April 25, 1944. A. T. JOHNSTON 2,347,602

SWITCH CONTROL SYSTEM

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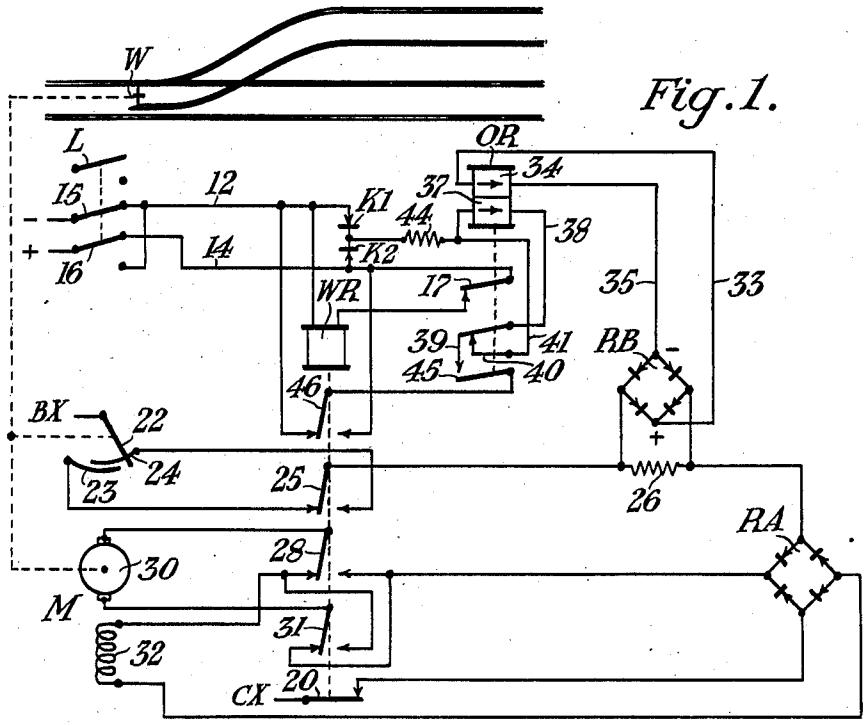


Fig. 1.

