Sept. 9, 1930. A. M. CONTI 1,775,422

AUTOMATIC TRAIN CONTROL SYSTEM

Filed May 19, 1927 2 Sheets-Sheet 1

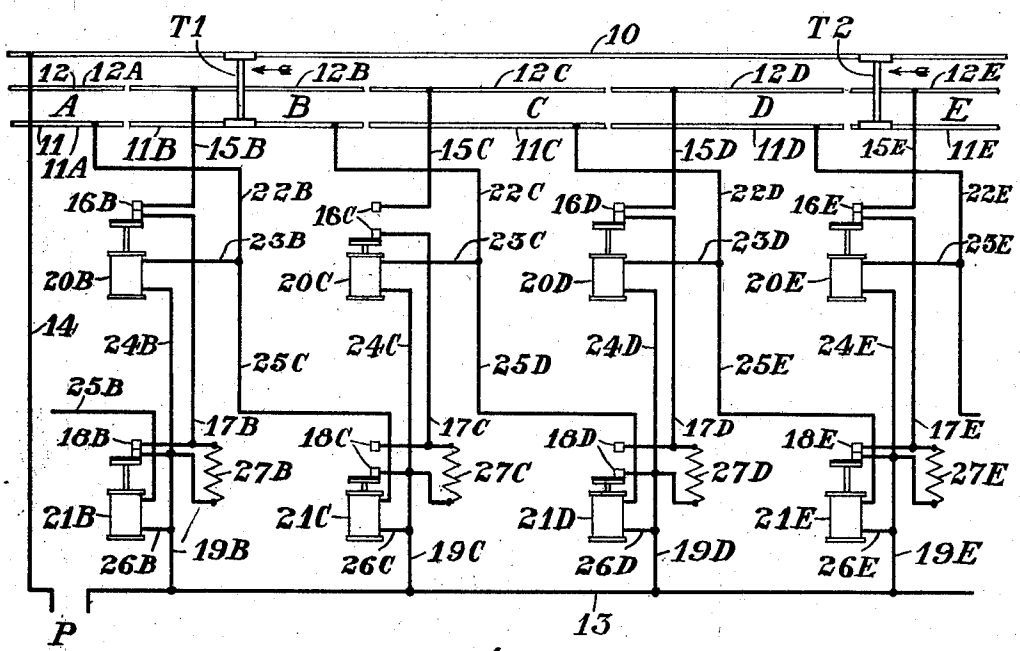


Fig. 1

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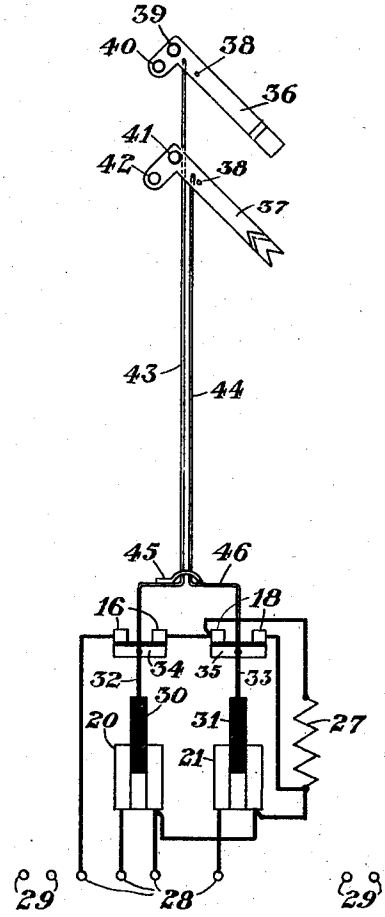


Fig. 2.

