March 28, 1939. G. R. PFLASTERER 2,152,276

CONTROLLING APPARATUS FOR HIGHWAY CROSSING SIGNALS

Original Filed June 30, 1936

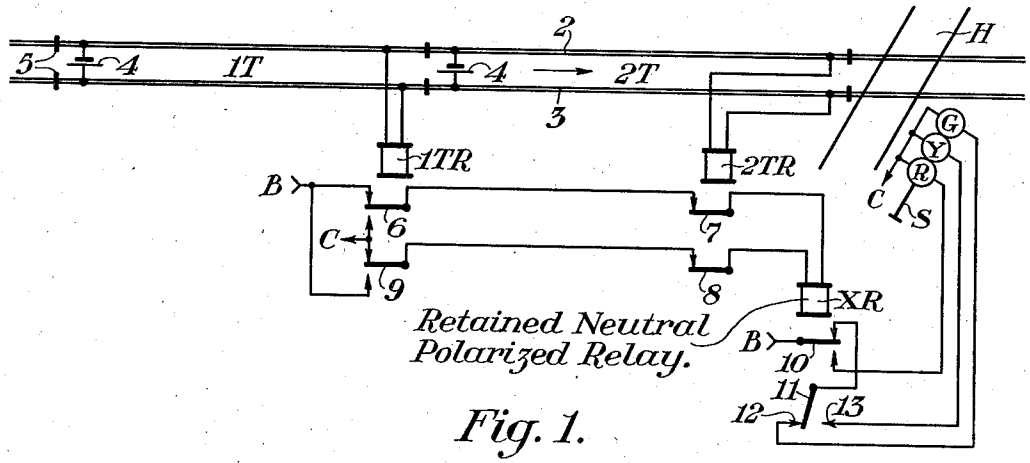


Fig. 1.

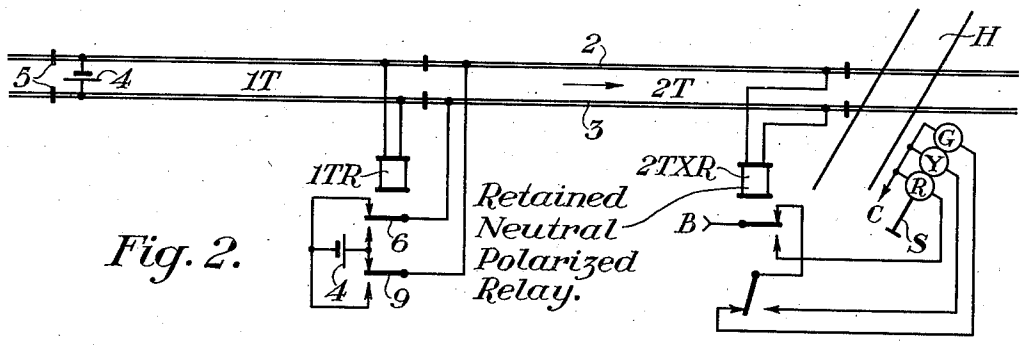


Fig. 2.

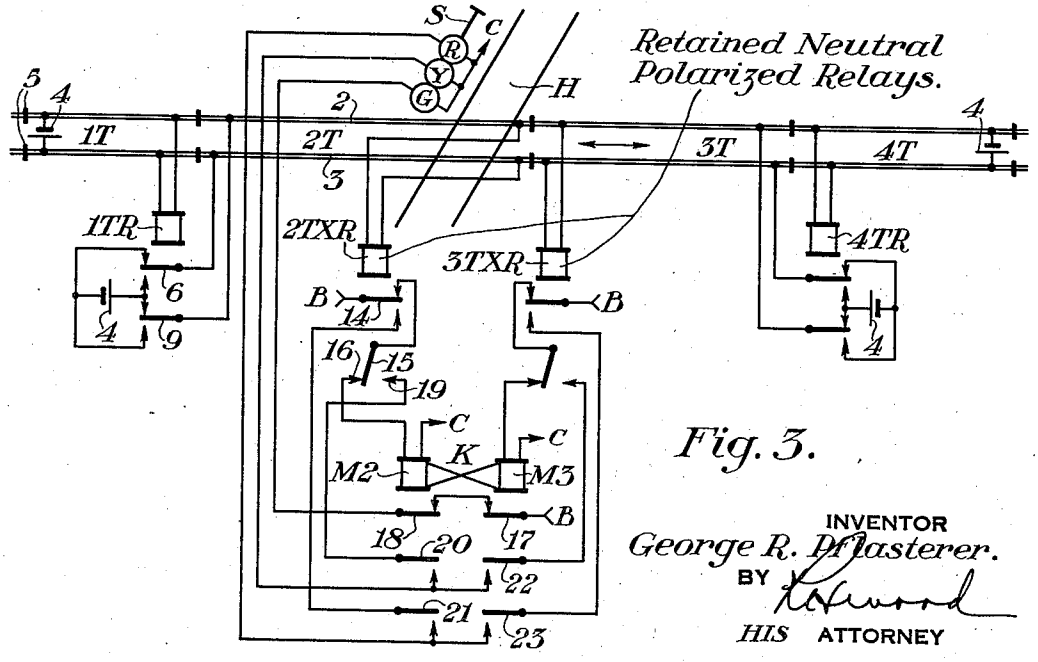


Fig. 3.

