

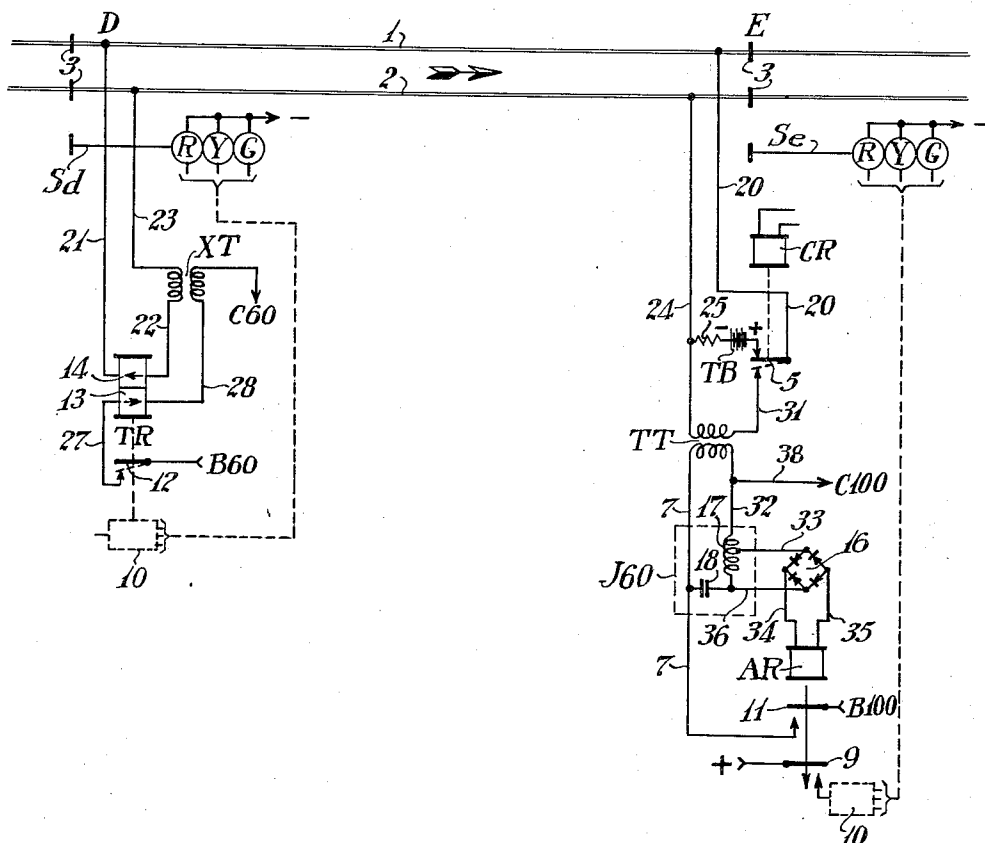
May 9, 1939.

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2,158,016

APPROACH CONTROL APPARATUS FOR RAILWAY SIGNALING SYSTEMS

Filed July 14, 1938



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## UNITED STATES PATENT OFFICE

2,158,016

APPROACH CONTROL APPARATUS FOR  
RAILWAY SIGNALING SYSTEMS

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Application July 14, 1938, Serial No. 219,232

19 Claims. (Cl. 246—38)

My invention relates to approach control apparatus for use in railway signaling systems of the coded track circuit class and it has special reference to the employment of such apparatus for approach controlling various signaling functions without the use of line wires.

Generally stated, the object of my invention is to improve certain features of an approach control without line wire scheme wherein the rails of each unoccupied signal block length of track transmit code step pulses of auxiliary energy forwardly from the block entrance to effect the energization of a slow release approach relay at the block exit.

A more specific object is to provide improved means for supplying the referred to pulses of auxiliary energy to the entrance end of each track circuit without interfering with the normal code following operation of the signaling system track relay at that location.

Another object is to provide improved means for receiving these pulses from the exit end of each track circuit and for energizing the associated slow release approach relay in step with them.

