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INTERMITTENT INDUCTIVE TRAIN CONTROL SYSTEM

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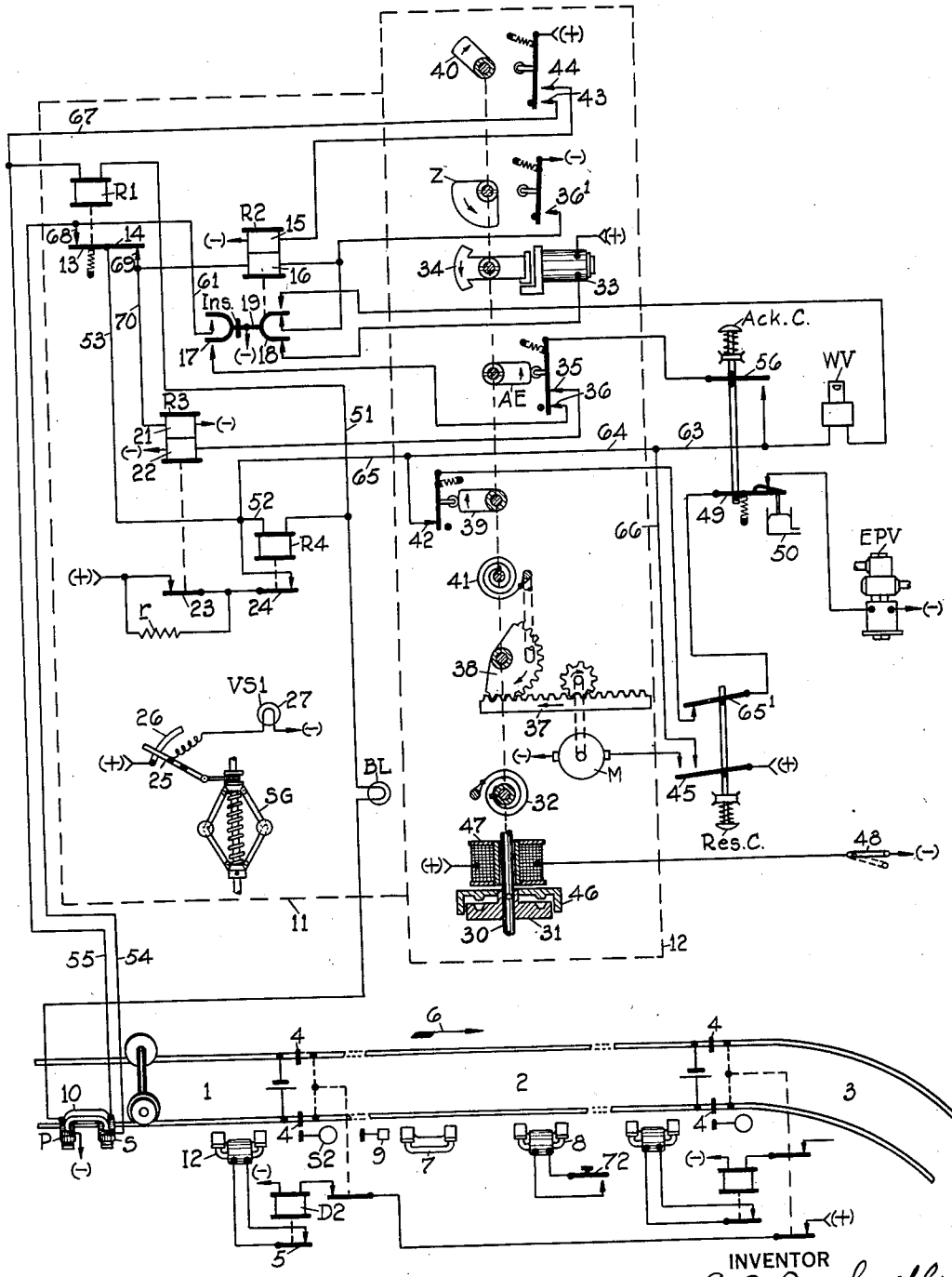

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INTERMITTENT INDUCTIVE TRAIN CONTROL SYSTEM

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10 Claims. (Cl. 246—63)

This invention relates in general to intermittent train control systems and has more particular reference to an intermittent inductive auto-manual type of train control including apparatus for enforcing any speed limit desired at any specific wayside location.

