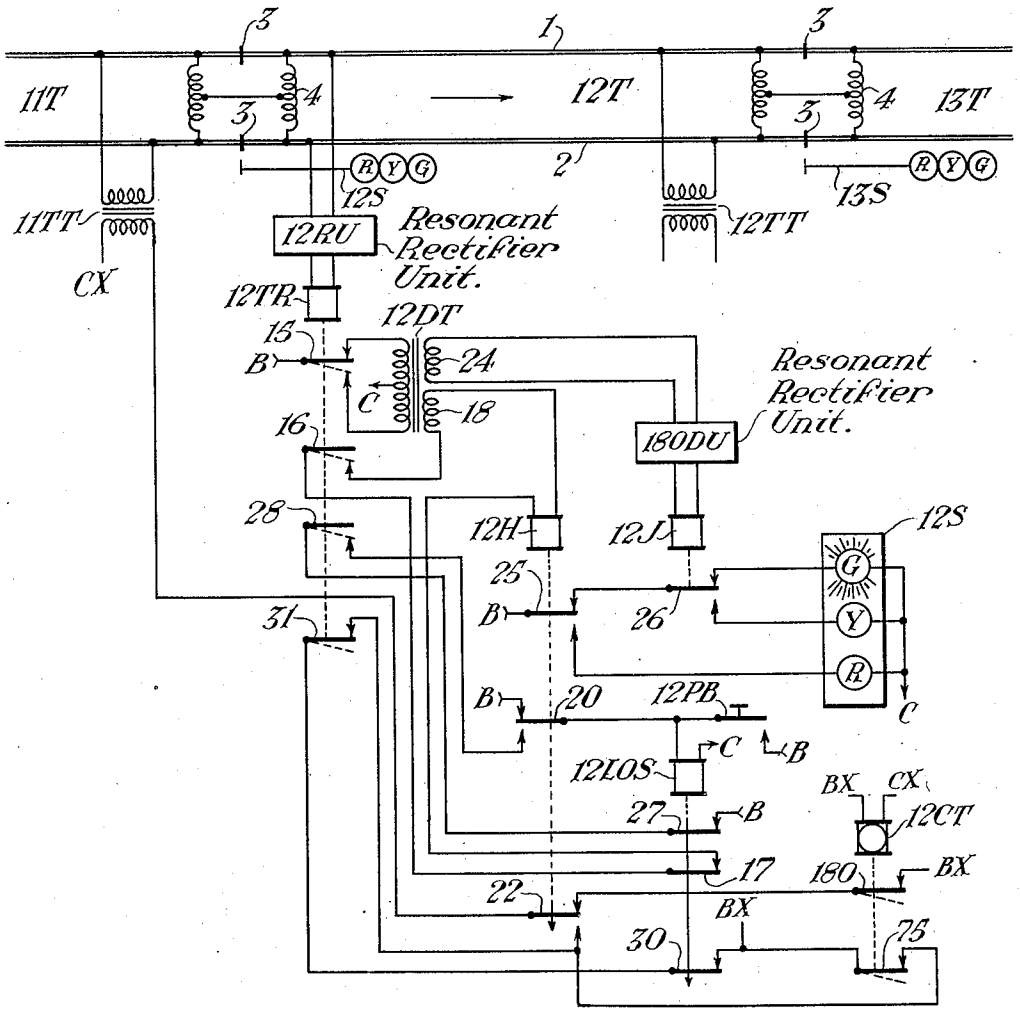
Feb. 6, 1945. A. L. JEROME 2,369,053

RAILWAY SIGNALING SYSTEM

Filed Oct. 29, 1943



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Patented Feb. 6, 1945 2,369,053

UNITED STATES PATENT OFFICE

2,369,053

RAILWAY SIGNALING SYSTEM

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Application October 29, 1943, Serial No. 508,113

7 Claims. (Cl. 246—37)

My invention relates to railway traffic controlling apparatus and particularly to a system employing coded energy in the track circuits thereof.

