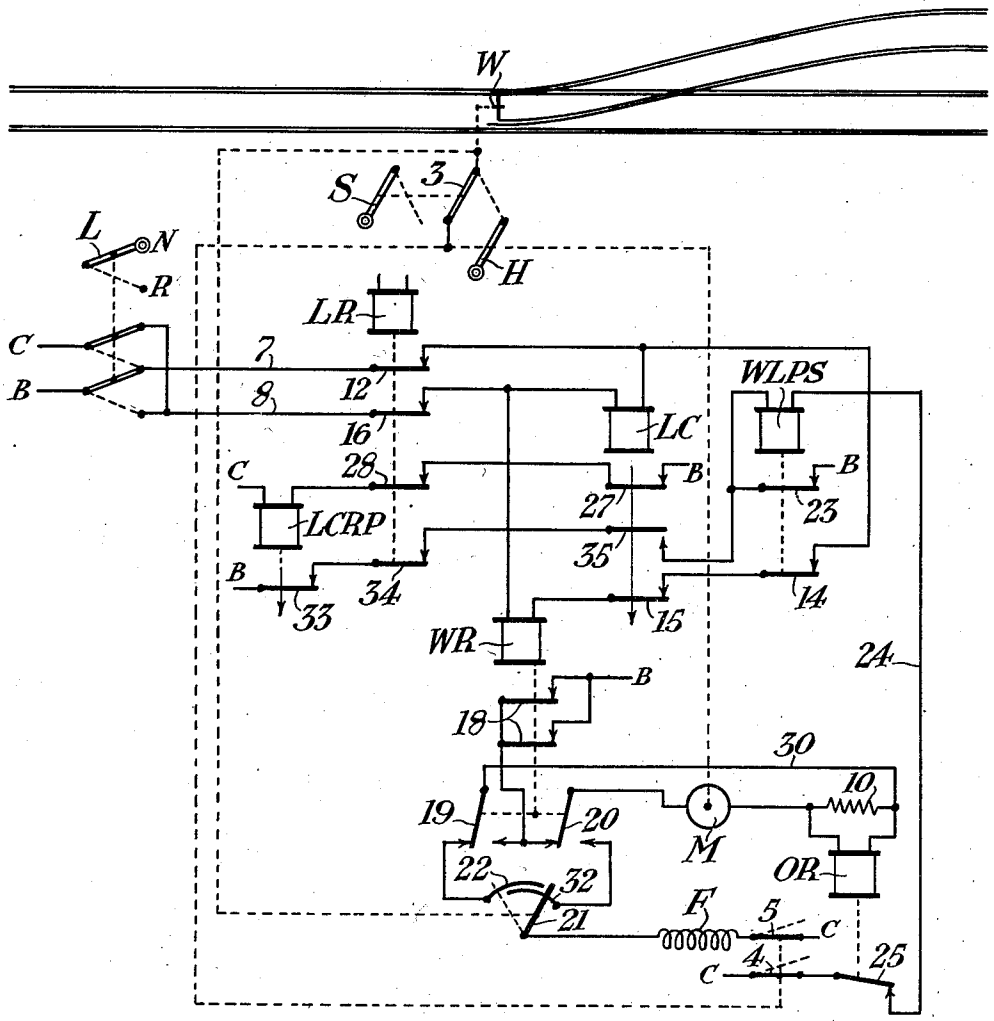
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SWITCH CONTROL CIRCUIT

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INVENTORS
Claude M. Hines and
BY Norman F. Agnew.
THEIR ATTORNEY

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SWITCH CONTROL CIRCUIT

Claude M. Hines, Pittsburgh, and Norman F. Agnew, Penn Township, Allegheny County, Pa., assignors to The Union Switch and Signal Company, Swissvale, Pa., a corporation of Pennsylvania

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Our invention relates to an improved control circuit adapted for use to control the motors employed to operate railway track switches.

It is customary to employ a polarized relay to control the motor for operating a track switch and to supply energy of one polarity or the other to this relay over a control circuit to cause the relay to control the motor to move the switch to one or the other of its positions. In order to prevent storage of switch control it has heretofore been proposed to have associated with the switch control relay a stick repeater relay which when released interrupts the circuit of the switch motor, while the circuit of this stick repeater relay is controlled in such manner that the relay when energized becomes deenergized on operation of the switch overload relay or on operation of the dual selector lever to condition the switch for hand operation. The pick-up circuit for the stick repeater relay is arranged so as to be established only on a change in energization of the control circuit subsequent to release of the overload relay or restoration of the dual selector lever to its normal position.

