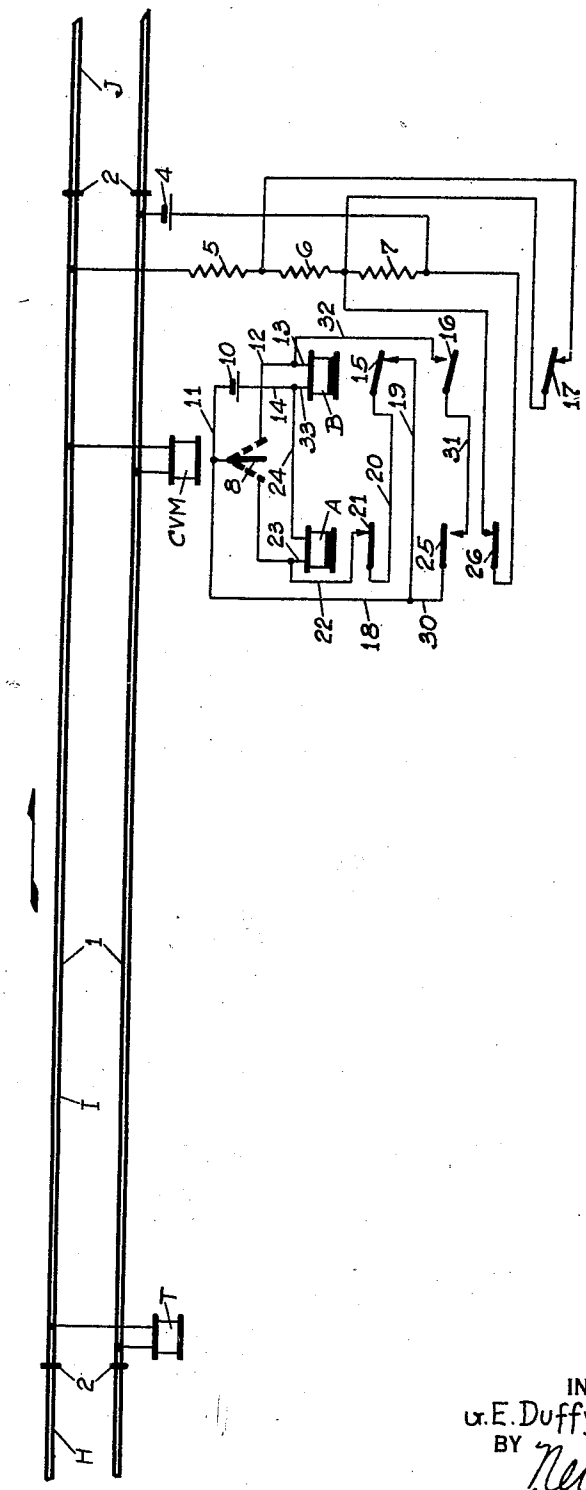
Sept. 22, 1931. G. E. DUFFY ET AL 1,824,128

SIGNALING SYSTEM FOR RAILROADS

Filed Oct. 15, 1930



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Patented Sept. 22, 1931 1,824,128

UNITED STATES PATENT OFFICE

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SIGNALING SYSTEM FOR RAILROADS

Application filed October 15, 1930. Serial No. 488,900.

This invention relates to track circuits for railway signaling systems.

A track circuit of the usual construction comprises an insulated section of track way, having a source of current connected across the rails at one end thereof preferably including a resistance in series with said source, and having a track relay responsive to such source connected across the track rails at the other end thereof. Obviously, even though the track circuit source in such a track circuit supplies a uniform and constant voltage, the current flowing through the track relay is not necessarily the same for all weather conditions, this because the ballast resistance between the track rails varies in accordance with the moisture and frost in such ballast. It is thus seen that when the ballast resistance between rails is low a correspondingly lower current will flow in the track relay, and consequently the track relay might even be deenergized in the absence of a train in the section when the ballast resistance is extremely low. Also, relays of the usual construction, and especially relays of the tractive soft iron armature type, require more current for picking them up than is required for holding them up when they have once reached their energized position. From the foregoing, it is apparent that it would be desirable to effect deenergization of the track relay of a particular track circuit upon entrance of a train upon such track circuit, in that with the track relay once deenergized it would probably remain deenergized even though the train shunt were rather poor. In this connection, it is of course understood that during extremely dry weather the ballast resistance is extremely high and a poor train shunt might be ineffective to drop the track relay upon entrance of the train into the track section.