In application for Letters Patent of the United States, Serial No. 436,327 of Howard A. Thompson, there is shown a signaling system arranged so that in the event that the insulated joints separating two track sections are defective, the equipment for the track section in advance of the defective joints operates to cause the signal for that section to display its most restrictive indication, while coded energy is supplied to the adjacent track section in the rear to cause the signal for that section to display its most restrictive permissive indication.

An object of this invention is to provide a system which will operate to provide the same results that are provided by the system of the Thompson application, but which requires less apparatus than is employed in the system of that application.

Other objects of the invention and features of novelty will be apparent from the following description taken in connection with the accompanying drawing, the single figure of which is a diagram showing a section of railway track equipped with signaling apparatus embodying my invention.

In practicing my invention, I provide a code detecting relay which is picked up when and only when the associated track relay is responding to coded energy, while I provide a circuit including a back contact of this relay for supplying energy of 75 code frequency to the rails of the adjacent section in the rear, and I provide another circuit including a back contact of this detector relay and a front contact of the associated track relay and over which steady energy may be supplied to the rails of the section in the rear. I also provide a slow releasing relay for controlling the detector relay and the supply of steady energy to the section in the rear. A circuit is provided for this relay when the detector relay is picked up, while when the detector relay is released, this relay is energized over a stick circuit including its own front contact and a back contact of the track relay so that if steady energy feeds across a defective joint and keeps the track relay picked up, the slow release relay will release to cut off the supply of steady energy and prevent the supply of energy to its own winding or to the detector relay.

Referring to the drawing, there is shown therein a stretch of railway track having track rails 1 and 2 over which traffic normally moves in the direction indicated by an arrow, that is from left to right. The rails of the track stretch are divided by insulated joints 3 into the customary successive track sections for signaling purposes.

Electric current is employed for propulsion purposes in the track stretch shown in the drawing and, for this reason, alternating current energy is employed in the track circuits, while impedance bonds 4 of the customary form are provided to conduct propulsion current around each pair of insulated rail joints. As the description proceeds, however, it will be apparent that the apparatus of this invention is equally well suited for use on a steam road, in which case either direct or alternating current may be employed in the track circuits while the impedance bonds may be omitted.

In the drawing, one complete section, which is identified as section 12T, and parts of two other sections, identified as sections 11T and 13T, are shown. Each of these sections has at the entrance end thereof a wayside signal S for governing traffic in the track stretch. The signals illustrated are of the familiar color light type having a green or proceed lamp G, a yellow or caution lamp Y, and a red lamp R which may be considered a stop or slow-speed indication. It should be understood, however, that this invention is not limited to the use of signals of this type and that any appropriate form of signal may be used. Likewise, the invention is not limited to a system employing wayside signals but is equally applicable to track stretches without wayside signals and over which are operated locomotives equipped with cab signal apparatus of well-known construction, such as that shown in Letters Patent of the United States No. 1,986,679 issued January 1, 1935, to Lloyd V. Lewis.

The rails of each track section form a part of a track circuit to which coded alternating current signal control energy is supplied at the exit or leaving end from the secondary winding of a track transformer TT. The alternating current supplied to the track circuits is derived from a suitable source and may be distributed throughout the track stretch by a transmission line, not shown, while the terminals of the alternating current source are designated BX and CX. It will be assumed that the energy supplied from this source is alternating current of a frequency of 100 cycles per second.

Each signal location is also provided with a suitable source of direct current such as a primary or storage battery, not shown, the terminals of which are designated B and C.

The signaling system shown in the drawing makes use of track circuit energy coded at two different frequencies. This coded energy is provided by code transmitters CT which interrupt the supply circuits of the track transformers a definite number of times per minute according to traffic or other conditions ahead. As shown, each code transmitter is provided with two circuit making and breaking contacts 75 and 180 which are continuously actuated by a motor or other suitable mechanism at speeds such as to provide 75 and 180 energy pulses per minute which are separated by periods of equal duration in which no energy is supplied.

Each track circuit includes a code following track relay TR connected across the section rails at the entrance end of the section. As shown, the track relay 12TR is of the direct current type and is connected across the section rails through a resonant rectifier unit 12RU. This unit includes a transformer, a capacitor and a reactor so arranged and proportioned as to freely pass 100 cycle signal control energy, but so as not to pass propulsion current of a different frequency. This unit includes, in addition, a rectifier which converts into direct current the alternating current supplied through the unit.

