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DOORLOCK MECHANISM FOR MULTIPLE UNIT CAR DOOR CONTROL SYSTEMS

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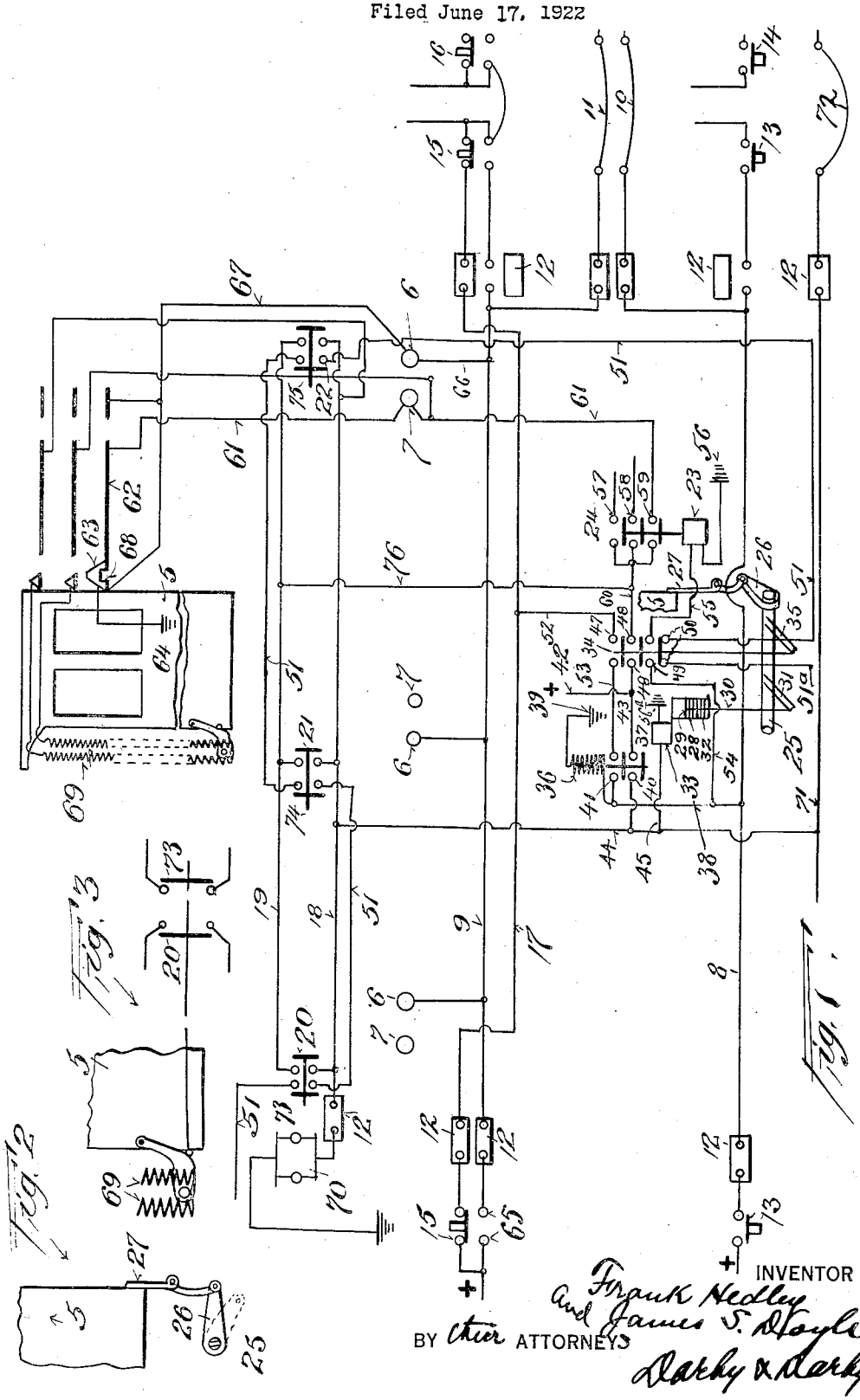


Fig. 1.

Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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DOORLOCK MECHANISM FOR MULTIPLE-UNIT CAR-DOOR-CONTROL SYSTEMS.

