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RAILWAY SWITCH CONTROLLING APPARATUS

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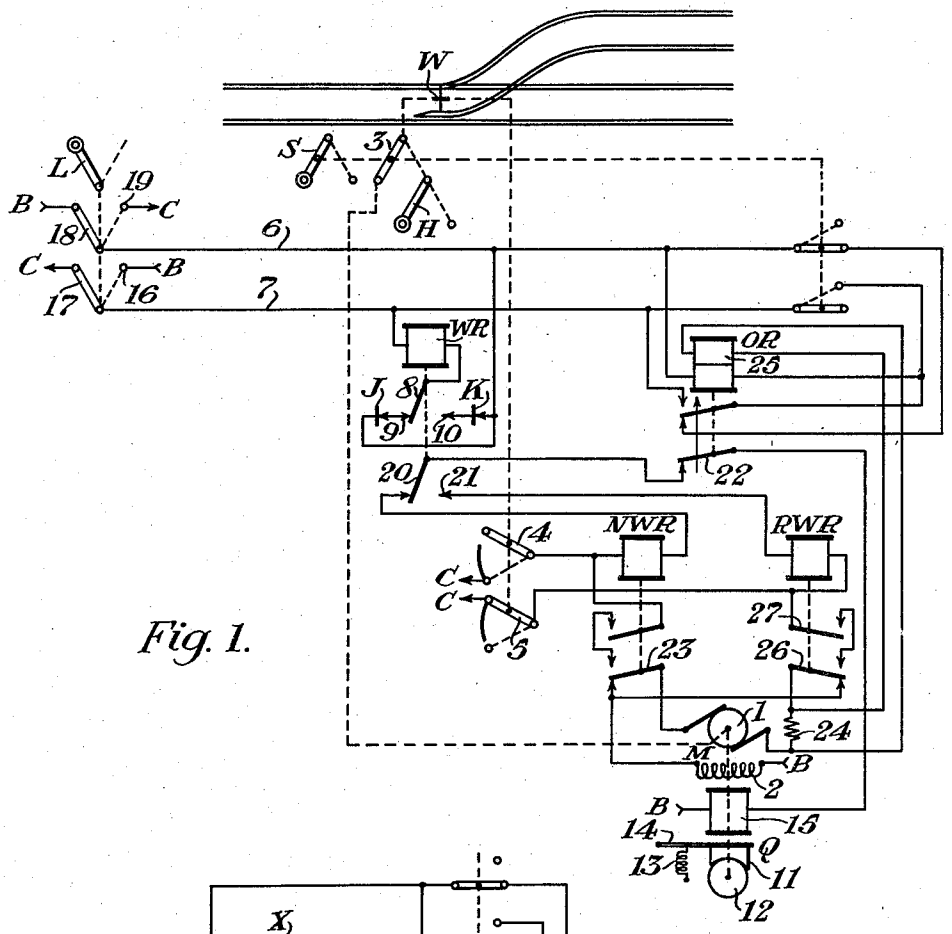


Fig. 1.

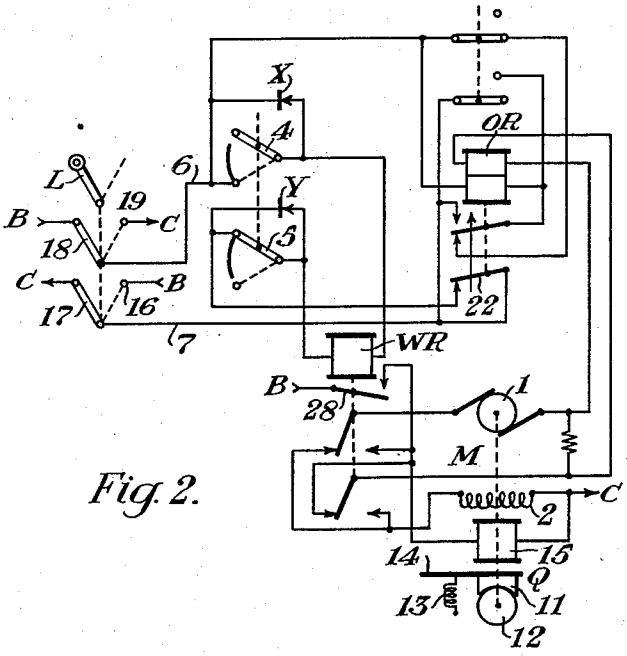


Fig. 2.