The track relay 12TR has associated therewith auxiliary relays 12H, 12J, and 12LOS, and a decoding transformer 12DT, while each of the other signals in the track stretch has associated therewith equipment corresponding to that associated with signal 12S.

The equipment is shown in the condition which it assumes when the track stretch is vacant. At such times, energy of 180 code frequency is supplied to the track transformer 12TT by the equipment associated with section 13T. The equipment for section 13T operates in the same manner as that for section 12T.

The coded energy supplied to the track transformer 12TT feeds to the track relay 12TR and produces code following operation of this relay with the result that its contact 15 alternately establishes the circuits of the two portions of the primary winding of decoding transformer 12DT and energy is induced in the secondary windings of this transformer. On release of the track relay 12TR, its contact 16 establishes a circuit including front contact 17 of the second auxiliary relay 12LOS for supplying energy from the secondary winding 18 of transformer 12DT to the first auxiliary relay 12H. The energy impulses supplied from the transformer to relay 12H pick up the relay contacts, while this relay is of a type the contacts of which are slow to release so that they remain picked up in the intervals between energy impulses. As relay 12H is picked up, its contact 20 establishes the circuit of relay 12LOS and its contact 17 is closed to maintain the circuit of relay 12H. In addition, as relay 12H is picked up, its contact 22 establishes the circuit controlled by contact 180 of code transmitter 12CT for supplying energy to the primary winding of track transformer 11TT and energy of 180 code frequency is supplied to the rails of section 11T to cause the signal for that section to display its green or clear indication.

As track relay 12TR is operated by energy of 180 code frequency, energy from the secondary winding 24 of transformer 12DT feeds through the resonant rectifier unit 180DU and picks up the relay 12J. The unit 180DU is similar in construction to the unit 12RU, but its elements are arranged to pass sufficient energy to pick up relay 12J when and only when the energy supplied thereto is of the frequency present when the track relay is responding to energy of 180 code frequency.

As relays 12H and 12J are both picked up, energy is supplied over front contact 25 of relay 12H, and front contact 26 of relay 12J to the green lamp G of signal 12S.

Operation of equipment on passage of a train through the track stretch

When a train moving in the normal direction of traffic enters section 12T, the track relay 12TR is shunted and energy is no longer supplied through the transformer 12DT to relays 12H and 12J and their contacts release with the result that contact 25 of relay 12H interrupts the circuit of the green lamp G and establishes the circuit of the red lamp R of signal 12S.

In addition, on release of relay 12H, its contact 20 interrupts one circuit for relay 12LOS and establishes a stick circuit for this relay which includes front contact 27 of relay 12LOS, back contact 28 of track relay 12TR, and back contact 20 of relay 12H so relay 12LOS remains picked up. The relay 12LOS is of a type the contacts of which are slow to release so its contacts remain picked up during movement of the contacts of relay 12H between the picked-up and released positions.

On release of relay 12H, its contact 22 interrupts the circuit for supplying energy of 180 code frequency to the transformer 11TT and establishes the circuit controlled by contact 75 of code transmitter 12CT for supplying energy to transformer 11TT, and energy of 75 code frequency is supplied to the rails of section 11T. As hereinafter explained in connection with section 12T, energy of 75 code frequency supplied to the rails of a track section will cause the signal for that section to display its yellow or caution indication.

At this time, as relay 12LOS is picked up, its contact 30 establishes a circuit controlled by track relay contact 31 and over which steady energy may be supplied to the track transformer 11TT. However, as long as section 12T is occupied and track relay 12TR is released, this circuit is interrupted by track relay contact 31 and energy is not supplied over this circuit to the track transformer, so energy of 75 code frequency is supplied through this transformer to the rails of section 11T.

When the train enters section 13T, the equipment for that section operates in the same manner as that for section 12T, and the signal 13S is caused to display its red indication, while the energy supplied to the rails of section 12T is changed from 180 to 75 code frequency. When the train vacates section 12T, this energy feeds to track relay 12TR and produces code following operation of the relay.