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To all whom it may concern:

Be it known that we, FRANK HEDLEY and JAMES S. DOYLE, both citizens of the United States, and residents, respectively, of Yonkers and Mount Vernon, in the county of Westchester, State of New York, have made a certain new and useful Invention in Doorlock Mechanism for Multiple-Unit Car-Door-Control Systems, of which the following is a specification.

This invention relates to door lock mechanism for use in multiple unit car door control systems.

The object of the invention is to provide means for mechanically locking the doors of a car or a train in their closed position, and to control the application and release of the locks.

A further object of the invention is to provide a door lock mechanism of the nature referred to for use in connection with a multiple unit door control system.

A further object of the invention is to provide a positive lock for each door of a car or train, which is independent of the supply of actuating medium to the door operating motors.

A further object of the invention is to provide a control system for a door lock mechanism of the character referred to, which effects the automatic operation of the lock device to locking position when the last door of the car or train subject to multiple unit door control operation reaches its closed position.

A further object of the invention is to so correlate the operations of the door locking device, the door operations and the motorman's starting signal, as to insure against the train or car being started before all of the doors are in closed position and the locks are in full locking position.

A further object of the invention is to provide a door locking mechanism for use in connection with the multiple unit control system for door actuating motors, wherein, when the car or train is in motion, no current is supplied to the train line wires or jumper connections employed in connection with the system.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location and relative arrangement of parts all as will be more fully hereinafter set forth as shown in the accompanying drawing and finally pointed out in the appended claims.

Referring to the drawing,—

Fig. 1 is a view in diagram illustrating the door lock mechanism embodying the principles of our invention as applied to a door in a multiple unit operating door control system;

Fig. 2 is a broken detail view in diagram illustrating the application of a door lock device for positively locking and retaining a door in its closed position;

Fig. 3 is a broken detail view in diagram illustrating means for controlling the motorman's signal and lock circuits by the door movements.

In accordance with the principles of multiple unit car door control systems, the operation of the doors of one or more cars of a train comprising a group or multiple of cars is controlled from the same control station, which may be located at any convenient point on any car included in the group or multiple. In this system it is important that the doors be positively secured or locked in their closed positions to prevent the danger of accident to passengers through the accidental or other untimely opening of the doors, or any of them, while the train is in motion. It is among the special purposes of our present invention to provide means, in a multiple door control system, therefore, under the control of the operator of each group or multiple of car doors, to positively lock each door in its closed position.

We also propose to control the lock mechanism for the doors in multiples or groups of cars of the train corresponding to the control of the door operations in multiples or groups of cars, each group or multiple consisting of one or more cars, and from the same control station from which the door operations are controlled.

We also propose, in accordance with our invention, to provide a locking system wherein the door locks are so arranged that the closing of the last door of the group or multiple of cars included in the control system controls the actuation of the locks into their locking positions, thereby insuring against the possibility of the lock devices jamming against the doors when open or partially open.

We also propose to interlock the control of the door locks with the circuits concerned in the door opening operations so as to in-

sure the withdrawal of the locks before the door opening movements commence.

We also propose to combine the door locking and operating circuits with a motorman's, as well as with door control station signals, so that the motorman's signal to start his train will not be given until all the doors of the train are closed and locked, and so that each door control station attendant will be informed when all the doors within his control are closed and locked.

We also propose to provide means, in a door operating and locking system of the nature referred to wherein when all the doors are closed and locked, no current is supplied to any train line circuit or jumper connections of the operating and locking systems, thereby eliminating the possibility of short circuiting or gounding wires which might cause untimely operation of the doors or locks.

We have shown in diagram in Fig. 1 the wiring and switch arrangements concerned in the operation of a single door on one car of a train, with jumper connections for coupling up electrically to like wiring on an adjacent car. The description of the wiring connections diagrammatically shown will, of course, apply to the circuit arrangements employed on each car included in the multiple or group of cars, the door movements and locks of which are to be controlled, according to the principles of the multiple unit car control system.

