

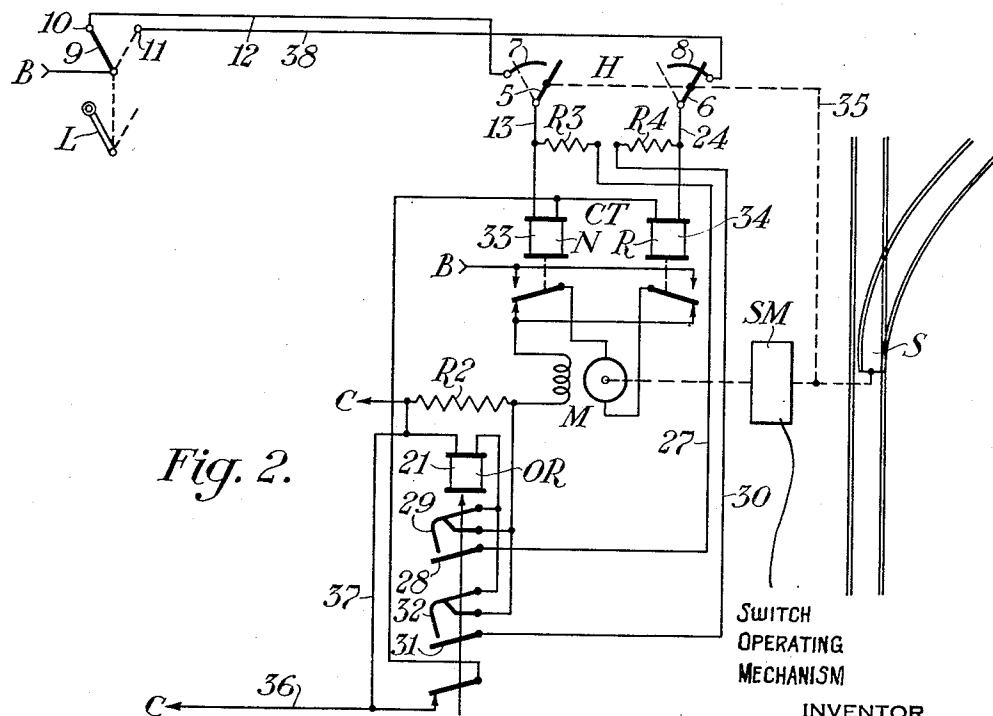
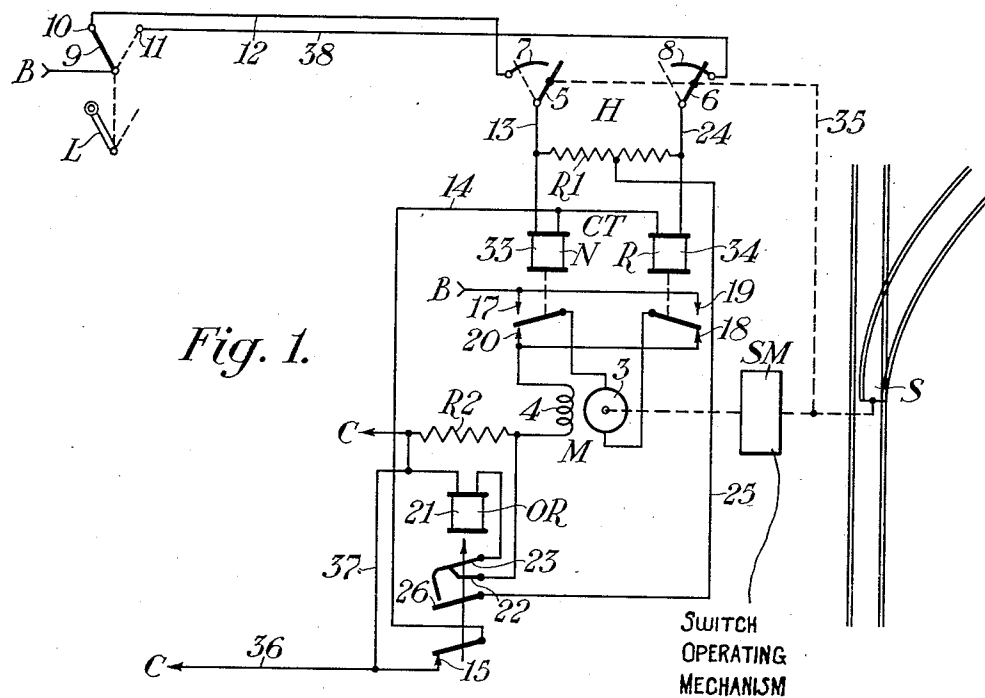
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B. E. O'HAGAN

