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Zhuzhou, Hunan 412001 (CN)
- **LI, Tingfang**
Zhuzhou, Hunan 412001 (CN)

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(74) Representative: **Ran, Handong et al**
Maucher Jenkins
Seventh Floor Offices
Artillery House
11-19 Artillery Row
London SW1P 1RT (GB)

(71) Applicant: **CRRC Zhuzhou Locomotive Co., Ltd.**
Zhuzhou, Hunan 412001 (CN)

(72) Inventors:
• **CHEN, Jianhua**
Zhuzhou, Hunan 412001 (CN)

(54) **METHOD AND SYSTEM FOR CONTROLLING VEHICLE DOOR AND LIGHTING DURING RAIL VEHICLE CLEANING**

(57) Provided are a method and system for controlling a vehicle door and lighting during rail vehicle cleaning. By activating a locked vehicle mode, a vehicle door is controlled to be closed and locked, and lighting is simultaneously controlled to be turned off. By activating a cleaning mode, a local door switch is allowed to control a vehicle door switch and the lighting is simultaneously controlled to be turned on. When sanitary cleaning is being carried out, vehicle door and lighting control in a cab is not needed, and cooperation of professional maintenance personnel or drivers is not needed, thus saving manpower and material resources. Meanwhile, in the locked vehicle mode, the vehicle door cannot be opened by means of an emergency unlocking device, thus preventing persons other than professional maintenance personnel, a driver or a cleaner from entering the vehicle, thereby enhancing management of personnel boarding the vehicle, reducing potential safety hazards, and ensuring vehicle safety.

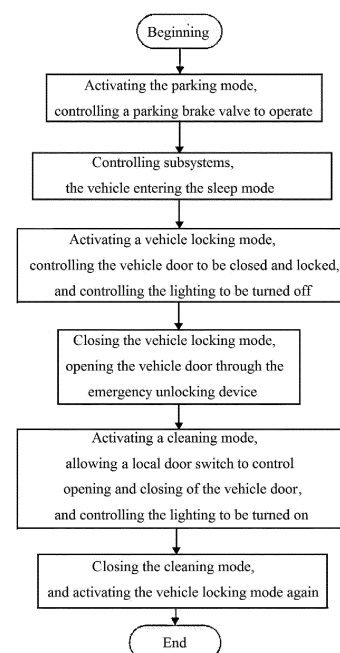


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The present invention belongs to the technical field of vehicle lighting and vehicle door control, and in particular relates to a method and system for controlling a vehicle door and lighting during rail transit vehicle cleaning, and a vehicle.

BACKGROUND OF THE INVENTION

[0002] For rail transit vehicles such as multiple unit trains and high-speed rail trains, its indoor environment need to be cleaned after operation in a day to ensure the normal operation in the next day. Lighting and door opening and closing control inside the vehicle are required during cleaning, but lighting and vehicle door control switches or buttons are arranged in a driver cab. Therefore, professional maintenance personnel or a driver is required during the cleaning to monitor and operate vehicle doors and lighting, which wastes manpower and material resources. Besides, when a vehicle is parked at a railway yard without power interruption for a long time, other person can open the vehicle door through an emergency unlocking device to enter the vehicle, which is inconvenient for the management of personnel boarding the vehicle and has potential safety concerns.

SUMMARY OF THE INVENTION

[0003] In view of the deficiencies of the prior art, the present invention provides a method and system for controlling a vehicle door and lighting during rail vehicle cleaning, and a vehicle, so as to solve the problem in the control of a vehicle door and lighting during rail vehicle cleaning.

[0004] The present invention solves the above technical problem through the following technical solution: a method for controlling a vehicle door and lighting during rail vehicle cleaning, including:

Step 1: in a parking mode, activating a vehicle locking mode, controlling the vehicle door to be closed and locked according to an activation signal of the vehicle locking mode, and controlling the lighting to be turned off at the same time; when the vehicle locking mode is activated, the vehicle door cannot be opened through an emergency unlocking device;
Step 2: when cleaning is required, closing the vehicle locking mode, and when the vehicle locking mode is closed, opening the vehicle door through the emergency unlocking device;
Step 3: activating a cleaning mode, opening and closing of the vehicle door is allowed to be controlled after the cleaning mode is activated, and controlling the lighting to be turned on at the same time; when the cleaning mode is activated, controlling the open-

ing and closing of the vehicle door through a local door switch; and

Step 4: after the cleaning is completed, closing the cleaning mode to make the local door switch unable to control opening and closing of the vehicle door, and activating the vehicle locking mode again.