Referring to the drawing, reference numeral 5 designates a portion of a door, shown in this instance as a door of the sliding type such as is commonly employed in cars or trains. Our invention, of course, is not to be limited or restricted in this respect. It is also to be understood that each door is operated by a power mechanism into its open and closed positions. We have not shown the motor for operating the door 5, but have indicated diagrammatically at 6 a device which controls the closing movement of the door, and at 7 a device for controlling the opening movement of the door. According to present practice, the devices 6 and 7 are magnets which operate or control the operation of valves for controlling the supply of pressure medium to pneumatic motors which are geared or otherwise suitably connected to the door for actuating it. We will refer, therefore, to the devices 6 and 7, respectively, as door closing and door opening magnets. To avoid complications, in the illustration we have shown the wiring connection for the door closing and door opening magnets for the motor which operates only one door. Each car, however, will be equipped with two or more doors and an operating motor for each having a door closing magnet 6, and a door opening magnet 7. Each car has a door opening control line wire 8, and a door closing line wire 9, the continuity of which throughout a train or group of cars is effected through the jumpers 10, 11, and to which lines current is supplied from any convenient source. If desired, each train line 8, 9, on each car, may be equipped with control cut-out switches as indicated at 12. These switches are manually operated, and are located at any desired point in the circuits on each car, and are designed to be locked by an attendant in proper position when applied for use and operation of the system. In the arrangement shown the cut-out switches 12 are in their closed position at the left hand end of Fig. 1, this being assumed to be the door and lock control station for a group or multiple of cars, and are shown open in corresponding positions at the right hand end of said figure, that is, at the non-operating end of the car. At each end of each car is located a normally open push button or other suitable closure device 13, for completing the car door opening conductor circuit 8 to current source. We will refer to this switch device as the door opening control button. A similar button 14 is indicated at the right of Fig. 1 as being on an adjacent car. Likewise at each end of each car is a switch device 15, associated with the door closing operations, which we will refer to as the door closing button. The corresponding button on the approximate end of an adjacent car is indicated at 16. Associated with the circuit of the door closing conductor 9, on each car is also a conductor which we will refer to as a relay retaining conductor 17, and in the arrangement shown the door closing buttons or switches 15 are arranged in this relay retaining conductor. These closing buttons are normally closed in the relay retaining circuit and open in the door closing circuit.

Located on each car are signal circuit conductors 18, 19, with associated door operated switch devices indicated at 20, 21, 22, which are closed when their associated doors are open, and are opened when the said doors are closed. Carried by each car is a switch controller indicated at 23. This device may be either pneumatically or electrically operated, or a combined electro-pneumatic device, and is a common appliance at present in general use. In the present instance it controls a switch device indicated generally at 24, through which the circuit connections to the door motor controller opening magnets 7 are controlled, as will be more fully hereinafter explained. Mounted upon each car, and usually extended longitudinally thereof, is a rock shaft 25. Connected to this shaft is a crank arm 26, to which is pivotally connected a lock bar 27, one for each door, arranged to engage behind the edge of the door remote

from the door jamb, when the door is closed and the lock is in its locking position, to mechanically and positively lock and retain the door in its closed position. The rock shaft 25 may be rocked in any suitable or convenient manner to effect the withdrawal of the lock device from locking position, or to actuate the same into locking relation with respect to the door, and it is among the special purposes of our present invention to control the operation of the lock device so as to secure and attain the objects and purposes of our invention as above pointed out.

The actuation of the lock devices may be effected, under the desired control, either electrically or pneumatically, or otherwise. In one embodiment of our invention we have shown an air cylinder 28, within which operates a piston 29, the rod or stem 30 of which is connected to a crank arm 31 on shaft 25. A spring 32 normally maintains the piston 29 in one limit of its travel in the cylinder 28, and in position to rock shaft 25, in a direction to effect the release of the lock devices 27 from the doors. When air pressure is supplied to the cylinder, the piston 29 is actuated from its normal position and against the action of spring 32, so as to rock the shaft 25, and thereby actuate the lock devices into locking position. The supply and exhaust of pressure medium to and from the cylinder 28 may be controlled in any convenient manner. We have indicated at 33 a magnet for effecting such control. Suitably actuated coincidently with the rocking movements of shaft 25, is a switch device indicated generally at 34, shown in this instance as being actuated from the crank arm 35 on the said shaft. The switch device 34 controls suitable circuit connections, as will be more fully hereinafter explained. A relay magnet 36 operates a switch device indicated generally at 37, which controls suitable circuit connections concerned in the control of the door operating and lock mechanisms, as will be hereinafter described.

