May 22, 1934. A. G. SHAVER 1,959,691

TRAIN CONTROL SYSTEM

Filed July 19, 1926

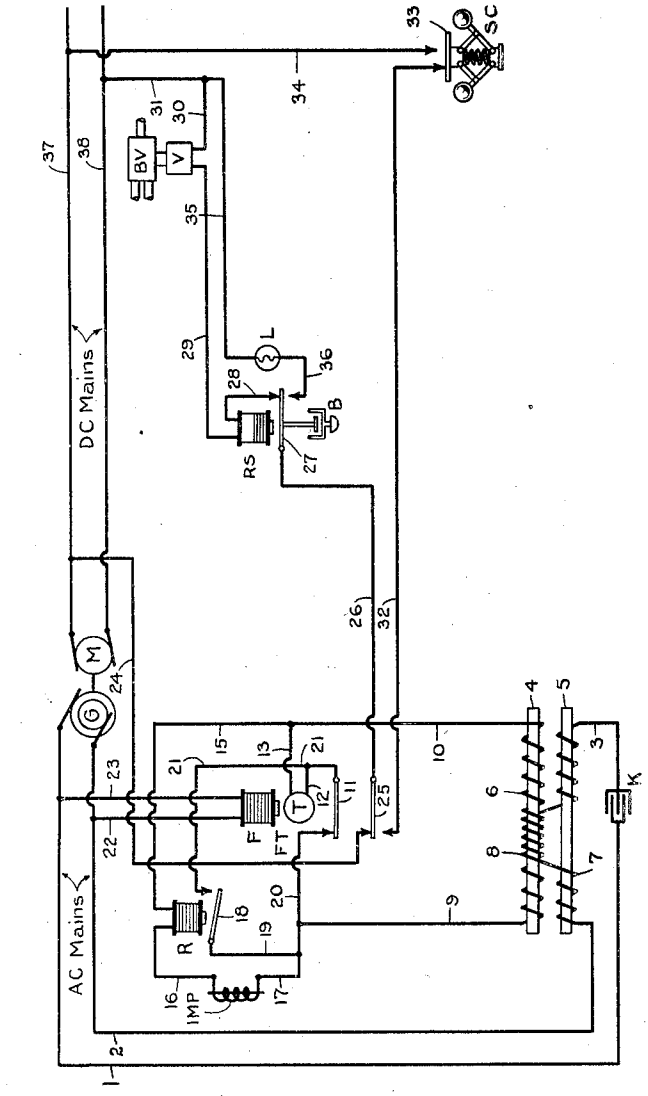


Fig. 1.

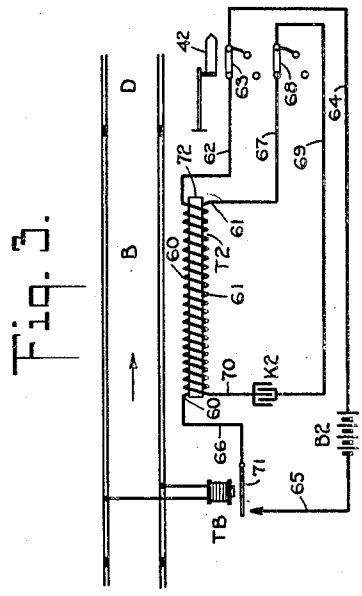


Fig. 3.

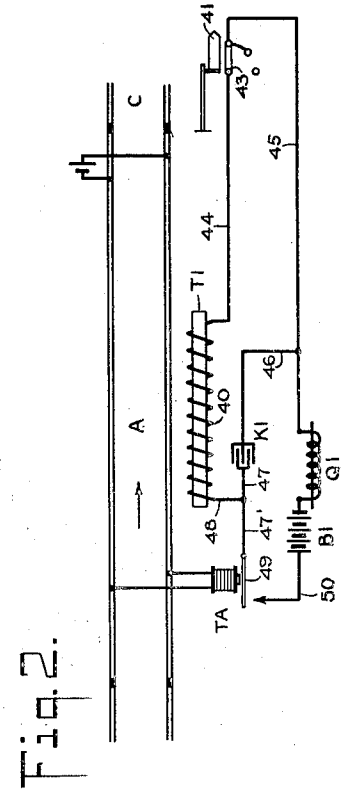


Fig. 2.

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TRAIN CONTROL SYSTEM

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20 Claims. (Cl. 246—63)

This invention relates to train control systems, and has special reference to the provision of an improved train control system of the induction type.