With the above and other important considerations in mind, it is proposed in accordance with the present invention to provide auxiliary means for effecting deenergization of the track relay upon entrance of a train upon a track circuit in spite of variable ballast conditions. More specifically it is proposed to provide potential responsive means for maintaining the voltage applied to the track circuit substantially constant irrespective of ballast conditions, this voltage being such that the track relay is sure to drop when a train enters the track circuit, the energy applied to the track circuit of course being a maximum when there is a train moving in the section, but since the track relay is preferably quicker acting than the auxiliary means of the present invention it will have dropped in the mean time, so that this track relay will not again pick up by reason of the difference in the pick up and drop away characteristics of a tractive type track relay of the usual construction.

Other objects, purposes and characteristic features of the present invention will in part be obvious from the accompanying drawing and will in part be more specifically pointed out hereinafter.

In describing the invention in detail reference will be made to the single drawing which illustrates one embodiment of the invention applied to a railway track.

Structure

In the drawing has been shown a railway track comprising rails 1 divided by insulating joints 2 into blocks, of which the block I and the adjacent ends of the two other blocks H and J only have been shown. Since the structure of all of the blocks is preferably the same, the description of the block I will suffice. At the entrance to the block I, the normal direction of traffic being from left to right as indicated by the arrow, a track relay T is connected across the track rails, whereas at the exit end of the track a suitable track circuit source of current such as the battery 4 is connected across the track rails, having included in series therewith the usual limiting resistance 5 and auxiliary resistance units 6 and 7. There is also connected across the track rails either at the exit end, or at an intermediate point, a contact making volt meter CVM, which contact making volt meter through its contact 8 and associated apparatus is adapted to include or exclude one or both of the resistances 6 and

7 through the medium of the relays A and B, which are preferably slow acting. The contacting volt meter CVM is preferably a volt meter of the D'Arsenvil type in which the current flowing through a movable coil acts on the flux from a permanent magnet, this contact making volt meter CVM preferably being damped in the usual way, namely by having its coil wound on a spool of conducting material in which eddy currents may be induced to retard movement, so that its movable contact is "dead-beat", so to speak. The manner in which the contact making volt meter CVM in combination with the relays A and B may control the degree of energization of the track circuit is best understood by considering the operation of the system, especially under variable ballast conditions.

Operation

As shown in the drawing the auxiliary resistance or impedance units 6 and 7 are shunted by the contacts 17 and 26 respectively, and with the contact making volt meter CVM indicating normal voltage, that is having its contact 8 in its middle position, it must be interpreted that the track ballast is wet and the track ballast resistance is low. The apparatus is so designed that both of the resistance of impedance units 6 and 7 will be shunted under low resistance ballast conditions, the auxiliary resistance unit 6 will be shorted under medium ballast conditions, and neither of the auxiliary ballast resistances 6 and 7 will be shorted under dry or high resistance ballast conditions.

Let us first assume that a train moving from left to right in the normal direction of traffic enters upon the track circuit of the block I, and in so doing shunts the track relay T. Since the track circuit is energized to its normal preferred extent, this because the contact 8 of the contact making volt meter CVM indicates normal voltage, the track relay T will of course drop. Also, this entrance of the train upon the track circuit of the block I causes the voltage at the exit end to fall, thereby causing the contact 8 of the volt meter CVM to move to the left closing the pick-up circuit for the relay A. Since the relay A is already energized no effect will be produced by the contact making volt meter CVM. When the train leaves the block I the track relay T will again pick up, and the contact 8 will again assume its normal pendent position.

Let us now assume that the ballast dries out and its resistance increases and the voltage across the track rails at the entrance end of the block increases, this because there is less current flowing through the resistance unit 5 and the shunted resistance units 6 and 7. This increase in voltage of the track circuit will cause the contact 8 to be moved toward the right, and when it engages its right hand stationary contact the following circuit for the relay B is closed:—beginning at the battery 10, wire 11, contact 8, wires 12 and 13, winding of the relay B, wires 33 and 14, back to the battery 10. The closure of this circuit picks up the relay B, thereby lifting its contacts 15, 16 and 17, whereby opening of the contact 15 breaks the stick circuit for the relay A which may be traced as follows:—beginning at the battery 10, wires 11, 18 and 19, back contact 15 of the relay B, wire 20, stick contact 21 of the relay A, wires 22 and 23, winding of the relay A, wires 24 and 14, back to the battery 10. Breaking of this stick circuit causes the relay A to drop, but before the relay A reaches its deenergized position, to complete the stick circuit for the relay B it preferably being slow acting, the relay B has already dropped, because the contact 8 of the contact making volt meter CVM returned to its neutral position as soon as the contact 17 of the relay B opened, this because the resistance unit 6 was momentarily included in the track circuit while the contact 17 was raised. The relay A will therefore drop and include the resistance 7 in the track circuit, but the relay B will not be stuck up, because even though its stick contact 16 is closed the back contact 25 of the relay A included in this stick circuit was at that time still open. The relay A thus assumes its deenergized position, opening its contact 26, thereby including the resistance unit 7 in series with the track circuit, and with this resistance unit 7 included in the track circuit the current applied to the track circuit is reduced to a value to bring the contact 8 of the contact making volt meter CVM back to its neutral position.