We will now describe the circuit connections and operation and functioning of the various elements of the system. Assuming the manually operated cut-out switch devices 12 to be in the positions as shown, with the closing buttons 15 in their normal closed position, and the opening buttons 13 in their normal opened position, with doors closed, and the lock devices 27 in locking relation with respect thereto, the operator, at the control station for the car or group constituting a multiple of units of cars according to the multiple unit system, closes the opening button 13. Thereupon current is supplied from trolley or other convenient source as indicated by the plus sign to conductor 8, and thence throughout the train or group of cars through the jumper connections 10 intermediate the cars constituting the group to be controlled. On each car the closing of conductor 8 to current source closes circuit through wire 38 and relay magnet 36 to ground at 39, thereby energizing all the magnets 36 throughout the multiple of cars. This actuates switch 37 on each car to close circuit connection between contacts 40 and between contacts 41. The closing of contacts 40 on each car of the multiple completes a circuit from current source through conductor 42, wire 43, contacts 40, conductor 44, conductor 45, magnet 33, to ground at 56^a. This actuates the motor employed to rock shaft 25. That is, in the instance illustrated, it opens a valve which controls the exhaust of pressure medium from cylinder 28, thereby enabling the spring 32 to move the piston 29, thereby effecting the rocking movement of shaft 25 in a direction to withdraw the lock devices 27 from engaging relation with respect to the doors 5. This operation takes place on each car included in the multiple. The actuation of shafts 25 also operates switches 34 for each car, thereby closing circuit between contacts 47, between contacts 48, and between contacts 49, and opening circuit between contacts 50. These latter contacts are normally closed when shaft 25 on each car is in its normal position, thereby closing circuit connections between conductors 51, 51^a, forming part of the motorman's series signal circuit, which circuit is closed to the motorman's signal only when all of the doors throughout all of the cars of the train are in their closed positions. The closing of contacts 47 closes a retaining circuit for magnet 36 on each car, from current source through the normally closed closing button 15, wire 17, wire 52, contacts 47, wire 53, contacts 41, magnet 36, to ground at 39. This retains the switch device 37 closed so that the operator need not continue to hold the opening button 13 in closed position. The closing of contacts 49 also completes a circuit through the closing button 15, wire 17, wire 52, contacts 47, wire 53, contacts 41, wire 38, through wire 54, contacts 49, wire 55, and car door controller device 23, to ground at 56, thereby actuating the controller 23, and hence closing the switch 24. The closing of switch 24 on each car closes circuit between the contacts 57, contacts 58 and the contacts 59, respectively. These contacts 57, 58, 59, are, respectively, in the circuit of the door opening magnets 7. We have shown the circuit connection through only one of these, but the arrangement is identical for each. The closing of switch 24 completes circuit from trolley or other source through conductor 42, contacts 48, conductor 60, contacts 57, 58 and 59, through the several door opening

magnets 7. We have shown one of these circuits continuing from contacts 59 through conductor 61, door opening magnet 7, door contact strip 62, bridge device 63, to ground at 64. Thereupon, the door lock device 27 having been withdrawn upon the actuation of shaft 25, as above explained, the door commences its opening movement, and continues such movement until it reaches its complete open position. When the door reaches its completely open position, the bridge member 63 rides off contact strip 62, thereby opening the circuit of opening magnet 7. The movement of shaft 25 to withdraw the door lock devices 27, causes the motorman's series signal circuit 51, 51ª, to be opened through contacts 50, as above described, and hence the motorman is made aware through the breaking of this circuit that the doors, or some one or more of them, throughout the train, are unlocked. The circuits of magnets 36 remain closed through the respective retaining circuits by reason of the fact that door closing button 15 remains closed, and hence said circuits remain completed through switch device 24, and the door opening magnets 7, on all the cars included in each multiple of cars to be controlled from the same control station, as well as through lock control magnet 33, and hence also the switch device 34, remain in position to open contacts 50 and to close contacts 47, 48 and 49.

