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(54) ELEVATOR, ELEVATOR CONTROL METHOD, AND ELEVATOR CONTROL PROGRAM

(57) Provided is an elevator including: a car; a landing control unit that includes a plurality of connection ports to each of which an operation terminal is connected, and is installed in each landing for the car; a control device having a drive control unit that controls traveling of the car on a basis of a signal from the landing control unit; and a return operation input unit that performs an operation for returning an operation mode of the car by the drive control unit from an inspection mode to a normal operation mode, wherein the control device includes a return permission determination unit that permits the drive control unit to return to the normal operation mode when it is determined that a return permission signal is transmitted from the return operation input unit, one of idle ports to which the operation terminals are not connected among the connection ports of the landing control units being set as the return operation input unit.

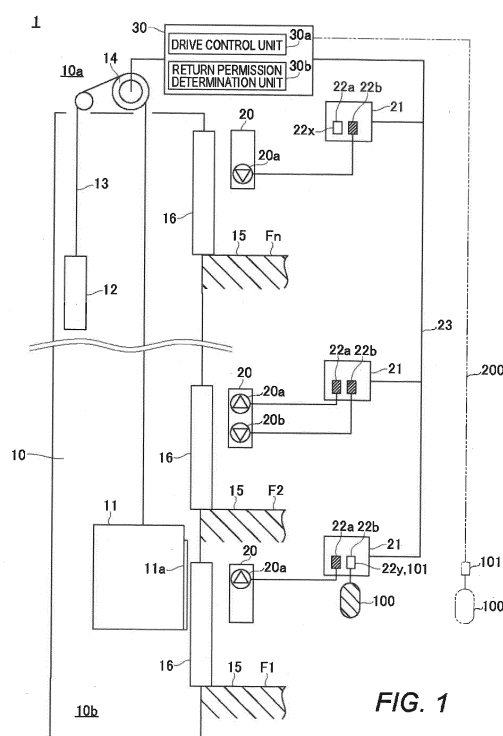


FIG. 1

Description

Technical Field

[0001] The present invention relates to an elevator, an elevator control method, and an elevator control program.

Background Art

[0002] As a technique related to elevator control including maintenance and inspection work, there is a technique disclosed in PTL 1 below. PTL 1 describes the following technique. A maintenance personnel who has entered a hoistway pit 17 exits from an inside of the pit 17 after predetermined maintenance and inspection or repair work, and at that time, operates a hoistway safety switch 18 inside the hoistway pit 17. As illustrated in FIG. 4, a main control device 11 monitors an ON operation of the hoistway safety switch 18 (step 8f), and when the hoistway safety switch 18 is turned ON, the main control device 11 cancels a door opening detection state based on a bit signal from a transmission line 16 (step 9f), and returns from an operation prohibition mode to a normal operation mode. On the other hand, when the hoistway safety switch 18 is not turned on, the door opening detection state based on the bit signal from the transmission line 16 is held (step 10f), and the operation prohibition mode is maintained".

[0003] In recent EN standards and new JIS standards, it is required to perform operation of returning to the normal operation mode after the maintenance and inspection or repair work outside the pit in order to ensure safety of the maintenance personnel. As a result, the above-described hoistway safety switch 18 is provided outside the pit.

Citation List

Patent Literature

[0004] PTL 1: JP 2011-32028 A

Summary of Invention

Technical Problem

[0005] However, in the above-described configuration, the hoistway safety switch 18 is connected to the main control device 11 by solo-lead wiring, which is a factor of complicating equipment.

[0006] Therefore, an object of the present invention is to provide an elevator, an elevator control method, and an elevator control program capable of reducing a number of wiring lines without adding equipment.

Solution to Problem

[0007] In order to solve the above problem, for example, the configuration described in the claims is adopted.