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RAILWAY SWITCH CONTROLLING APPARATUS

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Application March 5, 1937, Serial No. 129,210

9 Claims. (Cl. 246—3)

My invention relates to railway switch controlling apparatus.

The present application is a division-in-part and a continuation-in-part of my copending application, Serial No. 48,523, filed on November 6, 1935, now United States Patent 2,117,323, granted May 17, 1938 for Railway switch controlling apparatus.

The apparatus shown in this application is an improvement over that disclosed in United States Patent No. 2,097,202, issued October 26, 1937, to Lester E. Spray; in United States Patent No. 2,098,707, issued November 9, 1937, to Roderick M. MacGregor and Douglas G. Shipp; and in an application by Claude M. Hines and Bernard E. O'Hagan, Serial No. 179,704, filed December 14, 1937, for Railway traffic controlling apparatus.

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

In the accompanying drawing, Fig. 1 is a diagrammatic view illustrating one form of apparatus embodying my invention. Fig. 2 is a diagrammatic view illustrating a modification of a portion of the apparatus shown in Fig. 1, and also embodying my invention.

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

Referring first to Fig. 1, the reference character W designates a railway switch which is operated by the well-known dual selector type of mechanism. In the form here shown diagrammatically, this mechanism comprises a dual selector lever S which operates a link 3. When the lever S is in its normal position, as shown in the drawing, link 3 connects switch W with motor M, and when lever S is in its reverse position, link 3 disconnects the switch W from motor M and connects the switch with a hand throw lever H.

The switch W controls motor cut-out contacts 4 and 5 in accordance with the position of the switch. That is, contact 4 is opened only when the switch occupies its normal position and contact 5 is opened only when the switch occupies its reverse position.

The motor M is provided with an armature 1 and field 2 and is controlled by a normal switch control relay NWR and a reverse switch control relay RWR in such manner that motor M is caused to operate switch W to its normal position when relay NWR is energized and relay RWR is deenergized, and is caused to operate switch W to its reverse position when relay RWR is energized and relay NWR is deenergized.

The relays NWR and RWR are controlled by a polarized switch control relay designated by the reference character WR and by an overload device designated by the reference character OR. That is, when the overload device OR is in its initial deenergized condition, either the relay NWR or RWR can be energized depending upon the condition of the polarized switch control relay WR.

The polarized switch control relay WR is controlled by a lever designated by the reference character L which lever is usually located at some point remote from the switch. That is, when lever L occupies its normal position, as shown in the drawing, wires 6 and 7 are supplied with current in the normal direction, whereas, when lever L occupies its reverse position, wires 6 and 7 are supplied with current in the reverse direction. Relay WR is connected to wires 6 and 7 by two circuits, the first circuit including normal polar contact 8—9 and asymmetric unit J poled to pass energy in the reverse direction, and the second circuit including reverse polar contact 8—10 and asymmetric unit K poled to pass energy in the normal direction. It will be seen, therefore, that normally relay WR is deenergized because when contact 8 is in its normal position, as shown in the drawing, asymmetric unit J will permit only energy flowing in the reverse direction to pass through the relay and when contact 8 is in its reverse position, asymmetric unit K will permit only energy flowing in the normal direction to pass through the relay. In other words, relay WR will be energized only momentarily whenever the position of its polar contact 8 does not correspond to the direction of energization of wires 6 and 7.

The reference character Q designates a brake for preventing unnecessary movement of the motor M after current is disconnected from the motor. In the form here shown, the reference character 11 designates a brake shoe which cooperates with drum 12 connected to armature 1 of motor M. The shoe 11 is normally biased to a braking position by spring 13 cooperating with a pivotally mounted armature 14 to which the shoe 11 is fastened. The armature 14 is controlled by a magnet 15 in such manner that, when magnet 15 is energized, shoe 11 is raised free of drum 12. As will be explained more in detail hereinafter, magnet 15 is energized to render the brake ineffective whenever either relay NWR or relay RWR is energized to supply energy to motor M.

The purpose and operation of overload device OR is similar to that shown and described for

this device in my previously mentioned copending application and it is believed, therefore, that a detailed description of the operation of device OR is unnecessary.

