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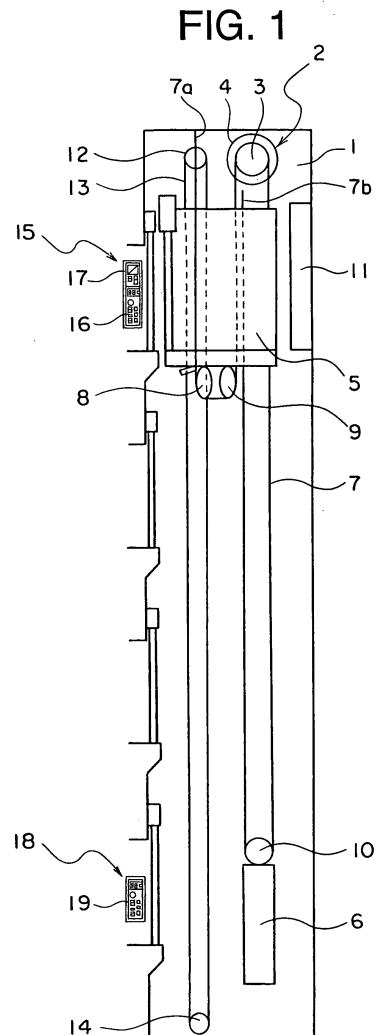
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(54) **ELEVATOR DEVICE**

(57) In an elevator apparatus, a car is stopped at a plurality of stop floors including a first stop floor and a second stop floor. A first landing inspection device is provided at a landing of the first stop floor. A second landing inspection device is provided at a landing of the second stop floor. The first landing inspection device is provided with a first maintenance service operation portion for carrying out a maintenance service of the car, and a first emergency service operation portion for moving the car in an emergency. The second landing inspection device is provided with at least one of a second maintenance service operation portion for carrying out a maintenance service of the car, and a second emergency service operation portion for moving the car in an emergency.



Description

Technical Field

[0001] The present invention relates to an elevator apparatus having a structure in which a maintenance service operation portion for carrying out a maintenance service of a car and an emergency service operation portion for moving the car in an emergency are provided at a landing.

Background Art

[0002] In a conventional machine-room-less elevator apparatus, a hoisting machine is disposed in a top within a hoistway. A lever for manually releasing a brake of the hoisting machine in an emergency is provided at a landing of an uppermost floor (e.g., see Patent Document 1).

[0003] A maintenance service operation portion for carrying out a maintenance service of a car may be provided at the landing of the uppermost floor. During maintenance, the maintenance service operation portion is operated to make a changeover in a service mode of an elevator to a maintenance mode. Then, the maintenance service operation portion is operated to lower the car to a position allowing an operator to get thereon. The operator opens a door of a landing, gets on the car, and performs a maintenance operation of components installed within the hoistway.

[0004] Patent Document 1: US 5971109

Disclosure of the Invention

Problems to be solved by the Invention

[0005] In the conventional elevator apparatus structured as described above, the lever for releasing the brake of the hoisting machine and the maintenance service operation portion are provided only at the landing of the uppermost floor. In order to operate them, therefore, the operator needs to move to the uppermost floor on a case-by-case basis, which is a troublesome task. In particular, the operator needs to move to the uppermost floor using stairs when a breakdown or a blackout has occurred in a building in which only one elevator is installed. Further, for example, a collective housing or the like is often provided with rooms for inhabitants at an uppermost floor as well. In some cases, only a landing of a reference floor is designed as a shared zone, and each of floors other than the reference floor, especially the uppermost floor is designed as a privacy zone. In such cases, the inhabitants feel uncomfortable every time the operator goes to the uppermost floor to perform maintenance and inspection.

[0006] The present invention has been made to solve the above-mentioned problems, and it is therefore an object of the present invention to obtain an elevator apparatus capable of enhancing the working efficiency in per-

forming a maintenance operation and the like, and alleviating a feeling of discomfort caused to building users due to the operation.

Means for Solving the Problems

[0007] An elevator apparatus according to the present invention includes: a drive device; a control device for controlling the drive device; a car for being raised/lowered within a hoistway due to a driving force of the drive device to be stopped at a plurality of stop floors including a first stop floor and a second stop floor; a first landing inspection device provided at a landing of the first stop floor; and a second landing inspection device provided at a landing of the second stop floor, in which: the first landing inspection device is provided with a first maintenance service operation portion for carrying out a maintenance service of the car and a first emergency service operation portion for moving the car in an emergency; and the second landing inspection device is provided with at least one of a second maintenance service operation portion for carrying out a maintenance service of the car and a second emergency service operation portion for moving the car in an emergency.