[0008] The present application includes a plurality of solutions to solve the problem, and one example thereof is a configuration in which an elevator including: a car; a landing control unit that includes a plurality of connection ports to each of which an operation terminal is connected, and is installed in each landing for the car; a control device having a drive control unit that controls traveling of the car on a basis of a signal from the landing control unit; and a return operation input unit that performs an operation for returning an operation mode of the car by the drive control unit from an inspection mode to a normal operation mode, wherein the control device includes a return permission determination unit that permits the drive control unit to return to the normal operation mode when it is determined that a return permission signal is transmitted from the return operation input unit, one of idle ports to which the operation terminals are not connected among the connection ports of the landing control units being set as the return operation input unit.

Advantageous Effects of Invention

[0009] According to the present invention, there can be provided an elevator, an elevator control method, and an elevator control program capable of reducing a number of wiring lines without adding equipment.

Brief Description of Drawings

[0010]

[FIG. 1] FIG. 1 is an overall configuration diagram of an elevator according to an embodiment.

[FIG. 2] FIG. 2 is a flowchart illustrating an elevator control method according to the embodiment.

Description of Embodiments

[0011] Hereinafter, an embodiment relating to an elevator, an elevator control method, and an elevator control program of the present invention will be described in detail with reference to the drawings.

<<Elevator>>

[0012] FIG. 1 is an overall configuration diagram of an elevator 1 according to an embodiment of the present invention. As illustrated in this figure, the elevator 1 has a car 11, a balance weight 12, and a main rope 13 connecting these to both ends of the main rope 13 inside a traveling path 10 extending in a predetermined direction along a building (structure). A machine room 10a is disposed above the traveling path 10, and a hoisting machine 14 around which the main rope 13 is wound is pro-

vided in the machine room 10a.

[0013] On a wall surface of the traveling path 10, a landing door 16 is provided facing a landing 15 provided on each floor F1, F2, ... of the building. Each of the landing doors 16 is engaged with a car door 11a in a state where the car 11 has arrived at each landing F, and the car door 11a is opened, by which the landing door 16 is opened together with the car door 11a.

[0014] In addition, each of the landings 15 is provided with a call operation unit 20 and a landing control unit 21. Of these, the call operation unit 20 has at least an upward call button 20a and a downward call button 20b.

[0015] That is, the call operation unit 20 provided in the landing 15 of the bottom floor F1 has the upward call button 20a. In addition, the call operation unit 20 provided in the landing 15 of the middle floor F2 has at least the upward call button 20a and the downward call button 20b. In addition, the call operation unit 20 provided in the landing 15 of a top floor Fn has the downward call button 20b. These upward call button 20a and downward call button 20b are landing call buttons provided as operation terminals in the call operation unit 20.

[0016] In addition, the landing control unit 21 is connected to the call operation unit 20, and transmits operation signals of the upward call button 20a and the downward call button 20b of the call operation unit 20 to a control device 30 described below. Each of the landing control units 21 described above typically includes a same number of connection ports 22a, 22b. Each of the connection ports 22a, 22b is individually connected to each of the upward call button 20a and the downward call button 20b of the call operation unit 20. Therefore, each of the landing control units 21 has the at least two connection ports 22a, 22b. The above-described landing control unit 21 is connected to the control device 30 described below via wiring 23.

[0017] In the configuration as described above, each of the landing control units 21 installed on the middle floors F2, ... is in a state where the upward call button 20a and the downward call button 20b are individually connected to the two connection ports 22a, 22b. In addition, in the landing control unit 21 installed on the top floor Fn, the downward call button 20b is connected to only the one connection port 22b of the two connection ports 22a, 22b, and the other connection port 22a is an idle port 22x. On the other hand, in the landing control unit 21 installed on the bottom floor F1, the upward call button 20a is connected to only the one connection port 22a of the two connection ports 22a, 22b, and the other connection port 22b is an idle port 22y.

[0018] Any one of the idle ports 22x, 22y is used as a return operation input unit, and is distinguished from the other connection ports 22a, 22b as a predetermined connection port 101 to which a connector 100 is detachably connected. Note that the connector 100 is used by the maintenance personnel of the elevator 1 to transmit, to the control device 30, a signal for permitting return to a normal operation mode. For example, the above-de-

scribed connector 100 transmits an ON signal in a state connected to the predetermined connection port 101, and transmission of the ON signal is stopped in a state where the connector 100 is removed from the predetermined connection port 101. Alternatively, the opposite may be applied.

