

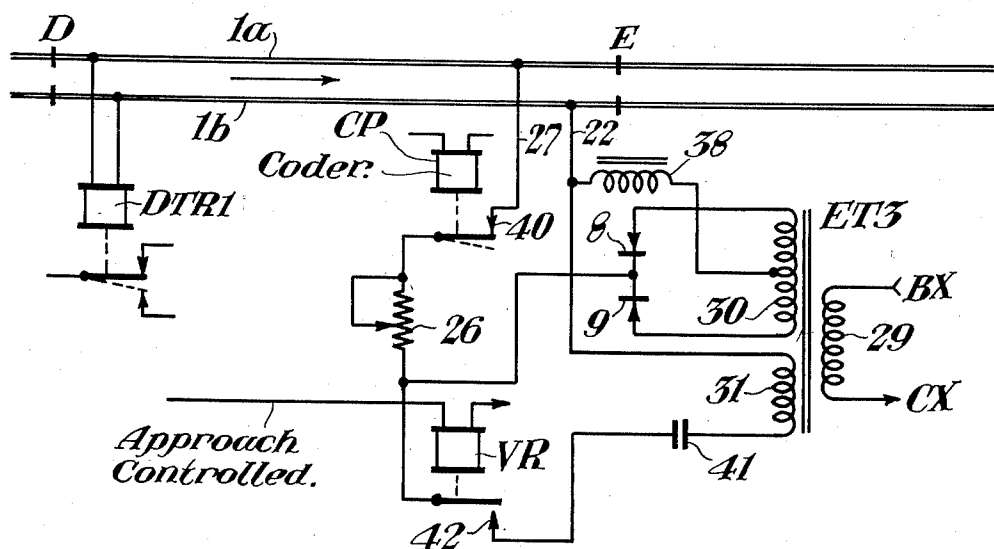
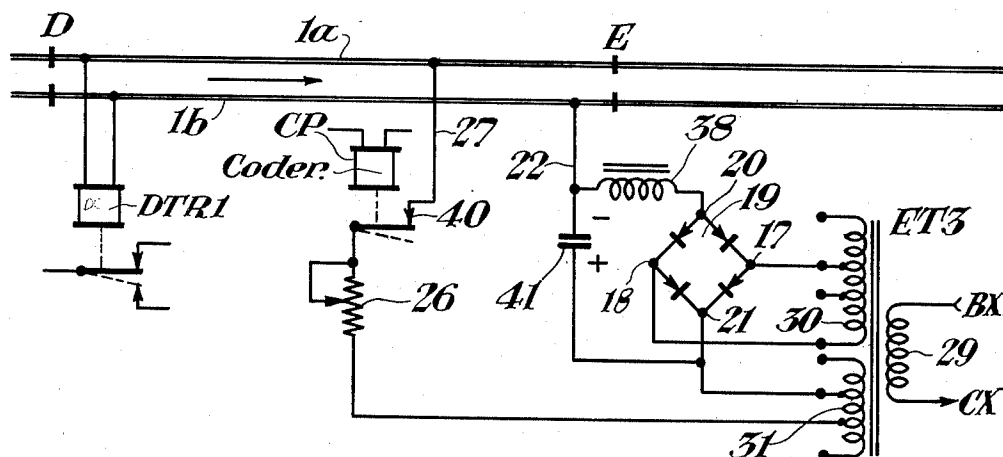
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TRACK CIRCUIT APPARATUS

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TRACK CIRCUIT APPARATUS

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4 Claims. (Cl. 246—34)

1 My invention relates to track circuit apparatus, and more particularly to track circuit apparatus for governing both wayside and cab signals.

The present application is a division of my copending application for Letters Patent of the United States, Serial No. 636,703, filed December 22, 1945, for Track Circuit Apparatus, now Patent No. 2,515,642, granted July 18, 1950.

In railway signaling the track circuit of a track section is supplied in many cases with direct current for energizing a track relay when the section is unoccupied and with alternating current for operation of a cab signal when a train moves through the section. There are well defined operating characteristics prescribed for track circuits and these characteristics are best met in one manner when direct current is used and in a somewhat different manner when alternating current is used. Also, when a track circuit is to be supplied with direct current for one function and with alternating current for another function, it is in the interest of economy and simplicity that a single source of power is used.