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RAILWAY TRAFFIC CONTROLLING APPARATUS

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INVENTOR
Bernard E. O'Hagan.
BY *Robert*
HIS ATTORNEY

UNITED STATES PATENT OFFICE

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RAILWAY TRAFFIC CONTROLLING
APPARATUS

Bernard E. O'Hagan, Swissvale, Pa., assignor to
The Union Switch & Signal Company, Swiss-
vale, Pa., a corporation of Pennsylvania

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My invention relates to railway traffic controlling apparatus, and has for an object the provision of novel and improved apparatus for the protection of a railway switch operating motor against overload conditions.

I shall describe two forms of apparatus embodying my invention, and shall then point out the novel features thereof in claims.

Figs. 1 and 2 of the accompanying drawing are diagrammatic views of two forms of apparatus, each form of which embodies my invention. Similar reference characters refer to similar parts in each of the two views.

Referring to Fig. 1, the reference character S designates a railway track switch which is actuated by an electric motor M through the medium of a suitable switch operating mechanism SM, the motor M being here shown as a direct current reversible motor having an armature 3 and a field winding 4. The switch operating mechanism SM may be of any of the standard types, and is shown conventionally for the sake of simplicity. The switch S operates a circuit controller H through the medium of any suitable connection indicated by a dash line 35. The controller H comprises two movable contact members 5 and 6, the contact member 5 being arranged to make engagement with a contact 7 at all positions of the switch S except the full normal position, that is, the position illustrated in Fig. 1; and the contact member 6 being arranged to make engagement with a contact 8 at all positions of the switch except the full reverse position, that is, the position opposite that shown in Fig. 1.

The motor M is reversibly operated by a normal and a reverse operating circuit, which circuits are governed by a contactor CT comprising a direct current normal magnet N and a reverse magnet R. When the normal magnet N is energized and picked up in a manner to later appear, the normal motor operating circuit is formed from the B terminal of any convenient source of current, such as a battery not shown, over front contact 17 of the normal magnet N, motor armature 3, back contact 18 of the reverse magnet R, field winding 4, a resistor R2 to be referred to later, and to the C terminal of the current source. The flow of current set up by this normal motor circuit in the motor armature 3 and field winding 4 is of such direction as to cause the motor to operate in the direction that moves the track switch to its normal position. With the reverse magnet R energized and picked up, the reverse motor operating circuit is formed from terminal B over front contact 19 of the reverse

magnet R, motor armature 3, back contact 20 of normal magnet N, field winding 4, resistor R2, and to the C terminal. The direction of the flow of current in the motor armature 3 is now reversed and the motor is operated in a direction as required to move the track switch to its reverse position.

The contactor magnets N and R are controlled by means of a manually operated device or lever L, which may be located at any convenient point, such as an operator's office remote from the track switch. The lever L may be a switch lever of an interlocking machine. The lever L is operated to a normal or left-hand position as indicated by the full lines in Fig. 1, and to a reverse or right-hand position as indicated by a dotted line in Fig. 1. A circuit controlling contact member 9 is actuated by the lever L, the arrangement being such that the contact member 9 engages a contact 10 at the normal position of the lever L, and engages a contact 11 at the reverse position of the lever. It is to be noted that the contact member 9 might be a polar contact finger of a polar relay, which relay in turn is controlled over pole changing contacts actuated by the lever L.