In the systems of this type heretofore known the stick repeater relay has been provided with contacts included in the switch motor circuit. This has necessitated placing the stick repeater relay adjacent the switch motor since, if the relay is located some distance from the motor, the voltage drop due to the length of the wires leading from the motor to the relay will be excessive.

The equipment boxes associated with track switches are relatively small and it is desirable that the motor control system be arranged so that the stick repeater relay does not control the switch motor circuit directly, but does so through the switch control relay so that the stick repeater relay need not be located adjacent the switch motor, but may be located some distance therefrom and therefore need not be located in the equipment box at the switch.

It is an object of our invention to provide an improved control system of the type described.

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

We shall describe one form of improved switch control system embodying our invention, and shall then point out the novel features thereof in claims.

In the drawing the single figure is a diagram illustrating one preferred embodiment of our invention.

Referring to the drawing, 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 includes 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 the switch W with the motor M, while when the lever S is in its reverse position, link 3 disconnects the switch from the motor and connects the switch with the hand throw lever H. The lever S also controls contacts 4 and 5 in such manner that these contacts are closed when and only when the lever S is in its normal position, and are open when the lever S is in its reverse position. The contact 5 is included in the circuit of the switch motor M so that the motor can be operated only when the dual selector lever S is in its normal position.

The motor M is controlled by a polarized switch control relay WR in the manner well known in the art, that is, the motor is energized in one direction or the other to cause switch W to move to a corresponding position in accordance with the direction of energization of the relay WR.

The polarized switch control relay WR is controlled by energy supplied over a control circuit consisting of control wires 7 and 8, while the polarity of the energy supplied over these wires is governed by a switch control lever L which is movable between a normal and a reverse position.

The supply of energy from the control wires 7 and 8 to the winding of relay WR is controlled by the stick repeater or auxiliary relay WLPS, the overload relay OR, lock relay LR, neutral relay LC, and slow releasing relay LCRP as hereinafter explained in detail.

The switch control lever L may be located at a point remote from the switch W, as for example in an interlocking tower, while the balance of the equipment may be located in the vicinity of the switch. As pointed out below, only the overload relay OR and the switch control relay WR need be located in the equipment box adjacent the switch as these are the only relays included in the switch motor circuit.

The lock relay LR may be governed in any manner well known in the art by traffic conditions in the vicinity of the switch W so as to be picked up when and only when it is safe for the switch to be moved.

The overload relay OR is here shown as having a winding controlled by the current in the circuit of the switch motor. This winding is connected in series with the motor circuit while a

thermal resistor 10 is connected in multiple with the winding of the overload relay. Under normal conditions the major portion of the current taken by the switch motor flows through the resistor 10. When the switch is obstructed, the motor M draws increased current which heats up the resistor 10 and increases its resistance. This increased resistance of the resistor 10 causes more current to flow in the winding of the relay OR so that the contact of this relay becomes picked up.

The equipment is shown in the condition which it assumes when the switch control lever L is in its normal position, the lock relay LR is picked up and the switch W is in its normal position.

As the lever N is in its normal position, terminal B of a source of direct current is connected to control wire 7, while terminal C of the source is connected to control wire 8 so that energy of normal polarity is supplied over the control wires. At this time the winding of relay WR is energized by current supplied from the control wires 7 and 8 over the circuit which is traced from wire 7 through front contact 12 of relay LR, front contact 14 of relay WLPS, front contact 15 of relay LC, winding of relay WR, and front contact 16 of relay LR to wire 8.

As the winding of relay WR is energized by current of normal polarity, the neutral contacts 18 of the relay are picked up, while the polar contacts 19 and 20 of the relay occupy their left-hand or normal positions as shown. At this time the switch W is in its normal position so that switch operated contact 21 is out of engagement with contact 22 and interrupts the circuit of the motor M.

The stick repeater relay WLPS is energized by current supplied over the circuit which is traced from terminal B of a local source of current through front contact 23 of relay WLPS, winding of relay WLPS, wire 24, back contact 25 of overload relay OR, and contact 4 of the dual selector mechanism to terminal C.