On picking up of the contacts of relay 12TR, its contact 15 causes a change in energization of the primary winding of transformer 12DT and energy is induced in the transformer secondary windings. At this time, however, contact 16 of the track relay interrupts the circuit for supplying energy from winding 18 to relay 12H so relay 12H remains released and maintains the circuit controlled by track relay contact 28 for supplying energy to relay 12LOS. As track relay contact 28 is picked up, the circuit for supplying energy to relay 12LOS is interrupted but, because of the slow releasing characteristic of this

relay, its contacts remain picked up for a period.

When the track relay contacts pick up at a time when relay 12H is released and relay 12LOS is picked up, energy is supplied to the transformer 11TT over the circuit which includes front contact 30 of relay 12LOS, front contact 31 of relay 12TR, and back contact 22 of relay 12H.

If the insulated joints 3 separating sections 11T and 12T are intact so that energy supplied to the rails of section 11T does not feed to track relay 12TR, this track relay will release at the end of the code impulse supplied at the exit end of section 12T. On release of relay 12TR, contact 15 causes a change in energization of the primary winding of transformer 12DT so impulses of energy are induced in the transformer secondary windings, while contact 16 of the track relay establishes the circuit for supplying energy from the transformer secondary winding 18 to relay 12H. The various parts of the apparatus are proportioned so that one impulse of energy supplied from winding 18 to relay 12H will pick up the relay contacts. Accordingly, on release of the track relay contacts, the relay 12H picks up and its contact 20 establishes a circuit to maintain the relay 12LOS energized, while contact 22 of relay 12H interrupts the circuits for supplying energy of 75 code frequency and for supplying steady energy to transformer 11TT, and establishes the circuit for supplying energy of 180 code frequency to the transformer 11TT.

In addition, on picking up of relay 12H, its contact 25 interrupts the circuit of the red lamp R and establishes the circuit including back contact 26 of relay 12J for supplying energy to the yellow lamp Y of signal 12S.

When the train advances far enough in the track stretch to vacate section 13T, the energy supplied to transformer 12TT is changed from 75 to 180 code frequency, and on the resulting change in the rate of operation of relay 12TR, the relay 12J picks up and its contact 26 interrupts the circuit of the yellow lamp Y and establishes the circuit of the green lamp G of signal 12S, while relay 12H remains picked up so that energy of 180 code frequency is supplied to the rails of section 11T.

Operation of the equipment if an insulated joint breaks down as a result of passage of a train

When a train moving in the normal direction of traffic enters section 12T, the track relay 12TR remains released, while relays 12H and 12J release as explained above to cause signal 12S to display its red indication. In addition, when relay 12H releases, its contact 22 establishes the circuit controlled by code transmitter contact 75 so that energy of 75 code frequency is supplied to transformer 11TT, while contact 22 also establishes the circuit controlled by contact 30 of relay 12LOS and track relay contact 31 for supplying energy to transformer 11TT, but as long as the track relay 12TR remains released, this circuit is interrupted by track relay contact 31.

On release of relay 12H, its contact 20 interrupts one circuit for relay 12LOS and establishes for the relay 12LOS the stick circuit which includes front contact 27 of relay 12LOS, back contact 28 of relay 12TR, and back contact 20 of relay 12H, so relay 12LOS remains picked up and its front contact 30 is closed to permit energy to be supplied over the circuit controlled by this contact.

For purposes of illustration, it will be assumed that the train entering section 12T broke down one of the insulated joints 3 separating sections 11T and 12T. Because of the well-known auto-transformer action of the impedance bonds, breaking down of one insulated joint permits energy supplied to the rails of section 11T to feed to the track relay 12TR and pick up its contacts.

Accordingly, when the train advances far enough for the rear of the train to be located some distance in advance of the entrance end of section 12T so that the train is ineffective to shunt the track relay 12TR with respect to energy feeding across the defective joint, the track relay 12TR will respond to energy supplied from transformer 11TT.