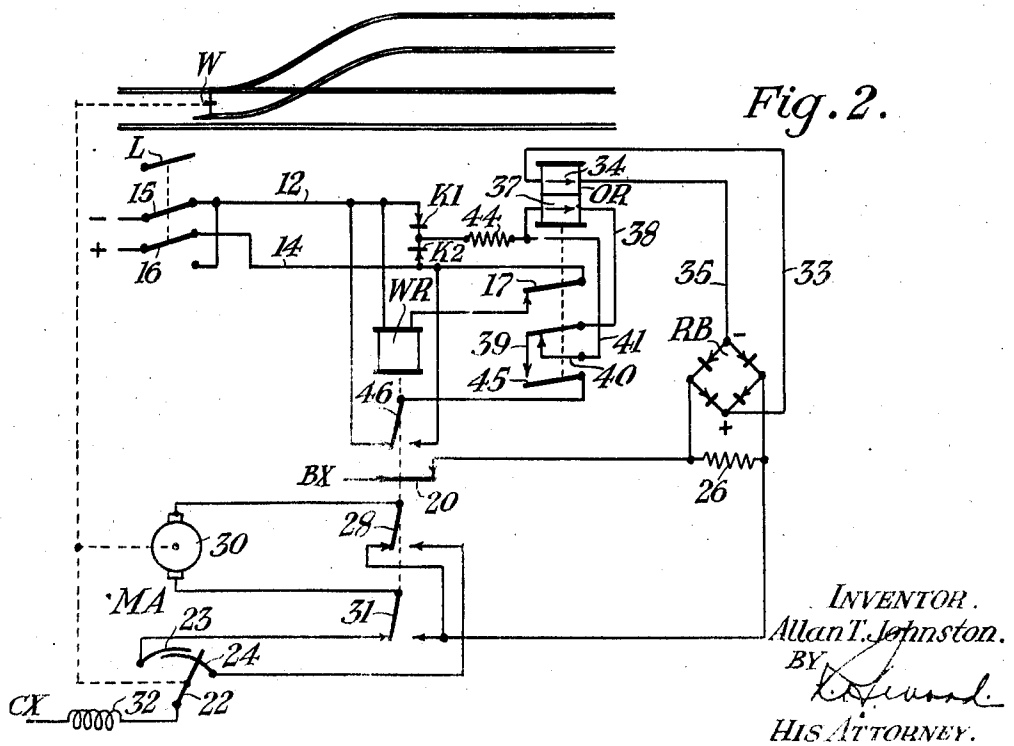


Fig. 2.

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UNITED STATES PATENT OFFICE

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SWITCH CONTROL SYSTEM

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4 Claims. (Cl. 246—219)

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

In United States Patent No. 2,124,601, issued July 26, 1938, to Norman F. Agnew and Claude M. Hines there are shown switch control systems employing an overload relay having a pick-up winding which is energized in series with the circuit of the switch motor, and having a holding winding which when the relay contacts are picked up is energized from the control circuit over which energy is supplied to the switch control relay.

In the systems shown in the above identified patent the motor is operated by energy supplied from a direct current source, and the systems are arranged so that the directions of flow of current through the pick-up and holding windings of the overload relay are in correspondence regardless of the direction in which the switch is being moved, and accordingly the forces exerted by these windings on the relay armature supplement each other.

In some situations it is desirable to operate a switch motor from a source of alternating current and to employ the overload relay which has been developed for use in connection with motors operated by direct current.

It is an object of this invention to provide switch control systems in which the switch motor is operated by energy supplied from a source of alternating current, the systems being arranged so that an overload relay of standard design may be employed to protect the switch motor.

A further object of the invention is to provide a system of the type described which is arranged so that the overload relay contacts when picked up are certain to release on a change in the polarity of the energy supplied to the control wires.

In practicing my invention I provide an overload relay governing the control circuit of the relay which controls the switch motor circuit, the overload relay having a pick-up winding which is energized in multiple with a thermal resistance element which is included in series with the circuit over which energy is supplied from a source of alternating current to the switch motor, while a rectifier is provided to rectify the energy supplied to the overload relay pick-up winding. In addition, I provide means governed by a polar contact of the switch control relay for supplying energy from the control circuit for the switch control relay to the holding winding of the overload relay, this means being arranged so that the energy supplied to the overload relay holding winding always flows in the same direction so that the relay pick-up and holding windings assist each other, while this means is also arranged so that energy is supplied to the overload relay holding winding only when the polarity of the energy supplied to the control circuit corresponds with the position of the polar contacts of the switch control relay so that on a change in the polarity of the energy supplied to the control circuit when the overload relay contacts are picked up the supply of energy to the overload relay holding winding will be cut off and the overload relay contacts will be certain to release.

Other objects of the invention and features of novelty will be apparent from the following description taken in connection with the accompanying drawing.

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

In the drawing Fig. 1 is a diagram showing one form of switch control system embodying my invention, and

Fig. 2 is a diagram showing another form of switch control system also embodying my invention.

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

Referring to Fig. 1 of the drawing, there is shown therein a track switch W which is moved between a normal and a reverse position by means of an electric motor M. The motor drives the switch through suitable mechanism, not shown.

The motor has associated therewith a polarized switch control relay WR, an overload relay OR, and rectifiers RA and RB. The winding of the relay WR is normally energized from control wires 12 and 14, while means is provided for supplying energy of one polarity or the other to these control wires. As shown, this means comprises a lever L which is movable between a normal and a reverse position and operates contacts 15 and 16 which are connected to the terminals of a source of direct current. The terminals of this source are designated + and — in the drawing.

The energy for operating the motor M is supplied from a suitable source of alternating current, the terminals of which are designated BX and CX in the drawing.

