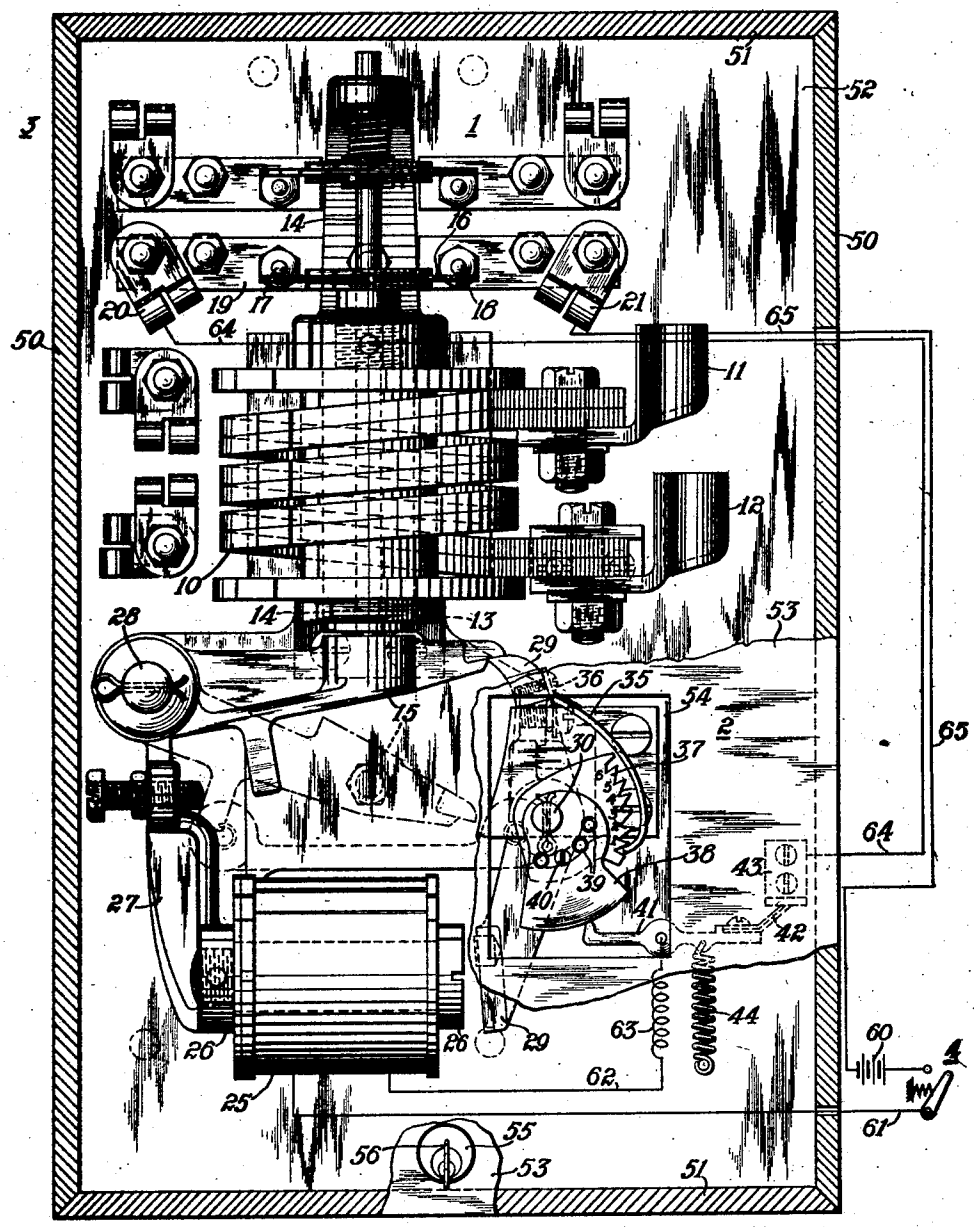
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CONTROL APPARATUS

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CONTROL APPARATUS.

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My invention relates to control apparatus and it has special relation to overload trip devices for protecting electric railway motors or the like from excessive current.

