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RAILWAY TRAFFIC CONTROLLING APPARATUS

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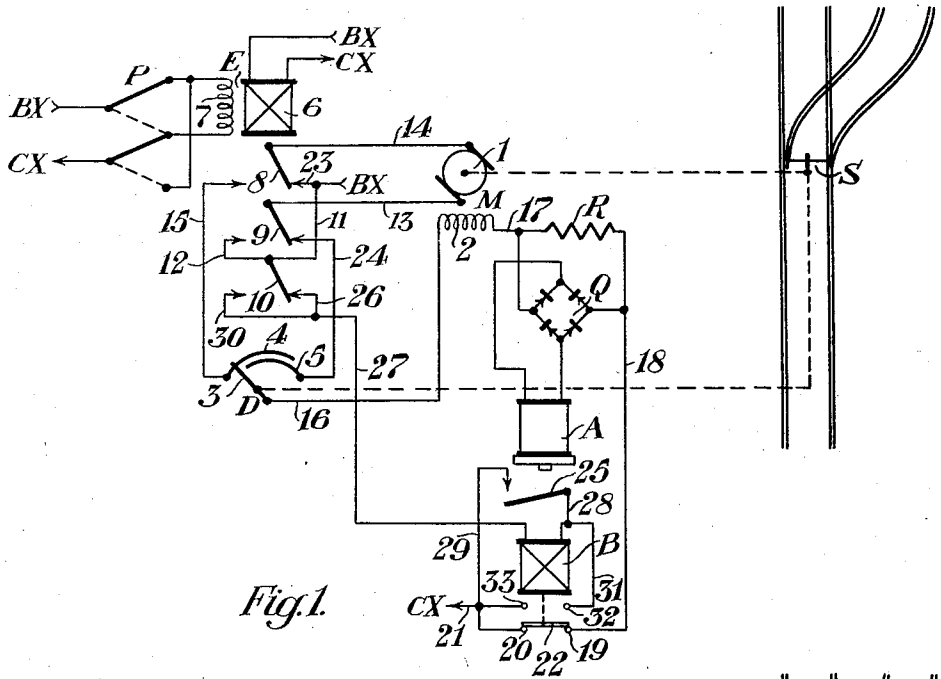


Fig. 1.

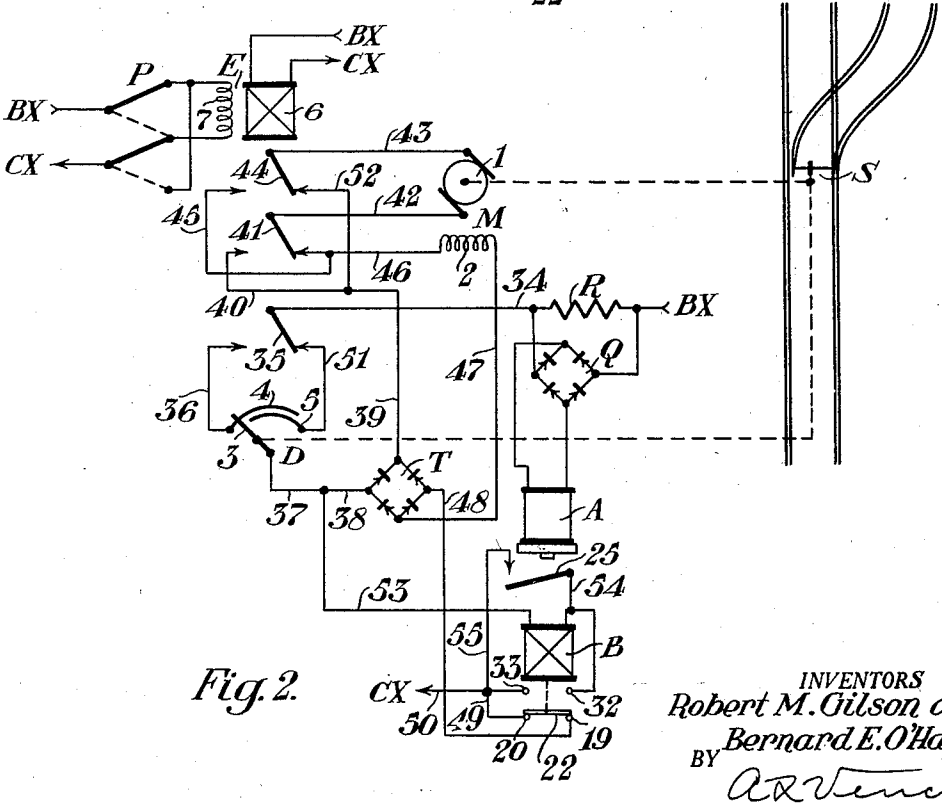


Fig. 2.

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RAILWAY TRAFFIC CONTROLLING APPARATUS

Application filed June 9, 1932. Serial No. 616,184.