In the system shown in Fig. 1 the motor M is of a type which is designed to operate on direct

current, and the energy supplied to the motor is rectified by the rectifier RA.

The equipment is shown in the condition which it assumes when the switch W and the control lever L are in their normal positions, and the contacts of the overload OR are released.

As the control lever L is in its normal position, contacts 15 and 16 cause energy of normal polarity to be supplied to the control wires 12 and 14. The control wire 12 is connected directly to one terminal of the winding of relay WR, while the wire 14 is connected through back contact 17 of relay OR to the other terminal of the winding of relay WR, Accordingly, the relay WR is energized with current of normal polarity and its neutral contact 20 is picked up, while its polar contacts occupy their normal or left-hand positions as shown.

As the switch W is in its normal position, contact 22 is out of engagement with contact 23 and interrupts the supply of energy from the alternating current source through the rectifier RA to the motor M. The contact 22 is operated in accordance with movement of the switch and is arranged so that it engages contact 23 in all positione of the switch except the normal position thereof, and so that it engages a contact 24 in all positions of the switch except the reverse position thereof.

If the operator desires to move the switch W to its reverse position, he may do so by moving the control lever L to its reverse position. On this movement of lever L contacts 15 and 16 cause energy of reverse polarity to be supplied to control wires 12 and 14, and thus to relay WR, so that the neutral contact 20 of this relay is picked up while the polar contacts of this relay shift to their right-hand or reverse positions and establish the circuit to supply energy to the motor M to cause it to move the switch to its reverse position.

The circuit for supplying energy to the motor M at this time is traced from terminal BX of the source of alternating current through switch operated contacts 22 and 24. reverse polar contact 25 of relay WR, and thermal resistance 26 to one input terminal of the rectifier RA, while terminal CX of the source is connected through front neutral contact 20 of relay WR to the other input terminal of the rectifier RA. At this time the positive output terminal of the rectifier RA is connected through reverse polar contact 28 of relay WR to one brush of the motor armature 30, while the other brush of the armature is connected through reverse polar contact 31 of relay WR to one terminal of the motor field winding 32, the other terminal of which is connected to the negative output terminal of the rectifier RA. The motor armature and its field winding are energized in series and the various parts are arranged so that the motor operates to move the switch W to its reverse position.

When the switch completes is movement to its reverse position, contact 22 is moved out of engagement with contact 24 to interrupt the circuit traced above for supplying energy to the motor M and the motor ceases to operate.

When the switch is in its reverse position, the operator may move the switch to its normal position by moving the control lever L to its normal position. On this movement of the lever L contacts 15 and 16 cause energy of normal polarity to the control wires 12 and 14, and thus to relay WR, so that neutral contact 20 is picked up and the polar contacts of the relay are shifted to their left-hand or normal positions and establish the circuit to supply energy to the motor M to cause it to move the switch to its normal position.

When the switch operated contact 22 is in engagement with contact 23 and the polar contacts of relay WR are in their normal positions, terminal BX of the source of alternating current is connected through switch operated contacts 22 and 23, normal polar contact 25 of relay WR, and thermal resistance unit 26 to one input terminal of the rectifier RA, while terminal CX of the source is connected through front neutral contact 20 of relay WR to the other input terminal of the rectifier RA. At this time energy is supplied from the positive output terminal of the rectifier RA through normal polar contact 31 of relay WR to one brush of the motor armature, through the armature, normal polar contact 28 of relay WR to one terminal of the motor field winding, and through this winding to the negative output terminal of the rectifier RA. Accordingly, the motor armature and field winding are energized in series. while the various parts are arranged so that the motor operates to move the switch to its normal position.

When the switch completes its movement to its normal position, contact 22 is moved out of engagement with contact 23 and interrupts the circuit traced about for supplying energy to the motor and the motor thereupon ceases to operate.

The thermal resistance 26 which is included in series with the circuit for supplying energy to the switch motor has a positive thermal coefficient of resistance, that is, the resistance of the unit increases as the temperature of the material of which it is constructed increases.