[0005] According to the control method of the present invention, the vehicle door is closed and locked and the lighting is turned off through an activation signal of the vehicle locking mode, and the vehicle door cannot be opened through an emergency unlocking device in the vehicle locking mode; when cleaning is required, the vehicle locking mode is closed, the vehicle door is opened through the emergency unlocking device, so that cleaning personnel can enter the vehicle, then opening and closing of the vehicle door can be controlled after the cleaning mode is activated, so that the opening and closing of the vehicle door can be controlled through a local door switch, and the lighting is turned on at the same time; after the cleaning is completed, the cleaning mode is closed, the vehicle locking mode is activated again, the vehicle door is controlled to be closed and locked through the activation signal of the vehicle locking mode, and the lighting is controlled to be turned off at the same time. The control method of the present invention does not require the control of the vehicle door and the lighting in the driver cab, so the vehicle door and the lighting can be controlled without the assistance of professional maintenance personnel or the driver, the vehicle maintenance is convenient, and the waste of manpower and material resources is reduced; meanwhile, the vehicle door cannot be opened through the emergency unlocking device in the vehicle locking mode, thus preventing persons other than professional maintenance personnel, the driver and cleaning personnel from entering the vehicle, thereby enhancing management of personnel boarding the vehicle, reducing potential safety concerns, and ensuring vehicle safety.

[0006] Further, in step 1, the vehicle locking mode is activated by operating a locking-mode switch outside the vehicle with a key.

[0007] Further, in step 2, the vehicle locking mode is closed by operating the locking-mode switch outside the vehicle with a key, and after the vehicle locking mode is closed, the limitation on the emergency unlocking device is released, that is, the vehicle door can be opened through the emergency unlocking device, so that cleaning personnel can enter the vehicle.

[0008] Further, in step 3, the cleaning mode is activated by operating a cleaning-mode switch inside the vehicle with a key.

[0009] Further, the method includes a step of entering the parking mode before step 1, which specifically comprises:

Step 0: when the vehicle is stationary at a railway yard, activating the parking mode, controlling a parking brake valve to operate according to an activation signal of the

parking mode, and keeping and recording the current status of each subsystem of the vehicle; and canceling a driver cab occupancy status, and allowing the vehicle to enter the parking mode.

[0010] Vehicles are generally parked by service braking. The service braking is effective only when the power is on, while the parking braking uses a spring force to generate a braking action, which can ensure safe parking of a vehicle even if the power is off.

[0011] Further, the method includes a step of entering a sleep mode between step 0 and step 1, which specifically comprises:

automatically controlling or closing a part of subsystems of the vehicle according to a set time, and allowing the vehicle to enter the sleep mode.

[0012] Some subsystems are closed or controlled according to the set time, for example, the brightness of lighting is controlled to save electric energy and reduce power consumption of the vehicle.

[0013] The present invention further provides a system for controlling a vehicle door and lighting during rail vehicle cleaning, including: a locking-mode switch, a cleaning-mode switch, an emergency unlocking device, a local door switch, a vehicle control unit, a door control unit and a lighting control unit

wherein the locking-mode switch and the emergency unlocking device are arranged outside the vehicle, and the cleaning-mode switch and the local door switch are arranged inside the vehicle; the locking-mode switch, the cleaning-mode switch, the emergency unlocking device and the local door switch are electrically connected to the vehicle control unit respectively, and the vehicle control unit is connected to the door control unit and the lighting control unit respectively.

[0014] Further, the system further includes a parking-mode switch electrically connected to the vehicle control unit.

[0015] Further, the locking-mode switch, the cleaning-mode switch, the emergency unlocking device and the local door switch are electrically connected to the vehicle control unit respectively by hard wires.

[0016] The present invention further provides a vehicle, including the above-mentioned system for controlling the vehicle door and lighting during rail vehicle cleaning.