The principal object of the present invention comprehends the provision of an induction train control system in which train carried mechanism is operated to produce a plurality of different effects responsive to the co-operation between vehicle carried and roadside inductive mechanism, the construction and the co-operation being such that the vehicle carried inductive mechanism is influenced by the roadside inductive mechanism to produce a controlling such as a tripping action of the vehicle carried mechanism to control the movement of the vehicle, and is then influenced under different roadside conditions to produce a modifying or resetting action of the vehicle carried mechanism.

A further principal object of the present invention relates to the provision of the inductive system of the type referred to in which novel means are provided, inductively controlled from the roadside, for actuating the vehicle carried indicating means to one position combined with an inductively controlled means for actuating the indicating means to a different position. A correlated object of the invention includes the provision of an inductive system in which the vehicle carried and roadside inductive means are operated by vehicle carried and roadside sources of energy.

A further principal object of the invention is to combine in one locomotive carried inductor and one track located inductor the two features of tripping, or producing the train stop condition, and a resetting, or elimination of the train stop condition, together with a prescribed speed control condition under which the train may operate in the case of a tripping condition being imposed.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, my invention consists in the elements and their relation one to the other, as hereinafter particularly described and sought to be defined in the claims, reference being had to the accompanying drawing which shows preferred embodiments thereof, and in which:—

Figure 1 is a diagrammatic view showing the vehicle carried apparatus and electric circuits in their normal condition.

Figure 2 is a diagrammatic view of the roadside apparatus and electric circuits in their normal condition intended to cooperate with the vehicle carried apparatus, and

Figure 3 is a diagrammatic view of a modification of the roadside apparatus.

In the train control system of the present invention, for directly controlling the movement of the train, there is provided an electrically operated device for controlling the operation of the air brake system, the said device being under the control of the cooperating train and roadside mechanism and being operated thereby in accordance with roadside conditions. This electrically operated device comprises, in the preferred construction, an electromagnet V which controls the operation of a combined reservoir and brake valve BV of the type disclosed for example in the patent to A. G. Shaver, No. 1,411,526 of April 4, 1922, and in the patent to Allen B. Kendall No. 1,540,017 of June 2, 1925, the said reservoir and brake valve functioning upon the de-energizing of the electromagnet V for cutting off the supply of air from the main reservoir of the air brake system to the engineman's brake valve, and for opening the train pipe to exhaust, the electromagnet V being normally energized to hold open the communication between the main reservoir and the engineman's brake valve and to close the train pipe to exhaust.

Supplying energy for the circuits and apparatus on the locomotive are the D. C. mains 37 and 38, connected directly to a battery or a generator such as the turbo headlight set commonly used on locomotives. Operated from these D. C. mains is a motor generator set or convertor MG which supplies alternating current.

4 and 5 are related inductors providing in effect a transformer, the secondary of which is the coil 6 on inductor 4 and the primary of which is the coil 7 on inductor 5. The primary coil 7 is connected directly to the alternating current terminals of the convertor by conductors 1 and 2. The coil 7 includes the coil 8, which is wound over the secondary inductor 4 for the purpose of adjusting the current value induced in the coil 6. This combination forms what is termed a shunting or trip device, which is fully explained in the patent to A. G. Shaver, No. 1,521,332, of December, 1924.

FT is a two element alternating current relay with a field F which is connected directly to the A. C. mains of the convertor by the conductors 22 and 23 and an armature T which is connected directly to the secondary coil 6 in a circuit including conductors 10, 13, 12 and 21, stick con-

tact 11, conductors 20 and 9, coil 6, and conductors 10 and 13.

R is a direct current relay intended to be operated by a low frequency A. C. current surge which will be induced from the roadside into coil 6 of inductor 4 as will be hereinafter explained. The circuit for relay R includes coil 6, conductors 10 and 15, relay coil R, conductor 16, impedance IMP, conductors 17 and 9.

The impedance IMP is inserted in the circuit of relay R to choke back any alternating current derived from the generator G which may tend to pass through relay R by induction from primary 7 into secondary 6.

RS including the push button B is a circuit controlling means, embodying with it a light or signal L, of the impulse operating type and termed a "release switch" which is fully described in the copending application of A. G. Shaver, Ser. No. 634,053 of April 23, 1923.

SC is a speed controller, for example like the governor type in the patent to A. G. Shaver Number 1,510,803 of October 7, 1924, attached to a wheel of the vehicle.

