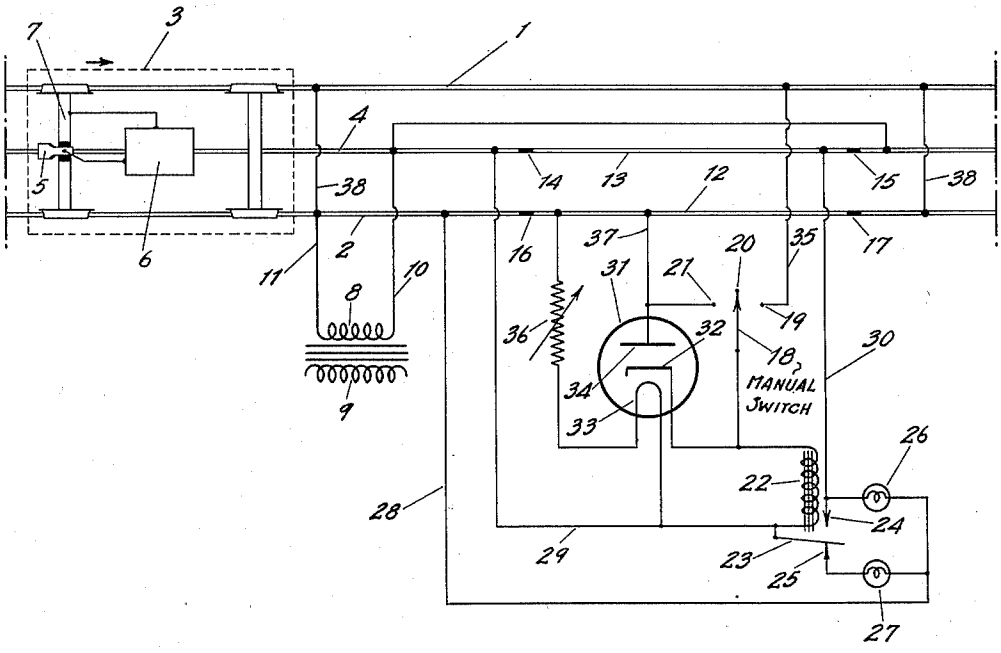
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AUTOMATIC TOY-TRAIN CONTROL

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AUTOMATIC TOY-TRAIN CONTROL

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This invention relates to train control apparatus and more especially to controls for toy-train systems and the like.

A principal object of the invention is to provide an improved block control arrangement for electric toy-train systems and the like.

A feature of the invention relates to an automatic block control arrangement for electric toy-trains whereby various combinations of signalling conditions may be set up in the system.

Another feature relates to an electric toy-train system whereby automatic means are provided for delaying the movement of the train for a predetermined time interval at a special block section of the track.

Another feature relates to an electric toy-train system having delay control means of the thermionic tube type, for automatically timing the blocking of a toy-train for a predetermined interval during transit from one section of the track to another.

A further feature relates to an improved form of time delay control for automatic electric toy-train systems.

A still further feature relates to the novel organization, arrangement and relative connection of parts which constitute a simple and efficient automatic block control and signalling arrangement for toy-electric train systems.

While the invention will be described herein as embodied in one particular type of electric toy-train system, it will be understood that it may be equally well applied to other types of systems.

Accordingly in the drawing, there is shown in schematic form, for explanatory purposes, a typical section of a toy-train system embodying features of the invention. The drawing shows a short section of a track arrangement usually employed in electric toy-train systems. The track comprises the outer rails 1 and 2 constituting the main track rails on which the wheels of the toy-train 3 ride, while the middle rail 4 is the trolley or contact rail which is adapted to contact with a suitable brush 5 or the like, carried by the train but insulated therefrom. One terminal of the train motor 6 is connected to brush 5 and the other terminal is grounded to the axle 7 and thence to rails 1 and 2. The power for operating the trains may be derived from the secondary winding 8 of a suitable step-down transformer, the primary winding 9 of which is connected to the electric light or power supply lines. One terminal of the secondary winding 8 is connected by conductor 10 to rail 4, and the other terminal is connected by conductor 11 to rails 1 and 2.

