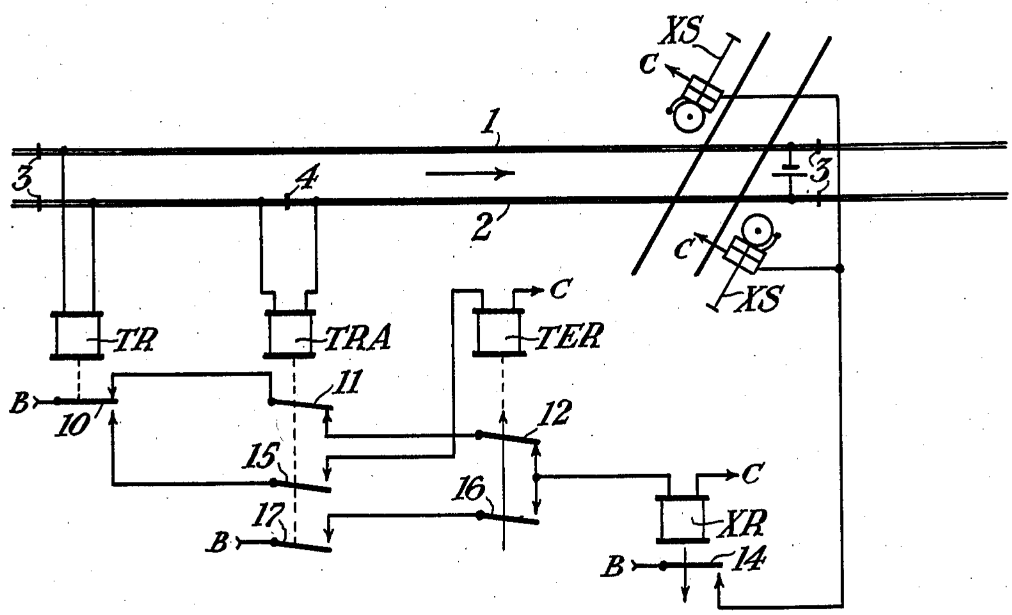
April 11, 1944. T. W. TIZZARD, JR 2,346,518

HIGHWAY CROSSING SIGNAL CONTROL SYSTEM

Filed Oct. 7, 1942



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Patented Apr. 11, 1944

2,346,518

UNITED STATES PATENT OFFICE

2,346,518

HIGHWAY CROSSING SIGNAL CONTROL SYSTEM

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Application October 7, 1942, Serial No. 461,102

2 Claims. (Cl. 246—130)

My invention relates to apparatus for controlling highway crossing signals, that is, to apparatus for the control of signals which are placed at the intersection of a highway and a stretch of railroad track to warn users of the highway of the approach of a train.

An object of my invention is to provide improved means for discontinuing operation of a crossing signal in the event that a train should stop within a control section for such signal before it reaches the crossing.

A further object of the invention is to provide an improved system of the type described and incorporating means to initiate operation of the crossing signals when a train which has stopped in the control section again advances towards the intersection.

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

I shall describe one form of highway crossing signal control system embodying my invention, and shall then point out the novel features thereof in claims.

In the drawing the single figure is a diagram of a stretch of railway track equipped with one form of apparatus embodying my invention.

In practicing my invention I provide an approach track section at one side of the intersection and equip this section with track circuit apparatus including a principal track relay at the end of the section remote from the intersection. An insulated joint is installed in one track rail of the approach section to divide the section into a "timing" portion remote from the intersection and a "restart" portion adjacent the intersection. An auxiliary track relay is connected around this insulated joint so as to be included in series with the principal track relay. The principal and auxiliary track relays cooperate to control the crossing signal control relay, and also cooperate to control a timing relay which operates to discontinue operation of the crossing signals if a train remains in the "timing" portion of the approach section for longer than a predetermined time. The equipment is also arranged so that as soon as a train enters the "restart" portion of the section, operation of the crossing signals will be initiated and will be continued as long as a train remains in that portion of the section.

Referring to the drawing, there is shown therein a stretch of railway track over which traffic normally moves in the direction indicated by the arrow, that is, from left to right. The track stretch is intersected at grade by a highway, while crossing signals XS of any suitable form are provided to warn users of the highway of the approach of a train. Insulated joints **3** are placed in the track rails **1** and **2** to form an approach track section for the control of the crossing signals, while an insulated joint **4** is placed in track rail **2** to divide the approach section into a "timing" portion remote from the intersection and a "restart" portion adjacent the intersection.

The approach section is of such length that if operation of the crossing signal is initiated when a train enters the section, the signals will be operated for at least a predetermined time, such as 30 seconds, before the train reaches the intersection even through the train is traveling at a high rate of speed.

