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APPARATUS FOR THE CONTROL OF HIGHWAY CROSSING SIGNALS

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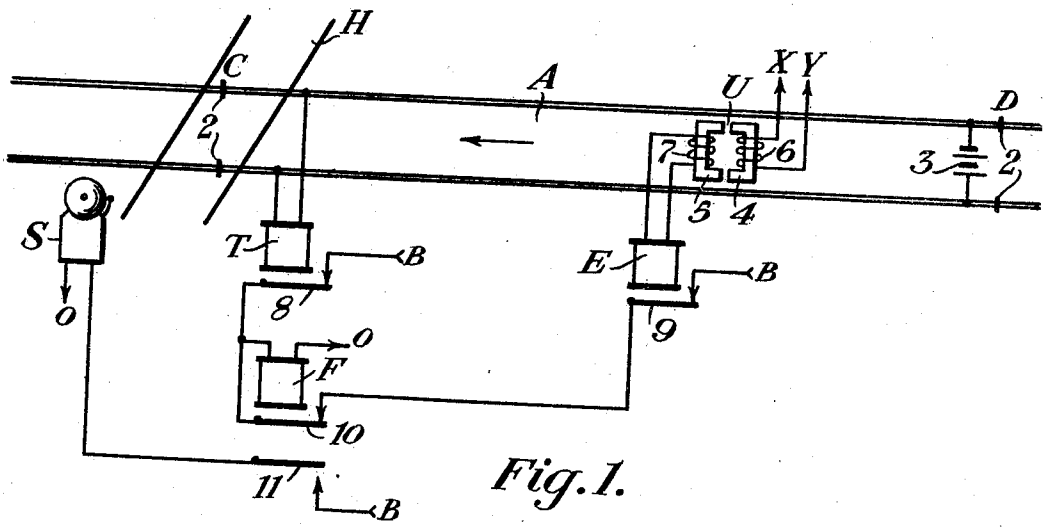


Fig. 1.

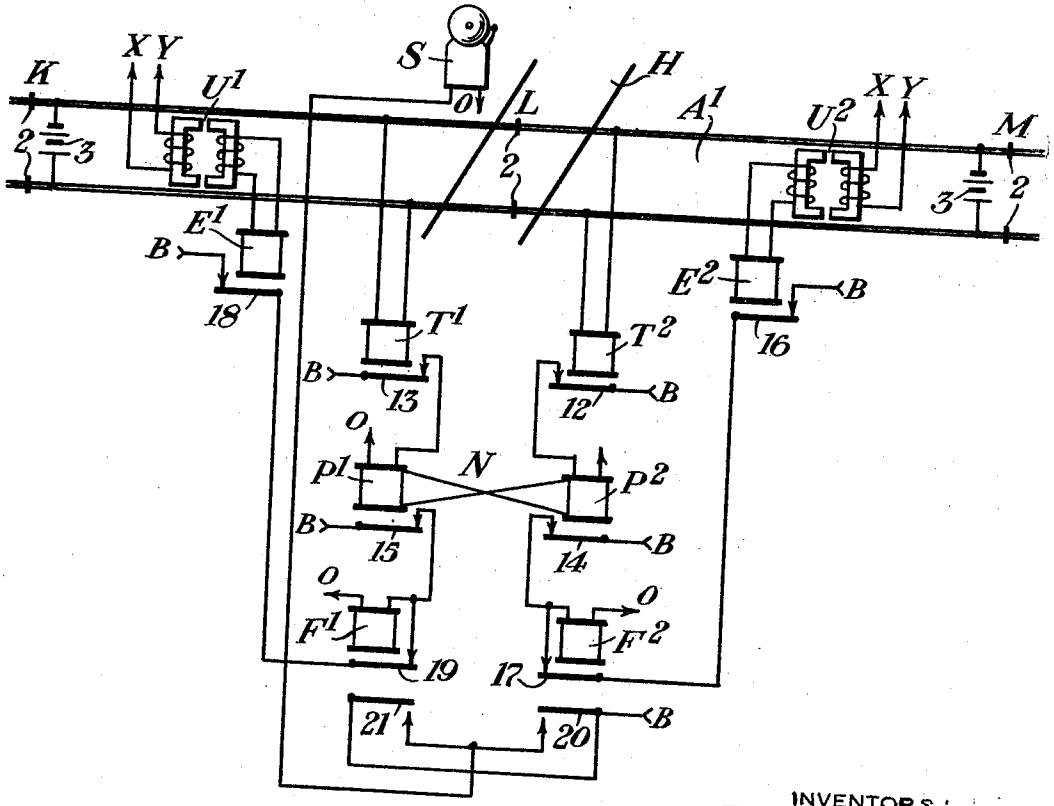


Fig. 2.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR THE CONTROL OF HIGHWAY CROSSING SIGNALS

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Our invention relates to apparatus for the control of highway crossing signals, and has for an object the provision of novel and improved means for controlling such signals jointly by track circuits and auxiliary devices located in the trackway, whereby the control limits of the signal may be different from the track circuit limits, so that unnecessary insulated joints in the track rails are avoided.