Brief Description of the Drawings

[0008]

Fig. 1 is a lateral view showing an elevator apparatus according to Embodiment 1 of the present invention. Fig. 2 is a lateral view showing an elevator apparatus according to Embodiment 2 of the present invention.

Best Modes for Carrying Out the Invention

[0009] Preferred embodiments of the present invention will be described hereinafter with reference to the drawings.

Embodiment 1

[0010] Fig. 1 is a lateral view showing an elevator apparatus according to Embodiment 1 of the present invention. Referring to Fig. 1, a drive device (hoisting machine) 2 is installed in top within a hoistway 1. The drive device 2 has a drive sheave 3 and a drive device body 4. The drive device body 4 has a motor portion (not shown) for rotating the drive sheave 3, and a brake portion (not shown) for braking rotation of the drive sheave 3.

[0011] A car 5 and a counterweight 6 are raised/lowered within the hoistway 1 due to a driving force of the drive device 2. The car 5 is stopped at a plurality of stop floors including an uppermost floor (first stop floor) and a lowermost floor (second stop floor). A plurality of guide rails (not shown) for guiding the raising/lowering of the car 5 and the counterweight 6 are installed within the hoistway 1. A main rope 7 for suspending the car 5 and

the counterweight 6 is looped around the drive sheave 3. The main rope 7 has a first end 7a and a second end 7b, which are connected to the top within the hoistway 1.

[0012] A pair of car suspending pulleys 8 and 9 are provided on a lower portion of the car 5. A counterweight suspending pulley 10 is provided on an upper portion of the counterweight 6. The main rope 7 is sequentially looped around the car suspending pulleys 8 and 9, the drive sheave 3, and the counterweight suspending pulley 10 from the first end 7a side. That is, the car 5 and the counterweight 6 are suspended within the hoistway 1 by means of the main rope 7 according to a 2:1 roping method.

[0013] A control device 11 for controlling the travel of the elevator apparatus is installed in an upper portion within the hoistway 1. The control device 11 controls the drive device 2 to control the service of the car 5. The control device 11 is mounted on a wall portion of the hoistway 1 in the vicinity of the uppermost floor. In addition, the control device 11 is constituted by a computer.

[0014] A speed governor 12 is installed in the upper portion of the hoistway 1. The speed governor 12 is provided with a speed governor sheave, an overspeed detecting switch, a rope catch, and the like. A speed governor rope 13 is looped around the speed governor sheave. The speed governor rope 13 is connected at both ends thereof to an operating mechanism of an emergency stop device (not shown) mounted on the car 5. The lower end of the speed governor rope 13 is looped around a tension pulley 14 disposed in a lower portion of the hoistway 1.

[0015] When the car 5 is raised/lowered, the speed governor rope 13 is circulated, so the speed governor sheave is rotated at a rotational speed corresponding to a running speed of the car 5. When the running speed of the car 5 reaches a first overspeed higher than a rated speed, the overspeed detecting switch of the speed governor 12 is operated. When the overspeed detecting switch is operated, the power supplied to the motor portion of the drive device 2 is shut off and the drive sheave 3 is braked by the brake portion. As a result, the car 5 is stopped as an emergency measure.

[0016] When the running speed of the car 5 reaches a second overspeed higher than the first overspeed, the speed governor rope 13 is gripped by the rope catch of the speed governor 12 and thereby stopped from being circulated. Thus, the emergency stop device is activated to stop the car 5.

[0017] A first landing inspection device 15 is provided at the landing of the uppermost floor. The first landing inspection device 15 is provided with a first maintenance service operation portion 16 for carrying out a maintenance service of the car 5, and a first emergency service operation portion 17 for moving the car 5 in an emergency.

[0018] The first maintenance service operation portion 16 is connected to the control device 11 via a connection cable (not shown), so a signal can be transmitted be-

tween the first maintenance service operation portion 16 and the control device 11. The first maintenance service operation portion 16 is provided with a mode changeover switch for making a changeover in a control mode of the control device 11 between an automatic mode and a maintenance mode, an UP/DOWN switch for raising/lowering the car 5, a display portion for displaying a state of the elevator apparatus (position of the car 5, malfunction mode, and the like), and the like.