One input terminal of the rectifier RB is connected to one terminal of resistance 26, while the other input terminal of the rectifier RB is connected to the other terminal of the resistance unit 26 so that the rectifier RB is connected across the resistance 26.

The positive output terminal of the rectifier RB is connected by wire 33 to the left-hand terminal of the pick-up winding 34 of the overload relay OR, while the negative output terminal of the rectifier is connected by wire 35 to the right-hand terminal of the winding 34.

The overload relay OR has, in addition, a holding winding 37, and means are provided to shunt this winding when the relay contacts are released and to energize the winding from the control wires 12 and 14 when the overload relay contacts are picked up.

The relay OR is equipped with contacts of the make-before-break type, and as shown the right-hand terminal of the holding winding 37 is connected by wire 38 to movable contact 39, while the contact 39, when released, engages stationary contact 40 which is connected by wire 41 to the left-hand terminal of the winding 37. Accordingly, as long as the contacts of relay OR are released, the holding winding 37 of the relay is short circuited by the circuit controlled by contacts 39 and 40. As the winding 37 is short circuited when the relay contacts are released, the relay contacts are rendered slow in picking up and the overload relay will not respond to momentary surges in the current in the motor circuit.

The control wire 12 is connected through rec-

tifier K1 and resistance 44 to the left-hand terminal of the winding 37, while the control wire 14 is connected through rectifier K2 and resistance 44 to this terminal of the winding 37. The rectifiers K1 and K2 are each poled to permit energy to flow from the associated control wire to the winding 37 and to prevent flow of energy in the opposite direction.

As hereinafter explained, contact 45 of the relay OR and polar contact 46 of the relay WR cooperate to establish connection from the right-hand terminal of the winding 37 of relay OR to one or the other of the control wires 12 and 14.

As explained above, the energy supplied to the motor M is supplied over the circuit which includes in series therewith the resistor 26, while the input terminals of the rectifier RB are connected across the resistor 26. On the supply of energy to the motor there is a voltage drop across the resistor 26 with the result that a portion of the energy supplied to the motor is supplied through the rectifier RB and the pick-up winding 34 of the overload relay OR. As a result of the supply of energy to the motor M, the resistance 26 becomes heated and its resistance increases so that there is a corresponding increase in the value of the current supplied through the pick-up winding 34 of the relay OR.

The various parts of the apparatus are arranged and proportioned so that under normal conditions most of the energy supplied to the motor is supplied through the resistor 26, while the current supplied through the winding 34 of relay OR is of too small value to pick up the relay contacts. Accordingly, the contacts of the relay OR remain released and contact 17 maintains the circuit for connecting the winding of relay WR across the control wires 12 and 14 so that the neutral contact 20 of relay WR remains picked up and maintains the supply of energy to the motor until the switch completes its movement and causes contact 22 to interrupt the circuit of the switch motor.

The various parts of the equipment are also arranged and proportioned so that if the motor M draws current of unusually high value for an abnormally long period, as occurs when movement of the switch is obstructed, the resistance 26 will become heated to a temperature such that its resistance increases to a degree effective to cause the current supplied through the winding 34 of relay OR to be great enough to pick up the relay contacts.

On movement of the contacts of relay OR towards their picked-up position contact 45 engages contact 39 to thereby establish a circuit to energize the winding 37 from the control wires, while contact 45 moves contact 39 out of engagement with the stationary contact 40 to interrupt the circuit short circuiting the winding 37.

If the switch is being moved to its normal position at the time the overload condition occurs, the circuit for supplying energy to the winding 37 of relay OR is traced from the positive terminal of the source through contact 16, control wire 14, rectifier K2, and resistance 44 to the left-hand terminal of the winding 37, through this winding, wire 38, contacts 39 and 45, normal polar contact 46 of relay WR, control wire 12, and contact 15 to the negative terminal of the source.