We will describe two forms of apparatus embodying our invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a diagrammatic view showing one form of apparatus embodying our invention and applied to a double track railroad. Fig. 2 is a diagrammatic view showing a modified form of apparatus embodying our invention applied to a single track railroad.

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

Referring first to Fig. 1, the reference character A designates a railway track, along which traffic normally moves in the direction indicated by the arrow. This track is divided by insulated joints to form a track section C—D, and the track is intersected by a highway H at substantially the end C of this track section. Located at the intersection of the track A and the highway H is a highway crossing signal S, which, as here shown, is an electric bell.

The track section C—D is provided with a track circuit comprising a battery 3 and a track relay T. It follows that this relay is energized or deenergized according as the track section C—D is unoccupied or occupied. Relay T may therefore be called the "main" relay.

Located between the track rails of the track A at an intermediate point in the section C—D is a transformer U comprising a magnetizable core made up of two confronting U-shaped members 4 and 5. Member 4 carries a primary winding 6, and member 5 carries a secondary winding 7. The primary winding 6 is constantly supplied with alternating current from a suitable source, the terminals of which are designated X and Y. The secondary winding 7 is directly connected with the winding of an auxiliary relay E. The parts of the transformer U are so proportioned that in the absence of a car or train the voltage which is induced in the secondary 7 is sufficient to energize relay E; when the track immediately adjacent the transformer is occupied by a car or train, the wheels and axles and the trucks shunt some of the primary flux from the secondary 7, so that the voltage induced in the secondary is reduced to such value that the relay E becomes deenergized. After the train has passed the transformer U, the parts are restored to their normal conditions, so that relay E again becomes energized.

The highway crossing signal S is controlled by the relays T and E through the medium of a stick relay F. Relay F is provided with a pick-up circuit which passes from terminal B of a suitable source of current, through front contact 8 of track relay T, and the winding of relay F to terminal O of the same source of current. Relay F is provided with a stick circuit which passes from terminal B, through contact 9 of relay E, contact 10 of relay F, and the winding of relay F to terminal O. The circuit for the crossing signal S includes a back contact of relay F as will be obvious from the drawings.

When the section C—D is unoccupied, relays T and E are both energized, so that relay F is energized and bell S is silent. When a train moving toward the left enters section C—D, it will immediately open track relay T, but this will have no effect on relay F, because the stick circuit for the latter relay remains closed. When the train passes transformer U, however, it will open the relay E, thereby opening the stick circuit for relay F, so that this relay will then open and the bell S will start to ring. Relay F will then remain open until the rear end of the train passes point C, whereupon, track relay T will again become closed, with the result that relay F will close and the operation of the bell S will cease.

Referring now to Fig. 2, the reference character A^1 designates a railway track along which traffic moves in both directions. This track is divided by insulated joints 2 to form two sections K—L and L—M, and the track

is intersected by a highway H at substantially the point L, that is, at substantially the junction of the two track sections. Track section K—L is provided with a track circuit comprising a battery 3 and a track relay T^1, whereas, track section L—M is provided with a track circuit comprising a battery 3 and a track relay T^2. Located at an intermediate point in track section K—L is a transformer U^1, and located at an intermediate point in the section L—M is a transformer U^2, each of which transformers may be similar to the device U of Fig. 1. Auxiliary relays E^1 and E^2 are associated with the transformers U^1 and U^2, respectively.

The two track relays T^1 and T^2 control the two elements P^1 and P^2, respectively, of an interlocking relay N.

The highway crossing signal S is controlled by two stick relays F^1 and F^2. When both of these relays are energized the signal is silent. When relay F^1 is deenergized, the signal S is energized by virtue of a circuit which includes back contact 21 of relay F^1, and when relay F^2 is deenergized the signal is operated by virtue of a circuit which includes a back contact 20 of this relay. These circuits will be obvious from the drawings without detailed explanation.

Relay F^1 is provided with a pick-up circuit which includes front contact 15 of interlocking relay element P^1, and with a stick circuit which includes contact 18 of relay E^1 as well as contact 19 of relay F^1. Relay F^2 is similarly provided with a pick-up circuit which includes contact 14 of interlocking relay element P^2, and with a stick circuit which includes contact 16 of relay E^2 as well as contact 17 of relay F^2.

Element P^1 of the interlocking relay N is provided with a circuit which includes contact 13 of track relay T^1, and element P^2 of the interlocking relay is provided with a circuit which includes contact 12 of track relay T^2. The relay referred to in certain of the appended claims as the "main" relay, may be interpreted to be element P^1 or element P^2 of the interlocking relay N in Fig. 2.

