Oct. 26, 1937. F. B. HITCHCOCK 2,096,935

RAILWAY TRAFFIC CONTROLLING SYSTEM

Filed May 24, 1935

FIG. 1.

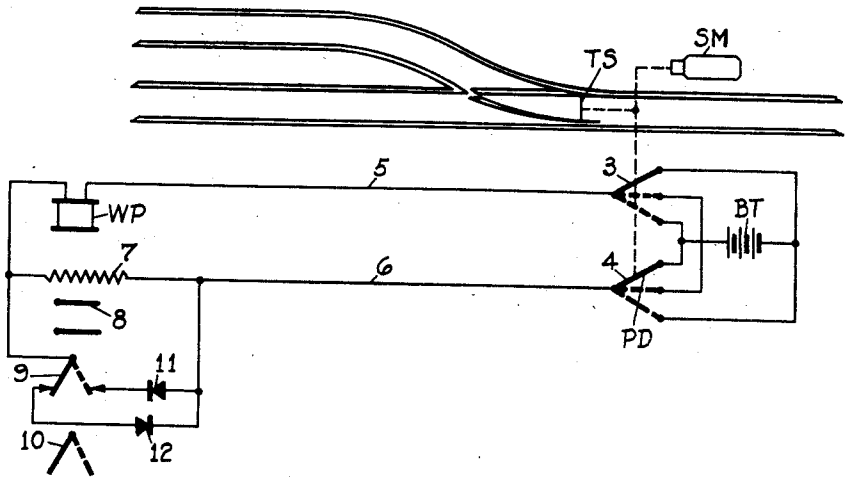
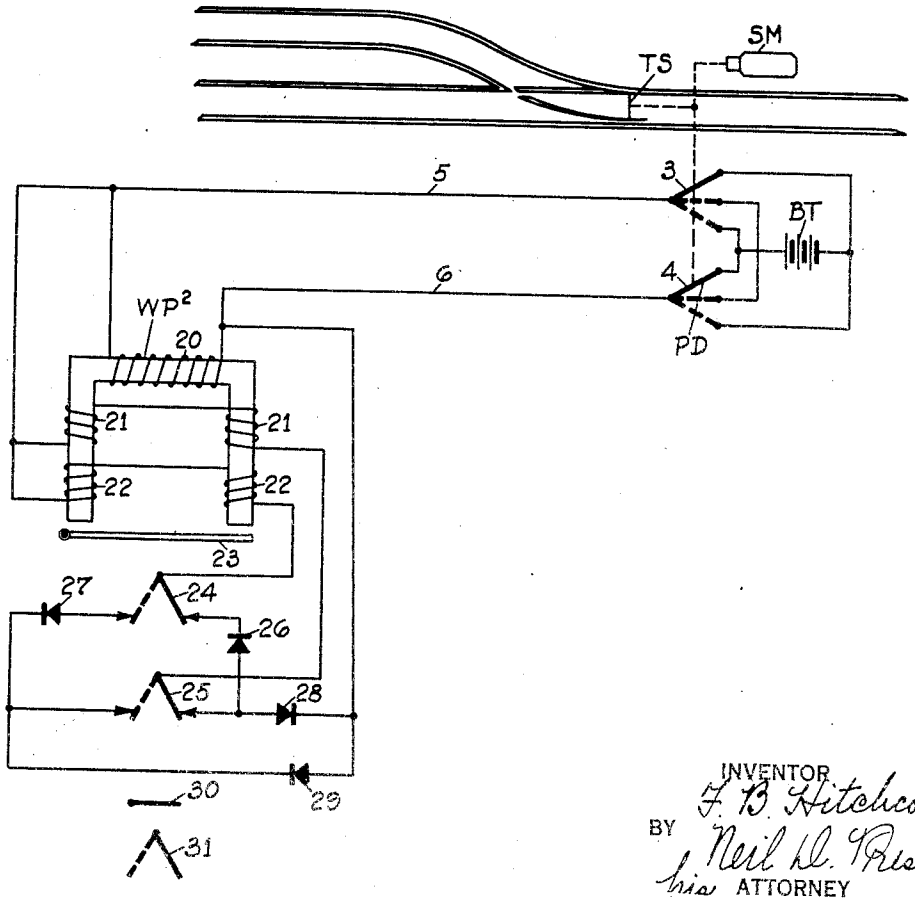


FIG. 2.



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RAILWAY TRAFFIC CONTROLLING SYSTEM

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5 Claims. (Cl. 246—220)

This invention relates to traffic controlling systems for railroads, and more particularly pertains to the indication of the position of power operated track switches in such systems.