An additional object is to make improved provision for rendering the approach relay unresponsive to the coded signal control energy which is supplied by facilities of the signaling system to the track circuit at the location of that relay.

In practicing my invention I attain the above and other objects and advantages by introducing the pulses of auxiliary energy into the track circuit during the "off" periods of the main signal control code; by providing the track relay with a neutralizing winding which prevents false response to this auxiliary energy; by employing auxiliary energy which is alternating current in character and which has a carrier wave frequency substantially different from that of the alternating current component of the coded signal control energy; and by connecting the operating winding of the slow release approach relay in energy receiving relation with the track rails over a circuit which includes a resonant unit tuned to pass energy of the auxiliary carrier wave frequency only.

I shall describe one form of approach control apparatus embodying my invention and shall then point out the novel features thereof in claims.

This illustrative embodiment is disclosed in the accompanying drawing which diagrammatically represents a section of railway track equipped

with one preferred form of my improved approach control facilities.

Referring to the single view of the drawing, reference characters D and E respectively designate the entrance and the exit ends of one of the successive sections into which a signaled stretch of railway track 1—2 is divided by the usual insulated rail joints 3; character TR designates a code following track relay which is installed at the entrance of each of these sections and operated by energy received from the rails thereof; character TB a track battery or other direct current source provided at the section exit for supplying the rails with the relay operating energy just referred to; character CR a coding device having a contact 5 which codes this relay operating energy by periodically interrupting the rail supply circuit; and character S the usual wayside signal which guards the entrance of each of the track sections and which is controlled by the associated track relay TR through the medium of decoding apparatus 10.

All of the elements above named are included in automatic block signaling systems which employ coded track circuit control of representative character and which operate without the aid of line wires. Such systems further comprise the customary facilities (not shown) for continuously operating each of the exit end relays CR at one or another of the usual plurality of distinctive code rates. Selection among these code rates (which may consist of 75 and 180 trackway energy pulses per minute in a typical three indication system) is made in accordance with conditions of advance traffic by the decoding apparatus 10 functioning in customary manner.

This decoding apparatus (details not shown) is controlled in the usual fashion by the associated track relay TR and it performs the further function of selectively setting up a lighting circuit for one or another of the lamps (G, Y and R in the typical three indication system above referred to) of the wayside signal S at the same location. In the arrangement represented, these signal lamps derive energizing current from a power source which is designated by the terminals "plus" and "minus."

For applications in which train carried cab signals (not shown) also are to be controlled, the representative signaling system further includes a circuit at the exit end of each track section for additionally supplying coded alternating current energy to the rails of that section. In the form shown at location E, this circuit includes a track transformer TT. The secondary winding

of this transformer is bridged across the track rails by the coding contact 5 of device CR during each "off" period of the direct current code which is supplied from battery TB over the same contact. At proper times the primary winding of transformer TT is energized over a conductor 7 from a suitable alternating current source which is designated by the terminals B100 and C100. To aid explanation, it will be assumed that the energy of this source has a frequency of 100 cycles per second.

In order that certain functions of the signaling system may be rendered active only when a train approaches each of the signal locations D, E, etc., the apparatus thereinstalled further includes an approach relay AR which is arranged to maintain the referred to functions inactive at all times except when the section of track to the rear of the location becomes occupied. In the illustrative arrangement shown at location E, these approach controlled functions consist in lighting the wayside signal S (normally dark) and in supplying the rails of the section to the rear of that signal with alternating current energy for cab signal control. The former function is governed by a contact 9 of the approach relay AR and the latter by a companion contact 11 thereof. Either of these functions may, of course, be controlled individually by the relay AR. Moreover, the same relay may be used to control signaling functions other than or in addition to the two just named.

For maintaining the approach relay AR picked up when and only when the track section to the rear thereof is vacant, I transmit recurring pulses of auxiliary energy forwardly from the section entrance over the track rails 1 and 2 and to the operating winding of the relay at the section exit. This auxiliary energy is derived from an alternating current source designated by the terminals B60 and C60. For a purpose later to be made evident the carrier wave frequency of source B60—C60 is chosen to differ substantially from that of the cab signal control energy from source B100—C100 and to aid explanation it will be assumed that this auxiliary carrier wave frequency is 60 cycles per second.