The control of the contactor magnets N and R by the lever L is effected over a normal and a reverse control circuit. The normal control circuit can be traced from the B terminal of any convenient source of current, contact 9—10 of lever L in its normal position, normal control wire 12, contact 5—7 of controller H when closed, wire 13, winding 33 of magnet N, wire 14, back contact 15 of an overload relay OR to be described later, and a common return wire 36 to the terminal C of the same source of current. The reverse control circuit extends from terminal B over contact 9—11 of lever L in its reverse position, reverse control wire 33, contact 6—8 of controller H, wire 24, winding 34 of reverse magnet R, wire 14, back contact 15 of relay OR, and the common return wire 36 to the C terminal. A resistor R1 is connected across these two control circuits by being connected between the wires 13 and 24 adjacent the outside terminals of the windings 33 and 34 of the normal and reverse magnets respectively, as will be readily understood by an inspection of the drawing. The function of resistor R1 will be described later on in the specification.

It follows that, with the lever L operated to its reverse position, when the switch S is normal closing controller contact 6—8, the reverse contactor magnet R is energized and picked up to close the reverse operating circuit and the switch

is moved to its reverse position. At the full reverse position the contact 6—8 is opened to cause the magnet R to be deenergized and released, opening the reverse motor operating circuit. With the lever L moved to its normal position, when the switch is in its reverse position, closing controller contact 5—7, the normal magnet N is energized and picked up to complete the normal motor circuit so that the switch is moved to its normal position. At the full normal position the contact 5—7 is operated to an open position so that magnet N is deenergized and released to open the motor operating circuit. With the switch in mid-stroke position so that both contacts 5—7 and 6—8 are closed, then the magnets N and R are selected according to the position of the lever L to cause corresponding operation of the motor.

An auxiliary or overload relay OR is associated with the switch operating circuits for protection of the motor M under overload conditions. The overload relay OR is a direct current neutral relay provided with a single operating winding 21. The resistor R2, which is common to both motor operating circuits, is disposed in the motor operating circuits in multiple with the winding 21 of the overload relay OR, one terminal of winding 21 being connected with one terminal of resistor R2 over a back contact 22 and transfer contact 23 of the relay OR, and the other terminal of winding 21 being connected with the other terminal of resistor OR over a wire 37. The resistor R2 is preferably constructed of material having a relatively high positive temperature coefficient of resistance such as nickel or iron. The resistor R2 and the overload relay OR are so constructed and proportioned that, when the motor current flowing in resistor R2 and winding 21 in multiple does not exceed that required to operate the motor and in turn the track switch S under usual operating conditions, the potential drop across resistor R2 is relatively low and the energization of winding 21 is insufficient to pick up the relay OR. However, under overload conditions such as occurs in the event the track switch S is obstructed the motor current is relatively large and the resistor R2 quickly heats up to materially increase its resistance so that the potential drop across the resistor R2 soon exceeds a predetermined value and the winding 21 of relay OR is energized sufficiently to cause the relay to be picked up. The parts are further so proportioned that surges of current, which are high in value but of relatively short duration, such as starting and reversal surges, are not effective to pick up the relay OR. Furthermore, the relay OR is preferably provided with slow-to-pick-up characteristics and does not respond to short durations of relatively high energizing current created by starting and reversal surges of current. The relay OR on picking up to open its back contact 15 opens the connection of the contactor magnet N or R, as the case may be, to the common return wire 36, and the contactor magnet is deenergized and released to open the overloaded motor circuit. That is, the contactor magnet N is released to open the normal motor circuit at front contact 17 if the overload occurs during a movement of the switch to the normal position, and the contactor magnet R is released to open the reverse motor circuit at front contact 19 if the overload occurs during a movement of the switch to the reverse position.