The operation of the other apparatus shown in Fig. 1 will best be understood by explaining the operation and tracing the circuits simultaneously.

I shall first assume that with all apparatus in its normal condition, as shown in the drawing, the operator desires to cause switch W to move to its reverse position. He may do this by moving lever L to its reverse position. When lever L occupies its reverse position, relay WR will become energized in the reverse direction by virtue of a circuit which passes over a path from a terminal B of any suitable source of energy through lever contact 16—17, wire 7, winding of relay WR, normal polar contact 8—9 of relay WR, asymmetric unit J, wire 6, and lever contact 18—19 to terminal C of the same source of energy. When polarized switch control relay WR is energized in the reverse direction, its polar contact 20 will move to the right to close contact 20—21. When contact 20—21 of relay WR is closed, reverse switch control relay RWR will become energized by a circuit which passes over a path from terminal B, through magnet 15 of brake Q, back contact 22 of overload device OR, reverse polar contact 20—21 of relay WR, winding of relay RWR, and reverse motor cut-out contact 5 to terminal C. It will be noted that since this circuit includes brake magnet 15, the brake Q will be rendered ineffective simultaneously with the energization of relay RWR. When reverse switch control relay RWR is energized, the motor M will be caused to operate in the reverse direction by a circuit which passes from terminal B through field winding 2, back point of contact 23 of relay NWR, armature 1, resistor 24 and overload winding 25 of relay OR in multiple, front points of contacts 26 and 27 of relay RWR in series, and reverse motor cut-out contact 5 to terminal C. When motor M completes the movement of switch W to its reverse position, motor cut-out contact 5 will become opened so that relay RWR, motor M and brake magnet 15 will all become deenergized.

The deenergization of brake winding 15 will release armature 14 so that spring 13 will bring shoe 11 into engagement with drum 12 to stop the rotation of motor armature 1, and the opening of reverse motor cut-out contact 5 will open the motor operating circuit so that front points of contacts 26 and 27 of relay RWR will not ordinarily be subjected to arcing due to motor current when these contacts become opened. Contacts 26 and 27 are connected in series so that in the event that these contacts should become opened while motor cut-out contacts 4 or 5 are closed such, for example, as will occur upon the operation of overload device OR, the arcing at the individual contacts due to the breaking of the motor current will be substantially reduced.

Although the motor operating circuits are herein shown as including a plurality of front contacts of the relays NWR and RWR, it is understood that a single front contact of these relays may be used if desired.

It is not considered necessary to describe the operation of the apparatus when it is desired to return the switch W to its normal position because such operation will be similar to that just described for a reverse operation of the switch.

Referring now to Fig. 2, the reference characters X and Y designate two asymmetric units connected in multiple with switch contacts 4 and 5, respectively, and so poled as to prevent the energization of polarized switch control relay WR when the lever L and the switch W occupy corresponding positions. For example, if lever L is moved to its reverse position, relay WR will become energized in the reverse direction by virtue of a circuit which passes over a path from terminal B through contact 16—17 of lever L, wire 7, back contact 22 of overload relay OR, reverse switch contact 5, relay WR, asymmetric unit X, wire 6, and contact 18—19 of lever L to terminal C. When the switch completes its movement to the reverse position in response to the reverse energization of relay WR, reverse switch contact 5 will become opened so that current will be disconnected from relay WR since asymmetric unit Y will not pass current in the reverse direction to relay WR. The asymmetric units X and Y, therefore, function in cooperation with switch contacts 4 and 5 to provide for energization of the relay WR only when the switch W is to be moved.

The relay WR controls the switch motor M direct without the use of the normal and reverse switch control relays NWR and RWR. That is, the operating circuits for the motor M are controlled by neutral and polar contacts of the relay WR in such manner that when the relay WR is energized, the motor M will operate in the normal or reverse direction according as the relay WR is energized in the normal or reverse direction and when the relay WR is deenergized, the motor will be disconnected from its source of energy.

The brake Q functions to prevent unnecessary movement of the motor M in a manner similar to that described for the apparatus shown in Fig. 1. That is, when relay WR is energized, the magnet 15 is also energized over a front contact 28 of the relay WR so that the brake is ineffective and when relay WR is deenergized, the magnet 15 is also deenergized so that the brake is effective for preventing unnecessary rotation of the armature 1.