During vacant conditions of the track section which is represented herein, code step pulses of this auxiliary energy are supplied to the rails 1 and 2 at the entrance end location D by way of a circuit which includes a transformer XT. This circuit is completed over a back contact 12 of the associated track relay TR each time that the relay releases, thereby causing the track circuit to have impressed upon it a pulse of auxiliary energy during each "off" period of the main track circuit code.

For rendering the track relay TR unresponsive to this auxiliary or "off" period energy, the magnetic circuit of the relay is provided with a neutralizing winding 13 which is serially included in the circuit over which the transformer XT receives primary current from source B60—C60. This neutralizing winding is so coordinated with the transformer and with the main operating winding 14 (which receives coded trackway energy from battery TB) of the relay TR that at any instant when the transformer is energized it carries current in polarity opposition (see the small arrows) to that which the secondary winding of the transformer circulates through the winding 14 in supplying auxiliary energy to the track rails. In this manner the contacts of relay TR are prevented from being falsely picked up

by the auxiliary energy during the "off" code periods.

For receiving the pulses of this auxiliary energy at the exit end of the track circuit and for energizing the slow release approach relay AR in step with them, I provide the facilities which are shown at location E. These include the before mentioned track transformer TT and associated means which connect it with the track rails during the "off" periods of the main track circuit code, a circuit extending from this transformer to the operating winding of the relay AR for the purpose of transmitting energy thereto, and a resonant unit J60 included in this circuit and tuned to pass energy of the 60 cycle or other auxiliary carrier wave frequency only.

Each pulse of this auxiliary energy which the transformer TT receives from the trackway is transmitted over the named circuit to the winding of relay AR. Preferably this winding is designed for direct current energization and for this reason a rectifier 16 ordinarily will be interposed between it and the resonant unit J60. When so used, the rectifier further serves as a snubbing element for the winding and thus cooperates in imparting slow release characteristics to the relay. Regardless of how obtained, the magnitude of this release delay is made sufficient to bridge the widest spacing between consecutive pulses of the received auxiliary energy. This relation is, of course, necessary in order that the approach relay AR may hold its contacts continuously picked up when energized in step with the "off" periods of any one of the trackway codes which the continuously operating device CR produces.

The purpose of the resonant unit J60 is to render the approach relay AR responsive only to auxiliary energy from source B60—C60 and unresponsive to all other coded energy. The energy to which relay AR is thus made immune includes that from source B100—C100 which at times is supplied to the track circuit for cab signal control by way of the transformer TT. It will be seen that this transformer also forms a part of the relay supply circuit in which unit J60 is included.

This unit J60 may, of course, be of any design suitable for passing auxiliary energy to the relay winding and excluding all other energy therefrom. As shown, it consists of inductance and capacitance elements 17 and 18 connected in series across the transformer TT and arranged to supply the winding of relay AR with a measure of the voltage appearing across the inductance element. When the unit is receiving energy of the auxiliary carrier wave frequency, assumed to be 60 cycles per second, this voltage is sufficiently high to cause the relay to pick up. However, when the unit is energized by the 100 cycle energy from source B100—C100, the inductance element voltage is too small to pick up the relay. The same is true to an even greater degree for direct current energy such as is available at track battery TB.

The operation of the complete approach control system herein disclosed will now be described. Under all traffic conditions of track section D—E, device CR at location E continuously operates coding contact 5 and thereby repeatedly connects the rails 1 and 2 first with the track battery TB and then with the secondary of track transformer TT.

As long as the section remains vacant, the track battery TB at location E thus supplies the oper-

ating winding 14 of the track relay TR at location D with recurring pulses of pick-up energy. The winding supply circuit which is effective during each "on" period of this direct current trackway code may be traced from the positive terminal of the track battery through front contact 5 of device CR, conductor 20, track rail 1, conductor 21, the winding 14 of relay TR, conductor 22, the secondary winding of transformer XT, conductor 23, track rail 2, conductor 24 and a current limiting impedance 25 back to the negative terminal of the track battery.