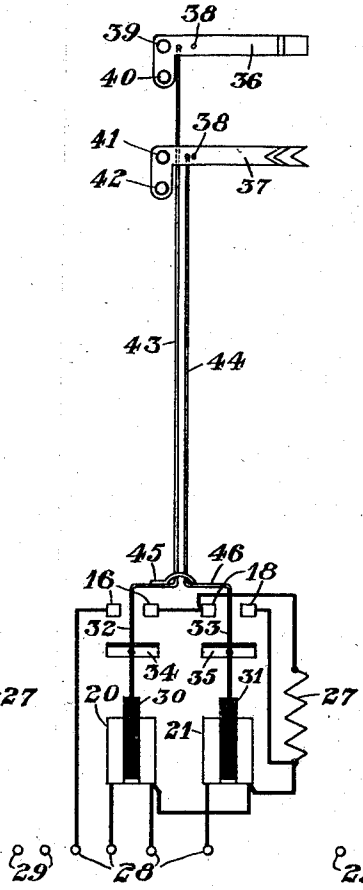


Fig. 3.

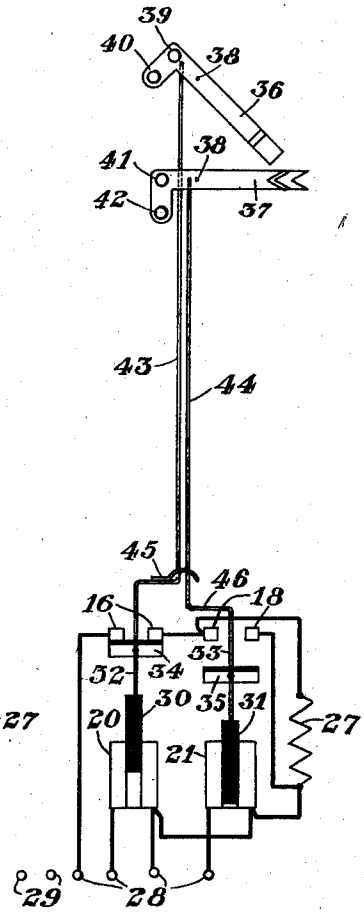


Fig. 4.

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AUTOMATIC TRAIN-CONTROL SYSTEM

Application filed May 19, 1927. Serial No. 192,515.

This invention relates to improvements in safety systems for control of trains wherein one train is automatically controlled by the movement or position of another train, and more particularly with reference to some of its details, the invention relates to improvements in such safety systems which are applicable to control of trains in toy railway systems.

It is a general object of the invention to provide an improved control system of the class mentioned which is simple in construction and operation and inexpensive in manufacturing costs, being especially adapted to the control of toy apparatus.

A further object of the invention is to provide an improved automatic system for controlling the operation of trains wherein, by utilizing a simple and effective arrangement, one train is automatically controlled in its movement by another train so as to avoid collisions between the two trains.

A further object of the invention is to provide an improved automatic block system for controlling operation of trains wherein, by utilizing a simple and effective arrangement, one train in one block is enabled to exert a restraining control over the movements of a train in another block, or to entirely stop the progress of the second train when it arrives in proximity to the block occupied by the first train.

Still another object of the invention is to provide an improved automatic electrically operated block system for the control of trains, wherein a train in one block is enabled to control the power supply of another block to cause a train therein to proceed at a reduced speed, and also to disconnect the power supply from a third block so as to stop the progress of any train that may be therein.

Another object of the invention is to provide an improved signal system cooperating through a mechanism associated in a novel manner with the train control mechanism whereby a train in one block may cause the display of a warning signal in another block subjected to automatic train control.

Another object is to provide improved inter-locking electro-magnetic control mechanisms for effecting automatic train control and signal display in one block by a train in another block.

Other objects will be in part pointed out in connection with the following detailed description of an illustrative but preferred embodiment of the invention, and will be in part obvious in connection therewith.

For a more complete understanding of the nature and objects of the invention, reference is had to the following detailed description of the preferred embodiment, and to the accompanying drawings, in which:

Fig. 1 is a diagrammatic view of a block system embodying the invention, and

Figs. 2, 3, and 4 are diagrammatic views of one of the power and signal controlling units, the operative elements being shown in different positions in the different views.