One object of my invention is to provide an attachment to overload trips or relay devices of the prior art, whereby the number of times that the relay device may be reset may be predetermined, either to indicate such movements or to limit the number of resettings and prevent further operation.

More specifically stated, it is the object of my invention to provide a pawl-and-ratchet device that is associated with the resetting lever of an overload trip, whereby a predetermined movement of the ratchet is effected upon each resetting operation, and such movement may be utilized to eventually effect interruption of the resetting circuit.

It is often of value to the maintenance department of an electric railway company to be appraised of the number of times that a circuit-breaker or overload trip is opened, that is, of the number of occurrences of excessive current conditions in the driving motors. If an unduly large number of operations and consequent resettings of the overload trip occurs in a given time, it follows that either a motor is defective by reason of a grounded circuit, for example, or the overload trip is defective in the way of calibration, for example, or else the motorman is particularly careless or ignorant in his operation of the vehicle. In any event, it is worth while to be provided with a reliable indicator of the number of overload operations; and it may be desirable to automatically prevent further operation of the vehicle after a certain number of such overload occurrences, in order that the driving motors and other apparatus may be thoroughly inspected before the car is again put into service.

It is the purpose of my invention, therefore, to provide a reliable device of the above-indicated character for rendering the desired information readily available to the maintenance-department officials.

My invention may best be understood by reference to the accompanying drawing, wherein the single figure is a view, in front elevation, of a control apparatus organized in accordance with my present invention, the necessary controlling circuits being indicated diagrammatically for the sake of simplicity and clearness.

Referring to the drawing, the structure here shown comprises an overload trip or excess-current relay device 1 of a familiar general form, my indicating or limiting attachment 2, an encasing member or box 3 which is provided with a lock and with a window, as subsequently set forth in detail, and a manual resetting switch 4.

The overload trip 1 comprises essentially an actuating coil 10, preferably of heavy strap conductor, which is connected in the main motor circuit (not shown) by means of a plurality of suitable terminals or sockets 11 and 12, in accordance with a familiar practice. In this way, the main motor current at all times traverses the actuating coil 10.

A stationary core member 13 extends through the middle of the coil 10 and, in turn, loosely surrounds a plunger pin or rod 14 which is adapted to be struck under overload conditions by a swinging armature 15. The armature 15 is shown in solid lines in its upper position corresponding to such overload operation, but normally occupies the lower position that it indicated in dotted lines.

The upper end of the pin or rod 14 is adapted to carry one or more contact disks 16 which are suitably insulated from the rod 14 and the lower one of which is adapted to bridge a pair of stationary bolts or fingers 17 and 18 in the illustrated upper or overload position of the relay device. The inner ends of the bolts or fingers 17 and 18 are suitably secured to contact bars or strips 19, to the opposite ends of which are fastened a plurality of contact clips or terminals 20 and 21, for a purpose to be set forth.

A resetting coil 25 is located below the normal position of the swinging armature 15 and is wound around a suitable stationary core member 26 which, in turn, is secured to a bracket or supporting arm 27. The swinging armature 15 is pivotally mounted upon the bracket 27, as indicated by the reference character 28, and the bracket is suitably attached to the encasing member or box 3, as will be understood.

In the illustrated overload or operated position of the relay device, the swinging ar-

mature 15 is initially attracted by the magnetism caused by the excessive current in the actuating coil 10 to the upper position that is illustrated in solid lines, wherein the plunger pin 14 is struck and actuated to its illustrated upper position. Although the motor circuit is opened by this action, in accordance with a familiar practice, to consequently effect deenergization of the coil 10, the swinging armature 15 nevertheless remains in its upper position by reason of the automatic action of a resetting lever or latch 29, which is pivotally mounted at an intermediate point on a pin 30. The upper end of this latch engages the right-hand or free end of the armature 15, as illustrated. The lower end of the lever 29 is located opposite the core member 26 of the resetting device. Upon energization of the resetting coil 25, the lever 29 is attracted into contact with the core member 26 to effect disengagement of the lever 29 from the armature 15, which is thereupon actuated by gravity to its normal position, indicated in dotted lines.

