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(54) **ELEVATOR SYSTEM**

(57) In an elevator apparatus, a car that is raised and lowered through a hoistway. Operation of the car is controlled by an elevator controller. An evacuating operation inputting means into which an evacuating operation command signal is inputted to make the car perform an evac-

uating operation is disposed on at least one landing. The elevator controller makes the car perform the evacuating operation in response to the evacuating operation command signal from the evacuating operation inputting means during an emergency evacuation.

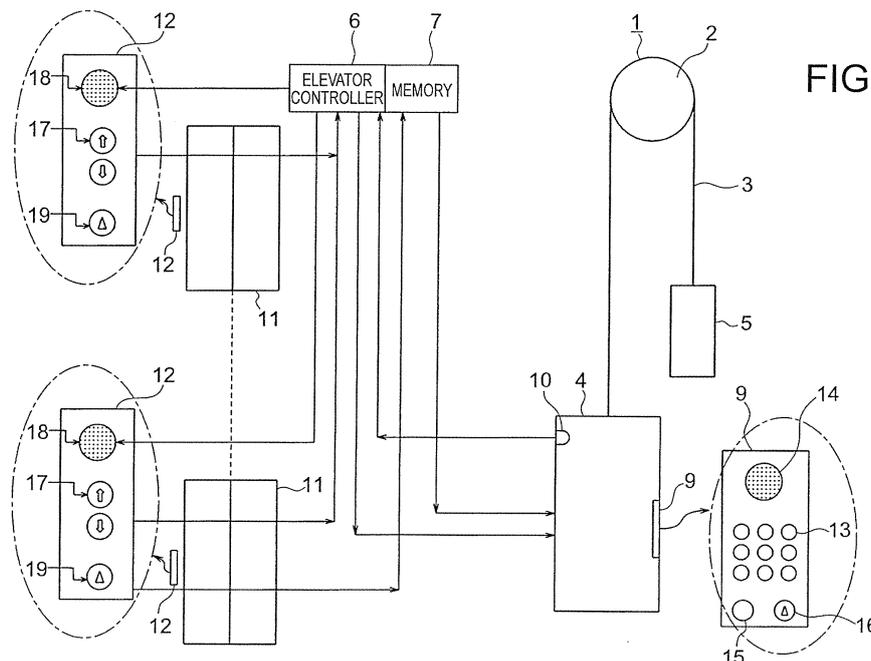


FIG. 1

Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator apparatus, and particularly relates to a system for performing an evacuating operation during an emergency evacuation such as in a fire, etc.

BACKGROUND ART

[0002] In conventional elevator apparatuses, when a fire is detected, cars are moved to predesignated floors, and operation is stopped. Later, when firefighters arrive at the building, the firefighters board the cars after checking fire conditions, and operate dedicated rescue operation on-board switches to make the cars perform evacuating operations (see Patent Literature 1, for example).

CITATION LIST

PATENT LITERATURE

[0003] [Patent Literature 1]
Japanese Patent Laid-Open No. 2005-112601 (Gazette)

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0004] In conventional elevator apparatuses such as that described above, because the firefighters board the car and perform the evacuating operation after the firefighters arrive at the building, it takes time to complete the evacuating operation.

[0005] The present invention aims to solve the above problems and an object of the present invention is to provide an elevator apparatus that enables people inside a building to be evacuated more efficiently during an emergency evacuation.

MEANS FOR SOLVING THE PROBLEM

[0006] In order to achieve the above object, according to one aspect of the present invention, there is provided an elevator apparatus including: a car that is raised and lowered through a hoistway; an elevator controller that controls operation of the car; and an evacuating operation inputting means that is disposed on at least one landing, and into which an evacuating operation command signal is inputted to make the car perform an evacuating operation, wherein the elevator controller makes the car perform the evacuating operation in response to the evacuating operation command signal from the evacuating operation inputting means during an emergency evacuation.

EFFECTS OF THE INVENTION

[0007] In an elevator apparatus according to the present invention, because an evacuating operation inputting means into which an evacuating operation command signal is inputted to make a car perform an evacuating operation is disposed on at least one landing, and an elevator controller makes the car perform an evacuating operation in response to the evacuating operation command signal from the evacuating operation inputting means during an emergency evacuation, the evacuating operation can be controlled by a person by operation by a fire warden who is on a landing during an emergency evacuation to give priority to evacuating other waiting passengers, enabling people inside a building to be evacuated more efficiently.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Figure 1 is a configuration diagram that shows an elevator apparatus according to Embodiment 1 of the present invention; and

Figure 2 is a flowchart that shows evacuation procedures during an emergency situation that use the elevator apparatus from Figure 1.