[0017] Beneficial effects are as follows:

Compared with the prior art, the present invention provides a method and system for controlling a vehicle door and lighting during rail vehicle cleaning. By activating a vehicle locking mode, the vehicle door is controlled to be closed and locked, and the lighting is simultaneously controlled to be turned off. By activating a cleaning mode, a local door switch is allowed to control the opening and closing of the vehicle door, and the lighting is simultaneously controlled to be turned on. When cleaning is carried out, vehicle door and lighting control in a cab is not needed, and assistance of professional maintenance personnel or a driver is not required, thus saving manpower and material resources. Moreover, in the vehicle locking

mode, the vehicle door cannot be opened by means of an emergency unlocking device, thus preventing persons other than the professional maintenance personnel, the driver and cleaning personnel from entering the vehicle, thereby enhancing management of personnel boarding the vehicle, reducing potential safety concerns, and ensuring vehicle safety.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] In order to illustrate the technical solutions of the present invention more clearly, the following briefly introduces the accompanying drawings used in the description of the embodiments. Obviously, the drawings in the following description are only an embodiment of the present invention, and those of ordinary skill in the art can obtain other drawings according to the drawings without any creative effort.

FIG. 1 is a flowchart of a control method in an embodiment of the present invention; and

FIG. 2 is a structural block diagram of a control system in an embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0019] A clear and complete description will be made to the technical solutions in the present invention below with reference to the accompanying drawings in the embodiments of the present invention. Apparently, the embodiments described are only part of the embodiments of the present invention, not all of them. All other embodiments obtained by those of ordinary skill in the art based on the embodiments of the present invention without any creative effort shall fall within the protection scope of the present invention.

[0020] As shown in FIG. 1, a method for controlling a vehicle door and lighting during rail vehicle cleaning, provided by the present invention, includes the following steps.

1. When the vehicle is stationary at a railway yard, a parking-mode switch is operated on an occupied cab to activate a parking mode, a vehicle control unit controls a parking brake valve to operate according to an activation signal of the parking mode, so that the vehicle can be parked safely; meanwhile, the current status of each subsystem of the vehicle is kept and recorded; a driver controller is operated to cancel a driver cab occupancy status, and the vehicle enters the parking mode.

[0021] Vehicles are generally parked by service braking. The service braking is effective only when the power is on, while the parking braking uses a spring force to generate a braking action, which can ensure safe parking of a vehicle even if the power is off. The parking-mode switch may be a hardware switch installed on a driver's

desk or a soft button on an HMI screen. After the vehicle enters the parking mode, the driver pulls out an occupation key and gets off the vehicle.

[0022] 2. Some subsystems of the vehicle are automatically controlled or closed according to a set time, and the vehicle enters a sleep mode.

[0023] The vehicle is not powered off in the parking mode for maintenance or cleaning of the interior of the vehicle by cleaning personnel, but this causes some loads to remain running and consuming electrical energy. The vehicle control unit automatically controls or closes the operation of some subsystems according to the set time to reduce the power consumption of the vehicle, for example, controlling the brightness of lighting, turning off an air conditioner, turning off fans in the toilet and bar, turning off a cabin display screen of a passenger information system, etc. In this embodiment, the set time is 30 minutes.

[0024] 3. In the parking mode, professional maintenance personnel or the driver operates an locking-mode switch outside the vehicle with a key to activate a vehicle locking mode, and the vehicle control unit controls the vehicle door to be closed and locked according to an activation signal of the vehicle locking mode, and controls the lighting to be turned off at the same time. When the vehicle locking mode is activated, the vehicle door cannot be opened through an emergency unlocking device, and the vehicle locking mode must be closed with a key before unlocking the vehicle door, thus preventing other persons from entering the vehicle at will by using the emergency unlocking device of the vehicle door when the vehicle is parked, which may cause safety issues, thereby enhancing management of personnel boarding the vehicle, ensuring vehicle safety, and achieving the advantages of safety, reliability, easy implementation, and convenient popularization and application.

[0025] 4. When cleaning is required, cleaning personnel operates the locking-mode switch outside the vehicle with a key to close the vehicle locking mode. When the vehicle locking mode is closed, the limitation on the emergency unlocking device is released, and the vehicle door can be opened through the emergency unlocking device, so that cleaning personnel can enter the vehicle.