In the control of railroad track switches combined with signalling means to govern traffic thereover, it is necessary to provide a relay which indicates the position of such track switch in order to select the controlling circuits for the signalling means. The present invention proposes to provide a polarized indication circuit for the control of a polar-neutral relay to indicate the position of a track switch, with the control of such polar-neutral relay so organized as to check the proper response of the polar armature of the relay.

In a relay indicating system of this character, the neutral armature indicates whether or not the track switch is locked, while the polar armature indicates in what position such track switch is locked. It may accidently happen that the polar contacts do not respond to properly indicate the position of the switch, but the present invention provides a safeguard in such a case. The system of the present invention accomplishes this added safety feature in an indicating system in a manner which is economical and simple in its arrangements and so organized that the checking feature is entirely controlled by the same source of electrical energy which is usually employed to control such a relay.

Various other features, advantages and characteristic functions of the present invention will be in part apparent from the accompanying drawing, and in part pointed out as the description thereof progresses.

In describing the invention in detail, reference will be made to the accompanying drawing, in which:—

Fig. 1 illustrates in a simplified and diagrammatic manner the circuits and parts of a switch indication system embodying the present invention; and

Fig. 2 illustrates in a simplified and diagrammatic manner circuits and parts of a switch indication system embodying the present invention in a modified form with respect to Fig. 1.

With reference to the accompanying drawing (both Figs. 1 and 2), a track switch TS is shown as operated by a switch machine SM which may be of any suitable type such, for example, as disclosed in the patent to W. K. Howe, Patent No. 1,466,903, dated September 4, 1923.

Associated with the switch machine SM and track switch TS is a suitable point detector contact mechanism PD which may be of any suitable type, such for example, as shown in the patent to C. S. Bushnell, Patent No. 1,517,236, dated November 25, 1924. For convenience in describing the present invention, the point detector contact mechanism PD is merely shown as having two movable contacts **3** and **4** which cooperate with fixed contacts to indicate the opposite extreme locked positions of the track switch and to indicate the unlocked or operating condition of the track switch. These movable contacts **3** and **4** of the point detector mechanism are jointly operated by the track switch TS and the switch machine SM so as to assume normal or reverse extreme positions when the track switch is in normal or reverse extreme positions respectively and locked by the switch machine SM, and so as to assume intermediate or midstroke positions whenever the track switch TS is being operated by the switch machine SM or whenever the track switch is unlocked. The movable contacts **3** and **4** are shown in their normal positions.

Although the switch machine SM is usually provided with remote control means and signals are usually provided for the governing of traffic over the track switch, such means have not been illustrated for the sake of simplifying the disclosure of the present invention. Likewise the usual detector track circuit and track relay have been omitted for the sake of simplicity.

The point detector contacts **3** and **4** of the point detector contact mechanism PD are connected to the central office or other suitable location by suitable line wires **5** and **6** which are supplied with energy from a local battery BT located at the track switch. However, it is to be understood that this battery may have substituted therefor other types of current supply, and that the energy may be transmitted to such track switch over line wires, if so desired, all within the scope of the present invention.

At the central office or other suitable location, a switch position indicating relay WP in Fig. 1 and WP^2 in Fig. 2 is provided to indicate the position of the track switch. This relay WP is of the usual polar neutral type such as shown for example in the patent to O. S. Field, Patent No. 1,749,331, dated March 4, 1930. The construction and control of these relays characteristic of the present invention will be more particularly pointed out hereinafter.

Associated with these relays WP and WP^2 are suitable asymmetric units or rectifiers which may be of any desired type, but which are preferably of the copper oxide type as such copper oxide disc

type rectifiers may be most conveniently mounted in the relay structure. These rectifier units with their connections will be specifically pointed out hereinafter.

The relays WP, as controlled in accordance with the present invention, have suitable neutral and polar contacts which are employed for the purpose of selecting the desired signal circuits and various other circuits employed in connection with centralized traffic controlling systems, all of which has been omitted for the sake of simplicity in the disclosure of the invention.

It is believed that the nature of the invention, its advantages and characteristic features can best be understood by further description being set forth from the standpoint of operation.