K is a condenser intended to give a resonance and power factor correction status to the circuit of inductor 5.

For directly controlling the operation of the electromagnet V and the release switch RS, which are in series in the same circuit, there is provided a train carried circuit which is normally energized by a train carried source of energy such as the D. C. mains 37 and 38, the said circuit including conductor 24, contact 25 normally closed when both elements of relay FT are energized, conductor 26, contact 27 closed on its front point when release switch RS is energized, conductor 28, coil of release switch RS, conductor 29, electromagnet coil V, and conductors 30 and 31. With this circuit, the energization of the electromagnet V and release switch coil RS is dependent upon contacts 25 and 27 made in their normal closed positions. The contact 25 is closed, as hereinbefore referred to and as will be described presently in detail, when the train is running under safe roadside conditions, and the contact 27 remains closed so long as contact 25 remains closed.

Whenever either element of the relay FT becomes deenergized, contact 25 will be open on its front point and closed on its back point. In such a case another circuit is created for the valve magnet V and release switch RS, including conductors 31 and 30, coil of magnet V, conductor 29, coil of release switch RS, conductor 28, contact 27 closed on its front point, conductor 26, contact 25 closed on its back point, conductor 32, contact 33 of the speed controller SC closed under a predetermined rate of speed, and conductor 34. Therefore, with this circuit the valve magnet V and the release switch RS are placed under the control of the speed controller SC.

The light L will burn when in a circuit including conductors 31 and 35, lamp L, conductor 36, contact 27 closed on its back point, conductor 26, contact 25 closed on its back point, conductor 32, contact 33 of speed controller closed under a prescribed rate of speed, and conductor 34. Therefore, lamp L will burn to signal the engineman when release switch RS is deenergized and the speed controller contacts are closed.

When armature T is in a deenergized condition, which is the case when its stick contact 11 is open, it may be returned to the energized condition closing contact 11 by the energization of relay R, closing contact 18. The closing of contact 18 for such purpose need be only momentarily. The circuit established for re-energizing armature T includes the circuit of inductor coil 6, conductors 10 and 13, armature coil T, conductors 12 and 21, contact 18 closed, conductors 19, 20 and 9. As soon as armature coil T is energized it closes its front contact 11, thereby becoming re-energized in its own circuit. Means for energizing relay R to close its contact 18 will be hereinafter explained.

For the translating of the roadside condition to the vehicle, certain roadside apparatus as that shown in Figure 2 is provided. 41 is a signal of the usual type controlled by circuits in the customary manner, which is well known in the art and on account of which no explanation is necessary here, since the operation and control of the signal is no part of this invention.

T1 is an inductor controlled by signal 41 and located on the roadside in a position such that as a vehicle passes over the track, the inductor combination 4—5 on the vehicle will come into correspondence with it.

A part of the inductor T1 is a coil 40 wound over an iron core. There is included in the circuit with coil 40, conductor 44, circuit controller 43, conductors 45 and 46, condenser K1, and conductors 47 and 48. This inductor T1 is therefore in an energyless closed circuit, which I term the A. C. circuit, and the function of which will be hereinafter described. This circuit is for tripping or stop influencing purposes.

Auxiliary to the circuit of T1 just described is the following circuit which I designate as a D. C. circuit and which is for resetting purposes: Coil 40, conductors 48 and 47', contact 49 closed on its back point when relay TA is deenergized, conductor 50, battery B1, impedance Q1, conductor 45, circuit controller 43, and conductor 44.

When signal 41 indicates stop, circuit controller 43 opens both the A. C. and D. C. circuits for inductor T1. When track section A is occupied, relay TA is deenergized closing its back contact 49 to establish the D. C. circuit at back contact of armature 49. When signal 41 is clear and a train occupies track section A, inductor T1 is energized as a D. C. electromagnet.

The theory of action taking place in the cooperation of vehicle carried inductor combination 4—5 with track inductor T1 as to the tripping or stop influencing condition, is as described in my copending application, Ser. No. 506,596, filed October 10, 1921, and my aforementioned Patent No. 1,521,332. With this construction it will be seen that normally when the train is running between track elements, magnetic flux is transmitted from the primary coil 7 to the secondary coil 6 inducing a current therein sufficient to energize the relay FT to normally keep the armatures controlled thereby in a closed condition. When the transformer 4—5 covers a track element T1 (in open circuit condition) the magnetic flux flows through the primary coil to and through the track element, resulting in a diverting or shunting of the magnetic flux from the secondary coil 4, the shunting of said secondary coil resulting in a reduction in the energizing current of the relay and in an effective deenergization of the latter, with the result that the armatures controlled thereby are opened for tripping other train control means.