More specifically, the speed control feature is enforced by the use of a fixed time element device on the locomotive operating in conjunction with pairs of unwound inductors located on the wayside. The time element is started into operation when passing the first of these inductors and if the train consumes less than a fixed time in passing between the two inductors an automatic service brake application is initiated.

Thus, the speed limit at any point is proportional to the distance between the two inductors and this makes for an unlimited number of speed restrictions for the enforcement of desirable speeds at wayside locations, as required. Also, the speed restrictions can be applied only where, and as required, so as to result in minimum interference with traffic. Also, if the speed restriction is to be cut out of operation temporarily this can be accomplished by short circuiting a winding on the second inductor of the particular pair in question.

Further objects, purposes and characteristic features of the present invention will appear as the description progresses, reference being made to the accompanying drawing, showing, solely for the purpose of illustration, and in no way whatsoever in a limiting sense one form which the invention can assume.

The single figure of drawing is a schematic showing of one form of this invention.

Referring now to the drawing there is illustrated a stretch of single track separated into isolated signal blocks 1, 2 and 3 by usual insulating joints 4, only the exit end of section 1 and the entrance end of section 3 being illustrated. At the entrance to each block, as block 2, is a signal S2 and a wayside inductor I2 having a winding thereon which is short circuited through contact finger 5 and front point of a distant relay D2 when this relay is energized. As illustrated, this distant relay is energized unless its block 2 or the block 3, next in advance, or both, be occupied. Thus, if block 2 be occupied to constitute a danger block or block 3 be occupied to constitute block 2 as a caution block the inductor I2 at the entrance to this block is open circuited, and hence constitutes a stop inductor. If closed circuited it constitutes a clear inductor.

It can be noted that on leaving block 2, travel being considered easterly as indicated by arrow 6, a special hazard is encountered in the form of a sharp curve in block 3. If it be desired to safe-guard traffic by enforcing a speed restriction before travel along this curve, speed enforcing inductors are suitably positioned along the wayside. In the present case these speed enforcing inductors 7 and 8 are positioned (adjacent a marker 9, if desired, to designate the approach to the speed enforcing inductors) at some distance ahead of the hazard which, in this case, is the curve.

This various wayside apparatus cooperates with car carried apparatus to give train control of the usual intermittent inductive auto-manual type, and in addition thereto, speed enforcement where desired.

As shown in the drawing, there is represented various car carried apparatus including a car carried receiver having a core 10 carrying a primary winding P and a secondary winding S.

The car carried apparatus includes in general a relay group as indicated by the dashed line enclosure 11 and a time element group as indicated by the dashed line enclosure 12.

The relay group includes a relay R1 having a double contact finger pivoted at the middle and having one portion 13 making up its front point when the relay is energized and the other portion 14 making up its front point when the relay is energized. A relay R2 includes two separate windings 15 and 16 and has a contact finger pivoted at its middle with a forked contact 17 at one side of the pivot and a forked contact 18 at the other side of the pivot. The bar interconnecting these two forked contacts has a conducting portion 19 connected to one side of a source of potential and an insulating portion Ins. at the other side to insulate the forked contact 17 from this one side of the source of energy.

Another relay R3 is employed and has two separate windings 21 and 22 and a usual contact finger 23.

A fourth relay R4 is employed and has a single winding and a usual contact finger 24.

The car carried relay group of apparatus also includes a ballast lamp BL which is employed to maintain current flow substantially constant through the primary winding P of the receiver regardless of fluctuations in the applied voltage. There is also a visual speed indicator VS1 which includes a speed governor SG driven from the car axle or its equivalent and connected to move a contactor 25 over a segment 26 so as to open

the energizing circuit for an indicating lamp 27 when the car speed exceeds a predetermined value such, for example, as 30 miles per hour.

The time element device employed in this invention is of the construction and operation disclosed generally in the patent to Bushnell, No. 1,628,453, granted May 10, 1927, and accordingly, need not be described in great detail in this application. Briefly, the time element device is of the oscillating type having a vertical shaft 30, carrying a weight 31 and biased by a spring 41 to move in a counter clockwise direction and normally held against such movement by a normally energized magnet 33 to thereby prevent movement of an armature 34 which is carried by the shaft.

Upon deenergization of magnet 33 the spring bias rotates shaft 30 to swing cams AE and Z in a counter clockwise direction. After a short movement of the shaft cam AE has moved far enough away from its shown position to allow contacts 35 and 36 to open while a short time thereafter cam Z operates to close contact 36^1. This occurs on the forward swing of the timer shaft which then oscillates back again close to its initial position and is then restored and stays, if at that time, magnet 33 is energized.