[0026] 5. The cleaning personnel operates a cleaning-mode switch inside the vehicle with a key to activate a cleaning mode, opening and closing of the vehicle door can be controlled after the cleaning mode is activated, the lighting is controlled to be turned on at the same time, and when the cleaning mode is activated, the vehicle door can be controlled through a local door switch. The cleaning-mode switch is arranged inside the vehicle, next to the vehicle door, which is convenient for the cleaning personnel to operate. The cleaning-mode switch may be the same as the locking-mode switch, and a key corresponding to the cleaning-mode switch may be the same as the key corresponding to the locking-mode switch.

[0027] 6. After the cleaning is completed, the cleaning personnel operates the cleaning-mode switch inside the

vehicle with a key to close the cleaning mode, so that the local door switch is unable to control opening and closing of the vehicle door. The cleaning personnel operates the locking-mode switch outside the vehicle with a key to activate the vehicle locking mode again, the vehicle door is controlled to be closed and locked according to the activation signal of the vehicle locking mode, and the lighting is controlled to be turned off at the same time.

[0028] 7. The driver operates the locking-mode switch again to close the vehicle locking mode, operates the driver controller to occupy the cab, and operates the parking-mode switch again to end the parking mode.

[0029] According to the control method of the present invention, the vehicle door is closed and locked and the lighting is turned off through the activation signal of the vehicle locking mode, and the vehicle door cannot be opened through an emergency unlocking device in the vehicle locking mode; when cleaning is required, the vehicle locking mode is closed, the vehicle door is opened through the emergency unlocking device, and cleaning personnel can enter the vehicle, then opening and closing of the vehicle door can be controlled after the cleaning mode is activated, that is, the opening and closing of the vehicle door can be controlled through a local door switch, and the lighting is turned on at the same time; after the cleaning is completed, the cleaning mode is closed, the vehicle locking mode is activated again, the vehicle door is controlled to be closed and locked through the activation signal of the vehicle locking mode, and the lighting is controlled to be turned off at the same time. The control method of the present invention does not require the control of the vehicle door and the lighting in the cab, so the vehicle door and the lighting can be controlled without the assistance of professional maintenance personnel or the driver, the vehicle maintenance is convenient, and the waste of manpower and material resources is reduced. Besides, the vehicle door cannot be opened through the emergency unlocking device in the vehicle locking mode, thus preventing persons other than professional maintenance personnel, the driver and cleaning personnel from entering the vehicle, thereby enhancing management of personnel boarding the vehicle, reducing potential safety concerns, and ensuring vehicle safety.

[0030] As shown in FIG. 2, the present invention further provides a system for controlling a vehicle door and lighting during rail vehicle cleaning, including: a parking-mode switch, a locking-mode switch, a cleaning-mode switch, an emergency unlocking device, a local door switch, a vehicle control unit, a door control unit and a lighting control unit;

[0031] The locking-mode switch and the emergency unlocking device are arranged outside the vehicle; the cleaning-mode switch and the local door switch are arranged inside the vehicle; the parking-mode switch, the locking-mode switch, the cleaning-mode switch, the emergency unlocking device and the local door switch are electrically connected to input ends of the vehicle

control unit respectively by hard wires, and output ends of the vehicle control unit are connected to the door control unit and the lighting control unit respectively.

[0032] The parking-mode switch is used to activate/close a parking mode; the locking-mode switch is used to activate/close a vehicle locking mode; the cleaning-mode switch is used to activate/close a cleaning mode; the emergency unlocking device is used to send out an emergency unlocking signal; the local door switch is used to send out a door opening/closing signal; the vehicle control unit is used to control a parking brake valve to operate according to the activation signal of the vehicle locking mode, send a vehicle locking control instruction to the door control unit and the lighting control unit according to the activation signal of the vehicle locking mode, send a signal allowing opening and closing of the vehicle door and a lighting turn-on signal to the door control unit and the lighting control unit respectively according to the activation signal of the cleaning mode, and feed the emergency unlocking signal and the door opening/closing signal back to the door control unit; the door control unit is used to control the vehicle door to be closed and locked according to the vehicle locking control instruction, control the vehicle door to be opened according to the emergency unlocking signal when the vehicle locking mode is closed, and control the vehicle door to be opened/closed according to the door opening/closing signal when the cleaning mode is activated; and the lighting control unit is used to control the lighting to be turned off according to the vehicle locking control instruction (when the vehicle locking mode is activated), and control the lighting to be turned on according to the lighting turn-on signal (when the cleaning mode is activated).