On picking up of the track relay 12TR, its contact 28 interrupts the stick circuit for relay 12LOS, while its contact 31 establishes the circuit over which steady energy is supplied to transformer 11TT as long as relay 12LOS remains picked up. The circuit for supplying steady energy to transformer 11TT includes front contact 30 of relay 12LOS, front contact 31 of relay 12TR, and back contact 22 of relay 12H, while energy supplied over this circuit to transformer 11TT feeds across the defective joint to relay 12TR and keeps its contacts picked up so that contact 28 interrupts the stick circuit for relay 12LOS.

On picking up of relay 12TR, its contact 15 causes a change in energization of the primary winding of transformer 12DT and an impulse of energy is induced in secondary winding 18 but, at this time, track relay contact 16 interrupts the circuit of relay 12H so energy is not supplied to the relay 12H and its contacts remain released so that contact 22 maintains the circuit traced above for supplying steady energy to transformer 11TT, while contact 20 causes relay 12LOS to be controlled by its stick circuit.

At this time, therefore, the track relay is held picked up by steady energy feeding across the defective joint and, as the track relay is not responding to coded energy, relay 12H remains released, while as the track relay is picked up and relay 12H is released, the circuit of relay 12LOS is interrupted. On expiration of the release time of relay 12LOS, its contacts release and contact 27 interrupts the relay stick circuit to prevent supply of energy to the relay on subsequent release of the track relay contacts, while contact 17 interrupts the circuit of relay 12H to prevent picking up of the contacts of relay 12H on subsequent code following operation of track relay 12TR. In addition, on release of relay 12LOS, its contact 30 interrupts the circuit for supplying steady energy to the transformer 11TT.

After release of relay 12LOS, energy of 75 code frequency continues to be supplied to the transformer 11TT over contact 75 of the code transmitter 12CT and back contact 22 of relay 12H. This energy will operate the equipment, not shown, at the entrance end of section 11T to cause the signal for section 11T to display its yellow or caution indication, while this energy will cause the cab signal apparatus on a locomotive in section 11T to provide its caution indication.

The energy of 75 code frequency, supplied to section 11T after release of relay 12LOS, will also feed over the defective insulated joint and cause code following operation of track relay 12TR, but this operation of relay 12TR is without effect as the circuit of relay 12H is interrupted by contact 17 of relay 12LOS. Accordingly, relay 12H remains released to prevent supply of energy to

relay 12LOS, while contact 25 of relay 12H maintains the circuit of the red lamp R of signal 12S.

It will be seen, therefore, that if an insulated joint is defective, coded energy supplied to the section in the rear of the joint will feed across the joint and pick up the track relay for the section in advance of the joint, while on picking up of this track relay, a circuit is established to supply steady energy to the section in the rear. This energy feeds across the insulated joint and holds the track relay picked up until the relay LOS releases to cut off further supply of steady energy to the section in the rear and to prevent picking up of the relay H. After the relay LOS releases, the associated signal is caused to display its most restrictive indication, and subsequent code following operation of the track relay will not alter the signal indication. This insures that once a defective insulated joint has been detected, the signal at that location will be caused to provide its most restrictive indication, while there is no possibility that changes in track circuit conditions occurring thereafter will cause the signal to display a less restrictive indication.

This system includes means for restoring the apparatus to normal operation after a defective joint has been repaired. This is done by depressing the normally open push button 12PB to thereby establish a pick-up circuit for relay 12LOS. When relay 12LOS picks up, its contact 17 establishes the circuit of relay 12H, while contact 27 of relay 12LOS establishes the circuit for supplying energy to relay 12LOS during the released periods of the track relay contact 28 as long as the relay 12H is released.

This system operates so that the signal for the section in the rear of the insulated joint will be caused to display its yellow or caution indication.

For purposes of illustration, it will be assumed that an insulated joint 3 separating sections 12T and 13T breaks down as a result of passage of a train, and that the equipment for section 13T operates as described in detail above in connection with section 12T to detect the defective condition of the insulated joints.

As explained above, as long as any part of the train is present in section 12T, energy from the track transformer 12TT is shunted from track relay 12TR and it remains released, while when the train enters section 13T, the track relay for that section is shunted and the equipment controlled thereby operates to supply energy of 75 code frequency to the track transformer 12TT.