Referring to my indicating and limiting device 2, the device comprises a pawl or spring finger 35, the upper end of which is attached by a screw 36 near the upper end of the resetting lever 29, while the lower or operating end engages a notch in a ratchet member 37, which is pivotally mounted upon the pivotal pin 30 for the resetting lever 29. A cam member or sector 38 is provided with a plurality of holes or apertures 39, whereby the cam member may be rigidly attached in the desired location to the ratchet member 37 by means of a screw 40, or the like.

A lever member 41 is pivotally mounted intermediate its ends, one of which bears against the lower surface of the sector or cam member 38 and to the other end of which a contact finger or brush 42 is secured to make contact with a stationary bracket or terminal 43, for a purpose to be set forth. A helical spring 44 has one end attached to the encasing box 3, the other end being hooked to the lever 41 at a point between the pivotal mounting-point thereof and the contact finger 42. In this way, the lever 41 is biased to engagement with the cam member 38.

The operation of my indicating and limiting device 2 may be set forth as follows. Each time that the resetting lever 29 is attracted toward the core member 26 for the resetting coil 25, by reason of the energization of that coil by the motorman, the pawl or spring finger 35 carries the loosely-mounted ratchet member 37 downwardly a distance corresponding to one notch. As soon as the resetting coil is de-energized, the ratchet remains in the new position, while the pawl member 35 returns to the illustrated or normal position, and, in this case, therefore, engages the next notch in the ratchet 37.

In this way, each resetting operation of the overload trip after an operation thereof causes the ratchet 37 and the cam member 38, which is rigidly attached thereto, to move in a clockwise direction by an amount corresponding to the distance between notches. Consequently, by properly positioning or initially setting the cam member 38 with respect to the ratchet 37, the number of times that the overload trip may be reset, that is, the number of notches of the ratchet 37 that may be engaged by the pawl 35 before the right-hand edge of the cam member 38 passes beyond the lever 41, is predetermined.

For example, if it is desired to limit the possible number of resettings of the overload trip to five, the cam member 38 is attached by the screw 40 to the corresponding position upon the ratchet 37. In this way, after five resettings have been made, the lever 41 is no longer in engagement with the cam member 38 but is actuated by the spring 44 in a clockwise direction to interrupt the contact between the finger 42 and the terminal 43. However, if desired, instead of limiting the number of resettings that may be made, dependent upon the initial relative position of the cam member 38 and the ratchet 37, such number of resettings may be merely indicated. This result may be obtained by so positioning the cam member 38 upon the ratchet 37 that the final notch in the ratchet may be reached by the pawl member 35 without effecting the disengagement of the cam member 38 from the lever 41. By counting the notches traversed by the pawl member, reference being had to the accompanying figures, the number of resettings that have occurred since the last inspection of the apparatus may be immediately determined.

For the purpose of rendering the apparatus available for ready inspection and, at the same time, free from unauthorized tampering, the encasing member or box 3 is constructed as follows. The apparatus is enclosed on all sides, the box comprising two side walls 50, a top and bottom wall 51, a rear wall 52 and a front cover member 53 which is hinged or otherwise suitably fastened to the remainder of the box. Opposite my indicating and limiting device 2, permitting a clear view of the ratchet member 37, is a glass window 54 that is suitably set into the front cover member 53. Furthermore, at some suitable location, a lock 55 is provided for the front cover member, and the key 56 is carried only by an authorized inspector.

In this way, the indicating and limiting device 2 may be readily inspected at any time, but, after a certain number of overload operations, which has caused the above-men-

tioned interruption of the resetting coil circuit, the overload trip cannot be again rendered operative to permit movement of the vehicle except by opening the door or cover 53 by means of the key 56 in the hands of an authorized person. Consequently, the reason for the unduly large number of overload operations within a given time may be discovered by the maintenance department, before any serious injury to the equipment occurs, as previously pointed out.