[0019] Here, in the inspection work of the elevator 1, the maintenance personnel enters a pit 10b in a lower portion of the traveling path 10 to perform the work, and the worker who has left the pit 10b after the work end operates the connector 100. Therefore, the connector 100 may be connected to any of the idle ports 22y, 22x. However, in consideration of convenience of the operation of the connector 100, as illustrated, it is preferable to connect the connector 100 using the idle port 22y of the landing control unit 21 on the bottom floor F1 closer to the pit 10b as the predetermined connection port 101 serving as the return operation input unit.

[0020] The control device 30 is typically disposed at a position close to the hoisting machine 14 and in the machine room 10a. The control device 30 controls opening and closing of the car door 11a provided in the car 11 and driving of the hoisting machine 14.

[0021] Here, the control device 30 is configured by a calculator. The calculator is hardware used as a so-called computer. The calculator may include a central processing unit (CPU), a random access memory (RAM), a non-volatile storage unit such as a read only memory (ROM) or a hard disk drive (HDD), and further, a network interface.

[0022] The control device 30 configured by the above-described calculator stores, in a nonvolatile storage unit, a control program related to the operation of the elevator including the driving of the car door 11a and the hoisting machine 14, and executes processing based on the stored control program to control the operation of the elevator 1. The above-described control device 30 includes a drive control unit 30a and a return permission determination unit 30b as functional units that execute the control program.

[0023] The drive control unit 30a controls opening and closing of the car door 11a and traveling of the hoisting machine 14 on the basis of a signal from a car call operation unit (not illustrated) provided inside the car 11, a signal from each of the call operation units 20, and signals from various sensors (not illustrated). In addition, the return permission determination unit 30b permits return from an inspection mode to the normal operation mode on the basis of the signal from the predetermined connection port 101 when the operation mode of the elevator 1 is the inspection mode. Details of the permission of the return by this return permission determination unit 30b will be described in the next elevator control method.

<<Elevator control method>>

[0024] FIG. 2 is a flowchart illustrating the elevator control method according to the embodiment. The elevator

control method illustrated in this figure is a procedure of control performed by the control program held in the control device 30 described with reference to FIG. 1, and is a procedure of processing for ending the inspection of the elevator 1 and returning to the normal operation mode. Hereinafter, the elevator control method will be described with reference to FIG. 1 along the flowchart of FIG. 2.

<Step S101>

[0025] In step S101, the return permission determination unit 30b determines whether the signal from the predetermined connection port 101 has been received. Here, the predetermined connection port 101 is an idle port 22y to which the connector 100 is connected, and is a port used as the return operation input unit of the connection ports 22a, 22b. When determining that the signal from the predetermined connection port 101 has been received (YES), the return permission determination unit 30b proceeds the processing to the next step S102, and repeats the determination otherwise.

<Step S102>

[0026] In step S102, the return permission determination unit 30b determines whether a return permission signal has been received from the predetermined connection port 101. Here, this return permission signal is a rectangular wave signal that is brought into an OFF state when the connector 100 connected to the predetermined connection port 101 is pulled out from the predetermined connection port 101 and is then brought into an ON state again when the connector 100 is connected to the predetermined connection port 101. That is, on the basis of the above-described rectangular signal, the return permission determination unit 30b determines whether the worker has escaped from the pit 10b, pulled out the connector 100 from the predetermined connection port 101 of the landing control unit 21, and subsequently connected the removed connector 100 to the predetermined connection port 101 again. When determining that the signal is the return permission signal (YES), the return permission determination unit 30b proceeds the processing to the next step S103. When it is determined that the signal is not the return permission signal (NO), the processing returns to step S101.

<Step S103>

[0027] In step S103, the return permission determination unit 30b permits the drive control unit 30a to return the operation mode from the inspection mode to the normal operation mode. As a result, the drive control unit 30a returns the operation mode from the inspection mode to the normal operation mode, and ends the processing.