Now, assuming the doors of the cars of a group or multiple, or those on one side of such cars, have been opened, as above described, if it is desired to close them, the operator depresses the closing button 15 at the control station. The first effect is to open the retaining circuit which includes conductor 17 and 52, through contacts 47, and through conductor 53, contacts 41, and retaining magnet 36, on each car. The instant this retaining magnet circuit is open, contacts 41 of the switch device 37 open. This, however, as will be explained later, does not open the circuit of contacts 40, and hence the door lock magnet 33 remains energized, and the motor 28 remains actuated to hold shaft 25 in position to maintain the locking member 27 in unlocking position, and the switch device 34 closed. The same actuation of closing push button 15 closes circuit thereby through contacts 65, thereby closing the door closing circuit 9, throughout the multiple of cars under control to current supply. This completes circuit through conductor 9, conductor 66, closing magnet 6, conductor 67, contact strip 68, bridge member 63 to ground at 64. The door thereupon starts to close. If in closing the front edge of the door encounters an obstruction, the contact members 69 ordinarily carried in a yielding shoe at the front edge of the door, close upon each other, thereby, according to well established practice, effecting a reversal of the door operating motor to cause the door to re-open in a well understood way, thereby preventing injury or accident to boarding or alighting passengers by reason of being caught or pinched between the advancing edge of the door and the door jamb during the closing of the door.

It may sometimes be desirable to indicate to the attendant at the control station whether or not any door on any car of the multiple or group controlled from his station is open. To accomplish this result, we have shown a signal device 70, which is to be located at the control station, and which is included in the circuit of conductor 18. This conductor is bridged to conductor 19 by contact devices 20, 21, 22, which are respectively controlled by the doors in such manner that when each door is moved towards its open position, its associated contact 20, 21, or 22, is closed, and when the door reaches its completely closed position, said contact is opened. Therefore, when any one of said contacts is closed, that is, when any door is moved towards open position, the attendant's signal is operated to disclose the fact that some one or more of the doors under his control is unlocked and has moved towards open position. When all of the doors under his control are closed and locked, then all of the switches or contacts 20, 21, 22, are opened, and this condition is likewise revealed by the signal device 70, at the control station. The system of control station signal throughout the multiple of cars controlled from the same station is extended to all the cars of the multiple through the conductors 44, and train line wire 71, and jumper connection 72.

We have referred to the motorman's series signal circuit including the conductors 51, 51ª, and the contacts 50. This circuit includes in series a number of switches which are individually controlled by each door throughout the train, and so arranged that it is completely closed only when all the doors throughout the train are in closed position, and is opened when any door is moved towards open position. A convenient arrangement is shown wherein we have associated on each car, and with each door thereof, a switch device 73, 74, 75, which is connected up in series in the circuit 51, 51ª, which extends through like switch devices on both sides of each car throughout the train. The several door switches 20, 21, 22, and 73, 74, 75, may be associated together, as indicated in Fig. 3, wherein the relation of switches 20 and 73 is shown, said switches being suitably connected to the door in such manner that when the door begins to move towards open position, switch 20 closes, and switch 73 opens, and when the door reaches

its completely closed position, switch 20 opens and switch 73 closes.

It is desirable to restrain all the door locks in withdrawn position until all the doors of the multiple or group under control are in their closed position. We, therefore, propose, in accordance with our invention, to maintain the door lock magnets 33 energized, and shaft 25 rocked into lock releasing position until all the doors are closed. For this purpose we connect the wires 44 and 76 across the station signal circuit wires 18, 19, thereby supplying current from trolley or other source through wire 42, contacts 48, wire 60, wire 76, wires 19, 18, to wire 44, wire 45, and lock magnet 33, to ground. This circuit remains completed as long as any one of the door contacts 20, 21, 22, remains closed. Since these contacts remain closed until their respective doors are closed, it will at once be seen that the door locks are held out of locking position until the last door of the multiple closes. This opens the circuits of lock magnets 33, and hence the locks are then actuated into locking position without danger of jamming against an open or partially open door.

While we have referred to the series circuit which includes the switch devices 73, 74, 75, as a motorman's signal circuit, it is obvious that this circuit may be employed to control the starting of the train propelling motor or motors.

Many variations and changes in the details will readily occur to persons skilled in the art and still fall within the spirit and scope of our invention.

We do not desire, therefore, to be limited or restricted to the exact details shown and described, but having now set forth the objects and nature of our invention, and means to carry the same into practical effect and operation, what we claim as new and useful and of our own invention, and desire to secure by Letters Patent, is:

1. A car having doors, a locking device for each door, and means to simultaneously lock all of the doors only when all the doors reach position to be locked.

2. In a car having doors, a locking device for each door, and means to simultaneously lock all of the doors in closed position, said means operating only when all the doors reach their closed position.