[0019] The first emergency service operation portion 17 is provided with a brake release operation portion for remotely releasing the brake portion of the drive device 2, and an inspection window for confirming the interior of the hoistway 1. An operating force applied to the brake release operation portion is transmitted to the brake portion either through an electric signal or mechanically via a wire or the like. When the brake portion is released, the car 5 is raised or lowered in accordance with a difference between weights of the car 5 and the counterweight 6 (however, when the weight of the car 5 is equal to the weight of the counterweight 6, the car 5 does not move).

[0020] The speed governor rope 13 or the main rope 7 is marked with a plurality of markings (not shown) for indicating that the car 5 has arrived at a stop floor in operating the brake release operation portion to raise/lower the car 5. The markings can be visually recognized from the landing through the inspection window.

[0021] A second landing inspection device 18 is provided at a landing of the lowermost floor. The second landing inspection device 18 is provided with a second maintenance service operation portion 19 for carrying out a maintenance service of the car 5. The second maintenance service operation portion 19, which is connected to the control device 11 via a connection cable (not shown), has the same construction as the first maintenance service operation portion 16.

[0022] Each of the first landing inspection device 15 and the second landing inspection device 18 is accommodated within a landing button device (not shown) provided on a landing wall, and thus not exposed to a corresponding one of the landings during normal operation. However, when the operator removes a front panel of the landing button device, each of the first landing inspection device 15 and the second landing inspection device 18 is exposed to the corresponding one of the landings.

[0023] When operations are input to the control device 11 from both the first maintenance service operation portion 16 and the second maintenance service operation portion 19, the control device 11 selects and validates only one of the operations. In this example, the first landing inspection device 15 and the second landing inspection device 18 are defined as a primary landing inspection device and a secondary landing inspection device, respectively. Accordingly, when both the first maintenance service operation portion 16 and the second maintenance service operation portion 19 become operable (en-

ter maintenance mode), the control device 11 validates the operation for the first maintenance service operation portion 16, and invalidates the operation for the second maintenance service operation portion 19. On the contrary, the operation for the second maintenance service operation portion 19 is validated when the first maintenance service operation portion 16 is in the automatic mode and the second maintenance service operation portion 19 is in the maintenance mode. This function of selecting the first maintenance service operation portion 16 by priority is realized based on a program stored in the computer constituting the control device 11.

[0024] Next, a procedure of a maintenance operation will be described. The operator exposes the second landing inspection device 18 at the landing of the lowermost floor, and operates the second maintenance service operation portion 19 to hold the control device 11 in the maintenance mode. The operator performs a maintenance that does not require a movement onto the car 5 simply at the lowermost floor. In performing a maintenance requiring the operator to get on the car 5, the operator lowers the car 5 from a landing of a floor directly above the lowermost floor to a position allowing the operator to move onto the car 5. Then, the operator moves to the floor directly above the lowermost floor, opens a landing door at that floor, and moves onto the car 5.

[0025] After having moved onto the car 5, the operator operates a service switch (not shown) on the car 5, thereby raising the car 5 in maintenance mode service (low-speed service). At this moment, the components in the hoistway 1 are sequentially inspected from below. The operator then stops the car 5 in the vicinity of the uppermost floor to perform operations of inspecting the drive device 2 and the control device 11.

[0026] After having finished the inspection, the operator lowers the car 5 to the position where the operator got thereon, and gets off at the landing of the floor directly above the lowermost floor. The operator then moves to the lowermost floor, operates the second maintenance service operation portion 19 to make a changeover to the automatic mode in the control device 11, and replaces the front panel of the landing button device, thereby terminating the maintenance operation. The maintenance operation as described hitherto can also be performed by the first maintenance service operation portion 16.

[0027] Next, an operation of rescuing passengers from within the car 5 that has stopped due to a blackout, a breakdown, or the like will be described. In this case, the operator exposes the first landing inspection device 15 at the landing of the uppermost floor, and operates the first maintenance service operation portion 16 to hold the control device 11 in the maintenance mode. After that, while confirming the car 5 and the markings from the inspection window, the operator intermittently operates the brake release operation portion to cause the brake portion to perform a release function and a braking function repeatedly and alternately. Thus, the operator gradually raises or lowers the car 5 to move it to a nearest

floor. The operator then opens the car door and the landing door at the nearest floor, and rescues the passengers within the car 5.