<<Effects of embodiments>>

[0028] According to the embodiment described above, it is possible to end the inspection work of the elevator 1 and return the elevator 1 to the normal operation mode by using, as the return operation input unit, any of the idle ports 22x, 22y among the connection ports 22a, 22b of the plurality of landing control units 21. As a result, as illustrated in FIG. 1, it is possible to eliminate solo-lead wiring 200 between a return operation input unit 101' for transmitting the return permission signal, and the control device 30, and to reduce a number of wiring lines in the elevator 1. As a result, it is possible to reduce the number of wiring lines without adding equipment to the elevator 1.

[0029] Note that in the embodiment described above, the configuration is such that in the determination of the input of the return permission signal, it is determined whether or not the procedure of pulling out the connector 100 connected to the predetermined connection port 101 and subsequently connecting the pulled-out connector 100 to the predetermined connection port 101 again has been performed. As a result, it is possible to prevent the connector 100 from being lost or mislaid. However, in a case where it is not necessary to consider the loss or mislaying of the connector 100, a configuration may be employed in which it is determined whether the connector 100 is connected to the predetermined connection port 101 and subsequently the connected connector 100 is pulled out from the predetermined connection port 101. Furthermore, in a case where it is not necessary to consider problems of an operation mistake, a configuration may be employed in which an input switch for return permission is connected to the predetermined connection port 101.

[0030] As described above, the present invention is not limited to the above-described embodiment and modifications, but includes various modifications. For example, the above-described embodiment has been described in detail in order to describe the present invention in an easy-to-understand manner, and is not necessarily limited to those having all the configurations described. Moreover, a part of a configuration of a certain embodiment can be replaced with a configuration of another embodiment, and a configuration of a certain embodiment can also be added to a configuration of another embodiment. Moreover, with respect to a part of a configuration of each embodiment, addition of another configuration, deletion, or replacement can be made. Reference Signs List

[0031]

1	elevator
11	car
15	landing
20a	upward call button (operation terminal)
20b	downward call button (operation terminal)
21	landing control unit
22a, 22b	connection port

22x, 22y idle port
 30 control device
 30a drive control unit
 30b return permission determination unit
 100 connector
 101 predetermined connection port (return operation input unit)
 F1 bottom floor

including

a car,
 a landing control unit that includes a plurality of connection ports to each of which an operation terminal is connected, and is installed in each landing for the car,
 a control device having a drive control unit that controls traveling of the car on a basis of a signal from the landing control unit, and
 a return operation input unit that performs an operation for returning an operation mode of the car by the drive control unit from an inspection mode to a normal operation mode,
 wherein a return permission determination unit provided in the control device permits the drive control unit to return to the normal operation mode when it is determined that a return permission signal is transmitted from the return operation input unit, one of idle ports to which the operation terminals are not connected among the connection ports of the landing control units being set as the return operation input unit.

Claims

1. An elevator comprising:

a car;
 a landing control unit that includes a plurality of connection ports to each of which an operation terminal is connected, and is installed in each landing for the car;
 a control device having a drive control unit that controls traveling of the car on a basis of a signal from the landing control unit; and
 a return operation input unit that performs an operation for returning an operation mode of the car by the drive control unit from an inspection mode to a normal operation mode,
 wherein the control device includes
 a return permission determination unit that permits the drive control unit to return to the normal operation mode when it is determined that a return permission signal is transmitted from the return operation input unit, one of idle ports to which the operation terminals are not connected among the connection ports of the landing control units being set as the return operation input unit.

2. The elevator according to claim 1, wherein the idle port used as the return operation input unit is one of the connection ports of the landing control unit installed on a bottom floor of the landing control units.

3. The elevator according to claim 1, wherein the operation terminal is a landing call button.

4. The elevator according to claim 1, wherein each of the landing control units has a same number of connection ports.

5. The elevator according to claim 1, wherein a connector that transmits a signal to the control device is detachably connected to the return operation input unit.