In Figure 3 is shown a modification of the track inductor arrangement. T2 is an inductor

with an iron core 72 and two windings or coils 60 and 61.

Coil 61 is included in a normally closed energyless circuit comprising conductor 67, circuit controller 68 closed except when signal 42 is at stop, conductor 69, condenser K2, and conductor 70. The condenser K2 is for the purpose of bringing this circuit, which I term an A. C. circuit, to a certain state of resonance when energized as hereinafter described. The purpose of this circuit, when open, is to influence the vehicle carried apparatus to cause the vehicle to stop.

Coil 60 is included in a circuit comprising conductor 62, circuit controller 63 closed except with signal 42 at stop, conductor 64, battery B2, conductor 65, relay contact 71 closed only when relay TB is deenergized and conductor 66. This circuit I designate as a D. C. circuit and is for the purpose of resetting from a restricted running condition of the vehicle to a condition of no restriction as will be hereinafter described.

The operation of this train control system may now be described as follows:—

Assume a vehicle with circuits and apparatus in the clear or unrestricted running condition as indicated in Figure 1. When the inductor combination 4—5 comes into correspondence with the track inductor T1, signal 41 being clear as illustrated in Fig. 2, armature T of relay FT is maintained energized and no tripping action to impose the stop or speed restricting condition on the locomotive takes place since the A. C. track inductor circuit remains closed. Relay R will become energized momentarily because battery B1, (contact 49 being closed by reason of the vehicle in section A,) energizes inductor T1 as a direct current electromagnet, thus influencing the inductor combination 4—5 to induce an impulse of current into the circuit of relay R. When relay R becomes energized in this case, closing its contact 18, no effect is produced in armature T since armature T is already energized.

It will be understood that while D. C. circuits are employed on the vehicle as well as on the roadside, the current induced from the roadside inductor to the vehicle carried inductor when the latter moves over the former is a surge of an A. C. current wave. This induced surge, however, is of a frequency much less than the frequency of the generator G of the vehicle carried apparatus. The impedance IMP in the vehicle D. C. circuit is selected so that the vehicle D. C. circuit is responsive to the current induced from the roadside inductor throughout the range of vehicle speeds normally encountered in service, the constants of this impedance being further such as to make this D. C. circuit discriminate against the current or energy derived from the alternator G by induction from primary 7 into secondary 6. It will be further understood that while in the specific embodiment of the invention D. C. circuits are employed, other circuits of different characteristics may be used so long as the circuits on the vehicle are enabled to discriminate and hence select the desired response or impulse.

Assume the circuits and apparatus on the vehicle to be in the normal or unrestricted running condition as shown in Figure 1, but that signal 41 is in the stop condition so that both circuits of inductor T1 are open at circuit controller 43. Upon correspondence of inductor combination 4—5 with track inductor T1, the circuit for armature T becomes deenergized so that its contact 11 is opened and 25 dropped. Contact 11 being a stick contact, armature T must remain deenergized until closed as hereinafter described. Contact 25 becomes made on its back point. Since generally the magnet of release switch RS is made slow acting, contact 27 does not open during the change from front to back contact 25.

However, assume that the speed of the train is above the prescribed rate so that contact 33 is open, then release switch magnet RS and valve magnet V become deenergized after the expiration of the time interval under which the magnet of RS operates and the brakes are applied to retard the train. As soon as the speed is reduced to the prescribed rate, contact 33 of the speed controller closes and light L circuit closes, signaling to the engineman that he may push the button B to restore the contact 27 to its normal energized position. As soon as contact 27 is closed, the magnet of release switch RS and valve magnet V are again energized, the speed of the vehicle being such that the contacts controlled by 33 remain closed. The engineman may now release the brakes and proceed so long as the vehicle continues under the prescribed rate of speed. When button B is pushed to close contact 27 and the magnet of release switch RS becomes energized, light L goes out, indicating to the engineman that conditions are established for the train to proceed under the prescribed rate of speed.