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 railway track switch including a motor connected thereto and having a normal position and a reverse position, a first contact which is opened only when said switch occupies its normal position, a second contact which is opened only when said switch occupies its reverse position, an asymmetric unit poled to pass current in the reverse direction constantly connected in multiple with said first contact, an asymmetric unit poled to pass current in the normal direction constantly connected in multiple with said second contact, a pair of conductors and means for energizing said conductors in the normal direction or in the reverse direction, a polarized relay, means including said first and second contacts for connecting said polarized relay to said conductors, and means governed by said polarized relay for reversibly governing said motor.

2. In combination, a railway track switch movable between a normal and a reverse position, a

motor for operating said switch, a first contact open only when the switch occupies its normal position, a second contact open only when the switch occupies its reverse position, a normal supply circuit including said first contact for suppling current to the motor to cause it to move the switch to the normal position, a reverse supply circuit including said second contact for supplying current to the motor to cause it to move the switch to the reverse position, a normal control relay operative when energized to permit the supply of current to the motor through the normal supply circuit and to interrupt the reverse supply circuit, a reverse control relay operative when energized to permit the supply of current to the motor through the reverse supply circuit and to interrupt the normal supply circuit, a pair of conductors, a polarized relay having an armature movable to a normal or a reverse position in accordance with the polarity of the current supplied to the relay winding, said armature being adapted when in either position to remain in such position until the relay winding is energized by current of a polarity effective to cause movement of the armature to the other position, means operative in the normal position of the armature to permit the supply of current of reverse polarity only from said conductors to said relay winding, means operative in the reverse position of the armature to permit the supply of current of normal polarity only from said conductors to said relay winding, manually controlled means for supplying current of one polarity or the other to said conductors, a source of current, a circuit including said first contact in series therewith for connecting one terminal of said source to one terminal of the winding of the normal control relay, a circuit including the second contact in series therewith for connecting one terminal of said source to one terminal of the winding of the reverse control relay, and means controlled by the armature of the polarized relay for connecting the other terminal of said source to the other terminal of one or the other of said switch control relays.

3. In combination, a railway track switch movable between a normal and a reverse position, a motor for operating said switch, a first contact open only when the switch occupies its normal position, a second contact open only when the switch occupies its reverse position, a source of current, means for connecting one terminal of said source to one terminal of said motor, a normal supply circuit including said first contact for establishing connection between the other terminal of said source and the other terminal of the motor to cause the motor to move the switch to the normal position, a reverse supply circuit including said second contact for establishing connection between said other terminal of said source and the other terminal of the motor to cause the motor to move the switch to the reverse position, a normal control relay operative when energized to permit the supply of current through the normal supply circuit and to interrupt the reverse supply circuit, a reverse control relay operative when energized to permit the supply of current through the reverse supply circuit and to interrupt the normal supply circuit, a pair of conductors, a polarized relay having an armature movable to a normal or a reverse position in accordance with the polarity of the current supplied to the relay winding, said armature being adapted when in either position to remain in such position until the relay winding is energized by current of a polarity effective to cause movement of the armature to the other position, means operative in the normal position of the armature to permit the supply of current of reverse polarity only from said conductors to said relay winding, means operative in the reverse position of the armature to permit the supply of current of normal polarity only from said conductors to said relay winding, manually controlled means for supplying current of one polarity or the other to said conductors, means controlled by the armature of the polarized relay for connecting said one terminal of said source to one terminal of the winding of one or the other of the control relays, means for connecting the other terminal of the winding of the normal control relay to the normal supply circuit at a point therein intermediate the first contact and the motor, and means for connecting the other terminal of the reverse control relay to the reverse supply circuit at a point therein intermediate the second contact and the motor.