Our invention relates to railway traffic controlling apparatus, and particularly to apparatus for the protection of a railway switch motor against overload.

We will describe two forms of apparatus embodying our invention, and will then point out the novel features thereof in claims.

Fig. 1 of the accompanying drawing is a diagrammatic view showing one form of apparatus embodying our invention. Fig. 2 is a modification of the apparatus shown in Fig. 1, and also embodying our invention.

Similar reference characters refer to similar parts in each of the two figures.

Referring to Fig. 1 of the drawing, the reference character S designates a railway switch which is actuated by an electric motor M having an armature 1 and a field 2. Operatively connected with the switch is a cut-out controller D comprising a contact arm 3 and contacts 4 and 5. Contact 3—4 is closed at all times except when the switch occupies its extreme reverse position, and contact 3—5 is closed at all times except when the switch occupies its extreme normal position.

The motor M is controlled by a two-element alternating current relay E having a constantly energized local winding 6, and a control winding 7 which is energized with current of one or the other instantaneous polarity according as the pole-changer P occupies one or the other position. Reversing pole-changer P reverses the instantaneous polarity of the current supplied to control winding 7 and causes polar contacts 8, 9 and 10 of relay E to reverse. The pole-changer P may be incorporated in a switch lever of an interlocking machine.

The reference character R designates a resistor constructed of material having a relatively high positive temperature coefficient of resistance, such as nickel or iron for example. Connected across the resistor R is a full-wave rectifier Q, which supplies energy to a slow-acting direct current relay A. The pick-up time interval of relay A is made sufficiently long so that relay A will not close its front contact 25 upon momentary surges of motor current such as occur at starting. The reason for making resistor R of positive temperature coefficient material is to provide an inverse time element in the operation of relay A as an aid in preventing the pickup of this relay on surges of current which are high in value but of relatively short duration, such as starting and reversal surges, as well as to provide a wider margin of operation of relay A when used with motors in which the overload current may vary over an appreciably wide range.

The reference character B designates an alternating current relay having a pick-up circuit controlled by contact 25 of relay A and capable of interrupting the motor circuit at back contact 19—20. A holding circuit for relay B becomes closed over front contact 32—33, and remains closed thereafter until relay E is pole-changed. The release period of relay B is so adjusted that this relay will release during the open circuit interval which occurs when contact 10 of relay E is being reversed.

As shown in the drawing, the switch S occupies its normal position and controller D as well as pole-changer P also occupy the normal position, relays A and B being deenergized.

When the switch is to be moved to the reverse position, the operator will reverse pole-changer P, thereby reversing contacts 8, 9 and 10 of relay E. The circuit for motor M can now be traced from one terminal BX of a source, wires 11 and 12, contact 9 of relay E, wire 13, armature 1 of motor M, wire 14, contact 8 of relay E, wire 15, contact 3—4 of controller D, wire 16, field winding 2 of motor M, wire 17, resistor R, wire 18, back contact 19—20 of relay B, and wire 21, to the other terminal CX of the source. Motor M will now move switch S to the reverse position.

When the switch is to be restored to the normal position from the reverse, pole-changer P and therefore contacts 8, 9 and 10 of relay E will be restored to the position shown in the drawing. The circuit for motor M will now extend from one terminal BX, wire 23, contact 8 of relay E, wire 14, armature 1 of motor M, wire 13, contact 9 of relay E, wire 24, contact 3—5 of controller D,

wire 16, field winding 2 of motor M, wire 17, resistor R, wire 18, back contact 19—20 of relay B, and wire 21 to terminal CX.

Should the movement of switch S become obstructed, the motor current will rise, heating resistor R and thereby increasing the potential applied to relay A, causing front contact 25 of this relay to become closed. Assuming that the overload occurs when the switch is being moved to the reverse position, the pick-up circuit for relay B may be traced from one treminal BX, wire 11, contact 10 of relay E, wires 30 and 27, winding of relay B, wire 28, front contact 25 of relay A, and wires 29 and 21 to terminal CX. Relay B will now pick up, interrupting the motor circuit at back contact 19—20 and closing its own holding circuit at front contact 32—33. Relay B will continue to remain energized, keeping the motor circuit open, until pole-changer P is reversed to reverse contact 10 of relay E. Since contact 10 is included in the holding circuit for relay B, this operation will deenergize relay B, causing the motor circuit to become re-closed preparatory to the subsequent reversal of the switch.

The cooling time of resistor R is made sufficiently short to permit quick release of relay A so that a reversal of switch S may be made immediately following the occurrence of an overload. It will be apparent that relay A could be replaced by a slow pick-up alternating current relay, thus eliminating rectifier Q. It will also be apparent that the apparatus of Fig. 1 can be applied to the control of a direct current motor by substituting direct current apparatus for relays E and B, and eliminating rectifier Q.