DESCRIPTION OF EMBODIMENTS

[0009] A preferred embodiment of the present invention will now be explained with reference to the drawings.

Embodiment 1

[0010] In this embodiment, a building evacuation method that uses an elevator apparatus during an emergency situation such as a building fire is disclosed. This evacuation method is controlled by a predesignated fire warden (FW). The fire warden performs an evacuating operation by controlling the elevator apparatus during a fire emergency situation in which evacuation is required from the entire building or from a portion of the building.

[0011] Normally, there is one or a plurality of fire wardens in a building. The fire warden is a person who works or lives in the building (this varies depending on the type of building), and has received a certain amount of training relating to emergency situations.

[0012] Figure 1 is a configuration diagram that shows an elevator apparatus according to Embodiment 1 of the present invention. In the figure, a hoisting machine 1 is installed in an upper portion of a hoistway. The hoisting machine 1 has: a driving sheave 2; a hoisting machine motor that rotates the driving sheave 2; and a hoisting machine brake that brakes rotation of the driving sheave 2.

[0013] A suspending means 3 is wound onto the driving sheave 2. A plurality of ropes or a plurality of belts can

be used as the suspending means 3. A car 4 and a counterweight 5 are suspended by the suspending means 3, and are raised and lowered inside the hoistway by the hoisting machine 1.

[0014] Operation of the hoisting machine 1 is controlled by an elevator controller 6. In other words, running of the car 4 is controlled by the elevator controller 6. A micro-computer that includes a memory 7 is used in the elevator controller 6.

[0015] Disposed on the car 4 are: a car operating panel (COP) 9; and a utilization rate detecting means 10 that investigates a utilization rate inside the car 4. An optical sensor that detects a utilization state inside the car 4 optically, or a weighing device that detects the utilization state inside the car 4 by weight, for example, can be used as the utilization rate detecting means 10.

[0016] Disposed on the car control panel 9 are: a plurality of destination floor buttons 13; an onboard speaker 14; an evacuation floor button (an evacuation floor switch) 15; and a bypassing key switch 16. The functions of the evacuation floor button 15 and the bypassing key switch 16 will be described below.

[0017] Landing door apparatuses 11 and landing operating panels 12 are disposed on landings on respective building floors. Disposed on the landing operating panels 12 are: a pair of up and down landing buttons 17; a landing speaker 18; and an FW controlled key switch 19 that functions as an evacuating operation inputting means.

[0018] The FW controlled key switch 19 enables only a fire warden to input an evacuating operation command signal. During an emergency situation in which the operating mode of the elevator apparatus switches to an evacuation mode, the fire warden comes to the landing, and controls the evacuating operation by the elevator apparatus using the FW controlled key switch 19.

[0019] Next, Figure 2 is a flowchart that shows evacuation procedures during an emergency situation that use the elevator apparatus from Figure 1. When a fire is detected by a fire detector or a smoke detector that is disposed inside the building, a signal is immediately inputted to the elevator controller 6 from the detector (Step S1). When information relating to the presence of a fire inside the building is received, the operating mode of the elevator apparatus is automatically switched over to an evacuation mode (Step S2). Alternatively, if the building has a 24-hour monitoring system, then a building administrator can also perform switching over to the evacuation mode manually.

[0020] When the operating mode is switched to the evacuation mode, all car calls and landing calls are canceled (Step S3), and audio announcement information relating to the evacuation mode is given to passengers who are waiting on the landings (Step S4).

[0021] Next, the car 4 is moved to a predesignated evacuation floor (a building lobby floor, for example) without stopping at any other floor (Step S5). If the car 4 was moving upward above the evacuation floor, for example, then the car 4 is first decelerated, is stopped while keep-

ing the door closed, then downward travel is started to move the car 4 to the evacuation floor.

[0022] When the car 4 arrives at the evacuation floor, a car door apparatus and the landing door apparatus 11 are opened, and audio instructions are given to the passengers to exit the car 4 and follow further instructions from a person in charge (the building administrator, the fire warden, or firefighters) (Step S6). Such audio instructions are given to the passengers in the car 4 by means of the onboard speaker 14.