[0033] The vehicle control unit is connected to the lighting control unit through multiple signal channels, and controls the brightness of the lighting according to the combination of different signal channels to save electric energy.

[0034] Described above are the specific embodiments of the present invention only, but the protection scope of the present invention is not limited thereto. Any skilled person who is familiar with this art could readily conceive of variations or modifications within the disclosed technical scope of the present invention, and these variations or modifications shall fall within the protection scope of the present invention.

Claims

1. A method for controlling a vehicle door and lighting during rail vehicle cleaning, wherein the method comprises:

step 1: in a parking mode, activating a vehicle locking mode, controlling the vehicle door to be closed and locked according to an activation signal of the vehicle locking mode, and controlling

the lighting to be turned off at the same time; when the vehicle locking mode is activated, the vehicle door cannot be opened through an emergency unlocking device;

step 2: when cleaning is required, closing the vehicle locking mode, and when the vehicle locking mode is closed, opening the vehicle door through the emergency unlocking device;

step 3: activating a cleaning mode, opening and closing of the vehicle door is allowed to be controlled after the cleaning mode is activated, and controlling the lighting to be turned on at the same time; when the cleaning mode is activated, controlling the opening and closing of the vehicle door through a local door switch; and

step 4: after the cleaning is completed, closing the cleaning mode to make the local door switch unable to control opening and closing of the vehicle door, and activating the vehicle locking mode again.

2. The method according to claim 1, wherein in step 1, the vehicle locking mode is activated by operating a locking-mode switch outside the vehicle with a key.
3. The method according to claim 1, wherein in step 2, the vehicle locking mode is closed by operating the locking-mode switch outside the vehicle with a key.
4. The method according to claim 1, wherein in step 3, the cleaning mode is activated by operating a cleaning-mode switch inside the vehicle with a key.
5. The method according to any one of claims 1-4, further comprising a step of entering the parking mode before step 1, specifically comprising:
step 0: when the vehicle is stationary at a railway yard, activating the parking mode, controlling a parking brake valve to operate according to an activation signal of the parking mode, and keeping and recording a current status of each subsystem of the vehicle; and canceling a drivers cab occupancy status and allowing the vehicle to enter the parking mode.
6. The method according to claim 5, further comprising a step of entering a sleep mode between the step 0 and the step 1, specifically comprising:
automatically controlling or closing a part of subsystems of the vehicle according to a set time, and allowing the vehicle to enter the sleep mode.
7. A system for controlling a vehicle door and lighting during rail vehicle cleaning, wherein the system comprises: a locking-mode switch, a cleaning-mode switch, an emergency unlocking device, a local door switch, a vehicle control unit, a door control unit and a lighting control unit, wherein the locking-mode switch and the emergency

unlocking device are arranged outside the vehicle, and the cleaning-mode switch and the local door switch are arranged inside the vehicle; the locking-mode switch, the cleaning-mode switch, the emergency unlocking device and the local door switch are electrically connected to the vehicle control unit respectively, and the vehicle control unit is connected to the door control unit and the lighting control unit respectively.

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8. The system according to claim 7, wherein the locking-mode switch, the cleaning-mode switch, the emergency unlocking device and the local door switch are electrically connected to the vehicle control unit respectively by hard wires.

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9. The system according to claim 7 or 8, wherein the system further comprises a parking-mode switch electrically connected to the vehicle control unit.

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10. A vehicle, wherein the vehicle comprises the system according to any one of claims 7-9.