The timer includes in addition to the above, a reset mechanism. This includes a motor M operating a rack 37 to turn a sector 38 in a clockwise direction to thereby drive cam members 39 and 40 each in a clockwise direction against the tension of a biasing spring 32. Cam 39 after a short travel permits the opening of contact 42 while a short time thereafter cam 40 closes contacts 43 and 44. Upon the motor being deenergized, the spring 32 returns the parts to their shown positions. The motor is manually energized by a reset contactor Res. C. through a contactor 45 and its front point.

The timer makes one oscillation over and back in a given period of time which is determined by the natural period of oscillation of the weight 31. This time can be varied if desired by adding to the weight 31 another weight 46 which is normally held out of operation by a magnet 47 which can be deenergized by a contactor 48 so as to allow the weight 46 to drop into engagement with weight 31 and change the time of the timer oscillation.

Additional apparatus carried by the car includes an acknowledging contactor Ack. C. which is protected against misuse by a slow opening contact 49, connected to a dashpot 50. There is also a whistle valve WV which sounds when energized, and an electro-pneumatic valve EPV which is of the type which is normally energized and upon being deenergized initiates an automatic brake application in such a manner that the brake application cannot be discontinued until a predetermined reduction has been effected, or possibly, until the car has been brought substantially to a stop.

Considering now the relays involved in this system, relay R4 has an energizing stick circuit which includes contacts 23 and 24 and their front points, the relay winding, ballast lamp BL, and primary winding P of the receiver. Connected in series with the secondary winding of the inductor is relay R1. This relay R1 is connected across relay R4 in series with secondary winding S whereby to be normally energized by the potential drop across relay R4. One side of relay R1 is connected to one side of relay R4 by wire 51 while the other side of this relay is connected across the other side of relay R4 by wires 52, 53, contact finger 13 and front point of relay R1, wires 68 and 54, secondary winding S, and wire 55.

Relay R2 has its winding 15 normally open at motor controlled contact 44. The other winding 16 of this relay is normally energized through a circuit including contact finger 23 and front point of relay R3, contact finger 24 and front point of relay R4, contact finger 14 and front point of relay R1, the winding 16, and the upper part of forked contact 18 and front point of relay R2.

Relay R3 has its winding 21 normally energized through a circuit including its contact finger 23 and front point, contact finger 24 and front point of relay R4, contact finger 14 and front point of relay R1, and winding 21. The other winding 22 of relay R3 having a circuit through point 35, etc., is normally open at the acknowledging contactor content 56.

The various parts of the system described above are shown in the drawing in their normal positions with the timer held against oscillation, the motor deenergized, the acknowledging and reset contactors in normal unoperated positions, and the various relays involved in their energized positions.

Assume now that a train passes inductor I2 to enter block 2, and this inductor is in its choked, clear condition, as illustrated. This is the case since neither block 2 nor 3 is occupied. In these circumstances the car carried receiver does not have its flux distribution changed to any marked degree, and as a result there is no change in the car carried system. The EPV valve remains energized and the engineer can operate his engine at speed, as he desires, with no necessity for acknowledging, or performing any other special act.

Assume now that, at the time of passing inductor I2, block 3 is occupied so that the winding of the inductor is open circuited. In these circumstances the flux from the primary winding passing through the core and the secondary winding of the receiver, increases and then decreases, to induce one cycle of alternating voltage in the secondary winding, one-half wave, preferably the first, of which opposes the voltage drop across relay R4 to cause relay R1 to release. The release of relay R1 deenergizes relay R2 which releases and also deenergizes winding 21 of relay R3.

Assume now that, before passing the inductor, the caution signal is noted by the engineer and he acts as he should and depresses the acknowledging contactor and maintains it depressed until he is past the signal and is apprised by the silencing of whistle valve WV that it can be released.

On the assumption that acknowledgement is properly performed, winding 22 of relay R3 is energized through a circuit including winding 22, contact 35 in closed position, acknowledging contact 56 in closed position, contact finger 24 and front point of relay R4, and contact finger 23 and front point of relay R3. Thus, relay R3 does not release due to this holding circuit. The release, however, of relay R2 deenergizes holding magnet 23 and allows the oscillator to begin its forward swing.