When both sections K—L and L—M are unoccupied, all of the relays shown in the drawing are energized, so that signal S is silent. When a train moving toward the left enters track section L—M, it will open track relay T^2, thereby opening the circuit for interlocking relay element P^2, but relay F^2 will remain energized by virtue of its stick circuit. When the train passes transformer U^2, it will open relay E^2, thereby opening the stick circuit for relay F^2, with the result that the signal S will start to operate. When the front end of the train passes point L, track relay T^1 will open, and this will open the circuit for interlocking relay element P^1, but contact 15 of this element will not open, because of the interlocking characteristics of the relay N. It follows that relay F^1 will remain energized. When the rear end of the train passes point L, relay T^2 will become energized, and this will cause relay element P^2 to become energized, so that relay F^2 will, likewise, become energized to stop the operation of the signal S.

The operation of the apparatus during the passage of a car or train moving toward the right will be obvious from the foregoing without detailed explanation.

One advantage of apparatus embodying our invention, is that the operation of the crossing signal may be started at any point in a track section, thereby avoiding the necessity for dividing the track rails into additional track sections in order to provide a starting point for the operation of the signal.

Although we have herein shown and described only two forms of apparatus 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 provided with a track section, a highway intersecting said track at one end of said section, a track circuit including a track relay for said section, an auxiliary device located at an intermediate point in said section and influenced by the passage of a train, and a highway crossing signal controlled jointly by said track relay and said device.

2. In combination, a railway track provided with a track section, a highway intersecting said track at one end of said section, a track circuit including a track relay for said section, an auxiliary device located at an intermediate point in said section and influenced by the passage of a train, a highway crossing signal for said intersection, means for setting said signal into operation when a train approaching said intersection passes said device, and means for stopping the operation of said signal when said track relay becomes energized due to such train leaving the section.

3. In combination, a railway track provided with a track section, a highway intersecting said track at the exit end of said section, a track circuit including a track relay for said section, an auxiliary device located at an intermediate point in said section, a normally energized auxiliary relay associated with said device and momentarily deenergized by the passage of a train, and a highway crossing signal controlled jointly by said auxiliary relay and said track relay.

4. In combination, a railway track provided with a track section, a highway intersecting said track at the exit end of said section, a track circuit including a track relay

for said section, an auxiliary device located at an intermediate point in said section, a normally energized auxiliary relay associated with said device and momentarily deenergized by the passage of a train, a highway crossing signal for the protection of said intersection, means for setting said signal into operation when a train approaching said intersection deenergizes said auxiliary relay, and means for stopping the operation of said signal when said track relay becomes energized due to such train leaving the section.

5. In combination, a railway track provided with a track section, a highway intersecting said track at one end of said section, a main relay energized or deenergized according as said section is unoccupied or occupied, an auxiliary device located at an intermediate point in said section, a normally energized auxiliary relay associated with said device and momentarily deenergized by the passage of a train, and a highway crossing signal controlled jointly by said two relays.

6. In combination, a railway track provided with a track section, a highway intersecting said track at one end of said section, a main relay energized or deenergized according as said section is unoccupied or occupied, an auxiliary device located at an intermediate point in said section, a normally energized auxiliary relay associated with said device and momentarily deenergized by the passage of a train, a highway crossing signal for the protection of said intersection, means for setting said signal into operation when a train approaching said intersection deenergizes said auxiliary relay, and means for stopping the operation of said signal when said main relay becomes energized due to such train leaving the section.

7. In combination, a railway track provided with a track section, a highway intersecting said track at one end of said section, a main relay energized or deenergized according as said section is unoccupied or occupied, an auxiliary device located at an intermediate point in said section, a normally energized auxiliary relay associated with said device and momentarily deenergized by the passage of a train, a stick relay, a pick-up circuit for said stick relay including a front contact of said main relay, a stick circuit for said stick relay including a front contact of said auxiliary relay, and a highway crossing signal controlled by said stick relay.

8. In combination, a railway track along which traffic normally moves in one direction, said track being provided with a track section, a highway intersecting said track at the exit end of said section, a main relay energized or deenergized according as said section is unoccupied or occupied, an auxiliary device located at an intermediate point in said section, a normally energized auxiliary relay associated with said device and momentarily deenergized by the passage of a train, and a highway crossing signal controlled jointly by said two relays.

9. In combination, a stretch of single track divided into two sections, a highway intersecting said track at the junction of said sections, an interlocking relay controlled by said sections, an auxiliary device located at an intermediate point in each section, a normally energized auxiliary relay associated with each device and momentarily deenergized by the passage of a train, and a highway crossing signal controlled jointly by said interlocking relay and said auxiliary relays.

10. In combination, a railway track provided with a track section, a highway intersecting said track at one end of said section, a track circuit including a track relay for said section, a transformer located in the trackway at an intermediate point in said section, a source of alternating current constantly connected with the primary of said transformer and an auxiliary relay constantly connected with the secondary thereof, the parts being so proportioned that said auxiliary relay is normally energized but becomes momentarily deenergized due to the influence of a train passing the transformer, and a highway crossing signal controlled jointly by said track relay and said auxiliary relay.

In testimony whereof we affix our signatures.

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