energizing the solenoid winding of the motor switch S is closed by the upper spring carriage 15. Since the motor switch M is also closed through the lever and link arrangement 43—49, closure of the solenoid switch S serves to energize the motor 10, which drives the associated cams in counterclockwise direction.

This initial actuation of the cam 5 serves to reset the spring structure and the releasing device 8 by reason of the fact that the lever 6, under bias of the weight of the spring structure, rotates counterclockwise to engage the low point of the cam as illustrated by Fig. 3. The spring structure in so dropping to the reset position likewise causes lowering of the floating lever 3, with the result that the toggle 17—18 of the releasing device 8 is stretched so as to reset the latch 21. The releasing device 9 was reset as above described, immediately after opening of the breaker as shown by Fig. 2.

With the floating lever 3, and consequently, the upper spring carriage 15 restrained by the latching devices the spring structure is now reset and continued rotation of the cam 5 is effective to rock the lever 6 clockwise for compressing the springs 14. Rotation of the cam to complete the spring charging operation is, however, dependent on certain conditions obtaining in the mechanism through the agency of interlocked control switches.

It will be noted that dropping of the spring carriage 15 results in opening of the switch at S_2. In order now to maintain the solenoid winding at S energized during the initial operation of the motor, a holding switch at H is closed by a cam 52, secured to the shaft 12. This holding switch, which is closed prior to opening of the switch S_2 and is in shunt therewith, is held closed but a short time for a purpose presently disclosed.

In order further to check the conditions of the mechanism, a releasing latch switch R, which is closed only when the releasing device 9 is reset, and a sequence switch responsive to the spring charging condition at C are connected in series with each other, and in shunt with the holding switch H. Consequently, when the holding switch H is opened, the solenoid remains energized, provided the switches R and C are in the closed position.

If, however, due to some fault in the mechanism, the releasing device 9 does not reset, opening of the holding switch H would automatically deenergize the solenoid, since the switch C is not yet closed, and the motor 10 would stop. Also, if the sequence switch C were open, as illustrated, for example, by Figs. 1 and 2, the motor could not be operated.

Summarizing the control of the solenoid operated motor switch, which is initiated immediately upon complete discharge of the spring structure and opening of the breaker, the solenoid is first energized, and the motor switch S closed by means of the switches S_1 and S_2. The holding switch H then takes the place of switch S_2, which drops out. Finally, the series connected checking switches R and C take the place of the holding switch H, which also drops out. At the end of the spring charging operation, as determined by the position of the cam 47, the roller 48 of the lever 43 drops into the cam notch, causing not only opening of the switch S_1, for deenergizing the solenoid motor switch, but also opening of the mechanical motor switch M. This operation can be readily understood by referring first to Figure 3, and then to Figure 1.

In order that drifting of the cam 5 shall not occur upon deenergization of the motor, a brake device coacting with the lever 43 is adapted to engage a brake drum 53, connected to the shaft 12. As shown, the brake comprises a flexible brake band 54, secured at 55 to a fixed abutment 56, and at its other end to a reciprocally guided member 57, which is normally biased by a spring 58, so as to set the brake. The member 57 is connected to the lever 43 through a pivoted beam 59 and link 60.

Referring again to Figures 3 and 1 respectively, where the brake is shown in the released and set positions respectively, setting of the brake is effected when the roller 48 drops into the cam notch. Conversely, the brake is released through link 49 as shown by Fig. 2, when the spring structure is completely discharged so that the motor can start the recharging operation. Upon resetting of the spring structure and starting of the motor, the brake is held in the released position during the spring charging operation by the cam 47.

In order that the spring structure shall not be prematurely released by reason of accidental tripping of the releasing devices, there is provided a mechanical interlock between the motor operated means and the releasing devices. This comprises a lever 61 which coacts with a cam 62 secured to the shaft 12, and a pair of linkages indicated at 63 and 64 interconnecting the lever 61 and the tripping devices at 8 and 9 respec-

tively. Referring to Fig. 3, it will be noted that when the lever 61 is rocked clockwise by the cam 62 during the spring charging operation, the linkage 63, through a blocking member 65, holds the latch 21 in positive engagement with its toggle roller. Also, the linkage 64 by means of member 66 blocks release of the latch 34. When the spring charging operation is completed, the linkages 63 and 64 move quickly under bias of spring 63' to non-blocking positions as illustrated by Fig. 1.

The linkage 63 also actuates the sequence switch at C, which is closed by the cam 62 during the charging operation, and a switch D, which is closed by the spring 63' only after the charging operation. Switch D remains closed during the charged condition of the spring. It is opened as shown by Fig. 3 immediately after the spring resetting operation and controls energization of the tripping solenoid 41. Closing of the push button at 67, to close the breaker through the releasing device 9, is therefore not effective unless the switch D is closed, indicating that the spring-charging operation has been completed.