If the switch is being moved to its reverse position at the time the overload condition occurs, the circuit for supplying energy to the winding 37 of relay OR is traced from the positive terminal of the source through contact 16, control wire 12, rectifier K1, and resistance 44 to the left-hand terminal of the winding 37, through this winding, wire 38, contacts 39 and 45, reverse polar contact 46 of relay WR, control wire 14, and contact 15 to the negative terminal of the source.

It will be seen, therefore, that on picking up of the contacts of the overload relay OR a circuit is established to energize the holding winding of the relay from the control wires 12 and 14, and that regardless of the polarity of the energy supplied to the control wires at the time the overload relay contacts pick up, the positive terminal of the source is connected to the left-hand terminal of the winding 37 so that energy flows through this winding from its left-hand to its right-hand terminal.

The pick-up winding 34 of the relay OR is supplied with energy from the rectifier RB and the positive output terminal of this rectifier is connected to the left-hand terminal of the winding 34 so that energy always flows through this winding from its left-hand to its right-hand terminal.

Accordingly, the energy supplied to the pick-up and holding windings of the overload relay OR always flows through these windings in the same direction, and the energy supplied to the holding winding flows through this winding in the same direction as the energy which is supplied to the pick-up winding of the relay. As a result, the energy supplied to the pick-up and holding windings of this relay cause flux of the same polarity to be developed in the relay core so that on picking up of the relay contacts, and resultant supply of energy to the relay holding winding, the relay contacts are maintained picked up.

In addition, on picking up of the contacts of relay OR its contact 17 interrupts the circuit of the winding of relay WR so that neutral contact 20 of relay WR releases and interrupts the supply of energy to the motor. Release of contact 20 also interrupts the supply of energy to the pick-up winding of the relay OR, but the contacts of this relay are maintained picked up by the holding winding of the relay.

The system provided by this invention is arranged so that after an overload has occurred, the operator may regain control of the switch by moving the switch control lever L to its other position.

If the overload occurs when the switch is being moved to its normal position, the polar contacts of the relay WR will be in their left-hand or normal positions, and as long as the control lever L remains in its normal position, the holding winding of the relay OR is energized by current supplied over the circuit which includes wire 14, rectifier K2, resistance 44, winding 37, wire 38, contacts 39 and 45 of relay OR, normal polar contact 46 of relay WR, and wire 12.

On movement of the control lever L to its reverse position the circuit traced above is interrupted and the supply of energy to the holding winding of relay OR is cut off. At this time the positive terminal of the source is connected by contact 16 to control wire 12, and energy may flow from this wire through rectifier K1 to the left-hand terminal of the winding 37 of relay OR, while wire 12 is connected to the other terminal of this winding through normal polar contact

46 of relay WR and contacts 45 and 39 of relay OR. As contact 46 of relay WR is in its normal position, it interrupts the connection which it controls from wire 14 to the right-hand terminal of the winding 37, while rectifier K2 prevents flow of energy from the left-hand terminal of the winding 37 to wire 14. Accordingly, on movement of the control lever L to its reverse position at a time when the polar contacts of relay WR are in their normal positions, the supply of energy to the holding winding 37 of relay OR is cut off, and, after a short time interval, the contacts of this relay release and contact 17 establishes the circuit of the relay WR so that energy of reverse polarity is supplied to the winding of relay WR, and its neutral contact 20 picks up while its polar contacts shift to their reverse positions to establish the circuit to supply energy to the motor M to cause it to move the switch to its reverse position.

In addition, on release of the contacts of relay OR, contact 45 becomes disengaged from contact 39 to interrupt the circuit for supplying energy from the control wires 12 and 14 to the holding winding 37 of relay OR, while contact 39 engages contact 40 to establish the circuit short circuiting the winding 37.

If the overload occurs when the switch is being moved to its reverse position, the polar contacts of the relay WR will be in their right-hand or reverse positions, and as long as the control lever L remains in its reverse position, the holding winding 37 of the relay OR is energized over the circuit which includes wire 12, rectifier K1, resistance 44, winding 37, wire 38, contacts 39 and 45 of relay OR, reverse polar contact 46 of relay WR, and wire 14.