The relay LC is energized from the control wires as is obvious, while the relay LCRP is energized over the circuit which is traced from terminal B of a local source of current through front contact 27 of relay LC, front contact 28 of relay LR, and winding of relay LCRP to terminal C. The relays LC and LCRP are slow in releasing and these relays are selected so that the relay LC is somewhat slower in releasing than the relay LCRP.

If the operator wishes to reverse the switch, he may do so by moving the switch control lever L from its normal to its reverse position to thereby change the energy supplied to the control wires from normal to reverse polarity. On this change in polarity of the energy supplied to the control wires and to the winding of relay WR, the polar contacts 19 and 20 of relay WR are shifted to their right-hand or reverse positions and establish the circuit to energize the motor to cause it to move the switch W to its reverse position. This circuit is traced from terminal B of a local source of direct current through front contacts 18 of relay WR, reverse polar contact 19, wire 30, resistor 10 and winding of overload relay OR in multiple, armature of motor M, reverse polar contact 20 of relay WR, switch machine contacts 32 and 21, motor field winding F, and contact 5 of the dual selector mechanism to terminal C of the source.

When the switch W completes its movement to its reverse position, contact 21 moves out of engagement with the contact 32 and interrupts the circuit of the motor M.

The operation of the system on movement of the switch from its reverse to its normal position is substantially the same as from its normal to its reverse position and will not be traced in detail.

The lock relay LR when released prevents the supply of energy to the winding of relay WR so that contacts 18 of this relay release and interrupt the circuit of the switch motor to thereby prevent movement of the switch.

The system provided by this invention is arranged so that on occurrence of an overload, or on movement of the dual selector lever S to the position to condition the switch for hand operation, the relay WLPS releases and interrupts the circuit of the relay WR, as well as its own stick circuit, and can thereafter be energized only if the lever L is moved so that relay LC releases.

On occurrence of an overload the contact 25 of relay OR picks up and interrupts the circuit of the relay WLPS, while on movement of the dual selector lever S to the hand throw position contact 4 interrupts the circuit of relay WLPS. On release of relay WLPS its contact 23 interrupts the stick circuit for the relay so that on closing of contact 25 of relay OR, or of contact 4 of the dual selector mechanism, the relay WLPS does not pick up but remains released until its pick-up circuit is established.

As long as relay WLPS is released, its contact 14 interrupts the circuit of the relay WR so that contacts 18 of the relay WR are released and interrupt the switch motor circuit so that contact 25 of the overload relay OR, if picked up, becomes released.

In order to establish the pick-up circuit for the relay WLPS the operator must manipulate the switch control lever L so as to interrupt or reverse the supply of energy to the line wires 7 and 8. As a result of this manipulation of the lever L, the contacts of relay LC release and pick up again. On release of relay LC its contact 27 interrupts the circuit of the relay LCRP, but because of the slow releasing characteristics of relay LCRP the contacts of this relay remain picked up for a period subsequent to the release of relay LC. Accordingly, while the contacts of relay LC are in their released position the pick-up circuit of relay WLPS is complete and is traced from terminal B through front contact 33 of relay LCRP, front contact 34 of relay LR, and back contact 35 of relay LC to one terminal of the winding of relay WLPS, while the other terminal of the winding of relay WLPS is connected to terminal C through wire 24 and contacts 25 and 4, assuming these contacts to be closed.

Although this circuit is interrupted as soon as the contact 35 of relay LC picks up, the energy supplied over the circuit while the contact 35 of relay LC is in its released position is effective to pick up the relay WLPS, while on picking up of the contacts of relay WLPS its contact 23 establishes the stick circuit to maintain the relay picked up after interruption of its pick-up circuit. When the contacts of relay WLPS are picked up, contact 14 establishes the circuit of the winding of relay WR so that the operator has complete control of the switch and may move it to either position. In addition, on picking up of the contacts of relay LC its contact 27 completes the circuit of relay LCRP so that the contacts of this relay are picked up.

The system provided by this invention is ar-

ranged so that release of the lock relay LR will not establish the pick-up circuit for this relay.

On release of the contacts of the lock relay LR its contacts 12 and 16 interrupt the circuit of control wires 7 and 8 so that relay LC releases, while contact 28 interrupts the circuit of relay LCRP so that it releases, and contact 34 of relay LR interrupts the pick-up circuit of relay WLPS to prevent establishment of this circuit as long as the lock relay is released. On subsequent picking up of the contacts of relay LR the pick-up circuit of relay WLPS is not complete as contact 33 of relay LCRP is released.