A signal lamp at 68 is lighted through the lamp switch L when the breaker is in the closed circuit position as illustrated by Fig. 1.

The mechanism is also trip-free in operation since it will be noted that the opening trip may release the floating lever at any point during the closing operation, thereby causing opening of the breaker.

Although the present mechanism as shown is intended for use in a circuit breaker system where the opening force required is considerably in excess of the closing force, it will be obvious that the mechanism can be readily adapted to the conventional system by changing the lengths of the lever arms of the floating lever 3.

Summarizing briefly the operation, the breaker which is normally closed is tripped open in response to overload, etc. by the releasing device at 8. The springs are now completely discharged and the motor operated cam is automatically started up, subject to the interlock controls above described, for resetting and recharging the springs. At the end of the recharging operation, the motor is automatically cut off and the interlocks opened for permitting closing under control of an operative and a subsequent automatic opening operation. The cycle is then repeated as above indicated.

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. Operating mechanism for a reciprocally movable device comprising energy storing means, a floating lever operatively interconnecting said means and said device, and releasable means restraining said lever at opposite ends thereof in an initial position of said mechanism with respect to the bias of said energy storing means, release of one of said restraining means causing rotation of said lever under influence of said bias about said other restraining means to actuate said device in one direction, and subsequent release of said other restraining means causing opposite rotation of said lever to actuate said device in the opposite direction.

2. Operating mechanism for a reciprocally movable device comprising a spring, a floating lever operatively interconnecting said spring and said device, a toggle at each end of said lever for restraining the same in an initial position of said mechanism with respect to the bias of said spring, and a relatively fixed abutment arranged to coact with said lever, tripping of one of said toggles causing rotation of said lever about said other toggle under said bias to actuate said device in one direction, and tripping of said other toggle causing rotation of said lever in the opposite direction about said abutment to actuate said device in the opposite direction.

3. Operating mechanism for a reciprocally movable device comprising a spring, a floating lever operatively interconnecting said spring and said device, a toggle coacting with electromagnetic tripping means at each end of said lever for restraining the same in an initial position of said mechanism with respect to the bias of said spring, and a relatively fixed abutment arranged intermediate said toggles for coacting with said lever, said spring being operatively connected to said lever at a point intermediate said abutment and one of said toggles so that tripping of one of said toggles causes rotation of said lever about said other toggle under said spring bias to actuate said device in one direction, and tripping of said other toggle causes rotation of said lever in the opposite direction about said abutment to actuate said device in the opposite direction.

4. Operating mechanism for an electric circuit breaker comprising a spring, a floating lever operatively interconnecting said spring and said circuit breaker, said lever being carried at a point intermediate its ends by a pivoted arm, a toggle at each end of said lever for restraining said lever in an initial position of said mechanism with respect to the bias of said spring, said spring being connected to said lever at a point intermediate said toggles, a relatively fixed abutment arranged to coact with said lever likewise at a point intermediate said toggles, tripping of one of said toggles causing rotation of said lever about said other toggle under bias of said spring to actuate said circuit breaker to the closed circuit position, and a prop movable to restrain said lever in said closed circuit position independently of said spring, tripping of said other toggle causing rotation of said lever in the opposite direction about said abutment to release said prop and actuate said circuit breaker to open circuit position.

5. Operating mechanism for an electric circuit breaker comprising spring structure adapted to store energy for opening and closing said circuit breaker, motor operated means for charging said spring structure, a lever mechanism interconnecting said spring structure and circuit breaker, tripping means for releasing said lever mechanism in successive stages for closing and opening said circuit breaker respectively, a brake operatively connected to said motor operated means, means operatively interconnecting said lever mechanism and said brake for releasing said brake in accordance with the opening operation of said tripping means, means initiating the operation of said motor operated means in accordance with said brake releasing operation, and means for applying said brake in accordance with complete charging of said spring structure.

6. Operating mechanism for an electric circuit breaker comprising spring structure adapted to store energy for actuating said circuit breaker, motor-operated means for charging said spring

structure, a brake operatively connected to said motor operated means, means operatively relating said brake and said spring structure so that said brake is released in response to discharge of said spring structure for permitting recharging thereof, and means operatively relating said motor-operated means and said brake so that said brake is held released during the spring charging operation, said last-named relating means also causing setting of said brake in accordance with completion of said spring charging operation.

7. Operating mechanism for an electric circuit breaker comprising spring structure adapted to store energy for opening and closing said circuit breaker, motor operated means for charging said spring structure, said spring structure including a movable carriage restrained during said charging operation, means interconnecting said carriage and circuit breaker, tripping means for releasing said carriage in successive stages for closing and opening said circuit breaker respectively, a brake operatively connected to said motor operated means, a lost motion connection between said carriage and said brake for releasing said brake in accordance with the breaker opening release of said carriage, means actuated through said lost motion connection for initiating the operation of said motor operated means in accordance with the brake releasing operation and means for applying said brake in accordance with predetermined charging of said spring structure.

