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(54) **OPERATING MODE CONTROL SYSTEM AND METHOD FOR CONTAINER TRACK POWER FLATCAR**

BETRIEBSMODUSSTEUERUNGSSYSTEM UND VERFAHREN FÜR
CONTAINERSCHIENENLEISTUNGSFLACHWAGEN

SYSTÈME ET PROCÉDÉ DE COMMANDE DE MODE D'EXPLOITATION POUR WAGON PLAT
PORTE-CONTENEUR ALIMENTÉ PAR LA VOIE

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Description

Technical Field

[0001] The invention relates to the field of transport by containers, in particular to an operating mode control system and method for a powered rail flatcar for containers.

Background Art

[0002] Transport by containers can reduce damage to and loss of goods and ensure transportation quality. The goods are loaded into a standard container in a production factory, and the goods can be directly transported to a user through road, railway and water transportation without opening the container. Therefore, the damage to and loss of goods during transportation can be reduced, and the packaging cost can be saved. Container multi-model transportation has the advantages of long industrial chain, high efficiency, rapidness, intensive economy, safety, reliability and the like, and is an important direction for the development of transportation of goods.

[0003] Transport by containers can realize automatic loading and unloading operation and management, which has been realized in port container management system at present. Railway container management and loading and unloading automatic control is still under development in China. Automatic control of railway loading vehicles is required in the automation of loading and unloading operations.

[0004] The existing operating mode of railway loading vehicles is primarily a train operating mode, namely a powered locomotive is coupled up to an unpowered walking mechanism to form a train for operation. Because the whole train is only powered by the locomotive, only the locomotive can be used as a control object of the in-vehicle automatic control system. Other unpowered compartments are respectively distinguished only by the flatcar numbers as identifiers, and can only be operated and controlled by being coupled up to the locomotive. This type of operation is advantageous in the case of passenger trains or long-distance trucks, but as a container loading and uploading station with a complicated working mode, unpowered vehicles require a large number of disorganizing and grouping operations because of different destination information of containers loaded thereon. All the operations need to be completed through hump sliding and shunting operations, a large-area field is needed, and the improvement of the operation efficiency is limited. Both railway loading vehicles and single flatcar operating modes are adopted, the operating destination of the vehicles is clear, but each flatcar is independently controlled, and the transportation efficiency is low.

[0005] It is therefore necessary to achieve railway loading vehicles operating in a variety of operating modes to accommodate a variety of requirements during

transport by containers. US2015/0191186 discloses a rail transport system with convoys automatic composition.

Summary of the Invention

[0006] The invention aims to provide an operating mode control system and method for a powered rail flatcar for containers, and aims to solve the problems that an existing railway loading vehicle is single in operating mode and cannot meet various requirements for transport by containers.

[0007] The invention is implemented as follows:

There are provided an assembly and a method as per the appended claims. The invention provides an operating mode control system for a powered rail flatcar for containers, which comprises an operating mode switching module provided in an in-vehicle control system of the powered rail flatcar for containers. The operating mode switching module is used for issuing a corresponding operating instruction to the powered rail flatcar for containers according to an operating mode instruction issued by a container automatic control system, to control the powered rail flatcar for containers to switch among a single flatcar operating mode, a coupled operating mode, and a train operating mode.

[0008] Further, the operating mode switching module also comprises an automatic coupler control device in communication connection with the operating mode switching module, the automatic coupler control device is used for controlling the coupler of the powered rail flatcar for containers to be automatically coupled or uncoupled with the coupler of the adjacent flatcar according to an instruction issued by the operating mode switching module, and when an instruction of executing a single flatcar operating mode is issued, the coupler of the powered rail flatcar for containers is controlled to be automatically uncoupled with the coupler of the adjacent flatcar; and when an instruction of executing a coupled operating mode or a train operating mode is issued, the coupler of the powered rail flatcar for containers is controlled to be automatically coupled with the coupler of the adjacent flatcar.

[0009] Further, the operating mode control system also comprises a traction power switching device in communication connection with the operating mode switching module, the traction power switching device is used for switching a power source of the powered rail flatcar for containers according to an instruction issued by the operating mode switching module, and when an instruction of executing a single flatcar operating mode or coupled operating mode is issued, the powered rail flatcar for containers is controlled to be driven by a power and traction system of the flatcar; and when an instruction of executing a train operating mode is issued, the powered rail flatcar for containers is controlled to exit from being driven by the power and traction system of the flatcar and pulled by a locomotive. Further, the controlling the powered rail flatcar for containers to be driven by a

power and traction system of the flatcar particularly comprises controlling a power module of the power and traction system of the powered rail flatcar for containers to be connected with a walking mechanism, and the controlling the powered rail flatcar for containers to exit from being driven by the power and traction system of the flatcar particularly comprises controlling a power module of the power and traction system of the powered rail flatcar for containers to be separated from the walking mechanism.

[0010] Further, the operating mode control system further comprises an electrically powered switching device in communication connection with the operating mode switching module, the electrically powered switching device is used for switching the energy storage form of the powered rail flatcar for containers according to an instruction issued by the operating mode switching module, and when an instruction of executing a single flatcar operating mode or coupled operating mode is issued, the power module of the power and traction system of the powered rail flatcar for containers is controlled to store energy itself; and controlling the power module of the power and traction system of the powered rail flatcar for containers to be charged by the locomotive through a power cable.

[0011] On the other hand, the invention also provides a method for controlling operating modes of powered rail flatcar for containers, which comprises the following steps:

receiving, by the in-vehicle control system of the powered rail flatcar for containers, an instruction of executing a single flatcar operating mode, a coupled operating mode or a train operating mode of the powered rail flatcar for containers issued by the container automatic control system, and issuing, by the operating mode switching module, a corresponding operating instruction to the powered rail flatcar for containers according to the instruction of executing the operating mode control the powered rail flatcar for containers to operate in the single flatcar operating mode, coupled operating mode or train operating mode.

[0012] Further, when a single flatcar operating mode of the powered rail flatcar for containers is received by the in-vehicle control system, the method comprises the following steps: issuing, by the operating mode switching module, an instruction corresponding to a single flatcar operating mode to an automatic coupler control device, a traction power switching device and an electrically powered switching device of the powered rail flatcar for containers according to an instruction of executing the single flatcar operating mode of the powered rail flatcar for containers; controlling, by the automatic coupler control device, the coupler of the flatcar to be automatically uncoupled from couplers of other flatcars; and controlling, by the traction power switching device, the powered rail flatcar for containers to be driven by flatcar power and traction system; controlling, by the electrically powered switching device, the power module of the power and

traction system of the powered rail flatcar for containers to store energy itself; and controlling by the in-vehicle control system, the powered rail flatcar for containers to travel to a destination according to a transportation starting point, an operation destination and an operation permission instruction of the container.

[0013] Further, when an instruction of executing a coupled operating mode of a powered rail flatcar for containers is received by the in-vehicle control system, the method comprises the following steps:

controlling, by the operating mode switching module, the powered rail flatcar for containers to reach a designated coupled position according to an instruction of executing a coupled operating mode and a coupled master-slave relationship instruction of the powered rail flatcar for containers, and sending an instruction corresponding to a coupled operating mode to an automatic coupler control device, a traction power switching device and an electrically powered switching device of the powered rail flatcar for containers; and controlling, by the automatic coupler device, the coupler of the flatcar to be automatically connected with a coupler of an adjacent flatcar; controlling, by the traction power switching device, the powered rail flatcar for containers to be driven by the flatcar power and traction system; and controlling, by the electrically powered switching device, the power module of the power and traction system of the powered rail flatcar for containers to store energy itself; controlling, by an in-vehicle control system of the master control flatcar, the power and traction system and the brake system of the slave control flatcar; and controlling, by the in-vehicle control system of the master control flatcar, the powered rail flatcar group for containers to travel to a destination according to a transportation starting point, an operation destination and an operation permission instruction of the container.