In this manner track relay TR is caused to pick up its contacts upon the occasion and for the duration of each of the "on" periods of the main track circuit code. During the "off" periods which intervene, it releases in the usual manner and completes for transformer XT an energizing circuit which may be traced from terminal B60 of the auxiliary supply source through back contact 12 of relay TR, conductor 27, the neutralizing winding 13 of relay TR, conductor 28, and the primary of transformer XT back to terminal C60 of the auxiliary source.

Each time that transformer XT is thus energized, the secondary winding thereof transmits a pulse of pick-up energy to the winding of the approach relay AR at location E by way of a supply path which includes the track rails 1 and 2, transformer TT, unit J60 and rectifier 16. The first mentioned portion of this supply path or circuit may be traced from the lower terminal of the secondary of transformer XT, through conductor 22, the winding 14 of relay TR, conductor 21, track rail 1, conductor 20, back contact 5 of coding device CR, conductor 31, the upper winding of transformer TT, conductor 24, track rail 2 and conductor 23 back to the upper terminal of the secondary of transformer XT.

The remaining portion of the supply path above referred to may be traced from the right terminal of the lower winding of transformer TT through conductor 32, a portion of the winding 17 of unit J60, conductor 33, one branch of the full wave rectifier 16, conductor 34, the winding of relay AR, conductor 35, a second branch of the rectifier 16, conductor 36, the capacitor 18 and conductor 7 back to the left terminal of the transformer winding.

As long as the track section D—E remains vacant, relay AR is in this manner supplied with the recurring code step pulses of auxiliary energy from source B60—C60. Due to its slow releasing characteristics, the relay holds its contacts 9 and 11 continuously picked up under the stated conditions and thereby renders inactive the wayside signal Se and the cab signal supply circuit involving source B100—C100.

In the event that a train comes into the track section D—E, the usual shunting action of its wheels and axles continuously deenergizes the operating winding 14 of relay TR and causes that relay to stay released. In so doing it completes at contact 12 the primary circuit for transformer XT. However, the output of this transformer does not reach the exit end of the track circuit but rather is by-passed by the train rolling stock within the section which directly interconnects the rails 1 and 2.

Consequently, no pick-up energy is supplied to the winding of the approach relay AR and it releases. Contact 9 thereof now completes the lighting circuit for the active lamp of wayside signal Se and companion contact 11 connects the lower winding of transformer TT with the cab

signal source B100—C100. The transformer energizing circuit now completed may be traced from terminal B100 through back contact 11 of relay AR, conductor 7, the lower winding of transformer TT and conductor 38 back to terminal C100.

Each time, now, that coding contact 5 occupies the lowermost position, the secondary winding of transformer TT supplies 100 cycle energy to the track rails over a circuit which may be traced from the right terminal of the upper winding of transformer TT through conductor 31, back contact 5 of device CR, conductor 20, the track rails 1 and 2 and conductor 24 back to the left terminal of the transformer winding.

This coded alternating current energy is effective for controlling train carried cab signals of the usual character. Although it too is impressed upon the resonant unit J60, the before explained selective characteristics of that unit prevent any substantial portion of it from reaching the operating winding of relay AR and as a result that relay continues to remain released as long as any part of the train continues to occupy the track section D—E.

When the rear of the departing train clears the exit end location E and thus removes the shunt from between the rails 1 and 2 of the section, these rails again transmit coded direct current energy from battery TB to the operating winding of relay TR at the entrance location D. That relay resumes its code following response and transformer XT again becomes effective for supplying pick-up energy from source B60—C60 to the winding of the approach relay AR at the exit end location E. In once more picking up, relay AR interrupts the lighting circuit for wayside signal Se at contact 9 and disconnects the alternating current source B100—C100 from the transformer TT at contact 11. In this manner the approach controlled signaling functions are restored to their normally inactive state in which they continue until the track section D—E once more becomes occupied.