After a short distance of travel, contact 35 opens and winding 22 of relay R3 is deenergized. Before this occurs, however, the receiver has

passed the wayside inductor, and relay R1 has picked up through a pick-up circuit which, on the one side of relay R4, is constituted by wire 51 and on the other side includes wire 55, winding S, wire 54, wire 61, contact finger 17 and back points of relay R2, contact 36 in closed position, contact 56 and the acknowledging contactor in closed position, and wires 63, 64, 65 and 52, to the other side of relay R4.

Thus, before the oscillator has opened the circuit for winding 22 of relay R3, relay R1 has picked up through a pick-up circuit including an acknowledging contactor and a back point of relay R2. This reenergizes winding 21 of relay R3 so that relay R3 does not release upon its winding 22 being deenergized by the first portion of movement of the oscillator in its forward swing.

As the oscillator continues its forward swing, cam Z closes contact 36^1 to energize lower winding 16 of this relay R2 through a circuit including contact finger 23 and front point of relay R3, contact finger 24 and front point of relay R4, contact finger 14 and front point of relay R1, wire 69, the winding 16, and contact finger 36^1 in closed position.

Upon picking up through this circuit, relay R2 sticks up through its stick circuit, and thus the relays are all restored to their normal positions without having permitted relays R3 or R4 to release and thus without having caused the deenergization of the brake controlling EPV. The picking up of relay R2 reenergizes magnet 33 through its above described energizing circuit whereby, when the oscillator returns on its backward swing to or adjacent its initial position, it is there held by the magnet.

The normal energizing circuit for the brake initiating valve EPV includes contact finger 23 and front point of relay R3, contact finger 24 and front point of relay R4, motor driven normally closed contact 42 and front point, reset contactor operated contact finger 65^1 in its closed position, acknowledging contactor contact finger 49 in closed position, and the winding of the EPV. It will be noted that this circuit is not opened so long as relays R3 and R4 do not release, and provided the motor M is not energized to open the contact 42, and provided the reset contactor is not operated to open reset contact finger 65^1, and also provided that the acknowledging contactor is not held in its depressed condition long enough to allow opening of slow opening protection contact finger 49.

So long as relay R2 is in released position the whistle valve sounds, as it is energized through a circuit including contact fingers 23 and 24 and their front points, the whistle valve winding, and the upper half of forked contact 18 and front point of relay R2. Thus, by the time the whistle valve has ceased to sound the oscillator has moved in its forward swing far enough to have caused the picking up of relay R2. Hence the silencing of the whistle valve apprises the engineer that he can safely release his acknowledging contactor which he of course must do with fair promptness to prevent the opening of slow operating protective contactor 49.

Assume now that a stop inductor is passed and the engineer fails to acknowledge. As before, relay R1 releases to release relay R2 and cause the oscillator to start its forward swing. Relay R3 has its winding 21 deenergized by the releasing of relay R1 and shortly after the oscillator starts its forward swing its winding 22 is deenergized. as described above. Relay R3 releases since with the acknowledging contactor not operated, the pick-up circuit for relay R1 is not completed. The release of relay R3 causes the release of relay R4 and each of these relays cause the deenergization of the brake initiating valve EPV.

Upon incurring the brake penalty it is necessary, in order to release the brakes, to restore the parts to normal position. This is effected by operating the reset contactor Res. C. This contactor is safe-guarded against misuse by positioning it so as to be accessible only from the ground, or possibly, subject to a speed contact closed only at very low speed (not shown), or by positioning it out of reach from the cab.

Thus the locomotive must be stopped or brought substantially to a stop and the reset contactor operated, whereupon motor M operates cams 40 and 39 in a clockwise direction to first open contact 42 to thereby make an added break in the energizing circuit for the EPV and to thus safe-guard against misuse of the reset function, and later to close contacts 43 and 44.

The reset contactor also places energy through wires 66, 64 and 65 on relay R4 in series with primary winding P so as to pick up relay R4. Upon contact 43 closing a restoring circuit for relay R1 is completed including contact 43 in closed position, the winding of relay R1, wire 51, etc., as above. The closing of contact 44 causes relay R2 to pick up, through an obvious circuit which relay, after picking up, sticks up through relay R1, etc., up, as described above. Relay R3 picks up upon relay R1 picking up, through a circuit including contact 43 in closed position, wires 67 and 55, winding S, wires 54 and 68, contact fingers 13 and 14, and wires 69 and 70, and then sticks up through its stick circuit.

