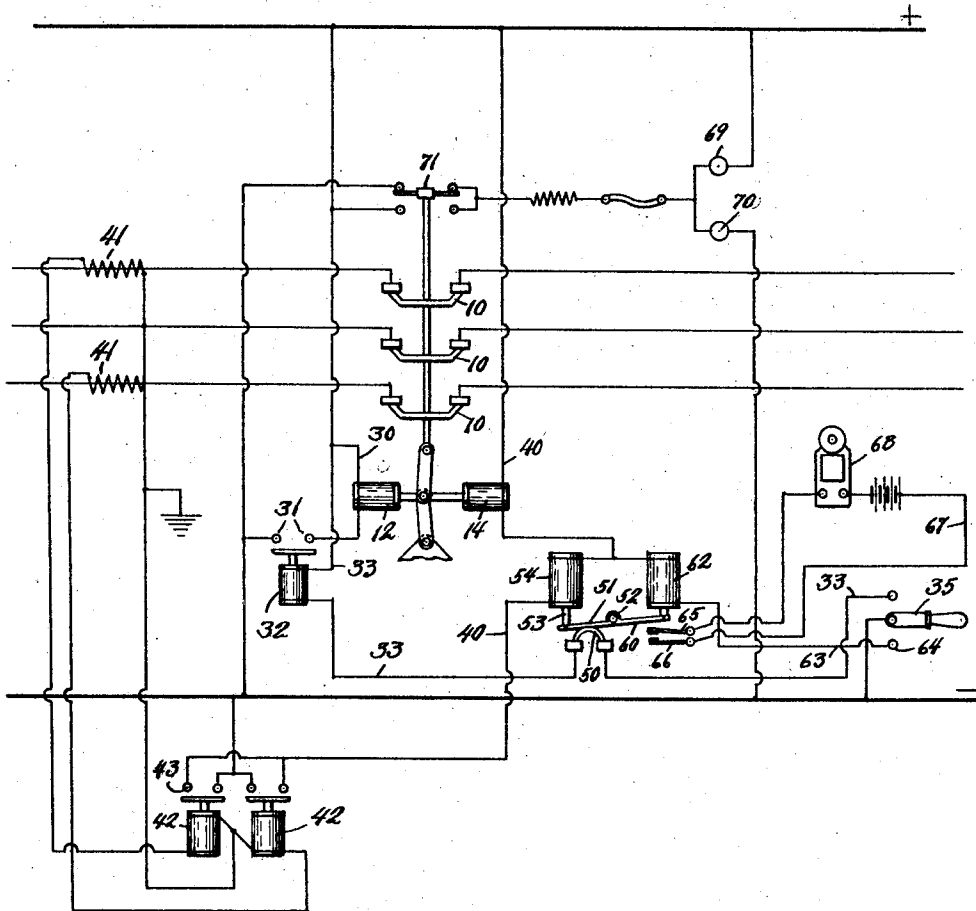


G. A. BURNHAM.
 LOCKOUT RELAY.
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1,391,241.

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LOCKOUT-RELAY.

1,391,241.

Specification of Letters Patent. Patented Sept. 20, 1921.

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To all whom it may concern:

Be it known that I, GEORGE A. BURNHAM, a citizen of the United States, residing at Saugus, in the county of Essex and State of Massachusetts, have invented an Improvement in Lockout-Relays, of which the following is a specification.

In view of the increase in the size of generators and transforming apparatus, the switches and circuit-breakers for controlling and distributing the loads have, of necessity, increased in size. In many cases this increase in size is so great that it is not practicable to mount the switches or circuit-breakers on or near the switch-board and bring the cables to the switches or circuit-breakers or to admit of their manual operation.

Furthermore, as this increase necessitates more space for the switches and circuit-breakers and more power for operating them a remote control system offers a possible solution. Such a system, generally speaking, includes a main switch or circuit-breaker for the generator or transformer circuit, an electromagnetic-device for closing the switch, an electromagnetic-device for opening the switch, a manually operable double-throw remote control-switch arranged at a distant place for controlling the electromagnetic-devices for closing and opening the switch manually, and automatic controlling-means adapted to cause the electromagnetic-device for opening the switch to respond to an abnormal rise in current value or short circuit or overload and here referred to generally as an overload, whereby the switch will be opened automatically.

It sometimes happens that, when the remote control switch is moved into switch-closing position to close the control-circuit and cause the closing of the main switch or circuit-breaker, there is an overload on the main circuit, and sometimes an overload occurs while the remote control-switch is being held in switch-closing position, and in either case, the main switch or circuit-breaker is caused to rapidly vibrate and disastrous results are liable to follow.

One of the objects of this invention is the provision of an overload-controlled circuit-controller for the control-circuit, adapted for operation upon the occurrence of an overload to open said control-circuit independently of the remote control-switch, and to hold said control-circuit open until said

circuit-controller has been reset, so that during such time the closing of the control-circuit by the remote control-switch will be ineffective, and consequently the main switch will not be closed.