Assume the vehicle being operated under clear block conditions with the circuits and apparatus normal as indicated in Figure 1, but that on approach to signal 41 indicating stop, the engineman himself reduces the speed of the train to or under the prescribed rate. In such a case, since speed controller contact 33 is closed before there is correspondence of vehicle inductor 4—5 with track inductor T1, the magnet of release switch RS will not become de-energized and the train may continue without the train control application taking place so long as the prescribed speed is not exceeded and without the necessity of the engineer's operating push-button B.

Assume the vehicle operating under prescribed speed restrictions after relay FT has been deenergized and that signal 41 is at stop so that circuit controller 43 has opened the circuits of roadside inductor T1. Upon correspondence of inductor combination 4—5 with track inductor T1 neither a tripping nor a resetting condition is transmitted to the vehicle apparatus. Therefore the train may travel beyond signal 41 under the existing speed restriction.

Assume the vehicle proceeding under the speed restrictive condition and the signal 41 indicating clear. Upon correspondence of the inductor combination 4—5 with track inductor T1, track inductor T1 becomes an electromagnet inducing an impulse of electrical energy into the circuit of relay R energizing relay R to close its contact 18 and re-energize armature T of relay FT. When armature T is energized, its stick contact 11 is closed and thus armature T remains energized. With armature T becoming energized, circuit closer 25 engages its front point of contact, thus eliminating the speed controller contact 33 from the circuit of the magnet of release switch RS and valve magnet V. This is a restoring of the normal operating condition for the vehicle and the engineman may now accelerate the speed of the train. Since the release switch RS is made slow acting, there will be no deenergization of its coil during the interval of open circuit be-

tween the breaking of back contact 25 and the making of front contact 25.

It is evident that adjustment of the front and back contacts of 25 may be such that back contact 25 will be made before front contact 25 breaks, and vice versa. With this arrangement, the slow acting feature for the coil of release switch RS will not be necessary.

Assume that the coil of release switch RS is not made slow releasing and that there is always an interval of open circuit between the opening of front contact 25 and making of back contact 25 and vice versa. Under such operation, release switch RS would always be deenergized and it would be immediately necessary in each of such cases for the engineman to push the button B to close the contact 27 again and thus re-energize the circuit for the magnet of release switch RS and valve magnet V. Under some conditions of railway operation, this condition is to be preferred since it would require the engineman to be alert to operate push button B on every change of indication translated from the roadway to the vehicle.

While I have shown my device in the preferred form, it will be apparent that many changes and modifications may be used in the structure disclosed, without departing from the spirit of the invention found in the following claims.

I claim:

1. An intermittent induction train control system comprising vehicle carried apparatus, a vehicle carried inductor means for controlling the operation of said apparatus and including an energizing element and an energy receiving element coupled together and operative for tripping and resetting the vehicle carried apparatus, the tripping being effected upon a reduction of transmitted energy between the coupled elements and roadside inductor means cooperating with the vehicle carried inductor means and comprising an inductor element capable when in open circuit of giving a tripping indication to produce a tripping operation in said vehicle carried apparatus, and circuit means governing the same for inhibiting the tripping operation of and for producing a resetting indication in the inductor to effect a resetting operation of the vehicle carried apparatus.

2. An induction train control system comprising vehicle carried apparatus, a vehicle carried inductor means for controlling the operation of said apparatus and roadside inductor means cooperating with the vehicle carried inductor means and comprising an inductor element capable when in open circuit of giving a tripping indication to produce a tripping operation in said vehicle carried apparatus, a circuit governing the inductor element for inhibiting the tripping operation and a second circuit governing the inductor element for producing a resetting indication therein to effect a resetting operation of the vehicle carried apparatus.

3. An intermittent induction train control system comprising vehicle carried apparatus, a vehicle carried inductor means including inductively coupled coils for controlling the operation of said apparatus, and roadside inductor means cooperating with the vehicle carried inductor means and comprising a single inductor element having a single main flux path capable when in open circuit of providing a shunt path for the magnetic flux between the vehicle carried coils to produce a tripping operation in said vehicle carried apparatus and circuit means governing the inductor element for producing therein a resetting indication to effect a resetting operation of the vehicle carried inductively coupled coils.

4. An intermittent induction train control system comprising vehicle carried apparatus, a vehicle carried inductor means including inductively coupled coils for controlling the operation of said apparatus and roadside inductor means cooperating with the vehicle carried inductor means and comprising an inductor element capable when in open circuit of modifying the flux conditions between the vehicle carried coils to produce a tripping operation in said vehicle carried apparatus and circuit means governing the inductor element for energizing the same for producing therein a resetting indication transmittable to for effecting a resetting operation of the vehicle carried inductively coupled coils.