The overload relay OR is provided with a normal and a reverse stick circuit by which it is retained energized subsequent to an overload con-

dition on a motor operating circuit that causes the overload relay to be picked up. Assuming the lever L has been moved to its reverse position, closing contact 9—11 to complete the reverse control circuit so that magnet R is picked up and the motor is operated to move the switch to its reverse position, and an overload occurs which causes the relay OR to be picked up, a reverse stick circuit for relay OR can be traced from terminal B, contact 9—11, control wire 38, contact 6—8, wire 24, through the right-hand portion of resistor R1 to a mid terminal, wire 25, front contact 26 and transfer contact 23 of relay OR, winding 21 of relay OR, wire 37, common return wire 36 and to the C terminal. In the event the lever L has been operated to its normal position, closing contact 9—10 to complete the normal control circuit so that magnet N is picked up and the motor operated to move the switch to its normal position, and an overload condition occurs which causes relay OR to pick up, a normal stick circuit is formed from terminal B over contact 9—10, control wire 12, contact 5—7, wire 13, left-hand portion of resistor R1 to its mid terminal, wire 25, front contact 26 and transfer contact 23 of relay OR, winding 21, wire 37, and the common return wire 36 to the C terminal. It follows that an overload condition that causes relay OR to be picked up to open the overloaded motor circuit also switches the winding 21 of the overload relay from the motor operating circuit to the control circuit active at the time of the overload, with the result that the relay OR is retained picked up subsequent to the overload condition to hold the overloaded circuit open, selection between the normal and reverse control circuits being effected through the medium of the resistor R1.

To regain control of the motor subsequent to an overload condition and the relay OR is held energized by virtue of its stick circuit, the operator must actuate the lever L to the position opposite that at which the overload condition occurred. Assuming the lever L is at its reverse position and relay OR is held energized over its reverse stick circuit including the contact 9—11, control wire 38 and the right-hand portion of resistor R1, the operator would move the lever L to its normal position where the contact 9—11 is open. The relay OR is now deenergized and released, closing back contact 15 interposed in the connection of magnet N with the common return wire 36. With magnet N thus energized and picked up, the motor M is operated to move the switch back to the normal position, that is, the position it occupied prior to the overload condition. Again, if the lever L is at its normal position and relay OR is picked up in response to an overload condition and held energized by its normal stick circuit, the operator would move the lever L to its reverse position where the relay OR is deenergized since the normal stick circuit is now open at contact 9—10.

In this connection, it is to be pointed out that overload relay OR is adjusted for relatively quick release, and release of the relay during movement of the lever L from one position to the other is assured. Also, the resistor R1 is preferably proportioned for relatively high resistance so that the energization of the overload relay OR by either of its stick circuits is not much greater than the release value of the relay, and release of the relay in response to a movement of the lever L is quickly effected.

With the resistor R1 proportioned for rela-

tively high resistance, the picking up of both contactor magnets N and R at either position of lever L is avoided, and the release of each contactor magnet when the lever is moved from one position to the other is assured. To be explicit, the current which flows, when the lever is at its reverse position, from wire 24 through both portions of resistor R1, winding 33 of contactor magnet N, wire 14, and back contact 15 to the common return wire, is not sufficient to energize the normal magnet N. When the lever L is moved to its normal position, the current which flows from wire 13 through resistor R1, winding 34 of magnet R, wire 14, and back contact 15 to the common return wire 36, is not nearly sufficient to pick up the reverse contactor magnet R.

In Fig. 2, the apparatus is the same as in Fig. 1, except that two separate resistors R3 and R4 are used in place of the resistor R1, and the relay OR is provided with additional contacts. The resistors R3 and R4 are interposed in the normal and reverse stick circuits for the relay OR, respectively. Assuming the lever L is in its normal position and relay OR is picked up in response to an overload, the normal stick circuit in Fig. 2 involves terminal B, contact 9—10, wire 12, contact 5—7, wire 13, resistor R3, wire 27, front contact 28 and transfer contact 29 of relay OR, winding 21 of relay OR, wire 37 and common return wire 36 to the C terminal. The reverse stick circuit involves terminal B, contact 9—11, wire 23, contact 6—8, wire 24, resistor R4, wire 30, front contact 31 and transfer contact 32 of relay OR, winding 21 of the relay, wire 37 and common return wire 36 to the C terminal.