6. The elevator according to claim 1, wherein the return permission signal is a rectangular signal.

7. An elevator control method for controlling an elevator

8. An elevator control program that is a control program of an elevator including

a car,
 a landing control unit that includes a plurality of connection ports to each of which an operation terminal is connected, and is installed in each landing for the car,
 a control device having a drive control unit that controls traveling of the car on a basis of a signal from the landing control unit, and
 a return operation input unit that performs an operation for returning an operation mode of the car by the drive control unit from an inspection mode to a normal operation mode,
 wherein the drive control unit is permitted to return to the normal operation mode when it is determined that a return permission signal is transmitted from the return operation input unit to a return permission determination unit provided in the control device, one of idle ports to which the operation terminals are not connected among the connection ports of the landing control units being set as the return operation input unit.

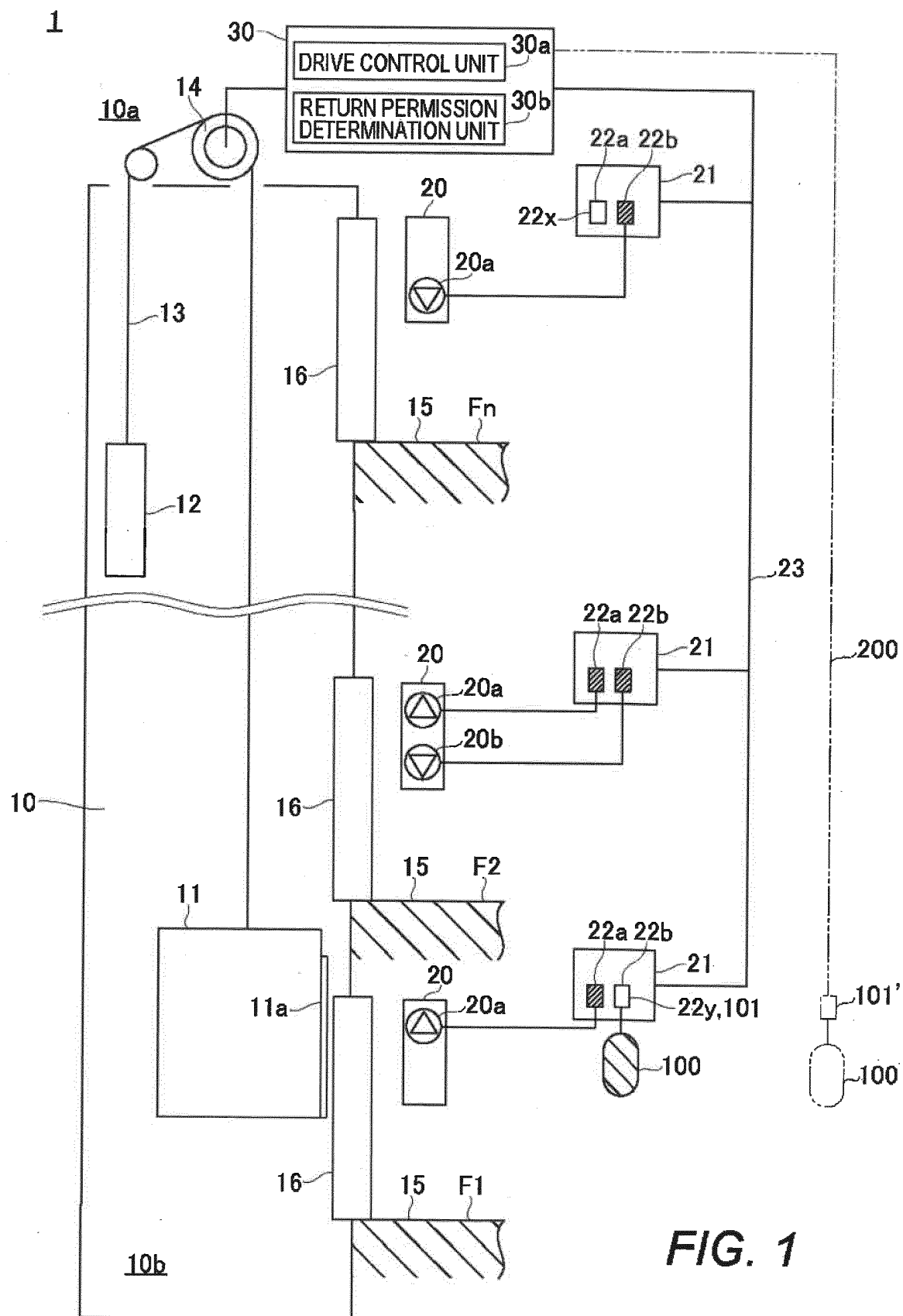
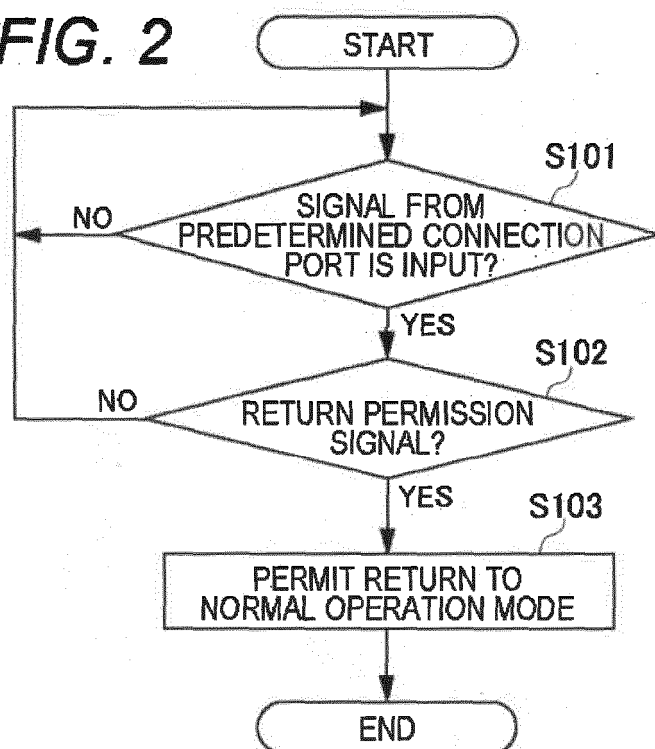