[0028] A restoration operation after the rescue of the passengers is performed as follows. That is, when the drive device 2 can be drivingly controlled, the operator operates the first maintenance service operation portion 16 to move the car 5 to a position allowing the operator to move onto the car 5 from the landing of the uppermost floor. After that, the operator gets onto the car 5 to inspect/repair the drive device 2 and the control device 11 in the same manner as in the case of maintenance. If necessary, the operator inspects/repairs the components within the hoistway as well.

[0029] In the elevator apparatus constructed as described above, the first landing inspection device 15 is provided at the landing of the uppermost floor, and the second landing inspection device 18 is provided at the landing of the lowermost floor. In addition, the second landing inspection device 18 is provided with the second maintenance service operation portion 19. Therefore, the maintenance operation can be performed without moving to the landing of the uppermost floor. As a result, the working efficiency in performing the maintenance operation can be enhanced, and a feeling of discomfort caused to building users due to the operation can be alleviated.

[0030] Further, the drive device 2 is disposed within the hoistway 1, and the first landing inspection device 15, which is disposed closer to the drive device 2 than the second maintenance service operation portion 19, is provided with the emergency service operation portion 17. Therefore, the transmission path of an operating force from the emergency service operation portion 17 to the drive device 2 can be shortened, so the drive device 2 can be operated more reliably. Especially in this example, the drive device 2 is disposed in the top within the hoistway 1, and the first landing inspection device 15 is disposed at the uppermost floor. Therefore, the drive device 2 can be operated more reliably and also visually confirmed from the inspection window.

Still further, only the first landing inspection device 15 is provided with the emergency service operation portion 17. Therefore, the overall construction can be simplified, and an improvement in reliability can be achieved.

Yet further, when operations are input to the control device 11 from both the first maintenance service operation portion 16 and the second maintenance service operation portion 19, the control device 11 selects and validates only one of the operations. Therefore, an improvement in reliability can be achieved.

Embodiment 2

[0031] Reference is made next to Fig. 2. Fig. 2 is a lateral view showing an elevator apparatus according to Embodiment 2 of the present invention. Referring to Fig. 2, the second landing inspection device 18 is provided

with the second maintenance service operation portion 19, and a second emergency service operation portion 20 for moving the car 5 in an emergency. The second emergency service operation portion 20 is constructed in the same manner as the first emergency service operation portion 17. Embodiment 2 of the present invention is identical to Embodiment 1 of the present invention in other constructional details.

[0032] As described above, the second landing inspection device 18 as well as the first landing inspection device 15 may be provided with the emergency service operation portion 20, so the operation of rescuing passengers within the car 5 can be performed from the lowermost floor without moving to the uppermost floor. As a result, the working efficiency can be enhanced.

[0033] The second landing inspection device 18 may not be provided with the second maintenance service operation portion 19 but only with the second emergency service operation portion 20.

In the foregoing examples, the uppermost floor is designated as the first stop floor. However, another stop floor may be designated as the first stop floor. By the same token, the second stop floor may not be the lowermost floor. However, if the first stop floor is set as a stop floor close to the drive device 2 as described above, the working efficiency in performing the operation of rescuing passengers and the like is further enhanced. If a hallway floor provided with an entrance to the building is designated as the second stop floor, the working efficiency in performing the maintenance operation and the like is further enhanced.

Further, in the foregoing examples, the first maintenance service operation portion 16 has priority over the second maintenance service operation portion 19. However, the first operated one of the first maintenance service operation portion 16 and the second maintenance service operation portion 19 may have priority over the other. In this case, each of the first maintenance service operation portion 16 and the second maintenance service operation portion 19 may be provided with an indicator for indicating whether or not the other is in use.

Still further, in the foregoing examples, the drive device 2 and the control device 11 are disposed in the upper portion within the hoistway 1. However, the drive device 2 and the control device 11 may be disposed at other positions, respectively. In this case as well, as described above, the first landing inspection device 15 having the emergency service operation portion 17 is preferably disposed closer to the drive device 2 than the second landing inspection device 18.