[0014] Further, when a train operating mode instruction for a powered rail flatcar for containers is received by the in-vehicle control system, the method comprises the following steps: controlling, by the operating mode switching module, the powered rail flatcar for containers to reach a designated connection position according to an instruction of executing a train operating mode of the powered rail flatcar for containers; issuing an instruction corresponding to a train operating mode to automatic coupler control device, a traction power switching device and an electrically powered switching device of the powered rail flatcar for containers; controlling, by the automatic coupler control device, the coupler of the flatcar to be automatically connected with couplers of adjacent flatcars; connecting groups by a plurality of powered rail flatcar for containers, and coupling up a locomotive to form a train; controlling, by the traction power switching device, the power and traction system of the powered rail flatcar for containers to exit from being driven; and controlling, by the electrically powered switching device, the power module of the power and traction system of the powered rail flatcar for containers to be charged by the

locomotive through the power cable; and pulling, by the locomotive, the powered rail flatcar group for containers to travel to a destination according to a transportation starting point, an operation destination and an operation permission instruction of the container.

[0015] Furthermore, when a plurality of powered rail flatcar for containers are connected through couplers, the brake system, the power cable and the in-vehicle internet of each flatcar of the coupled flatcar group are automatically connected, the in-vehicle control system of each flatcar is connected through the in-vehicle internet, and the brake system of the slave control flatcar is controlled by the in-vehicle control system of the master control flatcar.

[0016] Compared with the prior art, the invention has the following beneficial effects:

the operating mode control system and method for a powered rail flatcar for containers provided by the present invention can implement the switching of the powered rail flatcar for containers among a single flatcar operating mode, a coupled operating mode and a train operating mode, is simple to switch, and can be controlled full-automatically, so that the manpower is reduced and the efficiency is improved. The various operating modes meet various demands in the container transportation process, which is convenient for disorganizing and grouping the containers and improving the transportation efficiency; different operating modes are controlled by different control methods, and each powered rail flatcar for containers or coupled flatcar group is taken as a control object, so that the control mode is flexible, which is a suitable container operating mode, and can greatly improve the efficiency of exchanging the goods in the container during the coupled transportation.

Brief Description of the Drawings

[0017]

FIG. 1 is an overall structural block diagram of a powered rail flatcar for containers according to an embodiment of the present invention;

FIG. 2 is a block diagram of an operating mode control system for powered rail flatcar for containers according to an embodiment of the present invention.

Detailed Description of the Invention

[0018] The technical solutions in the embodiments of the present invention will be clearly and completely described below with reference to the drawings in the embodiments of the present invention, and it is obvious that the described embodiments are only a part of but not all of the embodiments of the present invention. Based on the embodiments of the present invention, all other embodiments obtained by a person skilled in the art without involving any inventive effort are within the scope of the

present invention.

[0019] As shown in FIG. 1, the embodiment of the invention provides an operating mode control system for a powered rail flatcar for containers, wherein the powered rail flatcar for containers comprises a frame structure, a walking mechanism is provided at the bottom of the frame structure, and automatic couplers are provided at two ends of the frame structure and used for being automatically coupled with or uncoupled from couplers of other flatcars. The powered rail flatcar for containers further comprises an in-vehicle control system 1, a power and traction system 2, a brake system 3, a positioning system 4 and a loading state detection system 5 which are provided on the frame structure, wherein the in-vehicle control system 1 is in communication connection with the power and traction system 2, the brake system 3, the positioning system 4 and the loading state detection system 5 through an in-vehicle bus for acquiring the state information of each system in communication connection therewith, and issuing operating instructions to each system according to an operation plan issued by the container automatic control system. The power and traction system 2 comprises a power module for supplying power to the walking mechanism, the power module and the walking mechanism can be coupled or uncoupled, the power mode of the power module is an internal combustion power mode, a storage battery mode or a super capacitor mode, and energy can be stored by the power module or charged by a locomotive through a power cable. The brake system 3 comprises a brake and a brake control device, wherein the brake is controlled by the brake control device to operate according to instructions of the in-vehicle control system 1. The positioning system 4 is used for positioning the powered rail flatcar for containers and comprises an autonomous positioning module and a relative positioning module. The loading state detection system 5 comprises a container loading state detection module and a container number identification module, wherein the container loading state detection module is used for detecting the loading state of the powered rail flatcar for containers and comprises the number and the loading position of the containers loaded on the powered rail flatcar for containers, and the container number identification module is used for identifying the numbers of the containers loaded on the powered rail flatcar for containers. The powered rail flatcar for containers further comprises a communication system 6, wherein the communication system comprises an in-vehicle wireless communication device used for communicating transmission of control data and state information between the powered rail flatcar for containers and the container automatic control system, a vehicle-to-vehicle wireless communication device used for exchanging close-range control information between the two flatcars during coupling or uncoupling between the powered rail flatcars for containers, and in-vehicle internet used for communication between the powered rail flatcars for containers.

[0020] The operating mode control system 7 for powered rail flatcar for containers provided by the embodiment of the invention is used for controlling the operating mode of the powered rail flatcar for containers, and comprises an operating mode switching module 71 provided in an in-vehicle control system 1 of the powered rail flatcar for containers, wherein the operating mode switching module 71 is used for issuing a corresponding operating instruction to the powered rail flatcar for containers according to the operating mode instruction issued by the container automatic control system to control the powered rail flatcar for containers to switch among a single flatcar operating mode, a coupled operating mode and a train operating mode.

[0021] Specifically, the operating mode switching module further comprises automatic coupler control device 72 in communication connection with the operating mode switching module 71, the automatic coupler control device 72 is used for controlling the coupler of the powered rail flatcar for containers to be automatically coupled or uncoupled with the coupler of the adjacent flatcar according to an instruction issued by the operating mode switching module, and when an instruction of executing a single flatcar operating mode is issued, the coupler of the powered rail flatcar for containers is controlled to be automatically uncoupled with the coupler of the adjacent flatcar; and when an instruction of executing a coupled operating mode or a train operating mode is issued, the coupler of the powered rail flatcar for containers is controlled to be automatically coupled with the coupler of the adjacent flatcar. The powered rail flatcar for containers can be controlled to be coupled or uncoupled by the automatic coupler control device 72 according to different operating mode instructions.

[0022] The operating mode control system 7 further comprises a traction power switching device 73 in communication connection with the operating mode switching module 71, the traction power switching device 73 is used for switching a power source of the powered rail flatcar for containers according to an instruction issued by the operating mode switching module 71, and when an instruction of executing a single flatcar operating mode or coupled operating mode is issued, the powered rail flatcar for containers is controlled to be driven by a power and traction system of the flatcar; the controlling the powered rail flatcar for containers to be driven by a power and traction system of the flatcar particularly comprises controlling a power module of the power and traction system of the powered rail flatcar for containers to be connected with a walking mechanism, the device is used for controlling the power and traction system of the flatcar to exit from being driven and pulled by a locomotive when an instruction of executing a train operating mode is issued and the controlling the powered rail flatcar for containers to exit from being driven by the power and traction system of the flatcar particularly comprises controlling the power module of the power and traction system of the powered rail flatcar for containers to be

separated from the walking mechanism. The traction power switching device can control the powered rail flatcar for containers to be driven by different powers according to different operating mode instructions.