Rail 1 is both electrically and mechanically continuous, while rails 2 and 4 are connected by short sections 12, 13 which are electrically insulated at the points 14, 15; 16, 17. The sections 12 and 13 may be insulated from the rails 2 and 4 by suitable insulator pins which may be inserted between the adjacent ends of rail 2 and section 12, and between the adjacent ends of rail 4 and section 13. The block section of track represented by rails 12 and 13 may be used for any suitable signalling or control purpose. For example, and in accordance with the invention, it is arranged to provide an automatic stopping and delaying of the train thereat, for a predetermined period of time.

For the purpose of setting and controlling the various signalling and blocking arrangements, there is provided a manual switch having a movable arm 18 and associated fixed contacts 19, 20, 21. When the switch arm is closed on contact 19, the winding 22 of a suitable relay is connected across the current supply conductors 10, 11 by means of rails 1 and 4. Relay 22 is provided with a movable armature 23, a front contact 24 and a back contact 25; contact 24 controlling the circuit of a green signal lamp 26, and contact 25 controlling the circuit of a red signal lamp 27. Normally, that is, when arm 18 is in position 20 and no axle of the train is present in the signaling section which contains the rails 12 and 13, winding 22 is deenergized, armature 23 engages contact 25 and maintains the red lamp 27 lighted over a circuit which may be traced from conductor 11, rail 2, conductor 28, lamp 27, contact 25, armature 23, conductor 29, rail 4 to conductor 10. As long as the lamp 27 is lighted, section 13 of the track is deenergized. On the other hand, when the relay 22 is energized, the green lamp 26 is lighted over a circuit traceable from conductor 11, rail 2, conductor 28, lamp 26, contact 24, armature 23, conductor 29, rail 4 to conductor 10. As long as contact 24 is closed, the rail 4 is directly connected to section 13 by means of conductor 29, armature 23, contact 24 and conductor 30. When the switch arm 18 is closed to contact 21, rail 13 is not energized before the train reaches the signaling section. This position of the switch short-circuits the cathode 32 and the anode 34 of tube 31. When the train enters the signaling section, its axles make contact between rail 1 and 12, thus energizing relay winding 22 over the circuit formed by conductor 11, rail 1, the train axle

(7 e. g.), rail 12, conductor 37, arm 8, winding 22, conductor 29, rail 4 to conductor 10. Energizing of winding 22 closes armature 23 to contact 24, energizing rail 13 and changing the light from red to green as discussed in detail above. Thus, when arm 18 is in position 21, the train entering the signal section changes the light from red to green and energizes the motor.

For the purpose of delaying the train in the block for a predetermined time interval, there is provided a thermionic discharge tube 31, having an electron-emitting cathode 32, which is adapted to be raised to electron-emitting temperature by a separate heater filament 33. Associated with the cathode 32 is an anode 34. Preferably the tube 31 is of the sluggish or slow-to-heat cathode type, so that a predetermined time interval elapses between the original energization of filament 33 and the attainment of a temperature enabling the tube to pass current of sufficient magnitude to operate relay 22. When the switch arm 18 engages either contact 19 or contact 21, relay 22 is operable independently of the tube 31. On the other hand, when switch arm 18 engages contact 20, the circuit for energizing relay 22 is controlled by the space current between cathode 32 and anode 34. Consequently, by operating switch arm 18, various combinations of signalling and blocking conditions may be attained.

Assuming for example the arm 18 is in engagement with contact 19, then relay 22 is energized over conductor 11, rail 1, conductor 35, contact 19, switch arm 18, winding 22, conductor 29, rail 4 to conductor 10. The operation of relay 22 closes the above described circuit for lighting the green lamp 26 and at the same time connects rail 4 electrically direct to section 13 through contact 24 and lines 29 and 30. Under these conditions, the green light 26 remains lighted and the train can move for example in the direction of the arrow through and past the block section, it being understood that rails 1 and 2 are connected together electrically before and after the block section by tie members 38. When it is desired to stop the train for a predetermined period in the block section, switch arm 18 is moved to contact 20. Under this condition, the relay 22 is not energized before the train enters the control block section. When the train moves into this block section, contact 24 is open and rail 13 is deenergized thus stopping the train. Section 12, however, is now brought to the potential of section 1 by the axle 7 of the train engine, current starts flowing through the filament 33, heating it up slowly. When the filament has reached high enough a temperature for emitting electrons, the tube 31 becomes conductive, and closes the circuit 1—12—37—34—32—22—29—4. The relay 22 is thus energized, opening control 25 and closing 24. Thereby the lamp 27 is switched off, 26 lights up and section 13 is connected to the potential of rail 4 by way of line 30, contact 24 and line 29. The train is now being energized in the control block section, and starts moving on. After the train has moved out of this secton, relay 22 is deenergized, as the plate circuit of tube 31 opens.