4. In combination, a railway track switch movable between a normal and a reverse position, a motor for operating said switch, a first contact open only when the switch occupies its normal position, a second contact open only when the switch occupies its reverse position, a source of current, means for connecting one terminal of said source to one terminal of said motor, a normal supply circuit including said first contact for establishing connection between the other terminal of said source and the other terminal of the motor to cause the motor to move the switch to the normal position, a reverse supply circuit including said second contact for establishing connection between said other terminal of said source and the other terminal of the motor to cause the motor to move the switch to the reverse position, a normal control relay operative when energized to permit the supply of current through the normal supply circuit and to interrupt the reverse supply circuit, a reverse control relay operative when energized to permit the supply of current through the reverse supply circuit and to interrupt the normal supply circuit, a pair of conductors, a polarized relay having an armature movable to a normal or a reverse position in accordance with the polarity of the current supplied to the relay winding, said armature being adapted when in either position to remain in such position until the relay winding is energized by current of a polarity effective to cause movement of the armature to the other position, means operative in the normal position of the armature to permit the supply of current of reverse polarity only from said conductors to said relay winding, means operative in the reverse position of the armature to permit the supply of current of normal polarity only from said conductors to said relay winding, manually controlled means for supplying current of one polarity or the other to said conductors, means controlled by the armature of the polarized relay for connecting said one terminal of said source to one terminal of the winding of one or the other of the control relays, means for connecting the other terminal of the winding of the normal control relay to the normal supply circuit at a point therein intermediate the first contact and the motor, and means for connecting the other terminal of the reverse control relay to the reverse supply circuit at a point therein intermediate the second contact and the motor.

4. In combination, a railway track switch movable between a normal and a reverse position, a motor for operating said switch, a first contact open only when the switch occupies its normal position, a second contact open only when the switch occupies its reverse position, a source of current, means for connecting one terminal of said source to one terminal of said motor, a normal supply circuit including said first contact for establishing connection between the other terminal of said source and the other terminal of the motor to cause the motor to move the switch to the normal position, a reverse supply circuit including said second contact for establishing connection between said other terminal of said source and the other terminal of the motor to cause the motor to move the switch to the reverse position, a normal control relay operative when energized to permit the supply of current through the normal supply circuit and to interrupt the reverse supply circuit, a reverse control relay operative when energized to permit the supply of current through the reverse supply circuit and to interrupt the normal supply circuit, a pair of conductors, a polarized relay having an armature movable to a normal or a reverse position in accordance with the polarity of the current supplied to the relay winding, said armature being adapted when in either position to remain in such position until the relay winding is energized by current of a polarity effective to cause movement of the armature to the other position, means operative in the normal position of the armature to permit the supply of current of reverse polarity only from said conductors to said relay winding, means operative in the reverse position of the armature to permit the supply of current of normal polarity only from said conductors to said relay winding, manually controlled means for supplying current of one polarity or the other to said conductors, means controlled by the armature of the polarized relay for connecting said one terminal of said source to one terminal of the winding of one or the other of the control relays, means for connecting the other terminal of the winding of the normal control relay to the normal supply circuit at a point therein intermediate the first contact and the motor, and means for connecting the other terminal of the reverse control relay to the reverse supply circuit at a point therein intermediate the second contact and the motor.

4. In combination, a railway track switch movable between a normal and a reverse position, a motor for operating said switch, a first contact open only when the switch occupies its normal position, a second contact open only when the switch occupies its reverse position, a source of current, means for connecting one terminal of said source to one terminal of said motor, a normal supply circuit including said first contact for establishing connection between the other terminal of said source and the other terminal of the motor to cause the motor to move the switch to the normal position, a reverse supply circuit including said second contact for establishing connection between said other terminal of said source and the other terminal of the motor to cause the motor to move the switch to the reverse position, a normal control relay operative when energized to permit the supply of current through the normal supply circuit and to interrupt the reverse supply circuit, a reverse control relay operative when energized to permit the supply of current through the reverse supply circuit and to interrupt the normal supply circuit, a pair of conductors, a polarized relay having an armature movable to a normal or a reverse position in accordance with the polarity of the current supplied to the relay winding, said armature being adapted when in either position to remain in such position until the relay winding is energized by current of a polarity effective to cause movement of the armature to the other position, means operative in the normal position of the armature to permit the supply of current of reverse polarity only from said conductors to said relay winding, means operative in the reverse position of the armature to permit the supply of current of normal polarity only from said conductors to said relay winding, manually controlled means for supplying current of one polarity or the other to said conductors, means controlled by the armature of the polarized relay for connecting said one terminal of said source to one terminal of the winding of one or the other of the control relays, means for connecting the other terminal of the winding of the normal control relay to the normal supply circuit at a point therein intermediate the first contact and the motor, and means for connecting the other terminal of the reverse control relay to the reverse supply circuit at a point therein intermediate the second contact and the motor.

therein intermediate the first contact and the motor, and means for connecting the other terminal of the reverse control relay to the reverse supply circuit at a point therein intermediate the second contact and the motor.