With relay R2 up, holding magnet 33 is energized and the operation of the motor swings armature 34 back to its initial position where it is held. Upon releasing the reset contactor the motor is deenergized and the various motor driven parts are restored by spring 41 to their initial shown positions, whereby to reclose the EPV circuit and permit release of the brakes.

The above description of the operation of this system shows that it includes all the various features of the usual intermittent inductive automanual train control system.

Coming now to the speed control feature of this invention, we can first assume that the locomotive passes the speed controlling inductors 7 and 8. The second inductor 8 of this pair is shown as having a winding which can be closed by a hand switch or the like 72, to thereby make it a clear inductor. Assume, however, that both of these inductors 7 and 8 are stop inductors. Upon passing the first inductor, if the engineer has acknowledged and maintains the acknowledging contactor in depressed position, relays R1 and R2 release, as before, and the oscillator starts its forward swing. However, relay R1 quickly picks up again to maintain relay R3 energized despite the opening of winding 22 of this relay R3 due to the oscillator swinging forward.

Thus, relays R3 and R4 do not release and the EPV does not become deenergized. A short time elapses, however, before the oscillator swings back to its initial position to again close the energizing circuit for winding 22 at contact 35. If, therefore, the train speed is such that it reaches the second inductor before the oscillator has substantially completed its return swing, relay R1 again releasing on passing the stop in-

ductor opens winding 21 of relay R3. With winding 22 still open, relay R3 releases to release relay R4 and cause initiation of an automatic brake application.

If, however, the train speed be low enough, so that the second deenergization of relay R1 does not occur until after the oscillator has returned substantially to its initial position, and hence, with Ack. C. properly operated, until after winding 22 of relay R3 has become reenergized, though the release of relay R1 occurs and likewise the following release of relay R2, relay R3 does not release and no automatic brake application is incurred.

There is a resistance r bridged across contact finger 23 of relay R3 which is used for preventing excessive sparking at the contact and is of a high enough value to prevent energizing current flowing around contact 23.

Thus, it can be seen that by varying the spacing of the pairs of speed controlling inductors and/or varying the time of oscillation of the oscillator very numerous different speed controls can be realized in a very cheap and effective manner.

Furthermore, if it be desired to cut out the speed control temporarily the second inductor of a pair of speed controlling inductors can be short circuited or choked as by closing contact 72, whereupon acknowledgement before encountering the first inductor and maintenance of the acknowledgment until the whistle valve ceases to sound, is all that is required of the engineer.

To more or less summarize the above description, it is clear that the roadside equipment includes relatively widely spaced inductors one at each signal location which can be characterized as signal inductors, and relatively closely spaced inductors ahead of special hazards which can be characterized as speed control inductors.

It is obvious that the acknowledging contactor, after being operated, can be safely maintained in operated position only for a limited period of time as otherwise the safety contact 49 will open and the brakes will automatically be applied. This safe acknowledging time clearly must be longer than the time required for a car carried receiver to pass from one to the other of a pair of speed control inductors when the speed of movement is not above the authorized speed for such inductors. Furthermore, it must be shorter than the time required for a receiver moving at highest speed to pass between any signal inductor and the nearest speed inductor.

Again, the time element which shortly after commencing its forward swing, opens contact 35 and then shortly before the completion of its return swing recloses this contact must consume a time period between the opening and the closing of this contact 35 which is less than the time of travel between the inductors of a pair of speed inductors when traveling at the prescribed speed limit for that pair of inductors, and of course this time must be less than the time of travel at the highest speed between any signal inductor and the nearest speed control inductor.

The various times of operation discussed just above can, of course, be varied at will to satisfy conditions so long as they come within the relative limits referred to above.

Thus, the system provides all the advantages of the usual intermittent inductive auto-manual control system, and in addition thereto, by the use of the timer, and other minor adjuncts, permits a very flexible speed control system to be placed in control at various locations as desired without having speed control enforced at other places where it is not necessary. Thus, traffic is facilitated and delays are reduced to a minimum while various wayside hazards can be safeguarded against in an effective manner.

The above rather specific description of one form of the invention is given solely by way of example and is not intended in any manner whatsoever in a limiting sense. It is to be understood that various modifications, adaptations, and alterations as may be applied from time to time to meet the requirements of practice can be employed without in any manner departing from the spirit or scope of this invention except insofar as limited by the appended claims.