FIG. 2

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/026179

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A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. B66B5/00 (2006.01) i

FI: B66B5/00 G

According to International Patent Classification (IPC) or to both national classification and IPC

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl. B66B5/00-5/28

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2020

Registered utility model specifications of Japan 1996-2020

Published registered utility model applications of Japan 1994-2020

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2005/102900 A1 (MITSUBISHI ELECTRIC CORP.) 03 November 2005	1-8
A	JP 2010-89877 A (TOSHIBA ELEVATOR AND BUILDING SYSTEMS CORP.) 22 April 2010	1-8
A	JP 11-130355 A (HITACHI BUILDING SYSTEMS CO., LTD.) 18 May 1999	1-8
A	JP 2011-32028 A (TOSHIBA ELEVATOR AND BUILDING SYSTEMS CORP.) 17 February 2011	1-8
A	WO 2017/212105 A1 (KONE CORPORATION) 14 December 2017	1-8

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☒ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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Date of the actual completion of the international search
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INTERNATIONAL SEARCH REPORT		International application No. PCT/JP2020/026179
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E, X	JP 2020-125180 A (HITACHI BUILDING SYSTEMS CO., LTD.) 20 August 2020, paragraphs [0015], [0019], [0026], [0027], fig. 1-5	1-2, 4-5

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INTERNATIONAL SEARCH REPORT
Information on patent family membersInternational application No.
PCT/JP2020/026179

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Patent Documents referred to in the Report	Publication Date	Patent Family	Publication Date
WO 2005/102900 A1	03.11.2005	CN 1777558 A	
JP 2010-89877 A	22.04.2010	(Family: none)	
JP 11-130355 A	18.05.1999	(Family: none)	
JP 2011-32028 A	17.02.2011	(Family: none)	
WO 2017/212105 A1	14.12.2017	(Family: none)	
JP 2020-125180 A	20.08.2020	(Family: none)	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2011032028 A [0004]