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CONTROLLING APPARATUS FOR HIGHWAY CROSSING SIGNALS

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11 Claims. (Cl. 246—130)

My invention relates to controlling apparatus for highway crossing signals, that is, to apparatus for the control of signals which are placed at intersections of railways and highways for the purpose of warning users of the highway when a train is approaching.

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

Fig. 1 of the accompanying drawing is a diagrammatic view illustrating one form of apparatus embodying my invention as applied to a stretch of track over which traffic normally moves in one direction only. Fig. 2 is a diagrammatic view illustrating a modification of the apparatus shown in Fig. 1 and also embodying my invention. Fig. 3 is a diagrammatic view illustrating another form of apparatus embodying my invention as applied to a stretch of track over which traffic moves in both directions.

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

Referring first to Fig. 1, the reference characters 2 and 3 designate the rails of a stretch of track over which traffic normally moves in the direction indicated by the arrow. The stretch is divided by insulated joints 5 into two adjacent sections designated by the reference characters 1T and 2T, respectively. Each track section is provided with a track battery 4 connected across the rails at one end of the section and with a track relay, designated by the reference character R with a prefix the same as the reference character of the associated section, connected across the rails at the other end of the section. Located adjacent the right-hand end of section 2T is an intersection of the rails of the stretch and a highway H. The highway H is protected by a signal S of any suitable type. As here shown, the signal S includes a green lamp G for displaying a proceed indication, a yellow lamp Y for displaying a caution indication, and a red lamp R for displaying a stop indication. The signal S is controlled by a polarized relay XR having a retained neutral characteristic. The relay XR is controlled by the track relays 1TR and 2TR.

With both sections 1T and 2T unoccupied so that both relays 1TR and 2TR are energized, the relay XR is supplied with energy in the normal direction so that the green lamp G is energized. The circuit for relay XR may be traced from terminal B of a suitable source of energy over front point of contact 6 of relay 1TR, front contact 7 of relay 2TR, relay XR, front contact 8 of relay 2TR, and front point of contact 9 of relay 1TR to terminal C of the same source of energy. The circuit for the green lamp G may be traced from terminal B through front point of neutral contact 10 of relay XR, normal polar contact 11—12 of relay XR, and lamp G to terminal C.

I shall now assume that an eastbound train, that is, a train moving toward the right, enters section 1T so that relay 1TR becomes released. When relay 1TR is released so that its back contacts become closed, the relay XR will be energized in the reverse direction. This circuit may be traced from terminal B over back point of contact 9 of relay 1TR, front contact 8 of relay 2TR, relay XR, front contact 7 of relay 2TR, and back point of contact 6 of relay 1TR to terminal C. When relay XR is energized in the reverse direction, the yellow lamp Y will become energized to cause the signal S to display a caution signal. The circuit for lamp Y may be traced from terminal B over front point of contact 10 of relay XR, reverse polar contact 11—13 of relay XR, and lamp Y to terminal C. When the train enters section 2T so that relay 2TR becomes released, energy will be disconnected from relay XR to cause the red lamp R to become energized. The circuit for lamp R may be very readily traced over the back point of contact 10 of relay XR. When the train vacates section 2T, relay XR will again become energized in the normal direction so that the green lamp G will be lighted to cause the signal to display the proceed indication.

It will be understood that the length of sections 1T and 2T will be so chosen that users of the highway will have ample warning before a train approaching the highway reaches the intersection.

Referring now to Fig. 2, the apparatus illustrated herein operates in a manner similar to that just described for the apparatus shown in Fig. 1. The relay 2TXR is directly connected across the rails of section 2T and the track battery 4 is connected across the rails of section 2T by contacts 6 and 9 of the relay 1TR. It will be readily apparent that the relay 2TXR will be supplied with energy in the normal or reverse direction according as the relay 1TR is picked up or released, respectively, provided section 2T is unoccupied, and that the relay 2TXR will be released whenever the section 2T becomes occupied. The arrangement shown in Fig. 2, therefore, functions in a manner similar to that described for the apparatus shown in Fig. 1, but eliminates the track relay 2TR and the line conductors for the control of the signal control relay.