The "timing" portion of the approach section is of such length that a train moving at any substantial speed will pass through this portion in less than the pick-up time of a slow pick-up relay TER. The "restart" portion of the approach section is of such length that a train which stopped in the "timing" portion of the section, or which traveled so slowly through that portion as not to pass through it before the relay TER picks up, will not traverse the "restart" portion and reach the intersection until after the expiration of a suitable time interval, such as 30 seconds, so that if operation of the signals was discontinued due to occupation of the "timing" portion, and the crossing signals are started when a train enters the "restart" portion, they will be operated for an appropriate time interval before the train reaches the intersection, and users of the highway will have adequate warning of the approach of the train.

The approach section is provided with track circuit apparatus including a track battery which is connected across the section rails at the end of the section adjacent the intersection, and a principal track relay TR which is connected across the section rails at the end of the section remote from the intersection. An auxiliary track relay TRA has the terminals of its winding connected to the track rail **2** on opposite sides of the insulated joint **4** so that this relay is included in series with the track circuit of the approach section. The various parts of the approach section track circuit apparatus are selected and adjusted so that when the section is vacant, too little energy flows through the winding of relay TRA to pick up the contacts of this relay, and so that when a train moving in the normal direction of traffic enters the section, the energy flowing through the winding of relay TRA is increased to a value effective to pick up the relay contacts.

The track relays TR and TRA cooperate to control a normally released slow pick-up relay TER, while the track relays TR and TRA, and the relay TER cooperate to control the crossing signal control relay XR. The relay TER may be of any suitable construction and is arranged so that on the supply of energy to the relay winding its contacts become picked up after the expiration of a predetermined time interval, such as 30 seconds, while the relay contacts thereafter remain picked up as long as energy is supplied to the relay winding, but release promptly when the supply of energy to the relay winding is interrupted. The construction of the relay TER is not a part of this invention; one form of relay which I may employ is shown in Letters Patent of the United States No. 1,966,965, issued July 17, 1934, to Branko Lazich and Harry E. Ashworth.

The relays TER and XR, and the crossing signals XS are supplied with energy from a suitable source of current, such as a storage battery, not shown, the terminals of which are designated B and C in the drawing.

The equipment is shown in the condition which it assumes when the track stretch is vacant. At this time the principal track relay TR is energized by current supplied from the track battery over the section rails and through the winding of the auxiliary track relay TRA. Accordingly, the contacts of relay TR are picked up, while as explained above, too little energy flows through the winding of relay TRA to pick up its contacts so the contacts of relay TRA are released.

Under these conditions the circuit of relay TER is interrupted and its contacts are released so energy is supplied to relay XR over the circuit which is traced from terminal B through front contact 10 of relay TR, back contact 11 of relay TRA, back contact 12 of relay TER, and winding of relay XR to terminal C. Accordingly, contact 14 of relay XR is picked up and interrupts the circuit of the crossing signals XS to prevent operation of these signals at this time.

When a train moving in the normal direction of traffic enters the approach section, the principal track relay TR is shunted and its contact 10 releases and interrupts the circuit of relay XR so contact 14 of relay XR releases and establishes the circuit of the crossing signals XS so that they operate to warn users of the highway of the approach of a train.

In addition, on entrance of a train into the approach section with resultant shunting of the track relay TR there is an increase in current flowing in the track circuit and in the winding of the auxiliary track relay TRA, and the contacts of this relay pick up so that contact 11 additionally interrupts the circuit of the relay XR, while contact 15 of relay TRA establishes a circuit including back contact 10 of relay TR for supplying energy to the slow pick-up relay TER.

If the train is traveling at a substantial speed, it will advance beyond the insulated joint 4 before the contacts of the relay TER become picked up. When the train advances beyond the insulated joint 4 and enters the "restart" portion of the approach section, the auxiliary track relay TRA is shunted and its contacts release so that contact 15 interrupts the circuit of relay TER and the contacts of relay TER remain released, while the circuit of relay XR continues to be interrupted by contact 10 of relay TR so contact 14 of relay XR maintains the circuit of the crossing signals XS and these continue to operate to warn users of the highway of the approach of the train.

When the train vacates the approach section, energy from the track battery again feeds to the relay TR and its contact 10 picks up and establishes the circuit traced above for supplying energy to the relay XR so that its contact 14 picks up and discontinues operation of the crossing signals.

As pointed out above, when a train moving in the normal direction of traffic enters the approach section, the relay TR releases and its contact 10 interrupts the circuit of relay XR to thereby initiate operation of the crossing signals XS, while relay TRA picks up so energy is supplied to relay TER over back contact 10 of relay TR and front contact 15 of relay TRA.