On picking up of the contacts of the lock relay LR energy is again supplied to the relay LC and contact 35 of this relay picks up and interrupts the pick-up circuit of relay WLPS so that this circuit is not established on picking up of the contact 33 of relay LCRP.

It will be seen, therefore, that the pick-up circuit of relay WLPS is maintained interrupted at all times during the release of relay LR.

This system is also arranged so that the pick-up circuit of the relay WLPS will not be established if the lock relay LR releases momentarily. On release of the lock relay LR its contacts 12 and 16 interrupt the circuit of the relay LC, while its contact 28 interrupts the circuit of the relay LCRP. The relays LC and LCRP both release, but as stated above these relays are selected so that when they are deenergized simultaneously, relay LC does not release until after relay LCRP releases. Accordingly, contact 35 of relay LC does not become closed until after contact 33 of relay LCRP releases so that even if the contacts of relay LR pick up promptly after their release, the pick-up circuit of relay WLPS will not be established as it will be interrupted either by contact 35, which has not become released, or by contact 33, which has already released.

As the pick-up circuit for the relay WLPS cannot be established by release of the lock relay LR, the relay WLPS, if released, will not be energized by release of the lock relay, but will remain deenergized until the control lever L is moved. This prevents storage of switch control and prevents unintended movement of the switch after restoration of the dual selector lever S to the motor operating position if the position of the switch control lever L is changed while the dual selector lever S is in the hand throw position.

It will be seen also that the stick repeater relay WLPS controls the circuit of the switch motor M through the relay WR instead of directly by its own contacts. As the current for the switch motor is not supplied through contacts of the relay WLPS, the relay WLPS need not be located adjacent the switch but may be located at any convenient point.

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

Having thus described our invention, what we claim is:

1. In combination, a railway track switch movable between a normal and a reverse position, a motor for moving said switch, a lever having a first position in which it conditions the switch to be moved by the motor and a second position in which it conditions the switch for manual operation, a polarized relay, a motor operating circuit including normal and reverse polar contacts as well as front neutral contacts of said polar relay, a pair of control wires, means for supplying energy of normal or reverse polarity to said control wires, a neutral relay energized from said control wires, an auxiliary relay, a pick-up circuit for said auxiliary relay including a back contact of said neutral relay, a stick circuit for said auxiliary relay including its own front contact and a contact closed only when said lever is in its first position, and means including a front contact of said auxiliary relay for energizing said polar relay from said control wires.

2. In combination, a railway track switch movable between a normal and a reverse position, a motor for moving said switch, a lever having a first position in which it conditions the switch to be moved by the motor and a second position in which it conditions the switch for manual operation, a polarized relay, a motor operating circuit including normal and reverse polar contacts as well as front neutral contacts of said polar relay, a pair of control wires, means for supplying energy of normal or reverse polarity to said control wires, a neutral relay energized from said control wires, an overload relay having a contact which becomes picked up on abnormal current flow in said motor operating circuit, an auxiliary relay, a pick-up circuit for said auxiliary relay including a back contact of said neutral relay, a stick circuit for said auxiliary relay including its own front contact, a back contact of said overload relay, and a contact closed only when said lever is in its first position, and means including a front contact of said auxiliary relay for energizing said polar relay from said control wires.

3. In combination, a railway track switch movable between a normal and a reverse position, a motor for moving said switch, a lever having a first position in which it conditions the switch to be moved by the motor and a second position in which it conditions the switch for manual operation, a polarized relay, a motor operating circuit including normal and reverse polar contacts as well as front neutral contacts of said polar relay, a pair of control wires, means for supplying energy of normal or reverse polarity to said control wires, a neutral relay energized from said control wires, a lock relay governed by traffic conditions in the vicinity of said switch, said lock relay being picked up only when movement of the switch is permitted, said lock relay being effective when released to interrupt the supply of energy over the control wires, an auxiliary relay, a pick-up circuit for said auxiliary relay including a back contact of said neutral relay and a front contact of said lock relay, a stick circuit for said auxiliary relay including its own front contact and a contact closed only when said lever is in its first position, and means including a front contact of said auxiliary relay for energizing said polar relay from said control wires.