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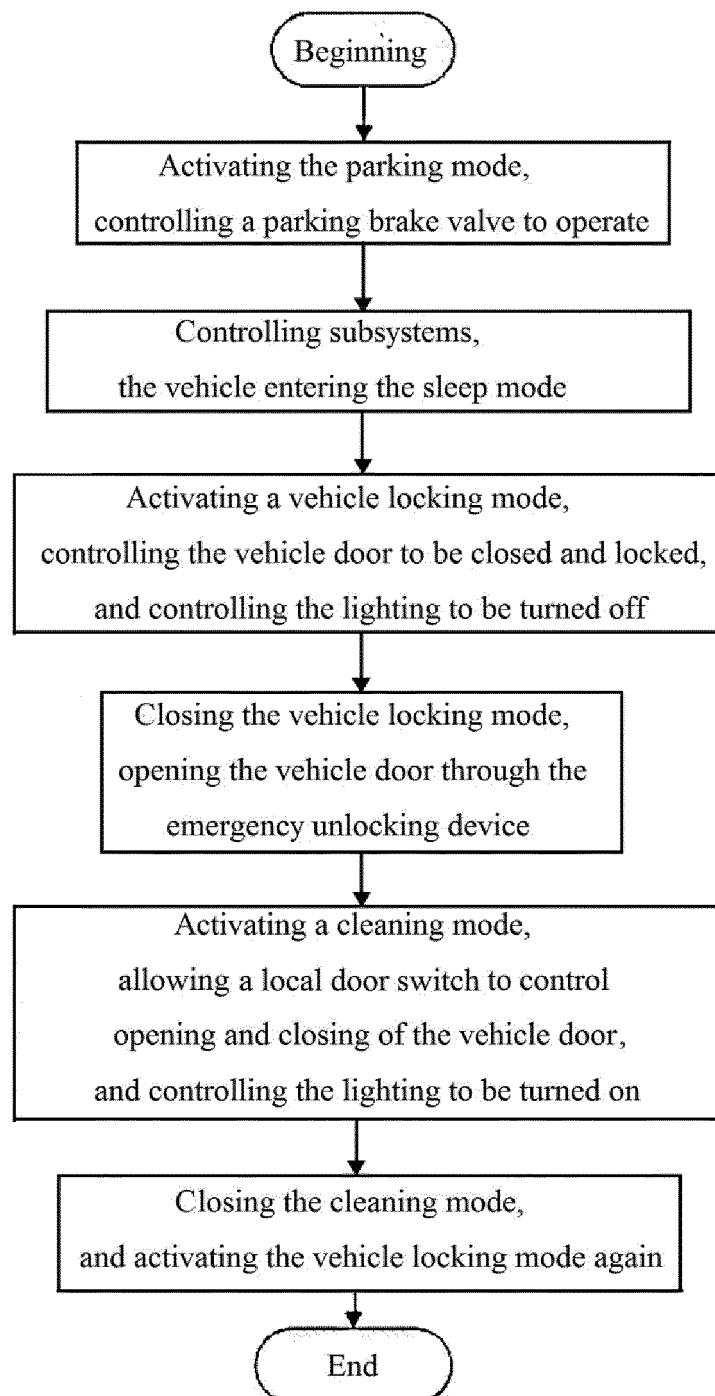