[0023] Further, the operating mode control system 7 further comprises an electrically powered switching device 74 in communication connection with the operating mode switching module 71, the electrically powered switching device 74 is used for switching the energy storage form of the powered rail flatcar for containers according to an instruction issued by the operating mode switching module, and when an instruction of executing a single flatcar operating mode or coupled operating mode is issued, the power module of the power and traction system of the powered rail flatcar for containers is controlled to store energy itself; and controlling the power module of the power and traction system of the powered rail flatcar for containers to be charged by the locomotive through a power cable. The traction power switching device can control the powered rail flatcar for containers to store energy itself in different ways according to different operating mode instructions.

[0024] The embodiment of the invention also provides an operating mode control method for the powered rail flatcar for containers, which comprises the following steps:

an instruction of executing a single flatcar operating mode, a coupled operating mode or a train operating mode of the powered rail flatcar for containers issued by the container automatic control system are received by the in-vehicle control system of the powered rail flatcar for containers, and a corresponding operating instruction is issued by the operating mode switching module to the powered rail flatcar for containers according to the instruction of executing the operating mode control the powered rail flatcar for containers to operate in the single flatcar operating mode, coupled operating mode or train operating mode.

[0025] Specifically, when an instruction of executing a single flatcar operating mode of the powered rail flatcar for containers is received by an in-vehicle control system, the method comprises the following steps:

an instruction corresponding to a single flatcar operating mode is issued by the operating mode switching module to an automatic coupler control device, a traction power switching device and an electrically powered switching device of the powered rail flatcar for containers according to an instruction of executing the single flatcar operating mode of the powered rail flatcar for containers; the coupler of the flatcar is controlled by the automatic coupler control device to be automatically uncoupled from couplers of other flatcars; the powered rail flatcar for containers being controlled by the traction power switching device to be driven by the flatcar power and traction system particularly comprises controlling a power module of the power and traction system to be connected with the walking mechanism, and the power module of the power and traction system of the powered rail flatcar for

containers is controlled by the electrically powered switching device to store energy itself; the power and traction system, the brake system and the positioning system are controlled by the in-vehicle control system according to the transportation starting point, the operating destination and the operating permission instruction of the container, to implement advancing, retreating, accelerating, decelerating, reversing, parking and the like of the powered rail flatcar for containers, the powered rail flatcar for containers is controlled to reach a designated position, and continuously report the execution progress and position to the container automatic control system through the communication system.

[0026] In the single flatcar operating mode, the powered rail flatcar for containers operates as an independent transportation unit and a self-contained in-vehicle control system, a power and traction system, a brake system, a positioning system and a communication system are adopted for operation; a single flatcar is controlled by the railway container automatic control system as an independent unit to operate under a single flatcar operating mode. A single flatcar operation by the control system is identified when the number of the first flatcar is the same as the number of the last flatcar.

[0027] Further, when an instruction of executing a coupled operating mode of a powered rail flatcar for containers is received by the in-vehicle control system, the method comprises the following steps:

the powered rail flatcar for containers is controlled by the operating mode switching module to reach a designated coupled position according to an instruction of executing a coupled operating mode and a coupled master-slave relationship instruction of the powered rail flatcar for containers, and an instruction corresponding to a coupled operating mode is sent to an automatic coupler control device, a traction power switching device and an electrically powered switching device of the powered rail flatcar for containers; and the coupler of the flatcar is controlled by the automatic coupler device to be automatically connected with a coupler of an adjacent flatcar, meanwhile, the power cable and the in-vehicle internet of each flatcar of the coupled flatcar group are automatically connected, the in-vehicle control system of each flatcar is connected through the in-vehicle internet; the powered rail flatcar for containers being controlled by the traction power switching device to be driven by the flatcar power and traction system particularly comprises controlling a power module of the power and traction system to be connected with the walking mechanism, and the power module of the power and traction system of the powered rail flatcar for containers is controlled by the electrically powered switching device to store energy itself. The powered rail flatcar group for containers is controlled by the in-vehicle control system of the master control flatcar to travel to a destination according to a transportation starting point, an operation destination and an operation permission instruction of the container, and instructions of operating direction, operating speed, accel-

eration, deceleration, braking and the like are issued to the power and traction system, the brake system and the positioning system of the master control flatcar through an in-vehicle bus of the master control flatcar according to a transportation starting point, an operation destination and an operation permission instruction of a container. Meanwhile, synchronous operating instructions such as operating direction, operating speed, acceleration, deceleration, braking and the like are issued to all in-vehicle control systems of slave control flatcars of the flatcar group through in-vehicle internet; and the power and traction system and the brake system are adjusted by a slave control flatcar according to the instruction of the master control flatcar so as to synchronously operate with the flatcar group until the slave control flatcar parks at a designated position, and the master control flatcar and the slave control flatcar continuously report the execution progress and position to the container automatic control system through the communication system in the operation process.

[0028] When in a coupled operating mode, the first flatcar in the operation direction of the coupled flatcar group is automatically regarded as a master control flatcar, other flatcars are automatically defined as slave control flatcars controlled by the master control flatcar in operation; when the flatcar group reverses operation, the last flatcar automatically turns into the master control flatcar from the slave control flatcar, and the original first flatcar turns into the last flatcar, then it is automatically regarded as a slave control flatcar; the coupled flatcar group is controlled by the automatic control system for railway containers to operate as an integral unit. A coupled operation by the control system is identified when the number of the first flatcar is the same as the number of the last flatcar of the flatcar group.

[0029] Further, when a train operating mode instruction for a powered rail flatcar for containers is received by the in-vehicle control system, the method comprises the following steps: The powered rail flatcar for containers is controlled by the operating mode switching module to reach a designated position according to an instruction of executing the train operating mode of the powered rail flatcar for containers; an instruction corresponding to a train operating mode is issued to an automatic coupler control device, a traction power switching device and an electrically powered switching device of the powered rail flatcar for containers; the coupler of the flatcar is controlled by the automatic coupler control device to be automatically connected with couplers of adjacent flatcars, a plurality of powered rail flatcar for containers are connected to the group, and are coupled up to a locomotive to form a train. Meanwhile, the brake system, the power cable and the in-vehicle internet of each flatcar are automatically connected, and the in-vehicle control system of each flatcar is connected through the in-vehicle internet; the power and traction system of the powered rail flatcar for containers is controlled by the traction power switching device to exit from being driven, which

specifically comprises controlling a power module of the power and traction system to be uncoupled from the walking mechanism, and the power module of the power and traction system of the powered rail flatcar for containers is controlled by the electrically powered switching device to be charged by the locomotive through a power cable. The brake system of the slave control flatcar is controlled by the locomotive which pulls the powered rail flatcar group for containers to travel to a destination according to a transportation starting point, an operation destination and an operation permission instruction of the container, and continuously reports the execution progress and position to the container automatic control system through the communication system in the operating process of the locomotive.

[0030] The first flatcar in the operating direction of the train is a locomotive, which is automatically regarded as a main control flatcar after being connected; the first powered rail flatcar for containers and other powered rail flatcar for containers are automatically defined as slave control flatcars which are controlled by a locomotive of the master control flatcar in operation; when the train reverses operation, the locomotive is still the main control flatcar; the train is controlled by the automatic control system for railway containers to operate as an integral unit. The number of the locomotive, the number of the first flatcar and the number of the last flatcar together are identified as operation of the train by the control system.

[0031] While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by a person skilled in the art that various changes in form and details may be made therein without departing from the scope of the invention, as defined by the appended claims.