Referring to the drawings for a detailed description of the embodiment of the invention there shown, a section of track for a toy or similar railway train is shown in Fig. 1, including a continuous metallic track rail 10 and spaced therefrom, a sectional metallic track rail 11. The track is divided into a plurality of sections or blocks indicated in the drawing as blocks A, B, C, D and E, and there may be as many of these blocks as desired. Also the blocks may be arranged in manners different from that shown in the drawing; for example, one or more of the blocks may be represented by a cross-over or cross-tracks, or by a switch where one track joins another track.

The track rail 11 is made up of a plurality of sections 11^A, 11^B, etc., positioned in the respective blocks, and insulated from each other, each section preferably being coextensive with the block in which it is located.

A sectional third rail or conductor 12 is also provided, being made up of a plurality of sections 12^A, 12^B, etc., insulated from each other, and each being coextensive with its respective block. This conductor or third rail may be positioned adjacent to the track rails 10 and 11 between the latter, or it may be positioned in some other convenient position for contacting with a collector shoe or

trolley carried by a train. Both track rails 10 and 11, and the third rail 12, are adapted to carry electric current, and therefore are preferably insulated from the ground. Train T^1 is diagrammatically represented as positioned in block B and a similar train T^2 is shown in block E, the direction of movement being indicated by the arrows.

It will be understood that each train or locomotive T^1, T^2, carries a contact shoe, or similar contact or trolley, which slidably engages with the third rail for collecting power therefrom. A power supply conductor or bus bar 13 leads from a source of power P, and another similar conductor 14 leads from said source to the rail 10, to which it is electrically connected.

The conductor 13 may extend along the track and supplies propelling energy through branch power circuits to each of the blocks of the system, and also supplies energy to certain power controlling apparatus through branch power controlling circuits.

As shown in Fig. 1, the third rail conductor 12^B is energized for supplying train propelling energy to the train in block B through the branch power circuit including the conductor 15^B electrically connected to rail section 12^B, contact 16^B, conductor 17^B, contact 18^B, and conductor 19^B connected to the bus bar 13. It will be clear also that the other blocks are supplied with train propelling energy by similar power circuits including a similar arrangement of conductors and contacts which, for convenience, are similarly designated in the different blocks by the same reference numerals with characteristic indices.

The power control mechanisms are similar for each of the blocks. This control mechanism for block C, for example, includes the electro-magnets, or solenoids 20^C and 21^C. The power controlling circuit for solenoid 20^C includes the conductor 22^C electrically connected to track rail section 11^B, and conductors 23^C, 24^C and 19^C, the latter being connected to the bus bar 13. The power controlling circuit for solenoid 21^C includes conductor 22^B connected to track rail section 11^A, conductors 25^C, 26^C and 19^C. The power circuit contacts 16^C are connected to solenoid 20^C so as to be opened when the solenoid is energized and to be closed when the solenoid is de-energized. These contacts will be moved to closed position by a biasing mechanism, either by a spring or by gravity, as more fully disclosed below. Similarly the power circuit contacts 18^C are connected for operation by the solenoid 21^C in the same manner.

Resistance units 27^B, 27^C, etc., are connected across the respective contacts 18^B, 18^C, etc., whereby they will be thrown into the power supply circuits whenever the controlling solenoids 21^B, 21^C, etc., are energized, thus reducing the energy which will be supplied to propel a train in a block thus affected, and causing train to proceed at a reduced speed.

The arrangement of the power supply circuit and also the arrangement for the power controlling circuit are the same in each block, and the arrangement for all of the blocks will be understood from the foregoing detailed description in connection with the description of the operation of the system given below.

Referring to Figs. 2, 3, and 4, the parts shown therein corresponding to those shown in Fig. 1 are designated by the same reference to numerals, with the index letter omitted. These views show different operative positions of one of the power and signal controlling units such as may be utilized in each block of the system. The power circuit controlling apparatus including the solenoids 20, 21, contacts 16, 18, resistance unit 27, and accessory parts, together with the signal mechanism presently to be described, may be mounted together in an appropriate frame or casing forming a unit which may be installed in the block and connected up thereto as described. Binding posts or terminals 28 may be employed upon each control unit, to which short conductors lead from the solenoids and contacts; these terminals serve to connect the unit operatively in the system. An additional pair of terminals 29 may be employed for supplying energy to light a signal lamp used in connection with the semaphores, or for the connection of other control apparatus.