When the train vacates section 12T, the energy of 75 code frequency supplied to transformer 12TT feeds to the track relay 12TR and the first impulse of coded energy picks up the track relay contacts, while on the first "off" period in the code, the contacts of relay 12TR release and an impulse of energy is supplied from winding 18 of transformer 12DT to relay 12H and its contacts pick up so that contact 20 establishes the circuit for steadily energizing relay 12LOS.

When the train advances far enough for the rear of the train to be located some distance in advance of the entrance end of section 13T, the train is no longer effective to shunt the track relay for section 13T with respect to energy feeding from transformer 12TT across the defective joint.

On the first movement of the track relay for section 13T to its picked-up position, the circuit for supplying steady energy to section 12T is established, and this energy feeding across the defective joint keeps the track relay picked up until the associated relay LOS releases to cut off further supply of steady energy to the rails of section 12T.

The steady energy supplied to section 12T feeds to the track relay 12TR and picks up its contacts and holds them picked up so that energy is no longer supplied to relay 12H. As long as relay 12H remains picked up, energy is supplied over its front contact 20 to relay 12LOS, but after a time interval, relay 12H releases and interrupts the circuit of relay 12LOS so that the release period of relay 12LOS begins. As pointed out above, the release time of relay 13LOS begins as soon as the track relay for the section picked up. Accordingly, relay 12LOS will remain picked up and maintain the circuit of relay 12H until after relay 13LOS releases and causes coded energy to be supplied to the transformer 12TT. On the first "off" period in the code supplied to transformer 12TT after release of relay 13LOS, the track relay 12TR releases and causes an impulse of energy to be supplied from transformer 12DT to relay 12H to pick up its contacts and reestablish the circuit for steadily energizing relay 12LOS. Accordingly, relay 12H picks up to reestablish the circuit of relay 12LOS before relay 12LOS releases to interrupt the circuit of relay 12H.

On continued supply of coded energy to track relay 12TR, the relay 12H is maintained picked up and causes signal 12S to display its yellow or caution indication, while energy of 180 code frequency is supplied to the rails of section 11T.

Operation of equipment if an insulated joint breads down when the track stretch is vacant

For purposes of illustration, it will be assumed that an insulated joint separating sections 11T and 12T breaks down at a time when the stretch is vacant. As the stretch is assumed to be vacant, energy of 180 code frequency is supplied to transformer 12TT, while relays 12H and 12LOS are both picked up and energy of 180 code frequency is supplied to the rails of section 11T.

If, at the time the insulated joint separating sections 11T and 12T breaks down, the impulses of energy supplied to section 11T are out of step with those supplied to section 12T, the impulses of energy supplied to section 11T and feeding over the defective insulated joint to track relay 12TR will fill in the "off" periods in the code supplied to section 12T so that the track relay 12TR will be maintained picked up all, or substantially all, of the time.

If, at the time the insulated joint becomes defective, the impulses of code supplied to the two sections are substantially in step with each other, they will soon become out of step. This will be true because the code transmitters are driven by electric motors of the squirrel cage induction type, and these motors will not operate at exactly the same speed for any substantial period of time. Accordingly, if track relay 12TR is not held picked up an abnormally large proportion of the time immediately upon breaking down of the joint, the track relay will soon be held up an abnormally large proportion of the time because of the increase in the time during which energy is supplied to the track relay when the two codes get out of step.

In consequence of the lengthened picked-up periods of track relay 12TR, contact 16 will not engage its back contact, or will engage it for such short time intervals that energization of relay 12H is reduced below the value effective to maintain the relay picked up. On release of relay 12H, its

contact 22 interrupts the circuit for supplying energy of 180 code frequency to section 11T and establishes the circuit for supplying energy of 75 code frequency thereto, and also establishes the circuit including front contact 30 of relay 12LOS and front contact 31 of relay 12TR for supplying steady energy to transformer 11TT. In addition, on release of relay 12H, its contact 20 interrupts the circuit for steadily energizing relay 12LOS and establishes the stick circuit for this relay.