Fig. 1

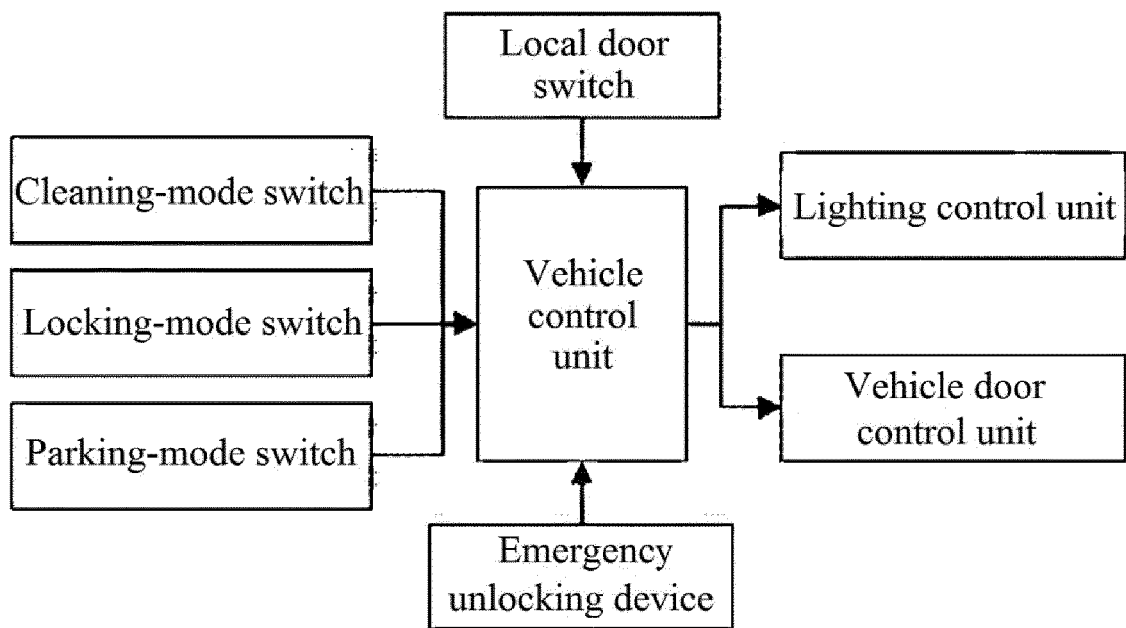


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/130347

A. CLASSIFICATION OF SUBJECT MATTER B61D 29/00(2006.01)i; B61C 17/00(2006.01)i; E05B 81/54(2014.01)i According to International Patent Classification (IPC) or to both national classification and IPC																					
B. FIELDS SEARCHED																					
Minimum documentation searched (classification system followed by classification symbols) B61D; B61C; E05B																					
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched																					
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNABS; CNTXT; VEN; CNKI: 列车, 轨道, 火车, 高铁, 动车, 清洁, 打扫, 照明, 控制, 车门, 驻车, 锁车, 解锁, 激活; train, rail, clean, light, control, door, parking, lock, unlock, release, activate																					
C. DOCUMENTS CONSIDERED TO BE RELEVANT																					
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>PX</td> <td>CN 111572578 A (CRRC ZHUZHOU LOCOMOTIVE CO., LTD.) 25 August 2020 (2020-08-25) claims 1-10</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 105781318 A (CRRC QINGDAO SIFANG CO., LTD.) 20 July 2016 (2016-07-20) description, pages 2-9, and figures 1-4</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 106368532 A (CRRC ZHUZHOU LOCOMOTIVE CO., LTD.) 01 February 2017 (2017-02-01) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 111119652 A (CRRC ZHUZHOU LOCOMOTIVE CO., LTD.) 08 May 2020 (2020-05-08) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 110439422 A (CRRC QINGDAO SIFANG CO., LTD.) 12 November 2019 (2019-11-12) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>JP 2014012508 A (DAITO ELECTRON CO LTD et al.) 23 January 2014 (2014-01-23) entire document</td> <td>1-10</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	PX	CN 111572578 A (CRRC ZHUZHOU LOCOMOTIVE CO., LTD.) 25 August 2020 (2020-08-25) claims 1-10	1-10	A	CN 105781318 A (CRRC QINGDAO SIFANG CO., LTD.) 20 July 2016 (2016-07-20) description, pages 2-9, and figures 1-4	1-10	A	CN 106368532 A (CRRC ZHUZHOU LOCOMOTIVE CO., LTD.) 01 February 2017 (2017-02-01) entire document	1-10	A	CN 111119652 A (CRRC ZHUZHOU LOCOMOTIVE CO., LTD.) 08 May 2020 (2020-05-08) entire document	1-10	A	CN 110439422 A (CRRC QINGDAO SIFANG CO., LTD.) 12 November 2019 (2019-11-12) entire document	1-10	A	JP 2014012508 A (DAITO ELECTRON CO LTD et al.) 23 January 2014 (2014-01-23) entire document	1-10
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<table border="1"> <tr> <td>Date of the actual completion of the international search 04 February 2021</td> <td>Date of mailing of the international search report 23 February 2021</td> </tr> </table>	Date of the actual completion of the international search 04 February 2021	Date of mailing of the international search report 23 February 2021																			
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Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No. PCT/CN2020/130347

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 200480669 Y1 (LEEK-N LEEKUN IND SYSTEMS CO LTD) 22 June 2016 (2016-06-22) entire document	1-10

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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