In carrying out this feature of my invention, the control circuit including the control-switch, which is adapted for operation by the remote control-switch to operate the closing-means for the main switch, may have arranged in it a circuit-controller, such as a circuit-breaking element, adapted to be controlled automatically by an overload on the main circuit, and upon the occurrence of an overload will be operated to open said control-circuit independently of the remote control-switch, and to maintain said control-circuit open until said overload controlled circuit-controller has been reset, so that in case the remote control-switch is moved into or held in switch-closing position during such time, the control-circuit, being open or opened at another place, will not be operated to cause the operation of the switch-closing means, and the main switch will not be closed.

The overload-controlled means of the circuit-controller for the control-circuit includes a coil, and said coil is or may be associated with the overload-controlled switch-opening means, to operate concurrently therewith, so that upon the occurrence of an overload, the switch will be opened and the control-circuit for the switch-closing means will also be opened or otherwise rendered inoperative.

Another object of this invention is the provision of means for resetting said overload-controlled circuit-controller by means controlled by the remote control-switch.

In carrying out this feature of my invention, an electromagnetic resetting device is provided for the overload-controlled circuit-controller which is or may be arranged for operation by a circuit controlled by the remote-control-switch, when the latter is moved into switch-opening position. Said resetting-device includes a coil which, when energized, moves the circuit-controller into its closed circuit position, in opposition to its direction of motion by the overload-controlled means or actuating-coil.

Another object of my invention is to provide an alarm that will operate, upon the opening of the main switch because of overload conditions, to give warning of the con-

dition of the switch, said warning to endure during the continuance of the switch in the open position.

A further object of my invention is the arrangement of the alarm controlling means whereby the alarm will be automatically reset upon the resetting of the switch.

The means whereby I accomplish these objects of my invention is the provision of contacts controlled by the overload-controlled circuit-controller, which contacts are arranged to control an alarm circuit. The operation of the circuit-controller upon an overload to cause the opening of the main switch, operates to close the contacts governing the alarm circuit and thereby operates the alarm which may endure as long as the main switch is open. Upon the resetting of the main switch, through the resetting feature of the overload-controlled circuit-controller, the alarm circuit contacts are automatically broken to cause the cessation of the alarm.

The figure is a diagram illustrating an electrically-operated switch with overload-controlling-means and remote control-means for the switch embodying this invention.

Referring to the figure, 10 represents an electric switch or circuit-breaker of any usual or suitable construction having a closing coil 12, and an opening coil 14. As here shown for the purpose of illustration, the closing coil 12 is arranged in an operating circuit 30, connected with a source of energy, which operating circuit is normally open at 31. Said operating circuit is adapted to be closed by a relay 32, which is included in or controlled by a controlling-circuit 33, connected with a suitable source of energy, and extended to a remote point where a remote circuit-closer is provided. The remote circuit-closer, as here shown, consists of a double-throw switch having its actuator 35 normally biased to open circuit position, as represented in the drawing, and adapted, when moved in one direction, to connect said controlling-circuit with its source of energy, thereby to close said circuit and cause the relay 32 to operate and close the operating-circuit 30 of the closing coil, thereby to cause energization of said closing coil to close the switch in any usual or suitable manner, so far as my invention is concerned. The opening coil 14 is included in an operating-circuit 40, connected with a suitable source of energy.

Overload controlled-means are associated with the circuit adapted to be controlled by the switch which controls the operation of the operating-circuit 40 of the opening coil, for the purpose of automatically opening the switch in case of an overload on the circuit. The overload controlled-means may be of any usual or suitable construction, and as here shown, comprises current trans-

formers 41, associated, as usual, with the circuit controlled by the switch, and overload relays 42 arranged in said transformer circuit adapted to close the operating-circuit 40 at 43. Upon the occurrence of an overload, the overload relays become energized and the operating circuit 40 is closed and the opening coil 14 energized to cause the switch to open.

To prevent the closing of the switch upon an overload or to prevent the operator from holding or attempting to hold the switch in closed position upon an overload, a circuit-controller 50 is provided for the controlling-circuit 33 of the relay, which controls the operating circuit of the closing coil, and said circuit-controller is adapted to be controlled by the overload controlled-means. As here shown, the movable member of the circuit-controller 50 is connected with a lever 51 pivoted at 52, at a point intermediate its length and an armature or movable core-piece 53 of a solenoid 54, is connected with said lever at one end, so that upon energization of the solenoid and the consequent attractive movement of its core-piece, said movable member of the circuit-controller 50 will be lifted to open the controlling-circuit 33. By this means it will be seen that, upon the occurrence of an overload not only will the switch be opened automatically as by the usual tripping coil, but the controlling-circuit of the closing coil will be opened. The electrically-operated circuit-controller 50, when operated to open the controlling-circuit 33, will remain in open-circuit position until it has been positively reset, that is to say, it is herein so intended. For the purpose of resetting it, suitable resetting means are associated with it adapted for operation by remote means, as for instance, by the actuator of the double-throw remote circuit-closer.