Operation

With more particular reference to Fig. 1 of the accompanying drawing, the track switch TS is shown in a normal position which causes energy to be supplied from the battery BT to the windings of the relay WP, so that its neutral contacts are picked up and its polar contacts are actuated to normal positions in accordance with the normal position of the track switch. This energizing circuit for the relay WP is closed from the positive terminal of the battery BT, through a circuit including contact 3 in a normal position, a line wire 5, winding of relay WP, polar contact 9 of relay WP in a left hand normal position, rectifier unit 12 in its low resistance direction, line wire 6, contact 4 in a normal position, to the negative terminal of battery BT.

Let us assume that the track switch TS is operated to its reverse position. During such operation the contacts 3 and 4 are actuated to their mid positions which removes energy from the line wires 5 and 6, and which shunts such line wires by a circuit readily apparent from the drawing. This causes the neutral contacts of the relay WP to drop away but the polar contacts of such relay remain in their last actuated positions, as such contacts are of the magnetic stick type as contemplated in accordance with the present invention, although it is to be understood that other types of relays may be employed and still be within the scope of the present invention.

Upon the completion of the operation of the track switch TS to a reverse position, the contacts 3 and 4 are operated to their reverse dotted line positions which supplies energy to the relay WP through a reverse polar contact operating circuit. This circuit is closed from the positive terminal of the battery BT, through a circuit including contact 4 in a reverse position, line wire 6, resistor 7, windings of relay WP, line wire 5, contact 3 in a reverse position, to the negative terminal of the battery BT. The current which flows in this circuit is of a value dependent upon the ohmic resistance of the resistor 7, and the value of such resistor is so chosen that this current will be of a value to cause the actuation of the polar contacts of the relay WP, but will be of insufficient value to cause the neutral contacts of such relay to be picked up.

The flowing of the current through the windings of the relay WP and the resistor 7 causes the polar contacts of the relay WP to be actuated to their reverse dotted line positions in which the contact 9 closes a shunting circuit through the rectifier unit 11 in its low resistance direction, which circuit shunts out the resistor 7 and allows sufficient current to flow through the windings of the relay WP to cause the neutral contacts of the relay to pick up.

In other words, the polar contacts operate on less current than the neutral contacts so that the current which may flow through the resistor 7 is of sufficient value to operate the polar contacts, and such response of the polar contacts is checked by the direction of current flow corresponding to the low resistance direction of the rectifier units 11 and 12 to determine whether or not the neutral contacts of the relay WP shall pick up, so that the signalling circuits may be properly selected in accordance with the condition of the contacts 8 and 10 for example.

It will be apparent that when the track switch TS is operated from its reverse position to its normal position that the operation is similar to that already described. However, the normal polar contact operating circuit will be pointed out. This circuit is closed from the positive terminal of the battery BT, through a circuit including contact 3 in its normal position, line wire 5, windings of relay WP, resistor 7, line wire 6, contact 4 in a normal position, to the negative terminal of the battery BT.

With reference to Fig. 2 of the accompanying drawing, the supply of energy to the line wires 5 and 6 is accomplished in the same manner as described in connection with Fig. 1, so that the track switch TS, switch machine SM, point detector contacts PD and its movable contacts 3 and 4 as well as the battery BT are all given the same reference characters. However, the relay WP^2 is constructed in its general structure the same as contemplated in connection with Fig. 1 as specifically shown in the Field Patent No. 1,749,331, above mentioned, but the windings provided for this relay in Fig. 2 are of a particular arrangement presently to be described.

With the track switch TS in a normal position, a circuit is closed from the positive terminal of the battery BT, through a circuit including contact 3 in a normal position, line wire 5, winding 20 of relay WP^2, line wire 6, contact 4 in a normal position, to the negative terminal of battery BT. In multiple with the winding 20, is an auxiliary winding 21 which has one terminal connected to line wire 5, and the other terminal connected to line wire 6 through polar contact 25 in a right hand normal position and rectifier unit 28 in its low resistance direction.

The energy which flows through the winding 20 is of a sufficient value to operate the polar contacts in accordance with the polarity of the energy supplied to such winding, but is of insufficient value to cause the neutral contacts to be picked up. But the current which flows through the auxiliary winding 21 causes a flux which is additive with respect to the flux produced by the current in the winding 20 so that the neutral contacts are caused to be actuated to their picked up positions. In other words, with the circuit closed as above pointed out the polar contacts are actuated to their normal positions and the neutral contacts are picked up allowing suitable signalling circuits to be selected by the contacts 30 and 31, for example.

During the operation of the track switch to a reverse position the contacts 3 and 4 are in their mid positions which causes the line wires 5 and 6 to be shunted by a circuit obvious from the drawing, thereby causing the neutral contacts of relay WP^2 to drop away.