The solenoids 20, 21 are provided with cores 30 and 31, respectively, to which signal and contact operating links or rods 32 and 33 are respectively connected. The operating rod 32 is connected to a movable contact block 34, positioned adjacent to the fixed contacts 16 and the operating rod 33 is similarly connected to a movable contact block 35 positioned adjacent to the fixed contacts 18. These contact blocks may be constructed or faced with carbon in order to reduce arcing and are biased to close the contacts either by gravity through the semaphore mechanism, or otherwise.

Signals such, for example, as semaphores 36, 37 are preferably mounted in combination with each controlling unit and may be pivoted as at 38 to a standard or tubular column (not shown) carried by the unit and rising thereabove. The semaphore arm 36 preferably carries a red glass window 39 and a green glass window 40, and the arm 37 may carry an orange glass window 41 and a green glass window 42. A lamp may be positioned adjacent each semaphore arm, so as to illuminate the green windows when the arms are inclined downwardly, as in Fig. 2, and to display red and orange lights respectively when the arms are positioned horizontally, as in Fig. 3. The solenoid link 32 is connected to or forms an extension of a signal

operating rod 43 operatively connected to the semaphore arm 36, and solenoid link 33 similarly forms an extension of an operating rod 44 connected to the semaphore arm 37, whereby the arms are operated to assume horizontal position when the solenoids are energized. The signal operating rods 43 and 44 are preferably positioned near to each other so as to be housed in a tubular standard or the like and an interlocking connection is provided between these operating rods. In the embodiment shown this interlocking connection is represented by the lug 45 attached to the rod 43 and extending in position to engage with an offset part 46, forming a lug upon the rod 44. It will thus be seen, referring to Fig. 2, that downward movement of the rod 43 caused by energizing the solenoid 20, will cause simultaneous downward movement of the operating rod 44, moving both semaphore arms into horizontal position, whereas energizing the solenoid 21 will move the semaphore arm 37 to horizontal position without affecting the position of arm 36. It will be understood that the semaphore arm 36 is the danger signal arm, and that the arm 37 is the caution signal arm.

The nature and objects of the invention having been stated, and an illustrative embodiment of the invention having been set forth in detail, the operation of the improved mechanism will now be clear to those skilled in the art.

Assuming a train to be in the block B of the track, as indicated diagrammatically at T^1 in Fig. 1, electric energy will be conducted from the source P to the train to furnish propelling power thereto through the following circuit: feed wire 14, track rail 10, locomotive or train wheels T^1, through the motors of the locomotive and the third rail shoe to third rail section 12^B, conductor 15^B, contacts 16^B, conductor 17^B, contacts 18^B, and conductor 19^B to bus bar 13. It is assumed also that at this time there is no train or other vehicle in block A and the block immediately preceding block A and therefore the solenoids 20^B and 21^B will be de-energized and contacts 16^B and 18^B consequently closed. The motors of the train or locomotive T^1 will therefore receive energy at full voltage, and the train will proceed at full speed in block B. When the train is in block B, as assumed, the control solenoid 20^C of block C is maintained energized through the following circuit: conductor 14, track rail 10, locomotive wheels T^1, track rail section 11^B, conductors 22^C, 23^C, solenoid 20^C, and conductors 24^C, 19^C, to bus bar 19. This energization of solenoid 20^C opens the contacts 16^C, thus breaking the power supply circuit to the block C. Propelling energy will therefore be cut off from any train that may be at that time in block C, and this train will, therefore, come to rest in block C. So long as a train remains in block B the power supply will be cut off from block C, thus preventing a rear end collision with a train in block B.