From the foregoing it will be seen that I have made important improvements in that form of approach control without line wire scheme wherein the rails of each signal block length of track transmit code step pulses of auxiliary energy forwardly from the block entrance to effect the energization of a slow release approach relay at the block exit as long as the block remains vacant.

In particular, I have provided improved means for supplying the referred to pulses of auxiliary energy to the entrance end of each track circuit without interfering with the normal code following operation of the signaling system track relay at that location. I have also provided improved means for receiving these pulses at the exit end of each track circuit and for energizing the associated slow release approach relay in step with them. Still further, I have made improved provisions for rendering the approach relay unresponsive to the coded signal control energy which is supplied by facilities of the signaling system to the track circuit at the location of that relay.

As all of these improvements are entirely a function of the track circuit and directly associated apparatus they are independent of the coding and decoding facilities of the coded signaling system and hence are usable with a wide variety of different types and forms of such facilities.

Although I have herein shown and described

only one form of approach control 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 system for approach controlling a railway signaling function without the use of line wires, the combination with a section of track of means for supplying coded track circuit energy to the rails of said section, a code following track relay connected to receive said coded energy from said rails and designed to respond to that received energy, means controlled by said track relay and effective during recurrent periods of the received track circuit code for supplying said rails with auxiliary energy of a given carrier wave frequency, an approach relay having a slowness of release which is sufficient to bridge the spacing between said recurrent periods, a circuit connecting the operating winding of said approach relay in energy receiving relation with said rails, resonant means included in said circuit for conditioning it to pass energy of said given carrier wave frequency only, and traffic controlling apparatus governed by said approach relay.

2. In combination with a section of railway track, means for supplying coded track circuit energy to the rails of said section, a code following track relay connected to receive said coded energy from said rails and designed to respond to that received energy, means controlled by said track relay and effective during recurrent periods of the received track circuit code for supplying said rails with alternating current energy of a preselected carrier wave frequency, an approach relay having a slowness of release which is sufficient to bridge the spacing between said recurrent periods, a circuit connecting the operating winding of said approach relay in energy receiving relation with said rails, means included in said circuit for conditioning it to pass energy of said given carrier wave frequency only, and traffic controlling apparatus governed by said approach relay and rendered active when that relay is released.

3. In a signaling system which comprises: a section of railway track, means for supplying coded track circuit energy to the rails of said section, a code following track relay connected to receive said coded energy from said rails and designed to respond to that received energy, an approach relay located at the exit end of the section and having a slowness of release which is sufficient to bridge the spacing between recurrent periods of said track circuit code, and traffic controlling apparatus governed by said approach relay and rendered active when that relay is released; the combination of means for maintaining said approach relay picked up as long as the section is vacant comprising: a circuit which connects the operating winding of said approach relay in energy receiving relation with said section rails, a resonant unit included in said circuit for conditioning it to pass energy of a preselected carrier wave frequency only, a source of alternating current energy having said preselected carrier wave frequency, and a circuit controlled by said track relay over which energy from said source is supplied to said rails during each of the aforesaid recurrent periods of the received track circuit code.

4. In combination with a section of railway track, means for supplying coded track circuit energy to the rails of said section, a code following track relay connected to receive said coded energy from said rails and designed to respond to that received energy, an approach relay having a slowness of release which is sufficient to bridge the spacing between recurrent periods of said track circuit code, a supply circuit for the operating winding of said approach relay, means included in said circuit for conditioning it to pass energy of a preselected carrier wave frequency only, means for connecting said supply circuit in energy receiving relation with said section rails during said recurrent code periods, means controlled by said track relay for supplying alternating current energy of said preselected carrier wave frequency to said rails during the aforesaid recurrent periods of the received trackway code, and traffic controlling apparatus governed by said approach relay and rendered active when that relay is released.