On movement of the control lever L to its normal position the circuit traced above is interrupted and the supply of energy to the holding winding 37 of relay OR is cut off. At this time the positive terminal of the source is connected by contact 16 to wire 14. Energy may flow from this wire through rectifier K2 to the left-hand terminal of the winding 37, while wire 14 is connected to the other terminal of this winding through reverse polar contact 46 of relay WR, and contacts 45 and 39 of relay OR. As contact 46 of relay WR is in its reverse position, it interrupts the connection controlled thereby from wire 12 to the right-hand terminal of the winding 37, while rectifier K1 prevents flow of energy from the left-hand terminal of the winding 37 to the wire 12.

Accordingly, on movement of the control lever L to its normal position at a time when the polar contacts of the relay WR are in their reverse positions the supply of energy to the holding winding 37 of relay WR is cut off, and after a short time interval the contacts of this relay release and contact 17 establishes the circuit of the relay WR so that energy of normal polarity is supplied from the control wires to the winding of relay WR and the neutral contact 20 of this relay picks up, while the polar contacts of the relay shift to their normal positions to establish the circuit to supply energy to the motor M to cause it to move the switch to its normal position.

In addition, on release of the contacts of relay OR, contact 45 is disengaged from contact 39 to interrupt the circuit for supplying energy to the holding winding 37, while contact 39 engages contact 40 to establish the circuit for short circuiting the winding 37.

From the foregoing it will be seen that this system is arranged so that on picking up of the contacts of the overload relay OR a circuit is established to energize the holding winding of the relay from the control wires to thereby maintain the relay contacts picked up, while a contact of the overload relay interrupts the circuit of the switch control relay WR to cause it to interrupt the circuit of the switch motor.

The system is also arranged so that on movement of the switch control lever subsequent to picking up of the contacts of the overload relay, the supply of energy to the holding winding of the relay is cut off so that the relay contacts release and prevent the supply of energy to this winding until the relay contacts are again picked up by the pick-up winding of the relay.

On release of the overload relay contacts a circuit is established to energize the relay WR from the control wires, and this relay thereupon establishes the circuit to supply current to the motor to cause it to move the switch in the direction opposite to that in which it was being moved when the overload occurred. This enables the operator to move the switch away from an obstruction.

Since the circuit of the relay WR is interrupted as long as the relay OR is picked up, there is no possibility that prior to the release of the contacts of the relay OR the polar contacts of the relay WR will move to their other position and permit energy to be supplied to the holding winding of the relay OR, while on release of the contacts of relay OR the circuit of the holding winding is interrupted and energy will not be supplied to this winding on a change in the position of the polar contacts of the relay WR. Accordingly, on a change in the position of the control lever when the contacts of the overload relay are picked up, the holding winding of the relay is deenergized and the relay contacts are certain to release and restore the equipment to its normal operating condition.

In the system of this invention on picking up of the contacts of relay OR, at the instant contact 45 engages contact 39, and before contact 39 is moved out of engagement with contact 40, connection is established between the control wires 12 and 14 by contacts of the overload relay. This connection is traced from one or the other of these wires through the rectifier K1 or K2 associated therewith, through resistance 44, wire 41, contacts 40, 39 and 45 of relay OR, and thence through polar contact 46 of relay WR to the other control wire. This circuit is interrupted as soon as contact 39 is moved away from the stationary contact 40, but the resistance 44 is included in this circuit to prevent excessive flow in this circuit during the momentary period in which the circuit is established.

It will be seen that this system is arranged so that the resistance 26 which governs the operation of the overload relay OR is incorporated in the circuit of the switch motor at a point between the source of current and one of the input terminals of the rectifier RA so that the overload relay operates to protect the rectifier under all conditions. If, for example, the operator attempts to move the switch, and before the switch completes its movement, one of the wires between one of the output terminals of the rectifier and the motor is broken or disconnected, the switch will not complete its movement and contact 22 will maintain the circuit of the switch motor. Under these circumstances energy will

continue to be supplied from the alternating current source to the input terminals of the rectifier RA.