When switch 18 is in position 21, the red light 27 is lighted and the relay deenergizes. As the train enters the control block section rail 12 becomes energized thru axle 7. This energizes relay 22 switching light to green and train proceeds. Under the last described set of conditions, as the train leaves the block section, rail 12 is disconnected from rail 1 and current ceases to pass through winding 22, thus releasing armature 23 and causing the lighting of red lamp 27. The above conditions are therefore repeated each time the same train or succeeding train enters the block section.

It will be understood of course, that while one specific embodiment of the invention has been described, various changes and modifications may be made therein without departing from the spirit and scope of the invention. For example, in addition to the red and green lamps, suitable buzzer or audible signals may be provided in parallel therewith to give suitable audible indications in place of or supplementary to the visual indications. It will also be understood that by varying the value of the resistance 36, the time delay period of the train in the block section may be varied as desired.

What I claim is:

1. In an electric train system, the combination of a track, a train adapted to ride on said track, a source of electric power for energizing said track to drive said train, said track having a block section including a main rail and a third rail normally insulated from said main rail whereby when said train enters said block it is stopped therein, and means controlled by the train to energize the said insulated third rail section to cause the train to proceed through the block only after a predetermined time interval, and for deenergizing said insulated third rail section substantially immediately after the train leaves the block, the last-mentioned means including a thermionic tube having a slow-to-heat electron-emitting cathode and an anode with the anode connected to a normally insulated section of one of said main rails in the block section, the potential of said anode being substantially immediately disconnected in response to the train leaving the block.

2. In an electric train system, the combination of a track, a train adapted to ride on said track, said track having main rails and a third rail, a source of electric power connected across said main rails and said third rail, a block section in said track including a section of main rail normally insulated from the track stretch, said block section also having a section of third rail normally insulated from the track stretch, a thermionic tube having a slow-to-heat cathode and a heater for the same; a connection from one terminal of said source to one terminal of said heater, a connection from the other terminal of the heater to said normally insulated main rail section, a bridging means carried by the train for connecting said normally insulated main rail section to the other terminal of the source when the train enters said block, a connection from said normally insulated main rail section to the anode of said tube, means to connect the insulated section of the third rail to the third rail of the track stretch under control of the anode-cathode current of said tube but only after a predetermined time interval determined by said cathode, a "go" signal energized at the end of said interval the anode of said tube being immediately deenergized when the train leaves said block, and a stop signal associated with said block and rendered effective substantially immediately upon deenergization of said anode and in response to the train leaving the block.

3. In an electric train system, the combination of a track having a control and signal section insulated from the track stretch with respect to one main rail and the third rail thereof, a source of electric power connected across the main and third rails of the track stretch, said block being normally disconnected from said source whereby the train is stopped in the block, means automatically effective to start the train through the block after a predetermined time interval, the last-mentioned means including a thermionic tube and a relay having an energizing winding connected in series with the anode and cathode of said tube, said tube having a slow-to-heat cathode, and a circuit for heating said cathode including means carried by the train for closing said circuit only when the train enters said block.

4. A system according to claim 3 in which the tube is of the indirectly heated cathode type having a heater filament and the filament is connected to said power source by said means carried by the train.

5. An electric train system comprising a track having main rails and a third rail, a control and signal section for the track insulated from the track stretch with respect to one main rail and the third rail, a source of electric power connected across said main rails and said third rail, a thermionic time delay tube having a heatable filament, means to apply heating current to said filament including a member carried by the train and electrically bridging the main rails in said section, a relay controlled by the space current of said tube, said relay when energized electrically bridging the third rail in said section to the third rail of the track stretch, said relay being energized only when the anode-cathode current of said tube reaches a predetermined magnitude.