5. An intermittent induction train control system comprising vehicle carried apparatus, a vehicle carried inductor means including inductively coupled coils for controlling the operation of said apparatus and roadside inductor means cooperating with the vehicle carried inductor means and comprising a single inductor element having a single main flux path capable when in open circuit of providing a shunt path for the magnetic flux between the vehicle carried coils to produce a tripping operation in said vehicle carried apparatus and circuit means governing the inductor element for inhibiting the tripping operation of and for producing a resetting indication in the inductor element to effect a resetting operation of the vehicle carried inductively coupled coils.

6. An induction train control system comprising vehicle carried apparatus, a vehicle carried inductor means including inductively coupled coils for controlling the operation of said apparatus and roadside inductor means cooperating with the vehicle carried inductor means and comprising an inductor element capable when in open circuit of modifying the flux conditions between the vehicle carried coils to produce a tripping operation in said vehicle carried apparatus, a circuit governing the inductor element for inhibiting the tripping operation and a second circuit governing the inductor element for producing a resetting indication therein to effect a resetting operation of the vehicle carried apparatus.

7. An intermittent induction train control system comprising vehicle carried inductor means including inductively coupled energizing and energy receiving coils, a plurality of circuits controlled by the energy receiving coil, one of the circuits being responsive to energy of one characteristic and the other of the circuits being responsive to energy of a different characteristic, a vehicle carried source of energy for operating said coils with energy of one characteristic to operate one of said circuits, and roadside inductor means comprising an inductor element cooperating with the vehicle carried inductor means for deenergizing the said one of said circuits, and circuit means governing the roadside inductor element for transmitting energy of another characteristic to the vehicle carried energy receiving coil to operate the other of said plurality of circuits.

8. In combination with a vehicle carried inductor means, of a roadside inductor means comprising a roadside inductor element for producing a tripping operation of the vehicle carried inductor means, a circuit for said inductor ele-

ment which when closed inhibits the inductor element from producing the tripping operation and a circuit for said inductor element operative for energizing the same to produce a resetting operation of the vehicle carried inductor means.

9. In combination with a vehicle carried inductor means, of a roadside inductor means comprising a roadside inductor element capable on open circuit of producing a tripping operation of the vehicle carried inductor means, a circuit for said inductor element which when closed inhibits the inductor element from producing the tripping operation and a circuit for said inductor element operative for energizing the same to produce a resetting operation of the vehicle carried inductor means.

10. In combination with a vehicle carried inductor means, of a roadside inductor means comprising a roadside inductor element for producing a tripping operation of the vehicle inductor means, an A. C. circuit for said inductor element which when closed inhibits the inductor element from producing the tripping operation and a D. C. energizing circuit for said inductor element operative for energizing the same to produce a resetting operation of the vehicle carried inductor means.

11. An intermittent induction train control system comprising vehicle carried apparatus, a vehicle carried inductor means including an energy transmitting element and an energy receiving element coupled together and operative for controlling the operation of the vehicle carried apparatus, and roadside inductor means cooperating with the vehicle carried inductor means and comprising an inductor element capable when in open circuit of reducing the transmission of energy from said energy transmitting element to said energy receiving element to produce a tripping operation in said vehicle carried apparatus, and circuit means governing the said inductor element for producing therein a resetting indication transmittable to for effecting a resetting operation of said vehicle carried inductor means.

12. An intermittent induction train control system comprising vehicle carried apparatus, a vehicle carried inductor means including an energy transmitting element and an energy receiving element coupled together and operative for controlling the operation of the vehicle carried apparatus, and roadside inductor means cooperating with the vehicle carried inductor means and comprising a single inductor element cooperating directly with the vehicle carried coupled elements and capable when in open circuit of reducing the transmission of energy from said energy transmitting element to said energy receiving element to produce a tripping operation in said vehicle carried apparatus, and circuit means governing the said single inductor element for producing therein a resetting indication transmittable to for effecting a resetting operation of said vehicle carried inductor means.