Having described my invention, I now claim:

1. In train control systems, in combination, car carried apparatus responsive to wayside means which includes relatively widely spaced wayside signals, an inductor at each signal location controlled by traffic in advance to be either a clear or a stop inductor, and a pair of relatively closely spaced stop inductors between two adjacent signal locations, said car carried apparatus comprising, a normally inactive penalty device, an acknowledging means movable to active position, means making the penalty device active if the acknowledging means remain in active position for more than a predetermined period of time, relay means responsive to movement of the car past a stop inductor to make the penalty device active unless the acknowledging means be then in active position, a normally inactive timer cooperating with the relay means and made active to operate through a predetermined timed cycle very shortly after the passing of a stop inductor by the car, and means whereby said relay means is affected by the timer during said cycle to make the penalty device active if a stop inductor be passed during the timer cycle, even though the acknowledging means be then in active position.

2. In train control systems, in combination, car carried apparatus responsive to wayside means which includes relatively widely spaced wayside signals, an inductor at each signal location controlled by traffic in advance to be either a clear or a stop inductor, and a pair of relatively closely spaced stop inductors between two adjacent signal locations, said car carried apparatus comprising, a normally inactive penalty device, an acknowledging means movable to active position, means making the penalty device active if the acknowledging means remain in active position for more than a predetermined period of time, relay means responsive to movement of the car past a stop inductor to make the penalty device active unless the acknowledging means be then in active position, a normally inactive timer cooperating with the relay means and made active to operate through a predetermined timed cycle very shortly after the passing of a stop inductor by the car, and means whereby said relay means is affected by the timer during said cycle to make the penalty device active if a stop inductor be passed during the timer cycle, even though the acknowledging means be then in active position, the timer cycle being shorter than said predetermined period of time of the acknowledging means.

3. In train control systems, in combination, car carried apparatus responsive to wayside means which includes relatively widely spaced

wayside signals, an inductor at each signal location controlled by traffic in advance to be either a clear or a stop inductor, and a pair of relatively closely spaced stop inductors between two adjacent signal locations, said car carried apparatus comprising, a normally inactive penalty device, an acknowledging means movable to active position, means making the penalty device active if the acknowledging means remain in active position for more than a predetermined period of time, relay means responsive to movement of the car past a stop inductor to make the penalty device active unless the acknowledging means be then in active position, a normally inactive timer cooperating with the relay means and made active to operate through a predetermined timed cycle very shortly after the passing of a stop inductor by the car, and means whereby said relay means is affected by the timer during said cycle to make the penalty device active if a stop inductor be passed during the timer cycle, even though the acknowledging means be then in active position, the timer cycle being shorter than said predetermined period of time of the acknowledging means, and said predetermined period of time of the acknowledging means being less than the time required for highest speed travel between any signal inductor and the nearest adjacent inductor.

4. In train control systems, in combination, car carried apparatus responsive to wayside means which includes relatively widely spaced wayside signals, an inductor at each signal location controlled by traffic in advance to be either a clear or a stop inductor, and a pair of relatively closely spaced stop inductors between two adjacent signal locations, said car carried apparatus comprising, a normally inactive penalty device, an acknowledging means movable to active position, means making the penalty device active if the acknowledging means remain in active position for more than a predetermined period of time, relay means responsive to movement of the car past a stop inductor to make the penalty device active unless the acknowledging means be then in active position, a normally inactive timer cooperating with the relay means and made active to operate through a predetermined timed cycle very shortly after the passing of a stop inductor by the car, and means whereby said relay means is affected by the timer during said cycle to make the penalty device active if a stop inductor be passed during the timer cycle, even though the acknowledging means be then in active position, the timer cycle being shorter than said predetermined period of time of the acknowledging means, and said predetermined period of time of the acknowledging means being less than the time required for highest speed travel between any signal inductor and the nearest adjacent inductor and greater than the time required for travel at slowest normal speed from one to the other of a pair of speed control inductors.