6. In an electric train system, the combination of a track having main rails and a third rail, a source of electric power having its terminals connected across said main rail and said third rail, a control and signal section in said track insulated from the track stretch with respect to one main rail and the third rail, a thermionic time delay tube having a slow-to-heat cathode with a heater filament and an anode, a member carried by the train and effective when the train enters said section to close a circuit through the said filament, a relay controlled by the space current of said tube and arranged to operate its contacts to bridge the third rail portion of said section to the third rail of the track stretch only after a predetermined time interval controlled by said cathode and the presence of the train in said block, said relay immediately releasing when the train leaves said section.

7. In an electric train system, the combination of a track, a train adapted to ride on said track, a source of electric power connected to said track, said track having a pair of main rails and a third rail, a control and signal section in said track insulated from the track stretch with respect to one main rail and the third rail, a relay having contacts for electrically bridging the third rail of said section to the third rail of the track stretch, a thermionic tube having a slow-to-heat cathode with the heater filament connected between the insulated portion of a main rail in said section and a terminal of said source, the anode-cathode circuit of said tube including a winding for said relay, a member carried by the train for completing said filament circuit to the other terminal of the source when the train enters said section, the train being automatically retained in said section until the anode-cathode current of said tube reaches a predetermined magnitude, said relay releasing substantially immediately when the train leaves the said section.

8. In an electric train system, the combination of a track, a train adapted to ride on said track, said train having an axle adapted to electrically bridge said main rails, a source of electric power connected to said track, said track having a control and signal section insulated from the track stretch with respect to one main rail and the third rail, a switch having a plurality of positions, a relay for electrically connecting the third rail of the said section with the third rail of the track stretch, an energizing winding for said relay, a circuit including the train axle for connecting the winding of said relay to said power source when said switch is in one position at the time the train enters the said section, said circuit being broken when the train leaves the said section, a thermionic tube having a slow-to-heat cathode and having the anode-cathode connected in series with said winding and source when said switch is in a second position whereby the train can proceed through the said section only after the duration of a predetermined time interval determined by said cathode, the initiation of energization of said cathode being controlled by the entrance of the train into said section and the energization ceasing substantially immediately when the train leaves said section.

9. A system according to claim 8 in which said switch is provided with a third position which controls another circuit for connecting said winding to said source independently of said tube and independently of said axle.

10. An electric train control system comprising a track having a pair of main rails and a third rail, a source of electric power connected to said main rails and third rail, said track also having a control and signal section insulated from the track stretch with respect to one main rail and the third rail, "stop" and "go" signals associated with said section, a relay for controlling said signals, said relay when operated closing a circuit for the "go" signal and when released closing a circuit for the "stop" signal, a three-position switch, a circuit closed when said switch is in one position for connecting said relay to said source only when there is a train in said section, a circuit closed when said switch is in a second position and a train is in said section for connecting said relay in series with the cathode and anode of a thermionic tube and said source said cathode being of the slow-to-heat type whereby the operation of said relay is delayed for a predetermined time interval controlled by said cathode during which interval the train is prevented from leaving said section, said relay when operated closing a circuit through the train motor to move it out of said section, and a third circuit closed when said switch is in its third position for connecting said relay to said source independently of said tube and independently of the presence of a train in said section.

11. An electric control system according to claim 10 in which said cathode is provided with a heater filament and an adjustable resistance connected in circuit with the filament for controlling the duration of said predetermined interval.

12. An automatic train control system includ-

ing a track stretch along which a train is to ride, a control and signal section for said track having at least one rail insulated from the corresponding rail of the track stretch, a relay for controlling the electrical connection of said insulated rail of said section to the corresponding rail of the track stretch, a time delay device for controlling the operation of said relay to cause said relay to connect said insulated rail of said section to the corresponding rail of the track stretch only after the train has been in said section for a predetermined time, the last-mentioned means including a thermionic vacuum tube having a slow-to-heat cathode and a circuit for heating said cathode and energizing the anode of said tube which circuit is closed upon the entry of the train into said section, said anode being immediately deenergized upon the train leaving the said section.

13. A system according to claim 5 in which a variable resistor is included in the said circuit for the filament for the purpose of varying the time delay interval of said tube in applying said power to said section but without materially delaying the disconnection of power from said section when the train leaves the same.

14. A system according to claim 6 in which a relay is connected in circuit with the anode and cathode of said tube, said relay having a pair of contacts for completing a circuit between the insulated portion and the uninsulated portions of said third rail said relay breaking said circuit immediately when the train leaves said section.

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