Further, in the foregoing examples, the two landing inspection devices 15 and 18 are provided in the entire elevator apparatus. However, three or more landing inspection devices may be provided. For instance, in a building having two hallway floors, the second landing inspection device 18 and a third landing inspection device may be provided at the landing of one of the hallway floors and the landing of the other, respectively.

In addition, the present invention is also applicable to an elevator apparatus having a drive device and a control device installed within a machine room. The present invention is especially effective for a machine-room-less elevator apparatus which requires a maintenance operation of a drive device and the like to be performed from a position on a car.

10 Claims

1. An elevator apparatus, comprising:

a drive device;
a control device for controlling the drive device;
a car for being raised/ lowered within a hoistway due to a driving force of the drive device to be stopped at a plurality of stop floors including a first stop floor and a second stop floor;
a first landing inspection device provided at a landing of the first stop floor; and
a second landing inspection device provided at a landing of the second stop floor, wherein:

the first landing inspection device is provided with a first maintenance service operation portion for carrying out a maintenance service of the car and a first emergency service operation portion for moving the car in an emergency; and
the second landing inspection device is provided with at least one of a second maintenance service operation portion for carrying out a maintenance service of the car and a second emergency service operation portion for moving the car in an emergency.

2. An elevator apparatus according to Claim 1, wherein:

the drive device is disposed within the hoistway;
the first landing inspection device is disposed closer to the drive device than the second landing inspection device; and
the second landing inspection device is provided only with the second maintenance service operation portion, out of the second maintenance service operation portion and the second emergency service operation portion.

3. An elevator apparatus according to Claim 2, wherein:

the drive device is disposed in top of the hoistway; and
the first stop floor is an uppermost floor.

4. An elevator apparatus according to Claim 1, wherein the second stop floor is a hallway floor of a building.

5. An elevator apparatus according to Claim 1, wherein the control device selects and validates only one of operations from both the first maintenance service operation portion and the second maintenance service operation portion when the operations are input thereto. 5