5. In combination, a railway track switch having a normal position and a reverse position, a contact which is opened when said switch occupies its normal position and a contact which is opened when said switch occupies its reverse position, a normally deenergized polarized switch control relay, a circuit including an asymmetric unit in an auxiliary path around said contact which is opened when the switch is in its normal position for energizing said relay in the reverse direction, a circuit including an asymmetric unit in an auxiliary path around said contact which is opened when the switch is in its reverse position for energizing said relay in the normal direction, a motor controlled by said switch control relay, an overload relay controlled by the current in said motor, a contact of said overload relay for controlling said switch control relay, and a brake on said motor controlled by said switch control relay.

6. In combination, a railway track switch including a motor connected thereto and having a normal position and a reverse position, a normal switch control relay and a reverse switch control relay, a first contact which is open only when said switch is in its normal position and a second contact which is open only when said switch is in its reverse position, a normal operating circuit for said motor governed by said normal switch control relay, a reverse operating circuit for said motor governed by said reverse switch control relay, a normal control circuit for said normal relay, and a reverse control circuit for said reverse relay, both said normal circuits including said first contact and both said reverse circuits including said second contact.

7. In combination, a railway track switch, a motor for moving the switch between a normal and a reverse position, a first contact open only when the switch is in the normal position, a second contact open only when the switch is in the reverse position, a normal supply circuit including said first contact for supplying current to the motor to cause it to move the switch to the normal position, a reverse supply circuit including said second contact for supplying current to the motor to cause it to move the switch to the reverse position, a normal control relay operative when energized to permit the supply of current through the normal supply circuit and to interrupt the reverse supply circuit, a reverse control relay operative when energized to permit the supply of current to the motor through the reverse supply circuit and to interrupt the normal supply circuit, a normal control circuit including the first contact in series therewith for energizing the normal control relay, a reverse control circuit including the second contact in series therewith for energizing the reverse control relay, and means for selectively controlling the normal and reverse control circuits.

8. In combination, a railway track switch, a motor for moving the switch between a normal and a reverse position, a first contact open only when the switch is in the normal position, a second contact open only when the switch is in the reverse position, a normal supply circuit including said first contact for supplying current to the motor to cause it to move the switch to the normal position, a reverse supply circuit including said second contact for supplying current to the motor to cause it to move the switch to the reverse position, a normal control relay operative when energized to permit the supply of current through the normal supply circuit and to interrupt the reverse supply circuit, a reverse control relay operative when energized to permit the supply of current to the motor through the reverse supply circuit and to interrupt the normal supply circuit, a normal control circuit including the first contact in series therewith for energizing the normal control relay, a reverse control circuit including the second contact in series therewith for energizing the reverse control relay, a polarized relay having polar contacts movable between a normal and a reverse position, said contacts being operable in one position to establish one of said control circuits and being operable in the other position to establish the other of said control circuits, and means for supplying current of one or the other relative polarity to said polarized relay.

9. In combination, a railway track switch, a motor for moving the switch between a normal and a reverse position, a first contact open only when the switch is in the normal position, a second contact open only when the switch is in the reverse position, a normal supply circuit including said first contact for supplying current to the motor to cause it to move the switch to the normal position, a reverse supply circuit including said second contact for supplying current to the motor to cause it to move the switch to the reverse position, a normal control relay operative when energized to permit the supply of current through the normal supply circuit and to interrupt the reverse supply circuit, a reverse control relay operative when energized to permit the supply of current to the motor through the reverse supply circuit and to interrupt the normal supply circuit, a normal control circuit including the first contact in series therewith for energizing the normal control relay, a reverse control circuit including the second contact in series therewith for energizing the reverse control relay, means for selectively establishing the normal and reverse control circuits, and an overload relay responsive to the value of the current in both the normal and the reverse supply circuits, said overload relay controlling both the normal and the reverse control circuits and being operative to interrupt said control circuits when the current in either of said supply circuits exceeds a predetermined value.

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