Referring now to Fig. 3, the rails 2 and 3 are divided by insulated joints 5 into track sections 1T, 2T, 3T, and 4T. The sections 1T and 4T are each provided with the usual track battery 4 connected across the rails at one end of the section and with track relays 1TR and 4TR, respectively, connected across the rails at the other end of the section. The polarity of the energy

supplied to sections 2T and 3T is controlled by relays 1TR and 4TR, respectively, and each of these sections is provided with a polarized track relay having a retained neutral characteristic and designated by the reference characters 2TXR and 3TXR, respectively. Located approximately at the junction between sections 2T and 3T is an intersection between the track rails and a highway H. The signal S is controlled jointly by the relays 2TXR and 3TXR and by an interlocking relay K having magnets M2 and M3. With all sections unoccupied so that track relays 2TXR and 3TXR are energized in the normal direction, both magnets M2 and M3 are energized. The circuit for magnet M2, for example, may be traced from terminal B over front point of contact 14 of relay 2TXR, normal polar contact 15—16 of relay 2TXR, and magnet M2 to terminal C. When both magnets M2 and M3 are energized so that "flagman" contacts 17 and 18 are closed, the green lamp G of the signal is energized so that a proceed indication is displayed.

I shall now assume that an eastbound train, that is, a train moving from left to right enters section 1T so that relay 1TR becomes released. When relay 1TR is released, relay 2TXR becomes energized in the reverse direction over the back points of contacts 6 and 9 of relay 1TR. When relay 2TXR is energized in the reverse direction, magnet M2 becomes released so that a circuit is completed for the yellow lamp Y to cause the signal to display the caution indication. The circuit for lamp Y may be traced from terminal B over front point of contact 14 of relay 2TXR, reverse polar contact 15—19 of relay 2TXR, back point of contact 20 of magnet M2, and lamp Y to terminal C. When the train enters section 2T so that relay 2TXR becomes released, a circuit is completed for the red lamp R to cause the signal to display a stop indication. This circuit may be traced from terminal B over back point of contact 14 of relay 2TXR, back contact 21 of magnet M2, and lamp R to terminal C. When the train vacates section 2T and enters section 3T, relay 2TXR will become energized in the normal direction to restore magnet M2 to its energized condition and relay 3TXR will become released to disconnect energy from magnet M3. Because the relay K, however, is of the interlocking type, "flagman" contact 17 will not become open and back points of contacts 22 and 23 of magnet M3 will not become closed. The green lamp G, therefore, will again become energized over the previously traced circuit for this lamp. When the train departs from section 4T, the relay 3TXR will again become energized in the normal direction so that magnet M3 will also become energized and all apparatus will then be in its normal condition.

While I have described the operation of the apparatus shown in Fig. 3 for an eastbound train only, it will be readily apparent how the apparatus operates for a train moving in the opposite direction.

As shown in the drawing, relays XR, 2TXR, and 3TXR may be provided with a retained neutral characteristic to avoid a momentary display of the stop indication during pole changing periods. For example, in Fig. 1 when relay 1TR becomes released so that the direction of current flow through relay XR is reversed, the front point of contact 10 remains closed so that a momentary energization of the red lamp R is avoided. If this feature is not considered to be worthwhile, relays of the ordinary and usual construction may be substituted for the relays having the retained neutral characteristic.

From the foregoing description of the apparatus embodying my invention, it will be seen that I have provided the reliable means for displaying at a highway intersection a proceed, a caution, and a stop signal in accordance with traffic conditions. In one form of apparatus shown herein, no timing devices are required and in other forms no timing devices or line wires are required.

Although I have herein shown and described only three 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 stretch of railway track including an intersection with a highway, a first track section and a second track section included in said stretch and successively occupied by a train approaching said intersection, a track circuit including a track relay for said first section, a pole changer including contacts of said track relay, a polarized relay governed by said pole changer and by traffic conditions in said second section, a highway crossing signal at the intersection capable of displaying three different indications, and means governed by said polarized relay for controlling said signal.

2. In combination, a stretch of railway track including an intersection with a highway, a first track section and a second track section included in said stretch and successively occupied by a train approaching said intersection, a track circuit including a track relay for said first section, a circuit, means including front contacts of said track relay for supplying said circuit with current of one polarity, means including back contacts of said relay for supplying said circuit with current of the other polarity, a polarized relay energized by said circuit provided said second section is unoccupied, a highway crossing signal at the intersection capable of displaying three different indications, and means governed by said polarized relay for controlling said signal.

3. In combination, a stretch of railway track including an intersection with a highway, a first track section and a second track section included in said stretch and successively occupied by a train approaching said intersection, a track circuit including a source of current and a track relay for each section, a pole changer including contacts of the track relay for said first section, a circuit controlled by said pole changer and by contacts of the track relay for the second section, a polarized relay connected to said circuit, a highway crossing signal at the intersection capable of displaying three different indications, and means controlled by said polarized relay for governing said signal.