8. Operating mechanism for an electric circuit breaker comprising spring structure adapted to store energy for opening and closing said circuit breaker, motor operated means for charging said spring structure, said spring structure including a movable carriage restrained during said charging operation, means operatively interconnecting said carriage and circuit breaker, tripping means for releasing said carriage in successive stages for closing and opening said circuit breaker respectively, a brake operatively connected to said motor operated means, a member interconnecting said carriage and brake and having limited free movement with respect to said carriage, a switch for controlling actuation of said motor operated means operatively connected to said member, and a cam operatively connected to said motor operated means coacting with said brake, said carriage in response to the breaker opening release thereof causing actuation of said member to release said brake and closing said switch, and said cam causing application of said brake in accordance with subsequent predetermined charging of said spring structure.

9. Operating mechanism for an electric circuit breaker comprising spring structure adapted to store energy releasable for closing and opening said circuit breaker respectively, an electric motor coacting with power transmitting structure for storing energy in said spring structure, and control means for opening the energizing circuit of said motor upon completion of the charging of said spring structure including two auxiliary switches, one switch being mechanically actuated in accordance with predetermined charging of said spring structure, the other switch having an operating solenoid, and a third switch for controlling said solenoid, also actuated in accordance with predetermined charging of said spring structure.

10. Operating mechanism for an electric circuit breaker comprising spring structure adapted to store energy releasable for closing and opening said circuit breaker respectively, an electric motor coacting with power transmitting structure for storing energy in said spring structure, and control means for the energization circuit of said motor comprising a switch operatively related to said motor to cause deenergization of said circuit in accordance with predetermined charging of said spring structure, said switch also having means operatively related to said spring structure to cause energization of said circuit in accordance with subsequent release of said spring structure.

11. Operating mechanism for an electric circuit breaker comprising spring structure adapted to store energy releasable for closing and opening said circuit breaker respectively, an electric motor coacting with power transmitting structure for storing energy in said spring structure, and control means for opening the energizing circuit of said motor upon completion of the charging of said spring structure including a solenoid operated switch and a mechanically operated switch, means for actuating said mechanically operated switch in accordance with predetermined charging of said spring structure, a switch for controlling said solenoid also actuated in accordance with predetermined charging of said spring structure, and means operatively connecting said spring structure and mechanically operated switch and the aforesaid controlling switch for causing energization of said motor circuit in accordance with complete release of said spring structure.

12. Operating mechanism for an electric circuit breaker comprising spring structure for storing energy, means for releasing said energy for effecting closing and opening of said circuit breaker respectively, an electric motor coacting with power transmitting structure for storing energy in said spring structure, interlocking control means for said motor including a solenoid operated motor switch, a switch for controlling initial energization of said solenoid actuated in accordance with complete discharge of said spring structure, means for opening said switch after initial operation of said motor and resetting of said spring structure, a switch operatively connected to said motor arranged to close prior to said opening of said spring controlled switch for maintaining said solenoid energized, a switch operatively connected to said releasing means adapted to be closed when said releasing means is reset, and means for opening said motor controlled switch prior to completion of said spring charging operation so that said solenoid is controlled by the condition of said releasing means switch.

13. Operating mechanism for an electric circuit breaker comprising spring structure for storing energy, means for releasing said energy for effecting closing and opening of said circuit breaker respectively, an electric motor coacting with power transmitting structure for storing energy in said spring structure, interlocking control means for the energizing circuit of said motor including a solenoid operated motor switch, and means for controlling energization of said solenoid during the spring charging operation comprising a switch actuated in accordance with predetermined charging of said spring structure, a switch in series therewith actuated in accordance with the released and reset positions of said spring structure respectively, closing of said switches causing initial operation of said motor, means operable upon said initial operation for causing resetting of said spring structure and

opening of said spring controlled switch, a switch operatively connected to said motor arranged momentarily to close for maintaining operation of said motor, a switch arranged to be closed in accordance with the reset position of said releasing means and means for connecting said last-named switch in shunt with said motor controlled switch prior to opening thereof so that said releasing means switch controls the continued energization of said motor.

14. Operating mechanism for an electric circuit breaker comprising spring structure for storing energy, means for releasing said energy for effecting closing and opening of said circuit breaker respectively, an electric motor coacting with power transmitting structure for storing energy in said spring structure, interlocking control means for insuring proper sequence of operation of said mechanism comprising a two-way switch, means operatively connecting said two-way switch to said motor so that said switch in one position thereof prevents actuation of said releasing means to close said circuit breaker when said motor is charging said spring structure, said switch in the other position thereof completing a control circuit for energizing said motor during the spring charging operation.

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