3. In a car having doors, a locking device for each door, means to simultaneously lock all of the doors in closed position, said means operating only when all the doors reach their closed position, and means to simultaneously release all of the locks.

4. In a car having doors, a locking device for each door, and means to actuate all of said locking devices into locking position only when all the doors are in closed position.

5. In a car having doors, a locking device for each door, and means operating automatically only when all the doors reach position to be locked for actuating the locking devices into locking position.

6. In a car having doors, a locking device to lock each door closed, and means to automatically actuate the locking devices into locking position only when all the doors reach their closed position.

7. In a car having doors, a locking device for each door, and means to actuate all of said locking devices into locking position only when all the doors are in closed position, and means to simultaneously release said locking devices.

8. In a car having doors, a locking device for each door, and means operating automatically only when all the doors reach positions to be locked for actuating the locking devices into locking position, and means to simultaneously release said locking devices.

9. In a car having doors, a locking device to lock each door closed, and means to automatically actuate the locking devices into locking position only when all the doors reach their closed position, and means to simultaneously release said locking devices to permit the doors to open.

10. A train of cars each having doors, a locking device for each door, and means to actuate the locking devices into locking position in multiples of units of the cars, and only when all the doors of the respective multiples are in position to be locked.

11. A train of cars each having doors, a locking device for locking each door closed, and means to automatically actuate the locking devices into locking position only when all the doors are closed.

12. A train of cars each having doors, a locking device for locking each door closed, and means to automatically actuate the locking devices into locking position in multiple units of the cars, said means, in each multiple, operating only when all the doors of the cars of said multiple are in closed position.

13. A train of cars each having doors, a locking device for each door, and means to actuate the locking devices into locking position in multiples of units of the cars, said means, in each multiple, operating only when all the doors of the cars of said multiple are in position to be locked.

14. A car having doors, and means to lock said doors closed, including a rock shaft carried by the car, connections between said shaft and each door locking means, and means to retain said shaft in position to hold the locking means out of locking position as long as any door of the car remains open.

15. A car having doors, a lock device for

locking each door closed, and means to retain all of the lock devices out of locking position as long as any door remains open.

16. A car having doors, a lock device for locking each door closed, and means to retain all of the lock devices out of locking position as long as any door remains open, in combination with means to control the opening movements of the doors, said means also controlling the release of said locking devices.

17. A car having doors, a lock device for locking each door closed, and means to retain all of the lock devices out of locking position as long as any door remains open, in combination with means to control the closing movements of the doors, and means effective when all the doors are closed to simultaneously actuate all of the locking devices into locking position.

18. A train of cars each car having doors, a lock device for each door, a device to control the closing movement of each door, means to control said door closing devices, said means operating to actuate the door locking devices into locking position only when all the doors reach their closed positions.

19. A train of cars each car having doors, a lock device for each door, a device to control the closing movement of each door, means to control said door closing devices in multiples of units of cars of the train, said means for each multiple also operating to control the actuation of the locks of the same multiple into locking position only when all the doors of said multiple are in closed position.

20. A train of cars each car having doors, a lock device for each door, a device to control the closing movement of each door, means to control said door closing devices in multiples of units of cars of the train, said means for each multiple also operating to control the actuation of the locks of the same multiple into locking position, and means to release said locks, and means to open said doors.

21. A train of cars each car having doors, a lock device for each door, a device to control the closing movement of each door, means to control said door closing devices in multiples of units of cars of the train, said means for each multiple also operating to control the actuation of the locks of the same multiple into locking position only when all the doors of said multiple are in closed position, and means to simultaneously release the locks when the doors are to be opened.

22. A train of cars each having doors, a lock device for each door, devices respectively controlling the door opening and closing operations, a switch device on each car for controlling the door opening devices on the same car therewith, means operated coincidently with the actuation of the door lock devices on each car for controlling said switch device, and means to actuate said lock devices.

23. A train of cars each having doors, a lock device for each door, devices respectively controlling the door opening and closing operations, a switch device on each car for controlling the door opening devices on the same car therewith, means operated coincidently with the actuation of the door lock devices on each car for controlling said switch device, and means to control the actuation of said lock devices in multiples of units of cars of the train.