The operating characteristics of the rectifier RA are such that on continued supply of alternating current to the rectifier input terminals after the circuit from the rectifier output terminals is interrupted, some energy flows through the rectifier elements in the reverse direction. This causes heating of the rectifier with a resultant decrease in its resistance to flow of energy in the reverse direction so that more energy flows through the rectifier and heats it further. If this process continued indefinitely the rectifier would be destroyed.

However, the energy supplied from the alternating current source through the rectifier flows through the resistance **26** and heats it so that its resistance increases and causes more energy to be supplied to the pick-up winding of the relay OR. The various parts of the equipment are proportioned so that the resistance **26** becomes heated sufficiently to cause picking up of the contacts of the overload relay OR before the rectifier RA becomes hot enough to permanently impair its efficiency. Accordingly, under these conditions the contacts of the overload relay OR pick up and interrupt the circuit of the relay WR so that contact **20** of relay WR releases and interrupts the circuit for supplying energy from the alternating current source to the rectifier RA and thus prevent further heating of the rectifier.

The system provided by this invention is also adapted for use in connection with switch motors which are operated by alternating current, and Fig. 2 is a diagram illustrating this application of the invention.

The modification shown in Fig. 2 is similar to that shown in Fig. 1 and differs therefrom in that it employs a motor MA of a type adapted to operate on alternating current so that energy is supplied directly from the source to the motor, and a rectifier similar to that employed in the system shown in Fig. 1 is not required.

The modification shown in Fig. 2 is shown in the condition which it assumes when the switch W and the control lever L are in their normal positions, and the contacts of the relay OR are released. At this time the neutral contact **20** of relay WR is picked up to permit energy to be supplied to the switch motor, but switch operated contact **22** is out of engagement with contact **23** so that the circuit of the switch motor is interrupted.

When it is desired to move the switch to its reverse position, the control lever L is moved to its reverse position so that energy of reverse polarity is supplied to the relay WR, and the polar contacts of this relay shift to their reverse positions and contacts **28** and **31** connect the motor armature **30** in series with the motor field winding **32** in such manner as to cause the motor to move the switch to its reverse position. The circuit for supplying energy to the motor includes contacts **22** and **24** associated with the switch so that the motor circuit is interrupted when the switch reaches its reverse position.

In order to move the switch from its reverse to its normal position the control lever L is moved to its normal position to cause energy of normal polarity to be supplied to the relay WR so that its polar contacts shift to their normal positions, and contacts **28** and **31** connect the motor armature in series with the motor field winding in such manner as to cause the motor to move the switch from its reverse to its normal position. The circuit for energizing the motor includes contacts **22** and **23** associated with the switch so that the motor circuit is interrupted when the switch completes its movement to its normal position.

The circuits for supplying energy to the switch motor include the resistance **26** in series therewith, and the overload relay OR operates in the same manner in this modification as in the system shown in Fig. 1.

From the foregoing it will be seen that this invention provides means to operate a switch motor from a source of alternating current and to employ an overload relay of standard design to protect the motor.

Although I have herein shown and described only two forms of switch control systems 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 track switch movable between a normal and a reverse position, a motor for moving said switch, means including a thermal resistance in series therewith for supplying energy from an alternating current source to said motor, a polarized control relay governing the supply of energy by said means so as to cause the motor to move the switch to its normal or reverse position according as energy of normal or reverse polarity is supplied to said relay, a pair of control wires over which energy may be supplied to the winding of said control relay, means for at times supplying energy of normal polarity and at other times supplying energy of reverse polarity to said control wires, an overload relay having a pick-up and a holding winding, a rectifier having its input terminals connected across the terminals of said resistance and having its output terminals connected to supply energy to the overload relay pick-up winding, and means including a polar contact of said control relay for supplying from said control wires to the overload relay holding winding energy of the same polarity as that supplied to the overload relay pick-up winding, said overload relay having a contact effective when picked up to interrupt the supply of energy from said control wires to the winding of said control relay.