4. In combination, a stretch of railway track including an intersection with a highway, a first track section and a second track section included in said stretch and successively occupied by a train approaching said intersection, a track circuit including a track relay for the first section, a source of current connected across the rails of the second section in one direction or in the other direction according as the track relay for the first section is energized or deenergized, a polarized track relay connected across the rails of the second section, a highway crossing signal at the intersection capable of displaying three different

indications, and means controlled by said polarized relay for governing said signal.

5. In combination, a stretch of railway track including an intersection with a highway as well as a first and a second track section successively occupied by a train approaching said intersection from one direction and a third and a fourth track section successively occupied by a train approaching said intersection from the other direction, a pair of polarized relays one controlled by traffic conditions in said first and second sections and the other controlled by traffic conditions in said third and fourth sections, an interlocking relay governed by said pair of polarized relays, and a signal capable of displaying three different indications governed jointly by said interlocking relay and by said pair of polarized relays.

6. In combination, a stretch of railway track including an intersection with a highway, a first track section and a second track section included in said stretch and successively occupied by a train approaching said intersection, a polarized relay, means controlled by traffic conditions in said sections for energizing said relay in one direction or the other according as said first section is occupied or unoccupied provided said second section is then unoccupied and for deenergizing said relay when said second section is occupied, a three indication highway crossing signal at said intersection, means governed by said relay for selectively controlling the three indications of said signal in accordance with the three conditions of the relay, and directional means controlled by traffic conditions in said stretch for removing said signal from control by said relay when said sections become occupied by a train receding from said intersection.

7. In combination, a stretch of railway track including an intersection with a highway, a first track section and a second track section included in said stretch and successively occupied by a train approaching said intersection, a polarized relay, means controlled by traffic conditions in said sections for energizing said relay at normal polarity when both sections are unoccupied or for energizing the relay at reverse polarity when said first section is occupied and said second section is unoccupied and for deenergizing the relay when said second section is occupied, a highway crossing signal at said intersection operative to display a warning indication and a stop indication, a first circuit controlled by said relay when energized at reverse polarity to cause said signal to display the warning indication, and a second circuit controlled by said relay when deenergized to cause said signal to display the stop indication.

8. In combination, a stretch of railway track including an intersection with a highway, a first track section and a second track section included in said stretch and successively occupied by a train approaching said intersection, a polarized relay, means controlled by traffic conditions in said sections for energizing said relay at normal polarity when both sections are unoccupied or for energizing the relay at reverse polarity when said first section is occupied and said second section is unoccupied and for deenergizing the relay when said second section is occupied, highway traffic controlling means to control highway traffic at the intersection, a first circuit including a contact closed only when said relay is energized at reverse polarity to establish a first warning condition of said controlling means, and a second circuit including a contact closed only when said relay is deenergized to establish a second warning condition of said controlling means.

9. In combination, a stretch of railway track including an intersection with a highway, a first track section and a second track section included in said stretch and successively occupied by a train approaching said intersection, a polarized relay, means controlled by traffic conditions in said sections for energizing said relay at normal polarity when both sections are unoccupied or for energizing the relay at reverse polarity when said first section is occupied and said second section is unoccupied and for deenergizing the relay when said second section is occupied, a highway crossing signal at said intersection operative to display a warning indication and a stop indication, a first circuit means including a front neutral contact and a reverse polar contact of said relay to cause said signal to display the warning indication, and a second circuit means including a back contact of said relay to cause said signal to display the stop indication.

10. In combination, a stretch of railway track including an intersection with a highway, a first track section and a second track section included in said stretch and successively occupied by a train approaching said intersection, a track circuit including a track relay for said first section, a track circuit including a current source and a polarized relay for said second section, means including front contacts of the relay for the first section to connect said source to the rails of the second section for energizing said polarized relay at normal polarity, means including back contacts of the relay for the first section to connect said source to the rails of the second section for energizing said polarized relay at reverse polarity, a highway crossing signal at the intersection, means including a reverse polar contact of the polarized relay for operating the signal to display a first warning indication, and means including a back contact of the polarized relay for operating the signal to display a second and different warning indication.

11. In combination, a stretch of railway track including an intersection with a highway, a first track section and a second track section formed to one side of the intersection and successively occupied by a train approaching the intersection, a polarized relay, means controlled by traffic conditions in said sections for energizing said relay at normal polarity or at reverse polarity according as said first section is occupied or unoccupied provided said second section is unoccupied and for deenergizing said relay when said second section is occupied, a highway crossing signal operative to display a warning indication and a stop indication, means including a reverse polar contact of the relay to display the warning indication of said signal, means including a back contact of the relay to display the stop indication of said signal, and directional means controlled by traffic conditions of said stretch to render said relay ineffective to display either the warning or the stop indication of said signal when a train recedes from the intersection through said sections.

GEORGE R. PFLASTERER.