Claims

1. An assembly for powered rail flatcar for containers, comprising
 - an in-vehicle control system (1),
 - a power and traction system (2),
 - a brake system (3);
 - an operating mode control system (7) comprising
 - an operating mode switching module (71), wherein the operating mode switching module is configured to issue a corresponding operating instruction to the powered rail flatcar for containers according to an operating mode instruction received from a container automatic control system, to control the powered rail flatcar for containers to switch among a single flatcar operating mode, a coupled operating mode, and a train operating mode,

an automatic coupler control device (72) in communication connection with the operating mode switching module (71), and configured to control a coupler of the powered rail flatcar;

a traction power switching device (73) in communication connection with the operating mode switching module (71), and configured to switch a power source of the powered rail flatcar for containers;

an electrically powered switching device (74) in communication connection with the operating mode switching module (71), and configured for switching the energy storage form of the powered rail flatcar;

wherein the assembly is arranged such that, when an instruction of executing a coupled operating mode is received,

the operating mode switching module (71) controls the powered rail flatcar for containers to reach a designated coupled position according to the instruction of executing a coupled operating mode and a coupled master-slave relationship instruction of the powered rail flatcar for containers, and the operating mode switching module (71) sends an instruction corresponding to a coupled operating mode to the automatic coupler control device (72), the traction power switching device (73) and the electrically powered switching device (74); and

the automatic coupler control device (72), controls the coupler of the flatcar to be automatically connected with a coupler of an adjacent flatcar to form a powered rail flatcar group;

the traction power switching device (73) controls the powered rail flatcar for containers to be driven by the flatcar power and traction system; the electrically powered switching device (74) controls the power module of the power and traction system of the powered rail flatcar for containers to store energy itself;

the in-vehicle control system (1) of the flatcar, as master flatcar, controls the power and traction system (2) and the brake system (3) of the adjacent flatcar, as slave control flatcar, and controls the powered rail flatcar group to travel to a destination according to a transportation starting point, an operation destination and an operation permission instruction.

2. The assembly of claim 1, arranged such that: when an instruction of executing a single flatcar operating mode is issued by the operating mode switching module (71), the coupler of the powered rail flatcar for containers is controlled to be automatically uncoupled with the coupler of the adjacent flatcar; and when an instruction of executing a coupled operating

mode or a train operating mode is issued by the operating mode switching module (71), the coupler of the powered rail flatcar for containers is controlled to be automatically coupled with the coupler of the adjacent flatcar.

3. The assembly of claim 1 or 2, arranged such that: when an instruction of executing a single flatcar operating mode or coupled operating mode is issued by the operating mode switching module (71), the powered rail flatcar for containers is controlled to be driven by a power and traction system of the flatcar; and when an instruction of executing a train operating mode is issued by the operating mode switching module (71), the powered rail flatcar for containers is controlled to exit from being driven by the power and traction system of the flatcar and pulled by a locomotive.

4. The assembly of claim 3, **characterized in that** the controlling the powered rail flatcar for containers to be driven by a power and traction system of the flatcar particularly comprises controlling a power module of the power and traction system of the powered rail flatcar for containers to be connected with a walking mechanism, and the controlling the powered rail flatcar for containers to exit from being driven by the power and traction system of the flatcar particularly comprises controlling a power module of the power and traction system of the powered rail flatcar for containers to be separated from the walking mechanism.

5. The assembly of any one of claims 1 to 4, arranged such that: when an instruction of executing a single flatcar operating mode or coupled operating mode is issued by the operating mode switching module (71), the power module of the power and traction system (2) of the powered rail flatcar for containers is controlled to store energy itself; and when an instruction of executing a train operating mode is issued by the operating mode switching module (71) the power module of the power and traction system (2) of the powered rail flatcar for containers is charged by a locomotive through a power cable.

6. A control method for operating modes of powered rail flatcar for containers, **characterized by** comprising the following steps:

receiving, by an in-vehicle control system (1) of the powered rail flatcar for containers, an instruction of executing a single flatcar operating mode, a coupled operating mode or a train operating mode of the powered rail flatcar for containers, from a container automatic control system, and issuing, by an operating mode switching module (71) a corresponding operating instruction to the powered rail flatcar for containers according to the instruction to operate in

the single flatcar operating mode, coupled operating mode or train operating mode, wherein

when an instruction of executing a coupled operating mode of a powered rail flatcar for containers is received by the in-vehicle control system (1), the method comprises the following steps:

controlling, by the operating mode switching module (71), the powered rail flatcar for containers to reach a designated coupled position according to an instruction of executing a coupled operating mode and a coupled master-slave relationship instruction of the powered rail flatcar for containers, and sending an instruction corresponding to a coupled operating mode to an automatic coupler control device (72), a traction power switching device (73) and an electrically powered switching device (74) of the powered rail flatcar for containers; and controlling, by the automatic coupler device (72), the coupler of the flatcar to be automatically connected with a coupler of an adjacent flatcar to form a flatcar group

controlling, by the traction power switching device (73), the powered rail flatcar for containers to be driven by a flatcar power and traction system of the powered rail flatcar for containers; and

controlling, by the electrically powered switching device (74), the power module of the power and traction system of the powered rail flatcar for containers to store energy itself;

controlling, by the in-vehicle control system (1) of the flatcar, as master control flatcar, a power and traction system and a brake system of the adjacent flatcar as slave control flatcar; and

controlling, by the in-vehicle control system (1) of the master control flatcar, the powered rail flatcar group for containers to travel to a destination according to a transportation starting point, an operation destination and an operation permission instruction of the container.

7. The control method for the operating modes of the powered rail flatcar for containers of claim 6, **characterized in that** when a single flatcar operating mode of the powered rail flatcar for containers is received by the in-vehicle control system, the method comprises the following steps:

issuing, by the operating mode switching module, an instruction corresponding to a single flatcar operating mode to an automatic coupler control device, a traction power switching device and an electrically powered switching device of the powered rail flatcar for containers according to an instruction of executing the single flatcar

operating mode of the powered rail flatcar for containers;

controlling, by the automatic coupler control device, the coupler of the flatcar to be automatically uncoupled from couplers of other flatcars; and
controlling, by the traction power switching device, the powered rail flatcar for containers to be driven by flatcar power and traction system;

controlling, by the electrically powered switching device, the power module of the power and traction system of the powered rail flatcar for containers to store energy itself; and
controlling by the in-vehicle control system, the powered rail flatcar for containers to travel to a destination according to a transportation starting point, an operation destination and an operation permission instruction of the container.

8. The control method for the operating modes of the powered rail flatcar for containers of claim 6 or 7, **characterized in that** when a train operating mode instruction for a powered rail flatcar for containers is received by the in-vehicle control system, the method comprises the following steps:

controlling, by the operating mode switching module, the powered rail flatcar for containers to reach a designated connection position according to an instruction of executing the train operating mode of the powered rail flatcar for containers;

issuing an instruction corresponding to a train operating mode to automatic coupler control device, a traction power switching device and an electrically powered switching device of the powered rail flatcar for containers;

controlling, by the automatic coupler control device, the coupler of the flatcar to be automatically connected with couplers of adjacent flatcars; connecting groups by a plurality of powered rail flatcar for containers, and coupling up a locomotive to form a train;

controlling, by the traction power switching device, the power and traction system of the powered rail flatcar for containers to exit from being driven; and

controlling, by the electrically powered switching device, the power module of the power and traction system of the powered rail flatcar for containers to be charged by the locomotive through the power cable; and pulling, by the locomotive, the powered rail flatcar group for containers to travel to a destination according to a transportation starting point, an operation destination and an operation permission instruction of the container.

9. The control method for the operating modes of the

powered rail flatcar for containers of any one of claims 6 to 8, **characterized in that:** when a plurality of powered rail flatcar for containers are connected through couplers, the brake system, the power cable and the in-vehicle internet of each flatcar of the coupled flatcar group are automatically connected, the in-vehicle control system of each flatcar is connected through the in-vehicle internet, and the brake system of the slave control flatcar is controlled by the in-vehicle control system of the master control flatcar.