5. In train control systems, in combination, car carried apparatus responsive to wayside means which includes relatively widely spaced wayside signals, an inductor at each signal location controlled by traffic in advance to be either a clear or a stop inductor, and a pair of relatively closely spaced stop inductors between two adjacent signal locations, said car carried apparatus comprising, a normally inactive penalty device, an acknowledging means movable to active position, means making the penalty device active if the acknowledging means remain in active position for more than a predetermined period of time, relay means responsive to movement of the car past a stop inductor to make the penalty device active unless the acknowledging means be then in active position, a normally inactive timer cooperating with the relay means and made active to operate through a predetermined timed cycle very shortly after the passing of a stop inductor by the car, and means whereby said relay means is affected by the timer during said cycle to make the penalty device active if a stop inductor be passed during the timer cycle, even though the acknowledging means be then in active position, the timer cycle being shorter than said predetermined period of time of the acknowledging means, the timed cycle being of a duration less than the time required for highest speed travel from any signal inductor to the nearest adjacent inductor.

6. In train control systems, in combination, car carried apparatus responsive to wayside means which includes relatively widely spaced wayside signals, an inductor at each signal location controlled by traffic in advance to be either a clear or a stop inductor, and a pair of relatively closely spaced stop inductors between two adjacent signal locations, said car carried apparatus comprising, a normally inactive penalty device, an acknowledging means movable to active position, means making the penalty device active if the acknowledging means remain in active position for more than a predetermined period of time, relay means responsive to movement of the car past a stop inductor to make the penalty device active unless the acknowledging means be then in active position, a normally inactive timer cooperating with the relay means and made active to operate through a predetermined timed cycle very shortly after the passing of a stop inductor by the car, and means whereby said relay means is affected by the timer during said cycle to make the penalty device active if a stop inductor be passed during the timer cycle, even though the acknowledging means be then in active position, the timer cycle being shorter than said predetermined period of time of the acknowledging means, said predetermined period of time of the acknowledging means being less than the time required at highest speed to travel between any signal inductor and the nearest adjacent inductor and greater than the time required at the lowest normal speed of travel to pass from one to the other of a pair of speed control inductors, the timed cycle of the timer having a duration less than the time required at highest speed of travel to pass from any signal inductor to the nearest adjacent inductor.

7. In an intermittent train control system with speed adjunct, in combination, car carried apparatus for cooperation with clear and stop wayside inductors, and including a normally inactive penalty device, a forestalling device operative to active position, a normally-at-rest timer operable, when initiated, through a timing cycle, relay means responsive to travel of the car past a stop inductor to initiate operation of the timer, and, if the forestalling device be not in active position, to make the penalty device active, and circuit means controlled by the timer during its cycle operation, making the penalty device active on passing a second stop inductor before the timer has completed its cycle of operation despite the forestalling device being in active position.

8. In an intermittent train control system with speed adjunct, in combination, car carried apparatus for cooperation with clear and stop wayside inductors, and including a normally inactive penalty device, a forestalling device operative to active position, a normally-at-rest timer operable, when initiated, through a timing cycle, relay means responsive to travel of the car past a stop inductor to initiate operation of the timer, and, if the forestalling device be not in active position, to make the penalty device active, circuit means controlled by the timer during its cycle operation making the penalty device active on passing a second stop inductor before the timer has completed its cycle of operation despite the forestalling device being in active position, and means causing the penalty device to become active after the forestalling device has been in active position beyond a predetermined period of time.

9. In an intermittent train control system with speed adjunct, in combination, car carried apparatus for cooperation with clear and stop wayside inductors, and including a normally inactive penalty device, a forestalling device operative to active position, a normally-at-rest timer operable, when initiated, through a timing cycle, relay means responsive to travel of the car past a stop inductor to initiate operation of the timer, and, if the forestalling device be not in active position, to make the penalty device active, circuit means controlled by the timer during its cycle operation making the penalty device active on passing a second stop inductor before the timer has completed its cycle of operation despite the forestalling device being in active position, and means causing the penalty device to become active after the forestalling device has been in active position beyond a predetermined period of time, the time required for the timer to complete its cycle of operation being substantially less than said predetermined period of time of the forestalling device.

10. In a train control system of the automatic speed control type, in combination, car carried apparatus for cooperation with clear and stop wayside inductors, and including a normally inactive penalty device, a forestalling device operative to active position, a normally-at-rest timer operable, when initiated, through a timing cycle, relay means responsive to travel of the car past a stop inductor to initiate operation of the timer, and, if the forestalling device be not in active position, to make the penalty device active, circuit means controlled by the timer during its cycle operation making the penalty device active on passing a second stop inductor before the timer has completed its cycle of operation despite the forestalling device being in active position, and means causing the penalty device to become active after the forestalling device has been in active position beyond a predetermined period of time, adjacent wayside inductors, and manual means to control one of the inductors to be a clear, or a stop, inductor.

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