5. In combination with a section of railway track, means for supplying coded energy to the rails of said section, an approach relay having a slowness of release which is sufficient to bridge the spacing between consecutive "off" periods of said track circuit code, a circuit connecting the operating winding of said relay in energy receiving relation with said rails, means included in said circuit for conditioning it to pass energy of a preselected carrier wave frequency only, a code following track relay connected to receive said coded energy from said rails and designed to respond to that received energy, means controlled by said track relay for supplying energy of said preselected carrier wave frequency to said rails each time that the track relay releases, and traffic controlling apparatus governed by said approach relay and rendered active when that relay is released.

6. In combination with a section of railway track, a source of direct current trackway energy, a continuously operating coding contact which recurrently connects said source to the rails of said section, an approach relay having a slowness of release which is sufficient to bridge the spacing between consecutive "off" periods of the direct current code which said contact produces, a supply circuit for the operating winding of said relay which is connected by said coding contact in energy receiving relation with said rails during each of said "off" periods, means included in said supply circuit for conditioning it to pass energy of a preselected carrier wave frequency only, a code following track relay connected in energy receiving relation with said section rails and designed to respond to the said coded direct current energy which is received therefrom and to be unresponsive to alternating current energy, a source of alternating current energy having said preselected carrier wave frequency, a circuit controlled by said track relay for connecting said alternating current source to said rails during each of the said "off" periods of the received direct current code, and traffic controlling apparatus governed by said approach relay and rendered active when that relay is released.

7. In combination with adjoining forward and rear sections of railway track, a signal positioned at the entrance of said forward section and controlled in accordance with advance traffic conditions, means at the exit end of said rear section for supplying the rails of that section with coded track circuit energy, an approach relay also po-

sitioned at said rear section exit and having a slowness of release which is sufficient to bridge the spacing between recurrent periods of said track circuit code, means governed by said approach relay for supplying energizing current to said forward section signal when and only when that relay is released, a code following track relay at the entrance end of said rear section connected to receive said coded energy from said rear section rails and designed to respond to that received energy, means controlled by said track relay for supplying the said rails of the rear section with alternating current energy of a given carrier wave frequency during the said recurrent periods of the received track circuit code, a circuit connecting the operating winding of said approach relay in energy receiving relation with the said rails of the rear section, and means included in said circuit for conditioning it to pass energy of said given carrier wave frequency only.

8. In combination with a section of railway track, a direct current source of trackway energy, a continuously operating coding contact, a first circuit which connects said direct current source to the rails of said section each time that said contact is in one position, a second circuit which is connected to said rails each time that said contact is in a second position, an alternating current source of trackway energy of a first carrier wave frequency, an approach relay being sufficiently slow in releasing to bridge the intervals between the periods that said coding contact occupies its said second position and having a contact which connects said alternating current source to said second circuit when and only when the relay is released, a code following track relay connected in energy receiving relation with said section rails and operated by the said coded direct current energy which is received therefrom, means controlled by said track relay and effective during recurrent periods of the received trackway code for supplying said rails with alternating current energy of a second carrier wave frequency which is suitable for picking up said approach relay, a circuit connecting the operating winding of said approach relay in energy receiving relation with said rails, and means included in said relay winding circuit for conditioning that circuit to pass energy of said second carrier wave frequency only.

9. In combination with a section of railway track, approach control apparatus comprising a resonant circuit at the exit end of said section which is tuned to pass energy of a given carrier wave frequency only, a source of track circuit energy also at said section exit, a coding contact which repeatedly connects the rails of said section first to said source and then to said resonant circuit, an approach relay connected to receive energy from said resonant circuit and having a slowness of release which is sufficient to bridge the intervals between said successive connections of that circuit with said rails, a code following track relay at the entrance end of the section connected in energy receiving relation with said rails and operated by the said coded energy which is received therefrom, a source of alternating current auxiliary energy also located at said entrance end and having a carrier wave frequency of the aforesaid given value, means controlled by said track relay for connecting said rails to said auxiliary energy source each time that the track relay releases, and traffic controlling apparatus governed by said approach

relay and rendered active when that relay is released.