Patentansprüche

1. Eine Baugruppe für einen mit Leistung versorgten Schienenflachwagen für Container, die Folgendes beinhaltet:

ein bordeigenes Steuersystem (1),
ein Leistungs- und Traktionssystem (2),
ein Bremssystem (3);
ein Betriebsmodussteuersystem (7), das Folgendes beinhaltet:

ein Betriebsmodusschaltmodul (71), wobei das Betriebsmodusschaltmodul dazu konfiguriert ist, eine entsprechende Betriebsanweisung an den mit Leistung versorgten Schienenflachwagen für Container gemäß einer von einem automatischen Containersteuersystem empfangenen Betriebsmodusanweisung auszugeben, um den mit Leistung versorgten Schienenflachwagen für Container zum Schalten zwischen einem Einzelflachwagenbetriebsmodus, einem gekuppelten Betriebsmodus und einem Zugbetriebsmodus zu steuern,
eine automatische Kupplungssteuervorrichtung (72), die in Kommunikationsverbindung mit dem Betriebsmodusschaltmodul (71) steht und dazu konfiguriert ist, eine Kupplung des mit Leistung versorgten Schienenflachwagens zu steuern;
eine Traktionsleistungsschaltvorrichtung (73), die in Kommunikationsverbindung mit dem Betriebsmodusschaltmodul (71) steht und dazu konfiguriert ist, eine Leistungsquelle des mit Leistung versorgten Schienenflachwagens für Container zu schalten;
eine elektrisch mit Leistung versorgte Schaltvorrichtung (74), die in Kommunikationsverbindung mit dem Betriebsmodusschaltmodul (71) steht und dazu konfiguriert ist, die Energiespeicherform des mit Leistung versorgten Schienenflachwagens zu schalten;

wobei die Baugruppe derart angeordnet ist, dass, wenn eine Anweisung zum Ausführen eines gekuppelten Betriebsmodus empfangen wird, das Betriebsmodusschaltmodul (71) den mit Leistung versorgten Schienenflachwagen für Container steuert, um eine bestimmte gekuppelte Position gemäß der Anweisung des Ausführens eines gekuppelten Betriebsmodus und einer Anweisung für eine gekuppelte Master-Slave-Beziehung des mit Leistung versorgten Schienenflachwagens für Container zu erreichen, und das Betriebsmodusschaltmodul (71) eine Anweisung, die einem gekuppelten Betriebsmodus entspricht, an die automatische Kupplungssteuervorrichtung (72), die Traktionsleistungsschaltvorrichtung (73) und die elektrisch mit Leistung versorgte Schaltvorrichtung (74) sendet; und

die automatische Kupplungssteuervorrichtung (72) die Kupplung des Flachwagens steuert, um automatisch mit einer Kupplung eines benachbarten Flachwagens verbunden zu werden, um eine Gruppe von mit Leistung versorgten Schienenflachwagen auszubilden;

die Traktionsleistungsschaltvorrichtung (73) den mit Leistung versorgten Schienenflachwagen für Container steuert, um von dem Leistungs- und Traktionssystem für Flachwagen angetrieben zu werden;

die elektrisch mit Leistung versorgte Schaltvorrichtung (74) das Leistungsmodul des Leistungs- und Traktionssystems des mit Leistung versorgten Schienenflachwagens für Container steuert, um selbst Energie zu speichern; das bordeigene Steuersystem (1) des Flachwagens als Master-Flachwagen das Leistungs- und Traktionssystem (2) und das Bremssystem (3) des benachbarten Flachwagens als Slave-Steuerflachwagen steuert und die Gruppe von mit Leistung versorgten Schienenflachwagen steuert, um gemäß einem Transportausgangspunkt, einem Betriebsziel und einer Betriebserlaubnisanweisung zu einem Ziel zu fahren.

2. Baugruppe gemäß Anspruch 1, die derart angeordnet ist, dass: wenn eine Anweisung zum Ausführen eines Einzelflachwagenbetriebsmodus durch das Betriebsmodusschaltmodul (71) ausgegeben wird, die Kupplung des mit Leistung versorgten Schienenflachwagens für Container gesteuert wird, um automatisch von der Kupplung des benachbarten Flachwagens entkuppelt zu werden; und wenn eine Anweisung zum Ausführen eines gekuppelten Betriebsmodus oder eines Zugbetriebsmodus durch

das Betriebsmodusschaltmodul (71) ausgegeben wird, die Kupplung des mit Leistung versorgten Schienenflachwagens für Container gesteuert wird, um automatisch mit der Kupplung des benachbarten Flachwagens gekuppelt zu werden.

3. Baugruppe gemäß Anspruch 1 oder 2, die derart angeordnet ist, dass: wenn eine Anweisung des Ausführens eines Einzelflachwagenbetriebsmodus oder eines gekuppelten Betriebsmodus von dem Betriebsmodusschaltmodul (71) ausgegeben wird, der mit Leistung versorgte Schienenflachwagen für Container gesteuert wird, um von einem Leistungs- und Traktionssystem des Flachwagens angetrieben zu werden; und wenn eine Anweisung des Ausführens eines Zugbetriebsmodus von dem Betriebsmodusschaltmodul (71) ausgegeben wird, der mit Leistung versorgte Schienenflachwagen für Container gesteuert wird, um nicht mehr von dem Leistungs- und Traktionssystem des Flachwagens angetrieben und von einer Lokomotive gezogen zu werden.

4. Baugruppe gemäß Anspruch 3, **dadurch gekennzeichnet, dass** das Steuern, dass der mit Leistung versorgte Schienenflachwagen für Container von einem Leistungs- und Traktionssystem des Flachwagens angetrieben wird, insbesondere das Steuern beinhaltet, dass ein Leistungsmodul des Leistungs- und Traktionssystems des mit Leistung versorgten Schienenflachwagens für Container mit einem Gehmechanismus verbunden wird, und das Steuern, dass der mit Leistung versorgte Schienenflachwagen für Container nicht mehr von dem Leistungs- und Traktionssystem des Flachwagens angetrieben wird, insbesondere das Steuern beinhaltet, dass ein Leistungsmodul des Leistungs- und Traktionssystems des mit Leistung versorgten Schienenflachwagens für Container von dem Gehmechanismus getrennt wird.

5. Baugruppe gemäß einem der Ansprüche 1 bis 4, die derart angeordnet ist, dass: wenn eine Anweisung des Ausführens eines Einzelflachwagenbetriebsmodus oder eines gekuppelten Betriebsmodus von dem Betriebsmodusschaltmodul (71) ausgegeben wird, das Leistungsmodul des Leistungs- und Traktionssystems (2) des mit Leistung versorgten Schienenflachwagens für Container gesteuert wird, um selbst Energie zu speichern; und wenn eine Anweisung des Ausführens eines Zugbetriebsmodus von dem Betriebsmodusschaltmodul (71) ausgegeben wird, das Leistungsmodul des Leistungs- und Traktionssystems (2) des mit Leistung versorgten Schienenflachwagens für Container von einer Lokomotive über ein Stromkabel geladen wird.