Upon the completion of the reverse operation, the coil 20 of relay WP^2 is energized by a circuit

closed from the positive terminal of battery BT, through a circuit including contact 4 in a reverse position, line wire 6, winding 20, line wire 5, contact 3 in a reverse position, to the negative terminal of the battery BT. The current which flows in this circuit is only of sufficient value to cause the polar contacts of the relay WP² to be actuated to their left hand reverse positions.

It is noted that the application of this polarity of current to the line wires 5 and 6 does not energize the winding 21 until the polar contact 25 is actuated to the left hand reverse position, which is because of the high resistance direction of the rectifier unit 29 preventing current flow. However, upon the proper response of the polar contacts of the relay WP², the winding 21 is connected in multiple with the winding 20 by a circuit closed from the line wire 6, through rectifier unit 29 in its low resistance direction, polar contact 25 in a left hand reverse position, winding 21, to the line wire 5.

The current which flows in the winding 21 is of such a value as to cause a flux which, when added to the flux produced by current in winding 20, is of sufficient value to cause the neutral contacts of the relay WP² to be picked up, so that the signal circuits may be properly selected by the contacts 30 and 31, for example.

The operation of the track switch TS back to a normal position and the response of the contacts of the relay WP² is believed to be readily understood by analogy to the operation already pointed out. It may be noted in this connection, that the winding 20 is always connected across the line wires 5 and 6, while the winding 21 is connected across the line wires 5 and 6 for the flow of current only when the polar contacts of the relay have properly responded. Thus, both windings 20 and 21 are energized by the same source of current with the proper response of the polar contacts being checked by the rectifier units 28 and 29.

This form of the present invention has an added feature for the purpose of checking whether or not the rectifier units 28 and 29 have accidentally broken down in their high resistance directions. This is accomplished by the provision of a bucking winding 22 which is so connected on the magnetic structure of the relay WP² that, when it is energized by the same polarity as the windings 20 and 21, it causes flux to oppose or buck down the flux produced by the winding 21. In other words, the current which is supplied to the winding 22 is of sufficient value under such circumstances as to merely neutralize the flux produced by the winding 21 so that the flux produced by the winding 20 is under all circumstances capable of causing the proper response of the polar armature of the relay.

Let us assume that the rectifier units 28 and 29 have broken down and no longer act as asymmetric units. With the track switch TS in the normal position, as shown, and the polar contacts of the relay WP² properly responded, the neutral contacts of the relay WP² are picked up by reason of the energization of both windings 20 and 21. The winding 22 is not energized under such conditions because contact 24 is properly operated to a right hand normal position and the rectifier unit 26 prevents the flow of current in this multiple circuit. But upon the operation of the track switch to a reverse position reversing the polarity across the line wires 5 and 6, current can flow from the line wire 6, through rectifier unit 28 in a broken down condition, rectifier unit 26 in its low resistance direction, polar contact 24 in a right hand position, winding 22, to the line wire 5. As the rectifier unit 28 is broken down, the winding 21 also receives energy through polar contact 25. With both the windings 21 and 22 energized, their fluxes neutralize each other so that the neutral contacts of the relay WP² cannot pick up. However, the polar contacts of the relay properly respond due to the energization of winding 20. The polar contact 24 in its left hand reverse position inserts the rectifier unit 27 which has its high resistance direction so arranged as to prevent the flow of current in the winding 22 with this polarity applied to the line wires 5 and 6. Thus, the windings 20 and 21 cause fluxes which are additive and the neutral contacts of relay WP² to pick up.

The operation from the reverse condition to the normal condition will now be considered under such broken down condition of the rectifier units 26 and 29. With normal polarity applied to the line wires 5 and 6 but before the polar contacts have responded, current can flow through the winding 21 including contact 25 in a left hand reverse position, in a direction which would ordinarily be prevented by the rectifier 29. The winding 22 also receives energy with polar contact 24 in a left hand position through rectifier 27 in its low resistance direction and the broken down rectifier unit 29. But, upon the proper response of the polar contacts, as caused by the flux produced by current in the winding 20, current flow in the winding 22 is prevented with contact 24 in a right hand position by the high resistance direction of the rectifier unit 26.

From the above description, it is apparent that, those rectifier units 28 and 29, which check the positions of the polar contacts against the direction of current flow over the line wires, are in turn checked against break-down by the rectifier units 26 and 27 together with the winding 22 in a manner that the system is still operable and still checked.