Let us now assume that the ballast dried out still further, and that the contact making volt meter CVM again engages its right hand stationary contact. This will pick up the relay B, and since the back contact 25 of the relay A is now closed the relay B will be stuck up through the following stick circuit:—beginning at the battery 10, wires 11, 18 and 30, back contact 25 of the relay A, wire 31, front stick contact 16 of the relay B, wires 32 and 13, winding of the relay B, wires 33 and 14, back to the battery 10. With the relay B now stuck up and the relay A deenergized both of the resistances 6 and 7 are included in the track circuit, and the inclusion of the additional resistance 6 reduces the potential across the track circuit to a value where the contact 8 again returns to its middle pendent position.

Let us now assume that a train moving from left to right enters the block I, and since the degree of energization of the track circuit is of a normal value, it is assured that the track relay T will drop, and even though the entrance of the train into the block I will

cause the contact making volt meter CVM to move to its left hand reduced voltage position, and has caused the relay A to pick up and by the opening of its contact 25 (the contact 8 by reason of the presence of a train in the block I remaining in its right hand position) has caused the relay B to drop, thus shunting both of the auxiliary resistances 6 and 7, the additional degree of energization of the track circuit will not be able to pick up the track relay T under the approaching train, this because of the margin between the pick up and drop away current values of the track relay T, more current being required to pick up the track relay T than is required to maintain it energized. As the train in question leaves the block I the increased potential of the track circuit will of course assure picking up of the track relay T, and with the train once out of the track circuit the contact making volt meter CVM will again include the resistances 6 and 7 in the track circuit, this on the assumption that the ballast resistance is still high by reason of dry ballast conditions.

Applicants have thus illustrated and described one specific embodiment of their invention, but it is desired to be understood that the particular embodiment selected has not been selected for the purpose of illustrating the scope of the invention nor the exact construction preferably employed in practicing the invention, and that various changes, modifications and additions may be made to adapt the invention to the particular problem encountered in practicing the same, for instance, the invention may be applied to alternating current track circuits by substituting impedances for the resistances 5, 6 and 7, and substituting suitable alternating current relays for the direct current relays illustrated, and it is understood that such changes may be made without departing from the spirit or scope of the invention or the idea of means underlying the same, except as demanded by the scope of the following claims.

What we claim as new is:—

1. In combination, a track section isolated from the remaining railway track by insulating joints, a track relay connected across the track rails at one end of said section, a track circuit source connected across the track rails at the other end of said section, and means for adjusting the potential across the track rails including a contact making volt meter and a stick relay and means for picking up said stick relay under one potential condition and for dropping said stick relay under another potential condition of said track circuit as manifested by said volt meter.

2. In combination, a track section isolated from the remaining railway track by insulating joints, a track relay connected across the track rails at one end of said section, a track circuit source connected across the track rails at the other end of said section, and means for adjusting the potential across the track rails including a contact making volt meter and two stick relays, a pick-up circuit for one of said stick relays including a contact of said contact making volt meter closed only if the voltage between rails is excessive, a pick-up circuit for the other of said stick relays including a contact of said contact making volt meter closed only if the voltage between said rails is deficient, and a stick circuit for each stick relay including a back contact of the other stick relay.

3. In combination, a track section isolated from the remaining railway track by insulating joints, a track relay connected across the track rails at one end of said section, a track circuit source connected across the track rails at the other end of said section, and means for adjusting the potential across the track rails including a contact making volt meter and two stick relays, a pick-up circuit for one of said stick relays including a contact of said contact making volt meter closed only if the voltage between rails is excessive, a pick-up circuit for the other of said stick relays including a contact of said contact making volt meter closed only if the voltage between said rails is deficient, a stick circuit for each stick relay including a back contact of the other stick relay, two resistance units included in series with said source, and means for shunting one of said resistance units when one of said stick relays is energized and shunting the other of said resistance units when the other of said stick relays is deenergized.

4. In combination, a track section isolated from the remaining railway track by insulating joints, a track relay connected across the track rails at one end of said section, a track circuit source connected across the track rails at the other end of said section, and means for adjusting the potential across the track rails including a contact making volt meter and two stick relays, a pick-up circuit for one of said stick relays including a contact of said contact making volt meter closed only if the voltage between rails is excessive, a pick-up circuit for the other of said stick relays including a contact of said contact making volt meter closed only if the voltage between said rails is deficient, a stick circuit for each stick relay including a back contact of the other stick relay, two resistance units included in series with said source, and means for shunting one of said resistance units when said one stick relay is deenergized and shunting the other of said resistance units when said other stick relay is energized.

In testimony whereof we affix our signatures.

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