6. Ein Steuerverfahren für Betriebsmodi von mit Leistung versorgten Schienenflachwagen für Container,

dadurch gekennzeichnet, dass es die folgenden Schritte beinhaltet:

Empfangen, durch ein bordeigenes Steuersystem (1) des mit Leistung versorgten Schienenflachwagens für Container, einer Anweisung des Ausführens eines Einzelflachwagenbetriebsmodus, eines gekuppelten Betriebsmodus oder eines Zugbetriebsmodus des mit Leistung versorgten Schienenflachwagens für Container von einem automatischen Containersteuersystem, und

Ausgeben, durch ein Betriebsmodusschaltmodul (71), einer entsprechenden Betriebsanweisung an den mit Leistung versorgten Schienenflachwagen für Container gemäß der Anweisung, in dem Einzelflachwagenbetriebsmodus, gekuppelten Betriebsmodus oder Zugbetriebsmodus zu arbeiten,

wobei

wenn eine Anweisung des Ausführens eines gekuppelten Betriebsmodus eines mit Leistung versorgten Schienenflachwagens für Container von dem bordeigenen Steuersystem (1) empfangen wird, das Verfahren die folgenden Schritte beinhaltet: Steuern, durch das Betriebsmodusschaltmodul (71), des mit Leistung versorgten Schienenflachwagens für Container, um eine bestimmte gekuppelte Position gemäß einer Anweisung des Ausführens eines gekuppelten Betriebsmodus und einer Anweisung für eine gekuppelte Master-Slave-Beziehung des mit Leistung versorgten Schienenflachwagens für Container zu erreichen, und Senden einer Anweisung, die einem gekuppelten Betriebsmodus entspricht, an eine automatische Kupplungssteuervorrichtung (72), eine Traktionsleistungsschaltvorrichtung (73) und eine elektrisch mit Leistung versorgte Schaltvorrichtung (74) des mit Leistung versorgten Schienenflachwagens für Container; und

Steuern, durch die automatische Kupplungsvorrichtung (72), der Kupplung des Flachwagens, um automatisch mit einer Kupplung eines benachbarten Flachwagens verbunden zu werden, um eine Gruppe von Flachwagen auszubilden;

Steuern, durch die Traktionsleistungsschaltvorrichtung (73) des mit Leistung versorgten Schienenflachwagens für Container, um durch ein Leistungs- und Traktionssystem für Flachwagen des mit Leistung versorgten Schienenflachwagens für Container angetrieben zu werden; und

Steuern, durch die elektrisch mit Leistung versorgte Schaltvorrichtung (74), des Leistungsmoduls des Leistungs- und Traktionssystems des mit Leistung versorgten Schienenflachwa-

gens für Container, um selbst Energie zu speichern;

Steuern, durch das bordeigene Steuersystem (1) des Flachwagens als Master-Steuerflachwagen, eines Leistungs- und Traktionssystems und eines Bremssystems des benachbarten Flachwagens als Slave-Steuerflachwagen; und Steuern, durch das bordeigene Steuersystem (1) des Master-Steuerflachwagens, der Gruppe von mit Leistung versorgten Schienenflachwagen für Container, um gemäß einem Transportausgangspunkt, einem Betriebsziel und einer Betriebserlaubnisweisung des Containers zu einem Ziel zu fahren.

7. Steuerverfahren für die Betriebsmodi des mit Leistung versorgten Schienenflachwagens für Container gemäß Anspruch 6, **dadurch gekennzeichnet, dass** das Verfahren, wenn ein Einzelflachwagenbetriebsmodus des mit Leistung versorgten Schienenflachwagens für Container von dem bordeigenen Steuersystem empfangen wird, die folgenden Schritte beinhaltet:

Ausgeben, durch das Betriebsmodusschaltmodul, einer Anweisung, die einem Einzelflachwagenbetriebsmodus entspricht, an eine automatische Kupplungssteuervorrichtung, eine Traktionsleistungsschaltvorrichtung und eine elektrisch mit Leistung versorgte Schaltvorrichtung des mit Leistung versorgten Schienenflachwagens für Container gemäß einer Anweisung des Ausführens des Einzelflachwagenbetriebsmodus des mit Leistung versorgten Schienenflachwagens für Container;

Steuern, durch die automatische Kupplungssteuervorrichtung, der Kupplung des Flachwagens, um automatisch von den Kupplungen anderer Flachwagen entkuppelt zu werden; und Steuern, durch die Traktionsleistungsschaltvorrichtung, des mit Leistung versorgten Flachwagens für Container, um durch das Leistungs- und Traktionssystem für Flachwagen angetrieben zu werden;

Steuern, durch die elektrisch mit Leistung versorgte Schaltvorrichtung, des Leistungsmoduls des Leistungs- und Traktionssystems des mit Leistung versorgten Schienenflachwagens für Container, um selbst Energie zu speichern; und Steuern, durch das bordeigene Steuersystem, des mit Leistung versorgten Schienenflachwagens für Container, um gemäß einem Transportausgangspunkt, einem Betriebsziel und einer Betriebserlaubnisweisung des Containers zu einem Ziel zu fahren.

8. Steuerverfahren für die Betriebsmodi des mit Leistung versorgten Schienenflachwagens für Container

gemäß Anspruch 6 oder 7, **dadurch gekennzeichnet, dass** das Verfahren, wenn eine Zugbetriebsmodusanweisung für einen mit Leistung versorgten Schienenflachwagen für Container von dem bordeigenen Steuersystem empfangen wird, die folgenden Schritte beinhaltet:

Steuern, durch das Betriebsmodusschaltmodul, des mit Leistung versorgten Schienenflachwagens für Container, um eine bestimmte Verbindungsposition gemäß einer Anweisung des Ausführens des Zugbetriebsmodus des mit Leistung versorgten Schienenflachwagens für Container zu erreichen;

Ausgeben einer Anweisung, die einem Zugbetriebsmodus entspricht, an eine automatische Kupplungssteuervorrichtung, eine Traktionsleistungsschaltvorrichtung und eine elektrisch mit Leistung versorgte Schaltvorrichtung des mit Leistung versorgten Schienenflachwagens für Container;

Steuern, durch die automatische Kupplungssteuervorrichtung, der Kupplung des Flachwagens, um automatisch mit den Kupplungen benachbarter Flachwagen verbunden zu werden; Verbinden von Gruppen einer Vielzahl von mit Leistung versorgten Schienenflachwagen für Container und Ankuppeln einer Lokomotive, um einen Zug auszubilden;

Steuern, durch die Traktionsleistungsschaltvorrichtung, des Leistungs- und Traktionssystems des mit Leistung versorgten Schienenflachwagens für Container, um nicht mehr angetrieben zu werden; und

Steuern, durch die elektrisch mit Leistung versorgte Schaltvorrichtung, des Leistungsmoduls des Leistungs- und Traktionssystems des mit Leistung versorgten Schienenflachwagens für Container, um durch die Lokomotive über ein Stromkabel geladen zu werden; und

Ziehen, durch die Lokomotive, der Gruppe von mit Leistung versorgten Schienenflachwagen für Container, um gemäß einem Transportausgangspunkt, einem Betriebsziel und einer Betriebserlaubnisweisung des Containers zu einem Ziel zu fahren.

9. Steuerverfahren für die Betriebsmodi des mit Leistung versorgten Schienenflachwagens für Container gemäß einem der Ansprüche 6 bis 8, **dadurch gekennzeichnet, dass:** wenn eine Vielzahl von mit Leistung versorgten Schienenflachwagen für Container über Kupplungen verbunden ist, das Bremssystem, das Stromkabel und das bordeigene Internet jedes Flachwagens der gekuppelten Gruppe von Flachwagen automatisch verbunden werden, das bordeigene Steuersystem jedes Flachwagens über das bordeigene Internet verbunden wird und das

Bremssystem des Slave-Steuerflachwagens durch das bordeigene Steuersystem des Master-Steuerflachwagens gesteuert wird.