Energization of the solenoid 20^C sets the corresponding semaphore arm 36 in horizontal position, and also sets arm 37 in horizontal position through the interlocking connection 45; this displays a danger signal in block C. At this time solenoid 21^C is de-energized unless a train chances to be in block A. It will be understood that the block C just referred to may be positioned adjacent to block B where the train is located, or it may be positioned elsewhere at the rear of block B, or it may be an intersecting track or a switch of a joining track.

Assuming the train T^1 to be still in block B, as above, the solenoid 21^D will be energized through the following circuit: conductor 14, track rail 10, locomotive wheels, track rail section 11^B, conductors 22^C, 25^D, solenoid 21^D, and conductor 19^D, thereby opening the contacts 18^D and thus introducing the resistance 27^D into series with the power supply circuit of block D. A train in block D will, therefore, receive energy at a decreased voltage, and will proceed at a reduced speed. The semaphore arm 37 in block D will then be set into horizontal position, displaying the orange cautionary signal in block D, but the arm 36 will not, at this time, be moved from its downwardly inclined position, since block C is assumed to be clear and solenoid 20^D is de-energized.

Assuming both blocks C and D to be clear, block E will be fully energized, since both solenoids 20^E and 21^E will be de-energized, and contacts 16^E and 18^E will remain in closed position. The train T^2 in block E may therefore be in motion at full speed, and may continue at full speed until it enters the block D, whereupon it will slow down automatically, due to the fact that the resistance 27^D is at that time in series in the power supply circuit, and it will proceed through block D at this decreased speed, entering block C, whereupon the power supply will be discontinued and the train will stop. The train will remain stopped in block C until train T^1 clears the block B, whereupon train T^2 will again proceed at reduced speed. Whenever a train is proceeding in any block at the reduced speed, the caution signal will be displayed in that block, and when the train is stopped, due to discontinuance of its power supply, in any block, the danger signal will be displayed in that block.

Since certain changes may be made in the above construction, and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing, shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an automatic train control system, in combination, a track divided into separate blocks or sections, power conductors insulated from each other for delivering energy to a train in different sections of said track, mechanism controlled automatically by a train in one track section to deliver a decreased amount of power to a second track section spaced at least one section from that containing the controlling train so as to automatically operate a train therein at a reduced rate of speed, and mechanism controlled automatically by a train in said one track section to cut off the power from a third track section positioned adjacent to the section containing the controlling train so as to prevent a train in said third section from receiving propelling energy.

2. In an automatic train control system, in combination, a track, power conductors insulated from each other for delivering energy to a train in different sections of said track, mechanism controlled automatically by a train in one track section to deliver a decreased amount of power to a second track section so as to automatically operate a train therein at a reduced rate of speed, mechanism controlled automatically by a train in said one section to cut off the power from a third section so as to prevent a train therein from receiving propelling energy, signal mechanism operated by one of said automatically controlled mechanisms for simultaneously displaying a caution signal in said second track section, and signal mechanism operated by another of said automatically controlled mechanisms for simultaneously displaying a danger signal in said third track section.

3. In an automatic train control system, in combination, a track divided into a plurality of sections or blocks, each block including a plurality of block conductors insulated from each other and from the other corresponding conductors of the other blocks, a power supply circuit for supplying propelling energy to a train in one block and including one of the insulated conductors thereof, a power control circuit for a second block connected in parallel with said power circuit and including another insulated conductor of said one block, a power circuit for said second block, a resistance adapted to be introduced into said second power circuit and an electro-magnetic circuit controlling mechanism in said power-controlling circuit automatically controlled by a train in said one block to introduce said resistance into said second power circuit.

4. In an automatic train control system, in combination, a track divided into a plurality of sections or blocks, each block including a plurality of block conductors insulated from each other and from the corresponding conductors of the other blocks, a power supply circuit for supplying propelling energy to a train in one block and including one of the insulated conductors thereof, a power control circuit for a second block connected in parallel with said power circuit and including another insulated conductor of said one block, a power circuit for said second block, a resistance adapted to be introduced into said second power circuit, an electro-magnetic circuit controlling mechanism in said power controlling circuit automatically controlled by a train in said one block to introduce said resistance into said second power circuit, a power circuit and a controlling circuit therefor for a third block positioned adjacent to the said one block containing said controlling train, and an electro-magnetic circuit controlling mechanism in said last mentioned controlling circuit automatically controlled by a train in said one block to disconnect the power supply from a train in said third block.