The resetting circuit is of a simple type and needs only a brief description. After an overload operation of the relay device, the motorman closes the switch 4 to establish a circuit from one terminal of a battery 60, or other source of supply, through the switch 4, conductor 61, resetting coil 25, conductor 62, conductor 63, which is made flexible to allow movement of the swinging lever 41, circuit being continued through the lever 41, contact finger 42, terminal 43, conductor 64, contact clip 20, contact bar 19, stationary contact fingers or bolts 17 and 18, which are bridged by the contact disk 16 in the illustrated upper overload condition, contact clip 21 and conductor 65 to the opposite battery terminal. After such action of the switch 4, the switch is released, and, being preferably of the push-button type, as illustrated, is automatically returned to its illustrated position in readiness for the next movement.

I do not wish to be restricted to the specific structural details, circuit connections or arrangement of parts herein set forth, as various modifications thereof may be effected within the spirit and scope of my invention. I desire, therefore, that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. The combination with a relay, of means for locking the relay to prevent operation and means manually operable to release the relay, and means for limiting the number of operations of the relay to any predetermined number.

2. The combination with a relay and means for locking the relay in operated position, of manually operable means for actuating the locking means to release the relay and adjustable means for limiting the number of times said relay may be released, thereby to limit the number of operations of the relay.

3. The combination with a relay, of means for limiting the number of operations of the relay, said means being adapted to lock the relay after each operation, means adapted for manual operation only to effect the release of the relay and adjustable means for limiting the number of operations of said releasing means, thereby to limit the number of operations of the relay.

4. The combination with a relay device and means for latching said device in operated position, of electrical means for withdrawing said latching means to reset said device, and means dependent upon the completion of a certain number of resettings for permanently interrupting the circuit of said electrical means.

5. The combination with a relay device and means for latching said device in operated position, of electrical means for withdrawing said latching means to reset said device, means rendered active after a given number of relay operations for permanently interrupting the circuit of said electrical means, and means for preselecting said number.

6. The combination with a relay device and means for latching said device in operated position, of electrical means for withdrawing said latching means to reset said device, a ratchet and a pawl respectively loosely and rigidly mounted on said latching means, and means dependent upon said ratchet for permanently interrupting the circuit of said electrical means after a predetermined number of relay operations.

7. The combination with a relay device and means for latching said device in operated position, of electrical means for withdrawing said latching means to reset said device, a ratchet and a pawl respectively loosely and rigidly mounted on said latching means, a cam member secured to said ratchet, and a switching member for governing said electric means biased to the open position in opposition to the action of said cam member.

8. The combination with a relay device and means for latching said device in operated position, of electrical means for withdrawing said latching means to reset said device, a ratchet and a pawl respectively loosely and rigidly mounted on said latching means, a cam member secured to said ratchet, a switching member for governing said electric means biased to the open position in opposition to the action of said cam member, and means for adjusting the relative positions of said ratchet and said cam member.

9. The combination with a relay device and means for latching said device in operated position, of electrical means for withdrawing said latching means to reset said device, means for energizing said electrical means only when the relay device occupies said operated position, and means dependent upon the completion of a certain number of resettings for permanently interrupting the circuit of said electrical means.

10. The combination with a relay device and means for latching said device in operated position, of electrical means for withdrawing said latching means to reset said device, a contact disk for energizing said electrical means only when the relay device

occupies said operated position, a ratchet and a pawl respectively loosely and rigidly mounted on said latching means, and means dependent upon said ratchet for permanently interrupting the circuit of said electrical means after a predetermined number of relay operations.

11. The combination with a relay device and means for latching said device in operated position, of electrical means for withdrawing said latching means to reset said device, a ratchet and a pawl respectively loosely and rigidly mounted on said latching means, a cam member secured to said ratchet, a switching member for governing said electric means biased to the open position in opposition to the action of said cam member, and a contact disk for energizing said electrical means in conjunction with said switching member only when the relay device occupies said operated position.

In testimony whereof, I have hereunto subscribed my name this 23rd day of June, 1920.

KARL A. SIMMON.