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FIG. 1

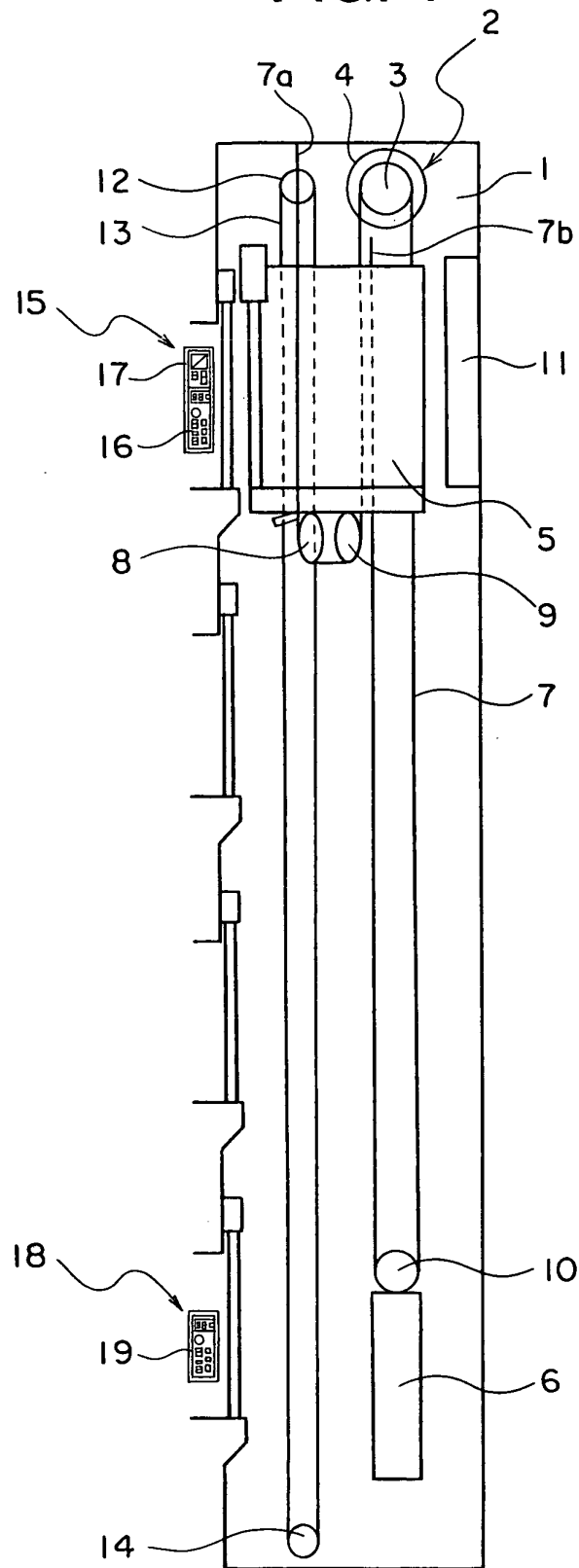
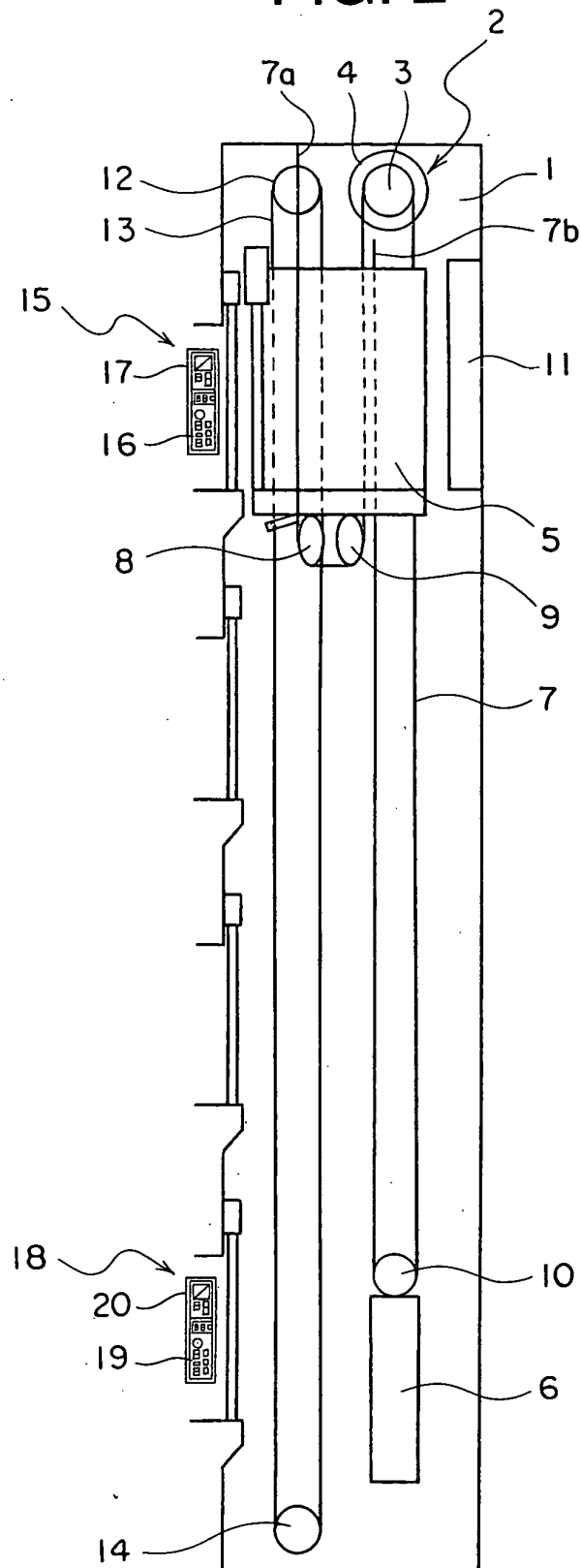


FIG. 2



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2005/021027

A. CLASSIFICATION OF SUBJECT MATTER B66B5/00 (2006.01) 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) B66B1/00-B66B20/00		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2006 Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	JP 08-059119 A (Mitsubishi Electric Building Techno-Service Co., Ltd.), 05 March, 1996 (05.03.96), Abstract; Fig. 1 (Family: none)	1-5
Y	JP 2003-252544 A (Hitachi Building Systems Co., Ltd.), 10 September, 2003 (10.09.03), Abstract; Fig. 1 (Family: none)	1-5
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 09 August, 2006 (09.08.06)		Date of mailing of the international search report 15 August, 2006 (15.08.06)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2005/021027

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Form PCT/ISA/210 (continuation of second sheet) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

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