As here shown, said resetting means consists of a solenoid core-piece 60 connected with the other end of said pivoted lever 51, having a solenoid winding 62, included in a circuit-controller resetting circuit 63, leading from the circuit of the opening coil to the other side of the double-throw circuit-closer at 64, so that when the actuator of said circuit-closer is moved to engage the contact at 64, the circuit of said circuit-controller resetting coil will be closed and its core-piece attracted, and the lever 51 moved on its pivot to move the movable member of the circuit-controller into closed circuit position, and thus close the controlling-circuit 33. In case an overload has occurred, the operator may throw the actuator of the double-throw circuit-closer onto 64, and thus reset the overload-controlled circuit-closer, and cause the controlling-circuit 33 to be closed, and then he may throw the actuator of said circuit-

closer in the other direction and close the controlling-circuit 33, and thus cause the closing coil of the switch to close said switch, whereupon the parts will be re-stored to normal.

A pair of contacts 65 and 66 disposed in proximity to the lever 51 of the circuit-controller 50 are arranged to be closed by a movement of said lever into the main switch opening position. Said contacts are connected to an alarm circuit 67 including the alarm 68, in this instance shown as a bell.

As lever 51 of the circuit controller is arranged to remain in the circuit closing condition of the alarm circuit contacts 65 and 66 while the main switch is in open position and until the remote circuit closer has been properly operated to close the switch. It is seen that the alarm will continuously operate during the period that the switch is in open position caused by the operation of the overload-responsive means. It may also be seen that the alarm will not be operated upon the opening of the main switch by the operation of the remote control-switch.

When remote control switch 35 is operated to close the main switch the circuit-controller is operated by its resetting coil 60 to move lever 51 to its initial position and thereby serves to break the alarm circuit and to cause the discontinuance of the alarm.

Means for providing a visible indication of the open or closed position of the switch are provided in the two electric lights 69 and 70. Both lights are connected in series across the source of energy, and the resistance of said lights is such that the normal current flow through them is insufficient to cause them to be effectively illuminated. One or the other of said lights is adapted to be short-circuited by a switch 71 actuated through a movement of said main switch to open or closed position, and thereby to illuminate to full power the un-short-circuited light, and serve to indicate the open or closed condition of the switch.

I claim:—

1. The combination of an electrically operated switch having a closing coil and an opening coil, means to cause operation of said closing coil including a controlling circuit, a circuit-controller for said controlling circuit having an overload-controlled coil and a resetting coil, means controlled by an overload on the circuit controlled by the switch for causing operation of said overload-controlled coil to open said controlling circuit and of said opening coil to open the switch, and a remote circuit-closer having two controlling positions movable into one position to control the controlling circuit and movable into the other position to cause operation of said resetting coil to reset the

circuit-controller and close the controlling circuit.

2. The combination of an electrically operated switch having a closing coil, means to cause operation of said closing coil to close the switch including a controlling circuit, a circuit controller for said controlling circuit comprising a controlling circuit control-member, an overload-controlled coil operable to move said control-member to open the controlling circuit, and a resetting coil operable to move said control-member in the opposite direction to close said controlling circuit, and a remote circuit-closer movable into one position to control the controlling circuit and movable into another position to control the resetting coil of said circuit controller.

3. In combination with an electrically operated switch having a closing coil and an opening coil, controlling circuits for said coils, a remote circuit-closer having two control positions movable into one position to cause operation of the opening coil to open the switch and movable into the other position to cause operation of the closing coil to close the switch, an alarm, means controlled by an overload in the circuit controlled by the switch to operate said opening coil to open the switch and to operate said alarm, and means controlled by said remote circuit closer to discontinue the operation of said alarm.

4. In combination with an electrically operated switch having an opening coil, an alarm, means controlled by an overload in the circuit controlled by the switch for operating the opening coil to open the switch and also to operate said alarm, a remote control device operable to control said opening coil, and means governed by said remote control-device for operating said opening coil to open the switch independent of the operation of said alarm.

5. The combination of an electric switch, means for automatically opening the switch upon overloads and also for opening and closing the switch manually from a remote point including a manually operable circuit-closer movable into one circuit-closing position to control the opening of the switch, and movable into another circuit-closing position to control the closing of the switch arranged to constrain the operator to move the circuit-closer first to switch-opening position and then to switch-closing position to close the switch after it has been automatically opened.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

GEORGE A. BURNHAM.

Witnesses:

H. B. DAVIS,

T. T. GREENWOOD.