Revendications

1. Un ensemble pour wagon plat sur rail motorisé pour conteneurs, comprenant un système de commande embarqué (1),

un système de puissance et de traction (2),
un système de freinage (3) ;
un système de commande de mode de fonctionnement (7) comprenant

un module de commutation de mode de fonctionnement (71), où le module de commutation de mode de fonctionnement est configuré pour émettre une instruction de fonctionnement correspondante à destination du wagon plat sur rail motorisé pour conteneurs selon une instruction de mode de fonctionnement reçue en provenance d'un système de commande automatique de conteneurs, afin de commander le wagon plat sur rail motorisé pour conteneurs pour qu'il commute entre un mode de fonctionnement en wagon plat individuel, un mode de fonctionnement couplé, et un mode de fonctionnement en train,
un dispositif de commande de coupleur automatique (72) en connexion de communication avec le module de commutation de mode de fonctionnement (71), et configuré pour commander un coupleur du wagon plat sur rail motorisé ;
un dispositif de commutation de puissance de traction (73) en connexion de communication avec le module de commutation de mode de fonctionnement (71), et configuré pour commuter une source de puissance du wagon plat sur rail motorisé pour conteneurs ;
un dispositif de commutation alimenté électriquement (74) en connexion de communication avec le module de commutation de mode de fonctionnement (71), et configuré pour commuter la forme de stockage d'énergie du wagon plat sur rail motorisé ;

où l'ensemble est conçu de telle sorte que, lorsqu'une instruction d'exécution d'un mode de fonctionnement couplé est reçue, le module de commutation de mode de fonctionnement (71) commande le wagon plat sur rail motorisé pour conteneurs pour qu'il atteigne une position couplée désignée selon l'instruction.

tion d'exécution d'un mode de fonctionnement couplé et d'une instruction de relation maître-esclave couplée du wagon plat sur rail motorisé pour conteneurs, et le module de commutation de mode de fonctionnement (71) envoie une instruction correspondant à un mode de fonctionnement couplé à destination du dispositif de commande de coupleur automatique (72), du dispositif de commutation de puissance de traction (73) et du dispositif de commutation alimenté (74) ; et

le dispositif de commande de coupleur automatique (72) commande le coupleur du wagon plat pour qu'il soit automatiquement raccordé à un coupleur d'un wagon plat adjacent afin de former un groupe de wagons plats sur rail motorisés ; le dispositif de commutation de puissance de traction (73) commande le wagon plat sur rail motorisé pour conteneurs afin qu'il soit entraîné par le système de puissance et de traction de wagon plat ;

le dispositif de commutation alimenté électriquement (74) commande le module de puissance du système de puissance et de traction du wagon plat sur rail motorisé pour conteneurs afin qu'il stocke lui-même de l'énergie ;

le système de commande embarqué (1) du wagon plat, en tant que wagon plat maître, commande le système de puissance et de traction (2) et le système de freinage (3) du wagon plat adjacent, en tant que wagon plat commandé en esclave, et commande le groupe de wagons plats sur rail motorisés afin qu'ils se déplacent vers une destination en fonction d'un point de départ de transport, d'une destination d'opération et d'une instruction d'autorisation d'opération.

2. L'ensemble de la revendication 1, conçu de telle sorte que : lorsqu'une instruction d'exécution d'un mode de fonctionnement en wagon plat individuel est émise par le module de commutation de mode de fonctionnement (71), le coupleur du wagon plat sur rail motorisé pour conteneurs est commandé afin d'être automatiquement désaccouplé d'avec le coupleur du wagon plat adjacent ; et lorsqu'une instruction d'exécution d'un mode de fonctionnement couplé est émise par le module de commutation de mode de fonctionnement (71), le coupleur du wagon plat sur rail motorisé pour conteneurs est commandé pour être automatiquement couplé avec le coupleur du wagon plat adjacent.
3. L'ensemble de la revendication 1 ou de la revendication 2, conçu de telle sorte que : lorsqu'une instruc-

tion d'exécution d'un mode de fonctionnement en wagon plat individuel ou d'un mode de fonctionnement couplé est émise par le module de commutation de mode de fonctionnement (71), le wagon plat sur rail motorisé pour conteneurs est commandé pour être entraîné par un système de puissance et de traction du wagon plat ; et lorsqu'une instruction d'exécution d'un mode de fonctionnement en train est émise par le module de commutation de mode de fonctionnement (71), le wagon plat sur rail motorisé pour conteneurs est commandé pour cesser d'être entraîné par le système de puissance et de traction du wagon plat et d'être tracté par une locomotive.

4. L'ensemble de la revendication 3, **caractérisé en ce que** le fait de commander le wagon plat sur rail motorisé pour conteneurs pour qu'il soit entraîné par un système de puissance et de traction du wagon plat comprend en particulier le fait de commander un module de puissance du système de puissance et de traction du wagon plat sur rail motorisé pour conteneurs afin qu'il soit raccordé avec un mécanisme de marche, et le fait de commander le wagon plat sur rail motorisé pour conteneurs pour qu'il cesse d'être entraîné par le système de puissance et de traction du wagon plat comprend en particulier le fait de commander un module de puissance du système de puissance et de traction du wagon plat sur rail motorisé pour conteneurs afin qu'il soit séparé du mécanisme de marche.
5. L'ensemble de n'importe laquelle des revendications 1 à 4, conçu de telle sorte que : lorsqu'une instruction d'exécution d'un mode de fonctionnement en wagon plat individuel ou d'un mode de fonctionnement couplé est émise par le module de commutation de mode de fonctionnement (71), le module de puissance du système de puissance et de traction (2) du wagon plat sur rail motorisé pour conteneurs est commandé afin qu'il stocke lui-même de l'énergie ; et lorsqu'une instruction d'exécution d'un mode de fonctionnement en train est émise par le module de commutation de mode de fonctionnement (71), le module de puissance du système de puissance et de traction (2) du wagon plat sur rail motorisé pour conteneurs est chargé par une locomotive au moyen d'un câble d'alimentation.
6. Un procédé de commande pour des modes de fonctionnement de wagon plat sur rail motorisé pour conteneurs, **caractérisé par le fait qu'il** comprend les étapes suivantes :
 - le fait de recevoir, par un système de commande embarqué (1) du wagon plat sur rail motorisé pour conteneurs, une instruction d'exécution d'un mode de fonctionnement en wagon plat

individuel, d'un mode de fonctionnement couplé ou d'un mode de fonctionnement en train du wagon plat sur rail motorisé pour conteneurs, en provenance d'un système de commande automatique de conteneurs, et

le fait d'émettre, par un module de commutation de mode de fonctionnement (71) une instruction de fonctionnement correspondante à destination du wagon plat sur rail motorisé pour conteneurs selon l'instruction de fonctionner dans le mode de fonctionnement en wagon plat individuel, le mode de fonctionnement couplé ou le mode de fonctionnement en train, dans lequel

lorsqu'une instruction d'exécution d'un mode de fonctionnement couplé d'un wagon plat sur rail motorisé pour conteneurs est reçue par le système de commande embarqué (1), le procédé comprend les étapes suivantes :

le fait de commander, par le module de commutation de mode de fonctionnement (71), le wagon plat sur rail motorisé pour conteneurs pour qu'il atteigne une position couplée désignée selon une instruction d'exécution d'un mode de fonctionnement couplé et d'une instruction de relation maître-esclave couplée du wagon plat sur rail motorisé pour conteneurs, et le fait d'envoyer une instruction correspondant à un mode de fonctionnement couplé à un dispositif de commande de coupleur automatique (72), à un dispositif de commutation de puissance de traction (73) et à un dispositif de communication alimenté électriquement (74) du wagon plat sur rail motorisé pour conteneurs ; et

le fait de commander, par le dispositif de coupleur automatique (72), le coupleur du wagon plat pour qu'il soit automatiquement raccordé avec un coupleur d'un wagon plat adjacent afin de former un groupe de wagons plats ;

le fait de commander, par le dispositif de commutation de puissance de traction (73), le wagon plat sur rail motorisé pour conteneurs pour qu'il soit entraîné par un système de puissance et de traction de wagon plat du wagon plat sur rail motorisé pour conteneurs ; et

le fait de commander, par le dispositif de commutation alimenté électriquement (74), le module de puissance du système de puissance et de traction du wagon plat sur rail motorisé pour conteneurs afin qu'il stocke lui-même de l'énergie ;

le fait de commander, par le système de commande embarqué (1) du wagon plat,

en tant que wagon de commande maître, un système de puissance et de traction et un système de freinage du wagon plat adjacent en tant que wagon de commande esclave ; et

le fait de commander, par le système de commande embarqué (1) du wagon plat de commande maître, le groupe de wagons plats sur rail motorisés pour conteneurs pour qu'ils se déplacent vers une destination en fonction d'un point de départ de transport, d'une destination d'opération et d'une instruction d'autorisation d'opération du conteneur.