24. A train of cars each having doors, a lock device for each door, devices respectively controlling the door opening and closing operations, a switch device on each car for controlling the door opening devices on the same car therewith, means operated coincidently with the actuation of the door lock devices on each car for controlling said switch device, and means to actuate said lock devices into locking position only when all the doors are in closed position.

25. A train of cars each having doors, a lock device for each door, devices respectively controlling the door opening and closing operations, a switch device on each car for controlling the door opening devices on the same car therewith, means operated coincidently with the actuation of the door lock devices on each car for controlling said switch device, and means to control the actuation of said lock devices in multiples of units of cars of the train into locking position only when the doors of the respective multiples are in closed position.

26. A car having doors, a lock device for each door, means to control the opening and closing movements of each door, said door opening means being controlled by the actuation of the door lock devices into unlocking position, and a signal circuit arranged to be controlled by the actuation of the door locking devices.

27. A car having doors, a lock device for each door, means to control the opening and closing movements of each door, said door opening means being controlled by the actuation of the door lock devices into unlocking position, and a signal circuit arranged to be controlled by the actuation of the door locking devices, and also by the door movements.

28. A car having doors, a lock device for each door, a switch controlled by each door, means to control from a single control station the opening and closing movements of the doors, said door opening means being controlled by the actuation of the door lock devices into unlocking position, and a signal device at the control station arranged to be controlled by the door controlled switches.

29. A car having doors, a lock device for each door, a switch controlled by each door, means to control from a single control station the opening and closing movements of the doors, said door opening means being controlled by the actuation of the door lock devices into unlocking position, and a signal device at the control station arranged to be controlled conjointly by the actuation of the door locking devices and the door controlled switches.

30. A car having doors, a lock device for each door, a switch controlled by each door, means to control from a single control station the opening and closing movements of the doors, said door opening means being controlled by the actuation of the door lock devices into unlocking position, and a signal device at the control station arranged to be controlled by the door controlled switches to indicate at the control station when any door of the car is open.

31. A train of cars each having doors, a lock device for each door, a switch device controlled by each door, devices respectively controlling the door opening and the door closing movements, means to control the actuation of the door locks in multiples of units of the cars of the train, the actuation of the locks into unlocking position on each car of the multiple controlling the door opening movements on the same car therewith, and a signal device arranged to be controlled by said door controlled switches.

32. A train of cars each having doors, a lock device for each door, electrical devices respectively controlling the door opening and the door closing movements, circuits for said devices, a relay on each car operating when actuated to control the release of the door locks on the same car therewith, and means actuated coincidently with the release of the locks on any car to control the supply of current to the door opening control devices on the same car therewith.

33. A train of cars each having doors, a lock device for each door, electrical devices respectively controlling the door opening and the door closing movements, circuits for said devices, a relay on each car operating when actuated to control the release of the door locks on the same car therewith, and means actuated coincidently with the release of the locks on any car to control the supply of current to the door opening control devices on the same car therewith, and means to control the circuits of the relays in multiple units of cars of the train.

34. A train of cars each having doors, a lock device for each door, electrical devices respectively controlling the door opening and the door closing movements, circuits for said devices, a relay on each car, a motor on each car to actuate the door locks on said car, said relay operating to control said motor, a local circuit on each car arranged to be controlled by the relay for supplying current to the door lock operating motor, and means actuated coincidently with the release of the door locks on any car for controlling a local car circuit for the door opening controller device.

35. A train of cars each having doors, a lock device for each door, electrical devices respectively controlling the door opening and the door closing movements, circuits for said devices, a relay on each car, a motor on each car to actuate the door locks on said car, said relay operating to control said motor, a local circuit on each car arranged to be controlled by the relay for supplying current to the door lock operating motor, and means actuated coincidently with the release of the door locks on any car for controlling a local car circuit for the door opening controller device, and means to control the circuits of said relays in multiples of units of the cars of the train.

36. A train of cars each having doors, a lock device for each door, electrical devices respectively controlling the door opening and the door closing movements, circuits for said devices, a relay on each car, a motor on each car to actuate the door locks on said car, said relay operating to control said motor, a local circuit on each car arranged to be controlled by the relay for supplying current to the door lock operating motor, and means actuated coincidently with the release of the door locks on any car for controlling a local car circuit for the door opening controller device, a train line circuit to control said relays, and means actuated by said relay to establish a retaining circuit therethrough.