It is clear that the operation of the apparatus of Fig. 2 is substantially the same as the operation of the apparatus of Fig. 1, and it is thought to be unnecessary to repeat the operation except to point out that in Fig. 2 there is no leakage current through the winding 33 of contactor magnet N when the lever is at its reverse position to energize contactor magnet R, and there is no leakage current through the winding 34 of contactor magnet R when the lever is moved to its normal position.

Although I have herein shown and described only two forms of apparatus embodying my 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 my invention.

Having thus described my invention, what I claim is:

1. In combination, a reversible electric motor, a normal and a reverse operating circuit for the motor, a normal and a reverse control circuit for governing said normal and reverse operating circuits respectively, said control circuits each comprising a control wire and a common wire as well as a circuit controlling contact, a resistor common to both of said motor circuits, a relay having a winding connected across said resistor, said relay and resistor proportioned and adjusted to pick up said relay only when an overload current flows through said resistor for a predetermined interval, means controlled by said relay when picked up to interrupt the overloaded motor circuit, a normal stick circuit for said overload relay including the control wire and circuit controlling contact as well as the common wire of the normal control circuit, and a reverse stick circuit for said relay including the control wire and circuit controlling contact as well as the common wire of the reverse control circuit.

2. In combination, a reversible electric motor, an operating circuit means for said motor, a contactor including a normal and a reverse magnet for governing said operating circuit means, a normal control circuit including a pair of control wires and a circuit controlling contact as well as a winding of said normal magnet, a reverse control circuit including a pair of control wires and a circuit controlling contact as well as a winding of said reverse magnet, a resistor interposed in said operating circuit means, a relay, means to connect a winding of the relay across the resistor to pick up the relay when and only when an overload current flows in the motor for a predetermined interval, means controlled by the relay when picked up to interrupt the operating circuit means, a normal stick circuit to connect the winding of said relay across said control wires of the normal control circuit including a front contact of the relay and a resistance, and a reverse stick circuit to connect the winding of said relay across said control wires of the reverse control circuit including a front contact of the relay and a resistance.

3. In combination, a reversible electric motor, a normal and a reverse operating circuit for said motor, a normal and a reverse direct current neutral magnet for governing said normal and reverse operating circuits respectively, a normal control circuit including a normal control wire connected to one terminal of the winding of the normal magnet and a common wire connected to the other terminal of the magnet winding, a reverse control circuit including a reverse control wire connected with one terminal of the winding of the reverse magnet and said common wire connected to the other terminal of the magnet winding, means including a contact member to selectively connect a current source with said control circuits to energize either the normal or reverse magnets, a resistor common to both of said motor circuits, a relay, means including a back contact of the relay to connect the winding of said relay across said resistor to pick up the relay when an overload current flows in said motor, a back contact of said relay interposed in the connection of the winding of each of said magnets with the common wire to cause an overloaded motor circuit to be interrupted, a normal stick circuit to connect the winding of said relay across said normal control wire and the common wire, and a reverse stick circuit to connect the winding of the relay across said reverse control wire and the common wire.

4. In combination, a reversible electric motor, a normal and a reverse magnet, a normal motor operating circuit including a front contact of the normal magnet, a reverse motor operating circuit including a front contact of the reverse magnet, a normal control circuit including a normal control wire connected to the outside terminal of the winding of the normal magnet and a common wire connected to the inside terminal of the magnet winding, a reverse control circuit including a reverse control wire connected with the outside terminal of the winding of the reverse magnet and said common wire connected with the inside terminal of the magnet winding, a first resistor connected across the outside terminals of the magnet windings, a second resistor common to both motor circuits, a relay, means including a back contact of the relay to connect the winding of said relay across said second resistor to pick up the relay when an overload current flows in the motor for a given interval, a

back contact of said relay interposed in the connections of the magnet windings with the common wire to release a magnet for interrupting an overloaded motor circuit, and a stick circuit means to connect the winding of the relay between the common wire and a mid terminal of said first resistor.