13. An intermittent induction train control system comprising vehicle carried apparatus, a vehicle carried inductor means including an energy transmitting element and an energy receiving element coupled together and operative for tripping and resetting the vehicle carried apparatus, and roadside inductor means cooperating with the vehicle carried inductor means and comprising an inductor element inductively cooperating with the vehicle carried coupled elements and capable when in open circuit of reducing the transmission of energy from said energy transmitting element to said energy receiving element to produce a tripping operation in said vehicle carried apparatus, and circuit means governing the said inductor element for producing therein a resetting indication transmittable to for effecting a resetting operation of said vehicle carried inductor means.

14. An intermittent induction train control system comprising vehicle carried apparatus, a vehicle carried inductor means including an energy transmitting coil and an energy receiving coil inductively coupled together and operative for tripping and resetting the vehicle carried apparatus, and roadside inductor means cooperating with the vehicle carried inductor means and comprising an inductor coil capable when in open circuit of reducing the transmission of energy from said energy transmitting coil to said energy receiving coil to produce a tripping operation in said vehicle carried apparatus, and circuit means governing the said roadside inductor coil for producing therein a resetting indication transmittable to for effecting a resetting operation of said vehicle carried inductor means.

15. An intermittent induction train control system comprising vehicle carried apparatus, a vehicle carried inductor means including an energy transmitting element and an energy receiving element coupled together and operative for tripping and resetting the vehicle carried apparatus, the tripping being effected upon a reduction of transmission of energy between the coupled elements, and roadside inductor means cooperating with the vehicle carried inductor means and comprising a single inductor element cooperable inductively with the vehicle carried coupled elements and circuit means governing said single inductor element for selectively producing therein tripping and resetting indications to selectively effect tripping and resetting operations of the vehicle carried inductor means.

16. An intermittent induction train control system comprising vehicle carried apparatus, a vehicle carried inductor means including an energy transmitting element and an energy receiving element coupled together and operative for tripping and resetting the vehicle carried apparatus, the tripping being effected upon a reduction of transmission of energy between the coupled elements, an A. C. source of energy for said induction means, and roadside inductor means cooperating with the vehicle carried inductor means and comprising a single inductor element cooperable inductively with the vehicle carried coupled elements and circuit means governing said single inductor element for selectively producing therein tripping and resetting indications to selectively effect tripping and resetting operations of the vehicle carried inductor means.

17. An induction train control system comprising a vehicle carried inductor, means including inductively coupled energizing and energy receiving coils, a plurality of circuits controlled by the energy receiving coil, one of said circuits being responsive to energy of one frequency and another of said circuits being responsive to energy of a different frequency, a vehicle carried source of energy for operating said inductor means with energy of one frequency to operate one of said circuits, a roadside inductor element cooperating with the vehicle carried inductor for deenergizing said one of said circuits and circuit means governing the roadside inductor element for transmitting energy of said different frequency

to said vehicle carried inductor to operate the other of said plurality of circuits.

18. An induction train control system comprising a vehicle carried inductor, a plurality of circuits controlled by said inductor, one of said circuits being responsive to energy of one frequency and another of said circuits being responsive to energy of a different frequency, a vehicle carried source of energy for operating said inductor with energy of one frequency to operate one of said circuits, a roadside inductor element cooperating with the vehicle carried inductor for deenergizing said one of said circuits and circuit means governing the roadside inductor element for transmitting energy of said different frequency to said vehicle inductor to operate the other of said plurality of circuits; and means connecting said plurality of circuits for reenergizing said one of said circuits when the said other of said circuits is so operated.

19. An induction train control system comprising a vehicle carried inductor, a plurality of circuits controlled by said inductor, one of said circuits being responsive to energy of one characteristic and another of said circuits being responsive to energy of a different characteristic, a vehicle carried source of energy for operating said inductor with energy of one characteristic to operate one of said circuits, a roadside inductor element cooperating with the vehicle carried inductor for deenergizing said one of said circuits and circuit means governing the roadside inductor element for transmitting energy of said different characteristic to said vehicle carried inductor to operate the other of said plurality of circuits; and means connecting said plurality of circuits for reenergizing said one of said circuits when said other of said circuits is so operated.

20. An induction train control system comprising vehicle carried inductor means including inductively coupled energizing and energy receiving coils, a plurality of circuits controlled by the energy receiving coil, a vehicle carried A. C. source of energy for operating said coils and roadside inductor means comprising an inductor element cooperating with the vehicle carried inductor means for deenergizing one of said vehicle carried circuits, and circuit means governing the roadside inductor element for inhibiting the deenergization of the said one of said circuits and for transmitting an impulse to the vehicle carried energy receiving coil to operate the other of said circuits.

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