5. In an automatic train control system, in combination, a track divided into a plurality of sections or blocks, each block including a conducting rail section insulated from the other rail sections, and a conducting third rail section insulated from the other third rail sections, a power supply circuit for supplying train propelling energy to each of said blocks, and including one of said insulated conducting rails therein, and a power controlling circuit for each of said blocks connected in parallel with the respective power circuits thereof and including the other said insulated rail section respectively of each of said blocks.

6. In an automatic train control system, in combination, a track divided into a plurality of sections or blocks, each block including a block conductor insulated from the other block conductors, and a second block conductor insulated from the other second block conductors, a power supply circuit for supplying train propelling energy to each of said blocks, and including one of said insulated block conductors therein, a power controlling circuit including parallel branches for each of a plurality of said blocks including the other said insulated block conductor respectively of each of said blocks, and an electro-magnetic circuit controlling mechanism in each of the parallel branches of each of said controlling circuits automatically controlled by a train in one block to control

power supply to a plurality of other blocks.

7. In an automatic train control system, in combination, a track divided into a plurality of sections or blocks, each block including a block conductor insulated from the other block conductors and a second block conductor insulated from the other second block conductors, a power supply circuit for supplying train propelling energy to each of said blocks, and including one of said insulated block conductors therein, and a power controlling circuit including parallel branches for each of a plurality of said blocks including the other said insulated block conductor respectively of each of said blocks, a resistance connected so as to be introduced into one of said power circuits, and an electro-magnetic circuit controlling mechanism connected in each of the parallel branches in each of said controlling circuits automatically controlled by a train in one block to disconnect the power from a second block and to introduce said resistance into the power supply circuit to a third block.

8. In an automatic train control system, in combination, a plurality of blocks, a power supply circuit for each block, resistances adapted to be connected in series respectively with said power circuits, and a control circuit for the power supply circuit of each of said blocks respectively under automatic control by a train in each respective block to open said power supply circuit for one block and to introduce certain of said resistances in the power circuit of another block.

9. In an automatic train control system, in combination, a plurality of blocks, a power supply circuit for each block, two power control circuits for each power supply circuit, an electro-magnetic power circuit controlling device in each of said power controlling circuits, a signal connected to each of said electro-magnetic controlling devices for operation thereby, and means for simultaneously operating a plurality of said signals by energization of only one of said electro-magnetic controlling devices.

10. In an automatic train control system, in combination, a plurality of blocks, a power supply circuit for each block supplying train propelling power thereto, a power control circuit for each power supply circuit, an electro-magnetic power circuit controlling device in each of a plurality of said power controlling circuits, a signal connected to each of said electro-magnetic controlling devices for operation thereby and inter-locking operating connections between a plurality of said electro-magnetic controlling devices to effect control of a plurality of said signals by energizing one only of said electro-magnetic devices.

11. In an automatic train control system, in combination, a plurality of blocks, a power supply circuit for each block supplying train propelling power thereto, a power control circuit for each power circuit, an electro-magnetic power circuit controlling device in each of a plurality of said power controlling circuits, a signal connected to each of said electro-magnetic controlling devices for operation thereby, and inter-locking operating connections between a plurality of said electro-magnetic controlling devices to control one only of said signals when one of said electro-magnetic devices is energized but to effect control of a plurality of said signals when another electro-magnetic device is energized.

12. In an automatic train control system, in combination, a track divided into blocks or sections, means for driving a vehicle in one block, means controlled by a vehicle in said one block for driving at a reduced speed a vehicle in another block spaced at least one block from that containing the controlling vehicle, and means simultaneously controlled by said first mentioned vehicle to discontinue operation of a vehicle in a block adjacent to that containing the controlling vehicle.

In testimony whereof I affix my signature.

ANTONIO M. CONTI.