Accordingly, a feature of my invention is the provision of novel and improved track circuit apparatus for control of both wayside and cab signals.

Another feature of my invention is the provision of improved track circuit apparatus to supply current for energizing a direct current track relay and for operating a cab signal from a single source of alternating current.

Other features, objects, and advantages of my invention will appear as the specification progresses.

To attain the foregoing features, objects and advantages of my invention, I provide a novel circuit network for connecting a source of alternating current to the track circuit to supply current through a full wave rectifier for energizing the track relay when the section is unoccupied, and to supply an alternating current for operation of the cab signal when a train moves through the section.

I shall describe two forms of apparatus embodying my invention and shall then point out the novel features thereof in claims.

In the accompanying drawings, Figs. 1 and 2 are diagrammatic views showing two different forms of track circuit apparatus, each of which form of apparatus embodies my invention.

In each of the two views like reference characters are used to designate similar parts.

Referring to Fig. 1, the reference characters

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1a and 1b designate the track rails of a railway over which traffic normally moves in the direction indicated by an arrow, and which rails are formed with a track section D—E, the section D—E being ordinarily one section of a series of sections of a signaling system. The rails 1a and 1b are arranged to be included in a track circuit which also includes a track relay, connected across the rails at one end of the section and a source of power connected across the rails at the other end of the section.

As here shown, the track relay is a direct current track relay DTR1 having a winding connected across the rails adjacent the entrance end D of section D—E. The power source comprises a track transformer ET3 having a primary winding 29 and two secondary windings 30 and 31.

A portion of secondary winding 30 is connected across input terminals 17 and 18 of rectifier 19, the portion of the winding to be used being preselected according to the particular track section to be supplied. The output terminals 20 and 21 of rectifier 19 are connected across the rails by terminal 20 being connected to rail 1b through a reactor 38 and lead wire 22; and terminal 21 being connected to rail 1a through winding 31, resistor 23, contact 40 of coder CP and lead wire 27. A capacitor 41 is connected around rectifier 19 and reactor 38.

Secondary winding 30 in combination with the rectifier 19 and the capacitor 41, which preferably is of relatively large capacitance, maintain a unidirectional voltage across the capacitor 41 of the polarity indicated in Fig. 1. Secondary winding 31 provides an alternating current component to the track circuit, the path for which includes lead wire 22 from rail 1b, capacitor 41, secondary winding 31, resistor 26, coder contact 40, and lead wire 27 to rail 1a. Capacitor 41 is thus a mutual element in the direct current and alternating current supply circuits and acts very much like a battery to provide a direct voltage in series with the alternating voltage with consequent direct current and alternating current components in the current in the rails. The direct current component is effective to energize the direct current track relay DTR1 when the section is unoccupied, and the alternating current component serves to operate a cab signal when a train occupies the track section. The reactor 38 prevents the alternating current component from unbalancing the currents between the two legs of each pair of legs in rectifier 19 and thus prevents any appreciable direct current component in secondary winding 30, and also re-

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duces the ripple in the rectified voltage supplied by secondary winding 30 and rectifier 19 to capacitor 41.

In Fig. 2, secondary winding 30 of transformer ET3 is connected across the outside terminals of rectifiers 8 and 9 in series and poled reverse to each other. The junction terminal of rectifiers 8 and 9 is connected to rail 1a through resistor 26, coder contact 40 and lead wire 27, and a mid terminal of winding 30 is connected to rail 1b through reactor 38 and lead wire 22. Thus a full wave rectified current is supplied to the track circuit from secondary winding 30 and such current is available to energize track relay DTR when the section is unoccupied.

Secondary winding 31 is connected across the track rails through capacitor 41, back contact 42 of approach controlled relay VR and resistor 26. Thus when relay VR is released an alternating current is supplied to the rails from secondary winding 31 and such current is available to operate a cab signal when a train occupies the section. The capacitor 41 serves to block the direct current from winding 30, and the reactor 38 serves to prevent the alternating current from unbalancing the rectifiers. Thus in Fig. 2, the direct current component and the alternating current component of the current in the rails can be independently adjusted.