After a time interval, the contacts of relay TER become picked up and contact 16 establishes a circuit including front contact 17 of relay TRA to supply energy to relay XR so that its contact 14 is picked up to discontinue operation of the crossing signals. As long as the train remains in the "timing" portion of the approach section and does not advance into the "restart" portion of this section, the contacts of relay TRA remain picked up so energy continues to be supplied to the relay TER and its contacts will remain picked up and maintain the circuit for supplying energy to relay XR and contact 14 of relay XR is picked up to prevent operation of the crossing signals. This is advantageous as it prevents operation of the crossing signals at a time when a train is not approaching the intersection. This eliminates unnecessary delay of users of the highway and helps to prevent disregard of the crossing signals by users of the highway.

When the train which stopped in the "timing" portion of the approach section advances beyond the insulated joint 4 and enters the "restart" portion of the approach section, the auxiliary track relay TRA is shunted and its contacts release with the result that its contact 17 interrupts the circuit of the relay XR so that contact 14 releases and establishes the circuit of the crossing signals XS and they operate to warn users of the highway of the approach of the train.

In addition, on release of relay TRA its contact 15 interrupts the circuit of the relay TER so the contacts of relay TER release and its contact 16 additionally interrupts the circuit of the relay XR.

As pointed out above, the insulated joint 4 is located far enough from the intersection to insure that after a train which stopped before reaching the joint, or traveled so slowly through the "timing" portion of the approach section that the relay TER became picked up before the train reached the joint 4, a predetermined time interval will elapse before the train reaches the intersection. This insures that users of the highway will have adequate warning of the approach of trains which stop in the "timing" section and subsequently start up again.

This system is arranged so that a back contact 11 of the auxiliary track relay TRA is included in the circuit for supplying energy to the relay XR when the contacts of the relay TR are picked up. Accordingly, if for any reason, such as changes in ballast conditions, track battery voltage or the like, the auxiliary track relay TRA should be picked up at a time when the "timing" portion of the approach section is vacant, the relay XR will be released and the crossing signals will operate continuously. This operation of the signals will provide an indication that the equipment is not functioning as intended, and the signal maintainer can thereupon change the adjustment of the track circuit to prevent picking up of the relay TRA while the approach section is vacant.

In addition, it will be seen that if the auxiliary track relay TRA is picked up when the approach section is vacant, energy will not be supplied to the timing relay TER since the circuit of relay TER includes back contact 10 of relay TR. Accordingly, if the auxiliary track relay TRA is picked up when the principal track relay TR is picked up, the timing relay TER will not pick up, but will remain released and will not establish the circuit controlled thereby for supplying energy to the relay XR.

Although I have illustrated and described only one form of highway crossing signal control system 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 stretch of railway track intersected by a highway, a highway crossing signal located at the crossing, a control relay effective when energized to prevent operation of said signal, the rails of said track stretch being divided by insulated joints into an approach section which is traversed by a train approaching said crossing, a source of energy connected across the approach section rails at the end of the section adjacent the crossing, a principal track relay connected across the approach section rails at the end of the section remote from the crossing, an auxiliary track relay connected in series with one of the rails of the approach section at an intermediate point in said section, the track relays and the source of energy being proportioned so that when the approach section is vacant the principal track relay is picked up and the auxiliary track relay is released and so that on entrance into the section of a train approaching the crossing the auxiliary track relay picks up and remains picked up until the train advances beyond said auxiliary relay, a timing relay having a normally open contact which on the supply of energy to the relay winding becomes closed only after the expiration of a predetermined time interval, a circuit including a front contact of said principal track relay and a back contact of said auxiliary track relay for supplying energy to said control relay, a circuit including a back contact of said principal track relay and a front contact of said auxiliary track relay for supplying energy to said timing relay, and a circuit including said timing relay contact for supplying energy to said control relay.

2. In combination, a stretch of railway track intersected by a highway, a highway crossing signal located at the crossing, a control relay effective when energized to prevent operation of said signal, the rails of said track stretch being divided by insulated joints into an approach section which is traversed by a train approaching said crossing, a source of energy connected across the approach section rails at the end of the section adjacent the crossing, a principal track relay connected across the approach section rails at the end of the section remote from the crossing, an auxiliary track relay connected in series with one of the rails of the approach section at an intermediate point in said section, the track relays and the source of energy being proportioned so that when the approach section is vacant the principal track relay is picked up and the auxiliary track relay is released and so that on entrance into the section of a train approaching the crossing the auxiliary track relay picks up and remains picked up until the train advances beyond said auxiliary relay, a timing relay having a normally open contact which on the supply of energy to the relay winding becomes closed only after the expiration of a predetermined time interval, a circuit including a front contact of said principal track relay and a back contact of said auxiliary track relay for supplying energy to said control relay, a circuit including a back contact of said principal track relay and a front contact of said auxiliary track relay for supplying energy to said timing relay, and a circuit including a front contact of said auxiliary track relay and said timing relay contact for supplying energy to said control relay.

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