10. In a system for approach controlling a railway signaling function without the use of line wires, the combination with a section of track of means for supplying coded energy to the rails of said section, a code following track relay connected at the entrance end of said section to receive said coded energy from said rails and designed to pick up upon the occasion of each received pulse of that energy, a source of alternating current auxiliary energy also at said section entrance, means controlled by said track relay for connecting said rails in energy receiving relation with said source each time that that releases, electromagnetic means controlled by said track relay and rendered active upon each release of that relay for preventing the track relay from being picked up by said auxiliary energy, and traffic controlling apparatus at the exit end of said section governed by said auxiliary energy and rendered inactive as long as that energy is there received from said rails.

11. In a system for approach controlling a railway signaling function without the use of line wires, the combination with a section of track of means for supplying coded energy to the rails of said section, a code following track relay located at the entrance end of said section and having a pair of differentially related windings, a source of alternating current auxiliary energy also at said section entrance, a similarly located transformer, a circuit connecting the output winding of said transformer and one of the windings of said track relay in series across the rails of said section whereby said relay receives said coded energy from said rails and is picked up by each received pulse of that energy, a circuit completed over a back contact of said relay for connecting the other of said relay windings and the input winding of said transformer in series across the terminals of said auxiliary source whereby to cause said rails to be supplied with auxiliary energy each time that the track relay is released and to prevent the track relay from being picked up by that auxiliary energy, and traffic controlling apparatus at the exit end of said section governed by said auxiliary energy and rendered inactive as long as that energy is there received from said rails.

12. In combination with a section of railway track, means for supplying coded energy to the rails of said section, a code following track relay having an operating winding and a bucking winding, a circuit connecting said operating winding in energy receiving relation with said rails whereby to transmit operating pulses of said coded energy to said relay, a transformer having an output winding serially included in said circuit, an alternating current energizing circuit for the input winding of said transformer which serially includes said relay bucking winding and which is completed upon each release of the track relay whereby to cause said transformer to transmit alternating current energy to said rails without picking up said track relay, and traffic controlling apparatus governed by said alternating current energy and rendered inactive as long as that energy is received from said rails.

13. In combination, a section of railway track, means for supplying coded direct current energy to the rails of said section, a code following track relay having an operating winding and a bucking winding, a transformer having an input winding and an output winding, a source of alternating

current energy, a circuit connecting said relay operating winding and said transformer output winding in series across the rails of said track section and acting to transmit said coded direct current energy to said relay, a circuit completed over a back contact of said track relay for connecting said relay bucking winding and said transformer input winding in series across the terminals of said alternating current source whereby to cause said transformer to transmit alternating current energy to said rails without picking up the track relay, and traffic controlling apparatus governed by said alternating current energy and rendered inactive as long as that energy is received from said rails.

14. In a system for approach controlling a railway signaling function without the use of line wires, the combination with a section of track of means including a coding contact at the section exit for supplying coded track circuit energy to the rails of the section, an approach relay also at said section exit having a slowness of release which is sufficient to bridge the "on" periods of said track circuit code, a supply circuit for said approach relay which includes resonant means for conditioning the circuit to pass energy of a given carrier wave frequency only, means governed by said coding contact for connecting said relay supply circuit in energy receiving relation with said rails during each "off" period of the track circuit code, means controlled by said coded energy for supplying said rails with auxiliary energy of said given carrier wave frequency during said "off" code periods, and traffic controlling apparatus governed by said approach relay and rendered active when that relay is released.

15. In a system for approach controlling a railway signaling function without the use of line wires, the combination with a section of track of a source of trackway energy at the exit end of said section, an approach relay also at said section exit, a supply circuit for said approach relay which includes resonant means for permitting passage of energy of a given carrier wave frequency only, a continuously operating coding contact which repeatedly connects the rails of said track section first with said trackway energy source and then with said relay supply circuit, means for supplying said rails with alternating current energy having said given carrier wave frequency, means for giving said approach relay a slowness of release which is sufficient to bridge the spacing between said recurrent connections of its said supply circuit with said rails, and traffic controlling apparatus governed by said approach relay and rendered active when that relay is released.