7. Le procédé de commande pour des modes de fonctionnement du wagon plat sur rail motorisé pour conteneurs de la revendication 6, **caractérisé en ce que**, lorsqu'un mode de fonctionnement en wagon plat individuel du wagon plat sur rail motorisé pour conteneurs est reçu par le système de commande embarqué, le procédé comprend les étapes suivantes :

le fait d'émettre, par le module de commutation de mode de fonctionnement, une instruction correspondant à un mode de fonctionnement en wagon plat individuel à destination d'un dispositif de coupleur automatique, d'un dispositif de commutation de puissance de traction et d'un dispositif de commutation alimenté électriquement du wagon plat sur rail motorisé pour conteneurs selon une instruction d'exécution du mode de fonctionnement en wagon plat individuel du wagon plat sur rail motorisé pour conteneurs ;

le fait de commander, par le dispositif de commande de coupleur automatique, le coupleur du wagon plat pour qu'il soit automatiquement désaccouplé d'avec des coupleurs d'autres wagons plats ; et

le fait de commander, par le dispositif de commutation de puissance de traction, le wagon plat sur rail motorisé pour conteneurs pour qu'il soit entraîné par un système de puissance et de traction de wagon plat ;

le fait de commander, par le dispositif de commutation alimenté électriquement, le module de puissance du système de puissance et de traction du wagon plat sur rail motorisé pour conteneurs afin qu'il stocke lui-même de l'énergie ; et

le fait de commander par le système de commande embarqué, le wagon plat sur rail motorisé pour conteneurs pour qu'il se déplace vers une destination en fonction d'un point de départ de transport, d'une destination d'opération et d'une instruction d'autorisation d'opération

tion du conteneur.

8. Le procédé de commande pour des modes de fonctionnement du wagon plat sur rail motorisé pour conteneurs de la revendication 6 ou de la revendication 7, **caractérisé en ce que** lorsqu'une instruction de mode de fonctionnement en train pour un wagon plat sur rail motorisé pour conteneurs est reçue par le système de commande embarqué, le procédé comprend les étapes suivantes :

le fait de commander, par le module de commutation de mode de fonctionnement, le wagon plat sur rail motorisé pour conteneurs pour qu'il atteigne une position de raccordement désignée selon une instruction d'exécution du mode de fonctionnement en train du wagon plat sur rail motorisé pour conteneurs ;

le fait d'émettre une instruction correspondant à un mode de fonctionnement en train à destination d'un dispositif de coupleur automatique, d'un dispositif de commutation de puissance de traction et d'un dispositif de commutation alimenté électriquement du wagon plat sur rail motorisé pour conteneurs ;

le fait de commander, par le dispositif de commande de coupleur automatique, le coupleur du wagon plat pour qu'il soit automatiquement raccordé avec des coupleurs de wagons plats adjacents ;

le fait de raccorder des groupes d'une pluralité de wagons plats sur rail motorisés pour conteneurs, et le fait de coupler en amont une locomotive afin de former un train ;

le fait de commander, par le dispositif de commutation de puissance de traction, le système de puissance et de traction du wagon plat sur rail motorisé pour conteneurs pour qu'il cesse d'être entraîné ; et

le fait de commander, par le dispositif de commutation alimenté électriquement, le module de puissance du système de puissance et de traction du wagon plat sur rail motorisé pour conteneurs pour qu'il soit chargé par la locomotive au moyen du câble d'alimentation ; et

le fait de tracter, par la locomotive, le groupe de wagons plats sur rail motorisés pour conteneurs pour qu'ils se déplacent vers une destination en fonction d'un point de départ de transport, d'une destination d'opération et d'une instruction d'autorisation d'opération du conteneur.

9. Le procédé de commande pour des modes de fonctionnement du wagon plat sur rail motorisé pour conteneurs de n'importe laquelle des revendications 6 à 8, **caractérisé en ce que** : lorsqu'une pluralité de wagons plats sur rail motorisés pour conteneurs est

raccordée au moyen de coupleurs, le système de freinage, le câble d'alimentation et l'internet embarqué de chaque wagon plat du groupe de wagons plats couplés sont automatiquement raccordés, le système de commande embarqué de chaque wagon plat est raccordé au moyen de l'internet embarqué, et le système de freinage du wagon plat de commande esclave est commandé par le système de commande embarqué du wagon plat de commande maître.

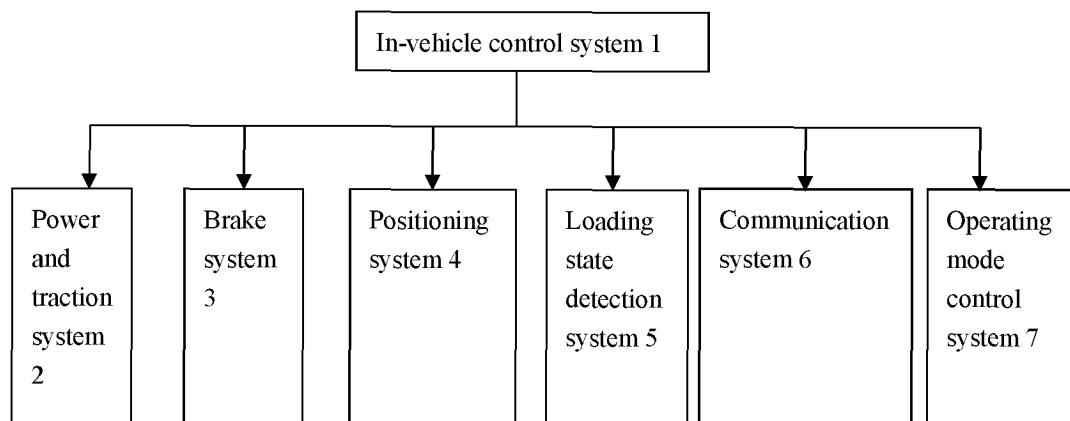


FIG.1

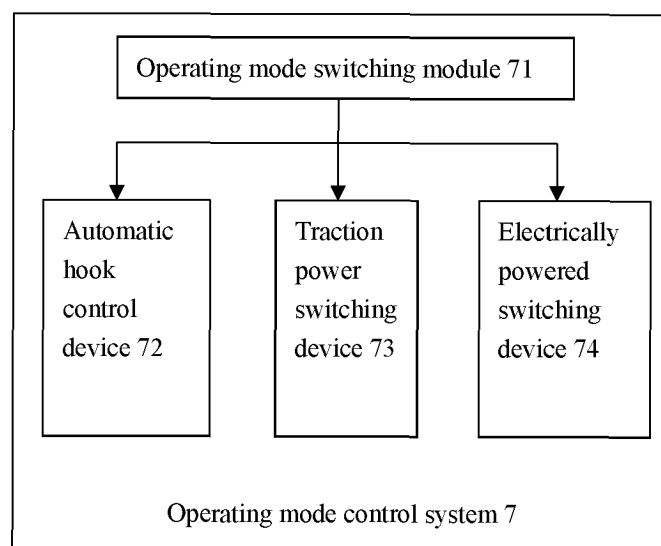


FIG.2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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