[0023] When the fire alarm sounds, the fire warden comes to the landing, inserts a key into the FW controlled key switch 19, and inputs the evacuating operation command signal to make the car 4 perform the evacuating operation (Step S21). The elevator controller 6 makes the car 4 perform the evacuating operation in response to the evacuating operation command signal from the landing operating panel 12 during emergency evacuation. The elevator controller 6 moves the car 4 between the floor at which the evacuating operation command signal was inputted and the evacuation floor as the evacuating operation in response to the inputting of the evacuating operation command signal.

[0024] Moreover, the evacuating operation inputting means is not limited to the FW controlled key switch 19, and, for example, may also be a card reader that reads information from an identification card, a code reader that reads a code, or any other identification means.

[0025] It is possible that two or more fire wardens may use FW controlled key switches 19 on different landings, i.e., the evacuating operation may be requested from the FW controlled key switches 19 of two or more landings. In that case, the elevator controller 6 enables only the evacuating operation command signal from the FW controlled key switch 19 that requested the evacuating operation first (Step S22).

[0026] In that case, the elevator controller 6 also saves the other evacuating operation requests in the memory 7 (Step S23). Thus, if control of the evacuating operation is canceled by the FW controlled key switch 19 that is enabled, the elevator controller 6 can enable the next FW controlled key switch 19 in sequence from the evacuating operation requests.

[0027] When an evacuating operation request (a call) is saved in the memory 7, the fire warden receives some kind of feedback from the elevator controller 6 (Step S24). If an evacuating operation is carried out by a fire warden who is on a different floor, then audio information to that effect is given to passengers who are waiting at landings via the landing speakers 18.

[0028] After being called by the fire warden, the elevator controller 6 checks whether the car 4 is empty at the evacuation floor using the utilization rate detecting means 10 (Step S7). Here, the car 4 can also be deemed to be empty by opening the door for a specified amount of time (a time sufficient for all of the passengers to alight from the car 4) and then closing them. In that case, it is preferable to announce audio information from the on-

board speaker 14 while the door is open that warns of closure of the door.

[0029] If the evacuating operation command signal is enabled, and it is determined that the car 4 is empty, the elevator controller 6 moves the car 4 to the landing from which the evacuating operation command signal was inputted (the floor to which it was called first) (Step S8).

[0030] When the car 4 arrives at the landing, the fire warden helps the occupants to board the car 4, and regulates the entire evacuation procedure (Step S9). The fire warden also instructs the passengers as to appropriate conduct for the emergency situation. In addition, the fire warden determines the order in which to evacuate the occupants.

[0031] Next, the fire warden checks whether or not there is room to carry the passengers on board the car 4 (Step S10). If there is no room left inside the car 4, the fire warden inputs a command signal to the elevator controller 6 using the FW controlled key switch 19 to move the car 4 preferentially toward the evacuation floor (i.e., by sending a pulse). All other calls are thereby bypassed, and the car 4 goes directly to the evacuation floor without stopping at any other floor (Step S12).

[0032] This prioritizing function saves precious evacuation time which is extremely important in an emergency situation. This prioritizing function can be given to the elevator controller 6 only from the landing for which the evacuating operation command signal is enabled, and is active only in the evacuation mode.

[0033] If the prioritizing function is active, then passengers who are waiting on the landings are notified of this function by audio instructions (Step S13). These audio instructions are given through the landing speakers 8. Panic among the waiting passengers can also be reduced by giving information relating to waiting times to the passengers who are waiting on the landings as the audio instructions.

[0034] When the car 4 arrives at the evacuation floor, all of the passengers are removed from the car 4 (Step S14). Then, after checking whether or not the car 4 is empty (Step S7), the car 4 is returned to the calling floor again (Step S8).

[0035] When the car 4 is not full, and the floor that needs to be evacuated is empty, the fire warden removes the key from the FW controlled key switch 19 to cancel control of the elevator by the fire warden (Step S15). Preparation can thereby be made for a different fire warden to control the elevator from another floor.

[0036] Next, the fire warden boards the car 4. The fire warden pushes the evacuation floor (EV) button 15 on the car control panel 9 inside the car 4 (Step S16). Moreover, if the elevator is controlled by the fire warden registering a code in a code reader on the landing, then a separate keypad on which the fire warden can register a separate code to cancel control of the elevator should be disposed inside the car 4.