The steady energy supplied to transformer 11TT after release of relay 12H feeds across the defective joint and keeps the contacts of the track relay 12TR picked up so that contact 28 interrupts the circuit of relay 12LOS, while contact 31 maintains the circuit for supplying steady energy to transformer 11TT. After a short time interval, the contacts of relay 12LOS release so that contact 27 interrupts the relay stick circuit, while contact 30 interrupts the circuit for supplying steady energy to transformer 11TT, and contact 17 interrupts the circuit of relay 12H. Accordingly, relay 12H remains released and causes signal 12S to display its most restrictive indication, while energy of 75 code frequency is supplied to the rails of section 11T to cause the signal for that section to display its yellow or caution indication.

Although I have herein shown and described only one form of railway signaling 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 a coded railway signaling system, in combination, a stretch of railway track having a pair of track rails divided by insulated joints into a plurality of successive track sections including a forward and a rearward section, a code following track relay having a winding receiving energy over the rails of said forward section, a first and a second auxiliary relay associated with said track relay, a circuit including a front contact of said second auxiliary relay for supplying energy to said first auxiliary relay when and only when said track relay is responding to coded energy, a circuit including a back contact of said first auxiliary relay for supplying coded energy to the rails of said rearward section, a circuit including a back contact of said first auxiliary relay and front contacts of said track relay and of said second auxiliary relay and over which steady energy may be supplied to the rails of said rearward section, a circuit including a front contact of the first auxiliary relay for supplying energy to the second auxiliary relay, and a circuit including a front contact of said second auxiliary relay and back contacts of said first auxiliary relay and of said track relay for also supplying energy to said second auxiliary relay.

2. In a coded railway signaling system, in combination, a stretch of railway track having a pair of track rails divided by insulated joints into a plurality of successive track sections including a forward and a rearward section, a code following track relay having a winding receiving energy over the rails of said forward section, a first and a second auxiliary relay associated with said track relay, a circuit including a front contact of said second auxiliary relay for supplying energy to said first auxiliary relay when and only when said track relay is responding to coded energy, a circuit for supplying coded energy to the rails of said rearward section, a circuit including front contacts of said second auxiliary relay and of said track relay and over which steady energy may be supplied to the rails of said rearward section, a circuit including a front contact of the first auxiliary relay for supplying energy to the second auxiliary relay, and a circuit including a front contact of said second auxiliary relay and back contacts of the track relay and of said first auxiliary relay for also supplying energy to said second auxiliary relay.

3. In a coded railway signaling system, in combination, a stretch of railway track having a pair of track rails divided by insulated joints into a plurality of successive track sections including a forward and a rearward section, a code following track relay having a winding receiving energy over the rails of said forward section, a first and a second auxiliary relay associated with said track relay, a circuit including a front contact of said second auxiliary relay for supplying energy to said first auxiliary relay when and only when said track relay is responding to coded energy, a circuit including a front contact of said first auxiliary relay for supplying energy of a first code frequency to the rails of said rearward section, a circuit including a back contact of said first auxiliary relay for supplying energy of a second code frequency to the rails of said rearward section, a circuit including a back contact of said first auxiliary relay and front contacts of said second auxiliary relay and of said track relay and over which steady energy may be supplied to the rails of said rearward section, a circuit including a front contact of said first auxiliary relay for supplying energy to the second auxiliary relay, and a circuit including a front contact of said second auxiliary relay and back contacts of said first auxiliary relay and of said track relay for also supplying energy to said second auxiliary relay.

4. In a coded railway signaling system, in combination, a stretch of railway track having a pair of track rails divided by insulated joints into a plurality of successive track sections including a forward and a rearward section, a code following track relay having a winding receiving energy over the rails of said forward section, a first and a second auxiliary relay and a decoding transformer associated with said track relay, means governed by a contact of said track relay for varying energization of the primary winding of said decoding transformer, a circuit including a front contact of said second auxiliary relay for supplying energy from a secondary winding of said decoding transformer to said first auxiliary relay, a circuit including a front contact of said first auxiliary relay for supplying energy of a first code frequency to the rails of said rearward section, a circuit including a back contact of said first auxiliary relay for supplying energy of a second code frequency to the rails of said rearward section, a circuit including a back contact of said first auxiliary relay and front contacts of said second auxiliary relay and of said track relay and over which steady energy may be supplied to the rails of said rearward section, a circuit including a front contact of said first auxiliary relay for supplying energy to said second auxiliary relay, and a circuit including a front contact of said second auxiliary relay and back contacts of said track relay and of said first auxiliary relay for also supplying energy to said second auxiliary relay.