16. In a railway signaling system, the combination of a section of track, a source of direct current trackway energy at the exit end of said section which is suitable for governing a first function of said signaling system, a similarly located source of alternating current trackway energy of a first carrier wave frequency which is suitable for governing a second function of said signaling system, a continuously operating coding contact, a circuit completed each time that said contact is in one position for connecting said direct current source to the rails of said section, a circuit set up each time that said contact is in a second position over which said rails may be supplied with energy from said alternating current source, an approach relay also located at said section exit and having a contact which

connects said alternating current source with the said recurrently set up rail supply circuit when and only when that relay is released, a circuit also completed by said coding contact when in said second position for connecting the operating winding of said approach relay in energy receiving relation with said rails, resonant means included in said relay winding circuit for conditioning it to pass alternating current energy of a second carrier wave frequency only, means for giving said approach relay a slowness of release which is sufficient to bridge the spacing between said recurrent connections of its said resonant supply circuit with said rails, and means for supplying said rails with auxiliary energy which has said second carrier wave frequency and which is effective to maintain said approach relay picked up as long as said track section remains vacant.

17. In a railway signaling system, the combination of a section of track, means for supplying coded direct current energy to the rails of said section, an approach relay having a slowness of release which is sufficient to bridge the spacing between consecutive "off" periods of said direct current trackway code, a supply circuit for said approach relay which includes a two winding transformer and resonant means for permitting the relay to receive energy of a first carrier wave frequency only, means for connecting one of the windings of said transformer across said rails during each of the said "off" periods of said direct current trackway code, means controlled by said coded direct current energy and effective during said "off" code periods to supply said rails with alternating current energy which has said first carrier wave frequency and which maintains said approach relay picked up as long as said track section remains vacant, a source of alternating current energy of a second carrier wave frequency which is suitable for governing a function of said signaling system, and a circuit completed when and only when said approach relay is released for connecting the other winding of said transformer across the terminals of said second frequency source.

18. In a railway signaling system, the combination of a section of track, means for supplying the rails of said section with coded direct current energy which is suitable for governing a first function of said signaling system, means including a circuit for at times also supplying said rails with coded alternating current energy of a first carrier wave frequency which is suitable for controlling a second function of said signaling system, an approach relay having a slowness of release which is sufficient to bridge the spacing between consecutive "off" periods of said direct current trackway code, means governed by said approach relay for causing the aforesaid circuit to supply said rails with the said coded alternating current energy when and only when that relay is released, a resonant supply circuit for the operating winding of said approach relay which is capable of transmitting energy of a second carrier wave frequency only, means for connecting said section rails to said relay supply circuit during the "off" periods of said direct current trackway code, and means for supplying said rails with auxiliary alternating current energy which has said second carrier wave frequency and which is effective to maintain said approach relay picked up as long as said track section remains vacant.

19. In a railway signaling system, the com-

5 bination of a section of track, a source of direct  
current energy which is suitable for governing a  
first function of said signaling system, a source  
of alternating current energy of a first carrier  
10 wave frequency which is suitable for governing a  
second function of said signaling system, a con-  
tinuously operating coding contact, a first cir-  
cuit which connects said direct current source to  
the rails of said section each time that said con-  
15 tact is in one position, a second circuit which is  
connected to said rails each time that said con-  
tact is in a second position, an approach relay  
having a slowness of release which is sufficient to  
span the spacing between the said recurrent con-  
nections of said second circuit to said rails,

means including a contact of said approach re-  
lay for connecting said first frequency alternat-  
ing current source to said second circuit when  
and only when that relay is released, a winding  
5 supply circuit for said approach relay which is  
partially coextensive with said second circuit and  
which includes means conditioning it to pass en-  
ergy of a second carrier wave frequency only,  
and means for further supplying said rails with  
10 auxiliary energy which has said second carrier  
wave frequency and which is effective to main-  
tain said approach relay picked up as long as said  
track section remains vacant.

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