It may happen that the same static charge, or the like, which accidently breaks the rectifier units 28 and 29 down, may also break down the units 26 and 27. In such an event, it will be apparent that both windings 21 and 22 are energized at the same time irrespective of which extreme position the polar contacts are in so that the neutrals can not pick up, as these windings neutralize each other when energized together.

Thus, an indication system for railway power operated track switches has been shown and described wherein the relay WP not only indicates the position and locked condition of the track switch with which it is associated but also indicates the proper response of its polar contacts by preventing the pick up of its neutral contacts unless the polar contacts have properly responded to the particular direction of current flow as checked by rectifier units. The present invention has the characteristic advantage that the controlling source of current also supplies the current wherewith the checking operation is accomplished, thereby providing an economical form of system. The present invention also provides means for checking the proper condition of the rectifier units so that under most adverse conditions the proper response of the indicating relay is assured.

Having thus described two forms of an indication system for a railroad track switch as the specific embodiment of the present invention, it

is desired to be understood that these forms are selected to facilitate in the disclosure of the invention rather than to limit the number of forms which it may assume; and, it is to be further understood that various modifications, adaptations and alterations may be applied to the specific forms shown to meet the requirements of practice, without in any manner departing from the spirit or scope of the present invention except as limited by the appended claims.

What I claim is:—

1. In combination; a polarized circuit; a polar-neutral relay; polar contacts for said relay requiring one degree of energization of said relay in order to be actuated thereby; neutral contacts for said relay requiring a relatively higher degree of energization of said relay in order to be actuated thereby; means connecting said relay in said circuit so as to be energized at least to said one degree whenever said circuit is energized; and polarity detecting means connecting said relay in said circuit so as to be energized to said higher degree when said circuit is energized only if said polar contacts are in polar positions corresponding to the polarity of energy in said circuit.

2. In combination; a circuit energizable with one polarity or the other from a source of substantially constant potential; a relay having both polar and neutral contacts, said polar contacts responding when said relay is energized to one degree or to a relatively higher degree, and said neutral contacts responding only when said relay is energized to said higher degree; a resistor; two rectifier units poled in opposite directions; means always connecting said relay in series with said resistor in said circuit, whereby said relay is energized to said one degree when said circuit is energized; and means including one of said polar contacts for connecting one or the other of said rectifier units in multiple with said resistor, whereby said relay is energized to said higher degree when said circuit is energized with a particular polarity and said resistor is shunted by the particular one of said rectifier units to by-pass current of that particular polarity.

3. In combination; a polar-neutral relay having polar contacts requiring one degree of current in said relay in order to be actuated to polar positions corresponding with the polarity of such current, and having neutral contacts requiring a relatively higher degree of current in said relay in order to be picked up; a polarized circuit at times supplied with current of one polarity and at other times supplied with current of the opposite polarity; means connecting said relay in said circuit so as to receive current of said one degree whenever said circuit is supplied with current regardless of its polarity; and means connecting said relay in said circuit so as to receive current of said higher degree only when said polar contacts have properly responded to the polarity of said current of said one degree, said means including polarity responsive means with which the positions of the polar contacts are compared.

4. In combination; a circuit at times supplied with current of one polarity and at other times supplied with current of the opposite polarity; a relay having both polar and neutral contacts, said polar contacts assuming one or the other polar position when said relay is energized to one degree or to a relatively higher degree, and said neutral contacts picking up only when said relay is energized to said higher degree; a resistor; two rectifier units; means always connecting said relay and said resistor in series in said circuit, whereby said relay is energized to said one degree whenever said circuit is supplied with current regardless of the polarity of such current; circuit means including a polar contact of said relay in one polar position and one of said rectifiers so poled as to shunt said resistor only when said polar contact is in that one polar position corresponding to the polarity of said one degree of current supplied to said relay, whereby said relay is energized to said higher degree; and circuit means including said polar contact of said relay in the other polar position and said other rectifier so poled as to shunt said resistor only when said polar contact is in that other position corresponding to the polarity of said one degree current supplied to said relay to said one degree, whereby said relay is energized to said higher degree.

5. In combination; a polarized circuit; a polar-neutral relay having polar contacts requiring one degree of energization of said relay in order to be actuated thereby, and having neutral contacts requiring a relatively higher degree of said energization of said relay in order to be actuated thereby; means connecting said relay in said polarized circuit so as to be energized at least to said one degree whenever said polarized circuit is energized; and means responsive to the polarity of energization of said circuit for connecting said relay in said circuit so as to be energized to said higher degree always and only when said polar contacts are in polar positions corresponding to the polarity of energy then applied to said polarized circuit.

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