5. In combination, a reversible electric motor, a normal and a reverse magnet, a normal motor operating circuit including a front contact of the normal magnet, a reverse motor operating circuit including a front contact of the reverse magnet, an overload relay, a normal control wire connected with the inside terminal of the winding of the normal magnet, a reverse control wire connected with the inside terminal of the winding of the reverse magnet, means including a back contact of the relay to connect the outside terminal of each of said windings with a common return wire, a circuit controller operative to connect a direct current source between either the normal or reverse control wire and the common wire, means including a back contact of the relay to associate the winding of the relay with both of said motor operating circuits to pick up the relay when an overload current flows in the motor to deenergize the magnet for interrupting the overloaded circuit, a resistor connected between the said inside terminals of the normal and reverse magnets, and means including a front contact of the relay to connect the winding of the relay between the common wire and a mid terminal of said resistor to retain the relay picked up subsequent to an overload condition.

6. In combination, a reversible electric motor, a normal and a reverse magnet, a normal motor operating circuit including a front contact of the normal magnet, a reverse motor operating circuit including a front contact of the reverse magnet, an overload relay, a normal control wire connected with one terminal of the winding of the normal magnet, a reverse control wire connected with one terminal of the winding of the reverse magnet, means including a back contact of the relay to connect the other terminal of each of said windings with a common return wire, a circuit controller operative to connect a direct current source between either the normal or reverse control wire and the common wire, a first resistor common to both of said motor circuits, means including a back contact of the relay to connect the winding of the relay across said resistor to pick up the relay when an overload current flows in a motor circuit for interrupting the overloaded circuit by deenergizing the corresponding magnet, a second resistor connected across said normal and reverse control wires, and means including a front contact of the relay to switch the winding of the relay to a mid terminal of said second resistor and the common return wire for retaining the overloaded circuit open.

7. In combination, a reversible electric motor, a normal and a reverse magnet, a normal motor

operating circuit including a front contact of the normal magnet, a reverse motor operating circuit including a front contact of the reverse magnet, an overload relay, a normal control wire connected with one terminal of the winding of the normal magnet, a reverse control wire connected with one terminal of the winding of the reverse magnet, means including a back contact of the relay to connect the other terminal of each of said windings with a common return wire, a circuit controller operative to connect a direct current source between either the normal or reverse control wire and the common wire, a first resistor common to both of said motor circuits, means including a back contact of the relay to connect the winding of the relay across said resistor to pick up the relay when an overload current flows in a motor circuit for interrupting the overloaded circuit by deenergizing the corresponding magnet, a second and a third resistor connected with said normal and reverse control wires respectively, a first stick circuit means including a front contact of the relay and said second resistor to connect said winding of the relay between the normal control wire and the common return wire, and a second stick circuit means including a front contact of the relay and said third resistor to connect said winding of the relay between the reverse control wire and the common return wire.

8. In combination, a reversible electric motor, a normal and a reverse magnet, a normal motor operating circuit including a front contact of the normal magnet, a reverse motor operating circuit including a front contact of the reverse magnet, an overload relay, a normal control wire connected with one terminal of the winding of the normal magnet, a reverse control wire connected with one terminal of the winding of the reverse magnet, means including a back contact of the relay to connect the other terminal of each of said windings with a common return wire, a circuit controller operative to connect a direct current source between either the normal or reverse control wire and the common wire, a first resistor common to both of said motor circuits, means including a back contact of the relay to connect the winding of the relay across said resistor to pick up the relay when an overload current flows in a motor circuit for interrupting the overloaded circuit by deenergizing the corresponding magnet, a second and a third resistor connected with said normal and reverse control wires respectively, a first stick circuit means including a front contact of the relay and said second resistor to connect said winding of the relay between the normal control wire and the common return wire, and a second stick circuit means including another front contact of the relay and said third resistor to connect said winding of the relay between the reverse control wire and the common return wire.

BERNARD E. O'HAGAN.