Referring now to Fig. 2, the apparatus shown therein is similar to that disclosed in Fig. 1 with the exception that the switch S is controlled by a direct current motor, supplied with energy from a rectifier T.

Assuming that pole-changer P of Fig. 2 is reversed, motor M will operate switch S to the reverse position over a circuit which extends from one terminal BX, resistor R, wire 34, contact 35 of relay E, wire 36, contact 3—4 of controller D, wires 37 and 38, rectifier T, wires 39 and 40, contact 41 of relay E, wire 42, armature 1 of motor M, wire 43, contact 44 of relay E, wires 45 and 46, field winding 2 of motor M, wire 47, rectifier T, wire 48, back contact 19—20 of relay B, and wires 49 and 50 to terminal CX.

To restore switch S to the normal position, pole-changer P will be restored to the position illustrated, whereupon a reverse operating circuit for motor M will become closed. This circuit may be traced from one terminal BX, resistor R, wire 34, contact 35 of relay E, wire 51, contact 3—5 of controller D, wires 37 and 38, rectifier T, wires 39 and 52, contact 44 of relay E, wire 43, armature 1 of motor M, wire 42, contact 41 of relay E, wire 46, field winding 2 of motor M, wire 47, rectifier T, wire 48, back contact 19—20 of relay B, and wires 49 and 50 to terminal CX.

The manner in which the apparatus of Fig. 2 operates when an overload occurs on motor M is identical with that described in connection with Fig. 1, so that no additional explanation of this function is required. It will be noted in connection with Fig. 2 that back contact 19—20 of relay B interrupts not only the motor circuit but also the supply of current to rectifier T, so that energy is not wasted following a sustained overload on motor M.

Although we have herein shown and described only two forms of apparatus embodying our invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of our invention.

Having thus described our invention, what we claim is:

1. In combination, an electric motor, a circuit for operating said motor, a manually controlled device for supplying current to said circuit, a resistor having a positive temperature coefficient included in said motor circuit, a first relay responsive to the potential across said resistor in such manner that said first relay becomes energized when the current carried by said resistor exceeds a predetermined value, a second relay, means controlled by said first relay for energizing said second relay when said first relay is energized, means controlled by said second relay for interrupting said motor circuit when said second relay is energized, a holding circuit for said second relay, and means controlled by said device for at times rendering said holding circuit ineffective.

2. In combination, an electric motor, a circuit for operating said motor, a manually controlled device for supplying current to said circuit, a resistor having a positive temperature coefficient included in said motor circuit, a slow-acting relay connected across said resistor which relay becomes picked up when the current carried by said resistor exceeds a predetermined value, a second relay, means controlled by said slow-acting relay for energizing said second relay when said slow-acting relay is picked up, means controlled by said second relay for interrupting said motor circuit when said second relay is energized, and a holding circuit for said second relay governed by said manually controlled device.

3. In combination, an electric motor, a circuit for operating said motor, a manually controlled pole-changer for reversibly supplying current to said motor circuit, a resistor having a positive temperature coefficient included in said motor circuit, a cir-

cuit breaker for said motor, means responsive to the potential across said resistor when the current carried thereby exceeds a predetermined value for closing an energizing circuit for said circuit breaker, a holding circuit for said circuit breaker effective when said circuit breaker has become energized, means controlled by said circuit breaker for interrupting said motor circuit when said circuit breaker becomes energized, and means controlled by said pole-changer effective during a reversal of said pole-changer for interrupting said holding circuit.

4. In combination, an electric motor, a circuit for operating said motor, a manually controlled pole-changer having a normal and a reverse position for reversibly supplying current to said motor circuit, a resistor having a positive temperature coefficient included in said motor circuit, a first relay connected across said resistor which becomes picked up when the current carried by said resistor exceeds a predetermined value, a second relay having a release time interval sufficiently short to permit release during a reversal of said pole-changer, a pick-up circuit for said second relay effective when said first relay is picked up, means controlled by said second relay for rendering said motor circuit ineffective when said second relay is picked up, a holding circuit for said second relay effective when said second relay is picked up and said pole-changer occupies said normal or said reverse position, and means controlled by said pole-changer effective for interrupting said holding circuit while said pole-changer is being reversed.

5. In combination, a reversible direct current motor, an alternating current source of supply, a rectifier connected between said motor and said source, a resistor having a positive temperature coefficient connected between said rectifier and said source, a manually controlled pole-changer for reversing the direction of current flow to said motor, a first relay connected across said resistor which becomes picked up when the current carried by said resistor exceeds a predetermined value, a second relay having a pick-up circuit which becomes closed when said first relay is picked up, a holding circuit for said second relay effective when said second relay is picked up, means effective for interrupting the supply of current to said rectifier when said second relay is picked up, and means controlled by said pole-changer for interrupting said holding circuit.

In testimony whereof we affix our signatures.

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