37. A train of cars each having doors, a lock device for each door, electrical devices respectively controlling the door opening and the door closing movements, circuits for said devices, a relay on each car operating when actuated to control the release of the door locks on the same car therewith, and means actuated coincidently with the release of the locks on any car to control the supply of current to the door opening control devices on the same car therewith, and a signaling circuit controlled by the movements of the doors.

38. A train of cars each having doors, a lock device for each door, electrical devices respectively controlling the door opening and the door closing movements, circuits for said devices, a relay on each car operating when actuated to control the release of the door locks on the same car therewith, and means actuated coincidently with the release of the locks on any car to control the supply of current to the door opening control devices on the same car therewith, a station signal circuit and a train line signal circuit.

both said signal circuits controlled by the movements of each door.

39. A train of cars each having doors, a lock device for each door, electrical devices respectively controlling the door opening and the door closing movements, circuits for said devices, a relay on each car operating when actuated to control the release of the door locks on the same car therewith, and means actuated coincidently with the release of the locks on any car to control the supply of current to the door opening control devices on the same car therewith, a signal circuit, and switches arranged in series therein, each switch arranged to be controlled by a door.

40. A train of cars each having doors, a lock device for each door, electrical devices respectively controlling the door opening and the door closing movements, circuits for said devices, a relay on each car operating when actuated to control the release of the door locks on the same car therewith, and means actuated coincidently with the release of the locks on any car to control the supply of current to the door opening control devices on the same car therewith, a train signal circuit, switches on each car bridging said circuit, each switch arranged to be controlled by a door.

41. A train of cars each having doors, a lock device for each door, electrical devices respectively controlling the door opening and the door closing movements, circuits for said devices, a relay on each car operating when actuated to control the release of the door locks on the same car therewith, and means actuated coincidently with the release of the locks on any car to control the supply of current to the door opening control devices on the same car therewith, a signal circuit, a local energizing circuit for the signal circuit, said local energizing circuit controlled by the actuation of the door locks, and a switch operated by the movement of each door for controlling said signal circuit.

42. A train of cars each having doors, a lock device for each door, electrical devices respectively controlling the door opening and the door closing movements, circuits for said devices, a relay on each car operating when actuated to control the release of the door locks on the same car therewith, and means actuated coincidently with the release of the locks on any car to control the supply of current to the door opening control devices on the same car therewith, a signal circuit, a local energizing circuit therefor, and means to retain said local energizing circuit closed as long as any door remains open.

43. A car having doors, a lock device for each door, devices respectively controlling the door opening and the door closing movements, a local energizing circuit for the door opening device circuit, a train line energizing circuit for the door closing device circuit, a relay, means controlled thereby for actuating the door locks, said means also controlling the local energizing circuit, and means to control the circuit of the relay.

44. A car having doors, a lock device for each door, devices respectively controlling the door opening and the door closing movements, a local energizing circuit for the door opening device circuit, a train line energizing circuit for the door closing device circuit, a relay, means controlled thereby for actuating the door locks, said means also controlling the local energizing circuit, means to initially control the circuit of the relay, and a retaining circuit for the relay controlled by the actuation of the relay.

45. A car having doors, a lock device for each door, devices respectively controlling the door opening and the door closing movements, a local energizing circuit for the door opening device circuit, a train line energizing circuit for the door closing device circuit, a relay, means controlled thereby for actuating the door locks, said means also controlling the local energizing circuit, a signal circuit, means actuated by the withdrawal of the locks from locking position to connect said local energizing circuit to said signal circuit and to the door opening device circuit, and switches arranged in said signal circuit to be controlled by the door movements.

46. A car having doors, a lock device for each door, devices respectively controlling the door opening and the door closing movements, a local energizing circuit for the door opening device circuit, a train line energizing circuit for the door closing device circuit, a relay, means controlled thereby for actuating the door locks, said means also controlling the local energizing circuit, a signal circuit, means actuated by the withdrawal of the locks from locking position to connect said local energizing circuit to said signal circuit and to the door opening device circuit, and switches arranged in said signal circuit to be controlled by the door movements, and means to retain said local circuit closed as long as any door is open.

In testimony whereof we have hereunto set our hands on this 15th day of June A. D., 1922.

FRANK HEDLEY.
JAMES S. DOYLE.