4. In combination, a railway track switch movable between a normal and a reverse position, a motor for moving said switch, a lever having a first position in which it conditions the switch to be moved by the motor and a second position in which it conditions the switch for manual operation, a polarized relay, a motor operating circuit including normal and reverse polar contacts

as well as front neutral contacts of said polar relay, a pair of control wires, means for supplying energy of normal or reverse polarity to said control wires, a neutral relay energized from said control wires, an overload relay having a contact which becomes picked up on abnormal current flow in said motor operating circuit, a lock relay governed by traffic conditions in the vicinity of said switch, said lock relay being picked up only when movement of the switch is permitted, said lock relay being effective when released to interrupt the supply of energy over the control wires, an auxiliary relay, a pick-up circuit for said auxiliary relay including a back contact of said neutral relay and a front contact of said lock relay, a stick circuit for said auxiliary relay including its own front contact, a back contact of said overload relay and a contact closed only when said lever is in its first position, and means including a front contact of said auxiliary relay for energizing said polar relay from said control wires.

5. In combination, a railway track switch movable between a normal and a reverse position, a motor for moving said switch, a polarized relay, a motor operating circuit including normal and reverse polar contacts as well as front neutral contacts of said polar relay, a pair of control wires, means for supplying energy of normal or reverse polarity to said control wires, a neutral relay energized from said control wires, a lock relay governed by traffic conditions in the vicinity of said switch, said lock relay being picked up only when movement of the switch is permitted, said lock relay being effective when released to interrupt the supply of energy over the control wires, an overload relay having a contact which becomes picked up on abnormal current flow in said motor operating circuit, an auxiliary relay, a pick-up circuit for said auxiliary relay including a back contact of the neutral relay and a front contact of the lock relay, a stick circuit for said auxiliary relay including its own front contact and a back contact of said overload relay, and means including a front contact of said auxiliary relay for energizing said polar relay from said control wires.

6. In combination, a railway track switch movable between a normal and a reverse position, a motor for moving said switch, a lever having a first position in which it conditions the switch to be moved by the motor and a second position in which it conditions the switch for manual operation, a polarized relay, a motor operating circuit including normal and reverse polar contacts as well as front neutral contacts of said polar relay, a pair of control wires, means for supplying energy of normal or reverse polarity to said control wires, a neutral relay energized from said control wires, a lock relay governed by traffic conditions in the vicinity of said switch, said lock relay being picked up only when movement of the switch is permitted and being effective when released to interrupt the supply of energy over said control wires, a slow release relay energized by current supplied over a circuit including front contacts of said neutral and lock relays, an auxiliary relay, a pick-up circuit for said auxiliary relay including front contacts of said slow release relay and of said lock relay and a back contact of said neutral relay, a stick circuit for said auxiliary relay including its own front contact and a contact closed only when said lever is in its first position, and means including a front contact of said auxiliary relay for energizing said polar relay from said control wires.

7. In combination, a railway track switch movable between a normal and a reverse position, a motor for moving said switch, a lever having a first position in which it conditions the switch to be moved by the motor and a second position in which it conditions the switch for manual operation, a polarized relay, a motor operating circuit including normal and reverse polar contacts as well as front neutral contacts of said polar relay, a pair of control wires, means for supplying energy of normal or reverse polarity to said control wires, a neutral relay energized from said control wires, a lock relay governed by traffic conditions in the vicinity of said switch, said lock relay being picked up only when movement of the switch is permitted and being effective when released to interrupt the supply of energy over said control wires, a slow release relay energized by current supplied over a circuit including front contacts of said neutral and lock relays, an overload relay having a contact which becomes opened on abnormal current flow in said motor operating circuit, an auxiliary relay, a pick-up circuit for said auxiliary relay including a back contact of the neutral relay and front contacts of the lock and slow releasing relays, a stick circuit for said auxiliary relay including its own front contact, the overload relay contact and a contact closed only when said lever is in its first position, and means including a front contact of said auxiliary relay for energizing said polar relay from said control wires.

8. A switch control system as described in claim 6 and in which the neutral relay is slower in releasing than the slow release relay to thereby prevent establishment of the pick-up circuit for the auxiliary relay on momentary release of the lock relay.

9. A switch control system as described in claim 7 and in which the neutral relay is slower in releasing than the slow release relay to thereby prevent establishment of the pick-up circuit for the auxiliary relay on momentary release of the lock relay.

CLAUDE M. HINES.
NORMAN F. AGNEW.