2. In combination, a track switch movable between a normal and a reverse position, a motor for moving said switch, means including a thermal resistance in series therewith for supplying energy from an alternating current source to said motor, a polarized control relay governing the supply of energy by said means so as to cause the motor to move the switch to its normal or reverse position according as energy of normal or reverse polarity is supplied to said relay,, a pair of control wires over which energy may be supplied to the winding of said control relay, means for at times supplying energy of normal polarity and at other times supplying energy of reverse polarity to said control wires, an overload relay having a pick-up and a holding winding, a rectifier having its input terminals connected across the terminals of said resistance and having its output terminals connected to supply energy to the overload relay pick-up winding, and means including a polar contact of said control relay and a front contact of said overload relay for supplying from said control wires to the hold-

ing winding of said overload relay energy of the same polarity as that supplied to the overload relay holding winding, said overload relay having a contact effective when picked up to interrupt the supply of energy from said control wires to the winding of said control relay.

3. In combination, a track switch movable between a normal and a reverse position, a motor for moving said switch, means including a thermal resistance in series therewith for supplying energy from an alternating current source to said motor, a polarized control relay governing the supply of energy by said means so as to cause the motor to move the switch to its normal or reverse position according as energy of normal or reverse polarity is supplied to said relay, a pair of control wires over which energy may be supplied to the winding of said control relay, means for at times supplying energy of normal polarity and at other times supplying energy of reverse polarity to said control wires, an overload relay having a pick-up and a holding winding, a rectifier having its input terminals connected across the terminals of said resistance and having its output terminals connected to supply energy to the overload relay pick-up winding, a terminal of said overload relay holding winding being connected through a first asymmetric unit to the first control wire and being connected through a second asymmetric unit to the second control wire, said asymmetric units both being poled to permit energy to flow in the same direction between the control wires and the overload relay holding winding, means including a polar contact of said control relay for establishing connection from the other terminal of said overload relay holding winding to one or the other of said control wires, the asymmetric units and the connections controlled by said control relay polar contact being arranged so that energy is supplied from said control wires to the overload relay holding winding when and only when energy of normal polarity is supplied to the control wires and the polar contacts of said control relay are in their normal positions and when energy of reverse polarity is supplied to the control wires and the polar contacts of said control relay are in their reverse positions, the asymmetric units and the connections controlled by said control relay polar contact also being arranged so that the energy supplied to the overload relay holding winding is of the same polarity as that supplied to the overload relay pick-up winding, said overload relay having a contact effective when picked up to interrupt the supply of energy from the control wires to the winding of said control relay.

4. In combination, a track switch movable between a normal and a reverse position, a motor for moving said switch, a source of alternating current, a supply circuit for supplying energy from said alternating current source to said motor and including a thermal resistance, a polarized control relay governing the supply of energy over said supply circuit so as to cause the motor to move the switch to its normal or reverse position according as energy of normal or reverse polarity is supplied to said relay, a pair of control wires over which energy may be supplied to the winding of said control relay, means for at times supplying energy of normal polarity and at other times supplying energy of reverse polarity to said control wires, an overload relay having a pick-up and a holding winding, a rectifier having its input terminals connected across the terminals of said thermal resistance and having its output terminals connected to the terminals of the pick-up winding of said overload relay, the first terminal of said overload relay holding winding being connected to one terminal of a current limiting resistance, the other terminal of said current limiting resistance being connected through a first asymmetric unit to one of said control wires and being connected through a second asymmetric unit to the other of said control wires, said asymmetric units both being poled to permit energy to flow in the same direction between the control wires and said current limiting resistance, said overload relay being provided with make-before-break contacts effective when released to establish a connection between the first and second terminals of said overload relay holding winding, said make-before-break contacts being effective when picked up to establish a connection including a polar contact of said control relay to connect the second terminal of the overload relay holding winding to one or the other of said control wires according as said control relay polar contact is in its normal or its reverse position, said overload relay having a contact effective when picked up to interrupt the supply of energy from the control wires to the winding of said control relay.

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