5. In a coded railway signaling system, in combination, a stretch of railway track having a pair of track rails divided by insulated joints into a plurality of successive track sections including a forward and a rearward section, a code following track relay having a winding receiving energy over the rails of said forward section, a first and a second auxiliary relay and a decoding transformer associated with said track relay, means governed by a contact of said track relay for varying energization of the primary winding of said decoding transformer, a circuit including a back contact of the track relay and a front contact of the second auxiliary relay for supplying energy from a secondary winding of said decoding transformer to said first auxiliary relay, a circuit including a front contact of said first auxiliary relay for supplying energy of a first code frequency to the rails of said rearward section, a circuit including a back contact of said first auxiliary relay for supplying energy of a second code frequency to the rails of said rearward section, a circuit including a back contact of said first auxiliary relay and front contacts of said second auxiliary relay and of said track relay and over which steady energy may be supplied to the rails of said rearward section, a circuit including a front contact of said first auxiliary relay for supplying energy to said second auxiliary relay, and a circuit including a front contact of said second auxiliary relay and back contacts of said track relay and of said first auxiliary relay for also supplying energy to said second auxiliary relay.

6. In a coded railway signaling system, in combination, a stretch of railway track having a pair of track rails divided by insulated joints into a plurality of successive track sections including a forward and a rearward section, a code following track relay having a winding receiving energy over the rails of said forward section, a first and a second auxiliary relay and a decoding transformer associated with said track relay, means governed by a contact of said track relay for varying energization of the primary winding of said decoding transformer, a circuit including a back contact of the track relay and a front contact of the second auxiliary relay for supplying energy from a secondary winding of said decoding transformer to said first auxiliary relay, a circuit including a front contact of said first auxiliary relay for supplying energy of a first code frequency to the rails of said rearward section, a circuit including a back contact of said first auxiliary relay for supplying energy of a second code frequency to the rails of said rearward section, a circuit including a back contact of said first auxiliary relay and front contacts of said second auxiliary relay and of said track relay and over which steady energy may be supplied to the rails of said rearward section, a circuit including a front contact of said first auxiliary relay for supplying energy to said second auxiliary relay, a circuit including a front contact of said second auxiliary relay and back contacts of said track relay and of said first auxiliary relay for also supplying energy to said second auxiliary relay, and a wayside signal for said forward section controlled so as to display its most restrictive indication when said first auxiliary relay is released.

7. In a coded railway signaling system, in combination, a stretch of railway track having a pair of track rails divided by insulated joints into a plurality of successive track sections including a forward and a rearward section, a code following track relay having a winding receiving energy over the rails of said forward section, a first and a second auxiliary relay associated with said track relay, a circuit including a front contact of said second auxiliary relay for supplying energy to said first auxiliary relay when and only when said track relay is responding to coded energy, said second auxiliary relay being slow acting and having contacts which normally occupy a first position and which are movable to a second position, means effective when the contacts of the first auxiliary relay are picked up to maintain the contacts of the second auxiliary relay in their first position, means effective when the contacts of the first auxiliary relay are released and the contacts of the track relay are picked up for causing the contacts of the second auxiliary relay to move to their second position, means effective on movement of the contacts of said second auxiliary relay to their second position to maintain the relay contacts in their second position, means responsive to code following operation of said track relay for supplying energy to said first auxiliary relay provided the contacts of said second auxiliary relay are in their first position, a circuit including a front contact of said first auxiliary relay for supplying energy of a first code frequency to the rails of said rearward section, a circuit including a back contact of said first auxiliary relay for supplying energy of a second code frequency to the rails of said rearward section, and a circuit including a front contact of said track relay and a back contact of said first auxiliary relay over which steady energy may be supplied to the rails of said rearward section provided the contacts of said second auxiliary relay are in their first position.

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