It is obvious that an approach controlled relay VR can be provided in the connection of secondary winding 31 of Fig. 1 to the rails and the alternating current component of the rail current for operation of cab signals supplied only when the section is occupied and my invention contemplates such a modification of Fig. 1.

Track circuit apparatus such as here disclosed has the advantages that from a single source of alternating current a track circuit is provided at times with a rectified direct current having a relatively small alternating current component for energization of a direct current track relay, and at other times with a current having a relatively large alternating current component for operation of cab signals; this latter current also having a direct current component effective to initially energize the track relay.

Although I have herein shown and described but two forms of track circuit 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 a track circuit for a track section through which traffic moves in a given direction, the combination comprising, a direct current track relay connected across the rails at the entrance end of the section, a transformer having a primary winding and a first and a second secondary winding, said primary winding connected to a source of alternating current, a reactor having inductance, a full wave rectifier; a first circuit including in series said first secondary winding, said rectifier and said reactor and connected across the rails at the exit end of the section to supply a full wave rectified current for energizing said track relay when the section is unoccupied; an impedance device, a second circuit including in series said second secondary winding and said impedance device and connected across the rails at the exit end of the section to supply an alternating current which is available for operating a

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cab signal when a train moves through the section, said reactor disposed in said first circuit with respect to said rectifier to substantially block the alternating current of the second circuit from unbalancing said rectifier, and said impedance device disposed adjacent said second secondary winding to minimize the flow of said rectified current through the second secondary winding.

2. In combination, a track section formed with a track circuit including the track rails and a direct current track relay connected across the rails at the entrance end of the section, a track transformer having a primary winding receiving an alternating current, two half wave rectifiers connected in series and poled reverse to each other across a first secondary winding of said transformer, said rectifiers having their junction terminal connected through a resistor to one rail at the exit end of the section and said first secondary winding having a mid terminal connected through a reactor to the other rail at the exit end of the section to supply full wave rectified current to energize said track relay, an approach controlled relay for said section, and means including a contact of said approach controlled relay and a capacitor to connect a second secondary winding of said transformer to the rails at the exit end of the section to at times supply an alternating current to the rails to operate a cab signal of a train traversing said section.

3. In a track circuit for a track section through which traffic moves in a given direction, the combination comprising, a direct current track relay connected across the rails at the entrance end of the section, a transformer having a primary winding and a first and a second secondary winding, said primary winding being connected to an alternating current source, a full wave rectifier, an inductance device; a first circuit means including said first secondary winding, said rectifier and said inductance device connected across the rails at the exit end of the section to supply a full wave rectified current for energizing said track relay; a second circuit means to connect said second secondary winding across the rails at the exit end of the section to supply an alternating current which is available for operating a cab signal of a train moving through the section, said inductance device disposed with respect to said rectifier to substantially block the flow of alternating current from the second circuit means in said rectifier, and an impedance interposed in said second circuit means adjacent said second secondary winding to minimize the flow of the rectified current from said first circuit means in said second secondary winding.

4. In a track circuit for a track section through which traffic moves in a given direction, the combination comprising, a direct current track relay connected across the rails at the entrance end of the section, a transformer having a primary winding and a first and a second secondary winding, said primary winding being connected to an alternating current source, a full wave rectifier, an inductance device, an impedance, a first circuit including said first secondary winding, said rectifier and said inductance device having connections across the rails at the exit end of the section to supply full wave rectified current for energizing said track relay; a second circuit including said second secondary winding and said impedance having connections across the rails at the exit end of the section to supply an alternating current which is available for operating

a cab signal when a train moves through the section, and said first and second circuits disposed in parallel for said inductance device to substantially block the flow of the alternating current supplied to the rails from unbalancing said rectifier and for said impedance to substantially block the flow of the rectified current supplied to the rails from flowing in said second secondary winding.

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