[0037] After that, the car 4 begins to move toward the evacuation floor (Step S17). In that case, the car 4 can

respond to a call from another landing in the direction of the evacuation floor, and stop at that landing collect several more passengers (Step S18). The evacuation floor button 15 becomes active only when the elevator apparatus is operating in the evacuation mode. Alternatively, this may also be a main lobby button that switches to an evacuation floor button when the elevator apparatus is operating in the evacuation mode.

[0038] If another call from a landing is received while the car 4 is proceeding toward the evacuation floor, then the elevator controller 6 first investigates the utilization rate of the car 4 using the utilization rate detecting means 10 (Step S19). If there is still some room to carry other passengers inside the car 4, then the car 4 is stopped at the calling floor (Step S8). If there is no room inside the car 4, the car 4 is made to go directly to the evacuation floor (Step S20), and moves to the calling floor after the elevator is emptied at the evacuation floor (Step S8).

[0039] Instead of the utilization rate detecting means 10, the car 4 can also be made to go directly to the evacuation floor by the fire warden operating the bypassing key switch 16. The fire warden operates the bypassing key switch 16 if there is no room inside the car 4.

[0040] When the car 4 arrives at the evacuation floor, the door is opened, and audio instructions are announced to the passengers to exit from the car 4 to the landing of the evacuation floor. The audio instructions are given through the onboard speaker 14. When the car 4 is empty, the car 4 is sent to the floor where the fire warden is waiting for return of the car 4.

[0041] The evacuating operation on each of the floors is carried out repeatedly until evacuation from that floor is completed (in the case of elevators exclusively for evacuating disabled persons, until evacuation of disabled persons is completed). When the evacuating operation on one floor is completed, the fire warden uses the FW controlled key switch 19 again to deactivate the function and boards the car 4. Thus, implementation of the evacuating operation by a different fire warden is made possible.

[0042] In an elevator apparatus of this kind, because an FW controlled key switch 19 into which an evacuating operation command signal is inputted to make a car 4 perform an evacuating operation is disposed on at least one landing, and an elevator controller 6 makes the car 4 perform an evacuating operation in response to the evacuating operation command signal from the FW controlled key switch 19 during an emergency evacuation, the evacuating operation can be controlled by a person by operation by a fire warden who is on a landing during an emergency evacuation to give priority to evacuating other waiting passengers, enabling the occupants inside a building to be evacuated more efficiently. Further flexibility can be imparted to the system, and confidence among evacuees can also be improved.

[0043] Because the car 4 is moved to the landing where the evacuating operation command signal was inputted after investigating whether or not the car 4 is empty, more

waiting passengers can be moved to the evacuation floor from calling floors, enabling the occupants inside the building to be evacuated more efficiently.

[0044] In addition, because the elevator controller 6 waits for the evacuation floor button 15 to be operated before moving the car 4 toward the evacuation floor when cancellation of control of the evacuating operation is inputted at a landing operating panel 12, the fire warden can also board the car 4 to evacuate his or herself after confirming evacuation of waiting passengers from that floor.

[0045] Because the FW controlled key switch 19 enables only a fire warden to input the evacuating operation command signal, the evacuating operation can be carried out more safely by only the fire warden.

[0046] Because the elevator controller 6 enables only the evacuating operation command signal from the FW controlled key switch 19 from which the evacuating operation is requested first if the evacuating operation is requested from the FW controlled key switches 19 of two or more landings, the evacuating operation is started earlier, enabling the time that is required for evacuation to be shortened.

[0047] In addition, because the elevator controller 6 enables the evacuating operation command signal from the next FW controlled key switch 19 when cancellation of control is inputted by an FW controlled key switch 19 that is enabled, the evacuating operation of the next floor can be started immediately after the evacuating operation of a given floor is completed, enabling the time that is required for evacuation to be shortened.

[0048] Furthermore, because the elevator controller 6 investigates available room inside the car 4 while moving the car 4 toward the evacuation floor after cancellation of control has been inputted by an FW controlled key switch 19, and determines whether or not to make the car 4 go directly to the evacuation floor or to stop the car 4 at the landing of the FW controlled key switch 19 that is enabled next depending on available room, space inside the car 4 can be used efficiently, and more people can be evacuated in a single operation, enabling the time that is required for evacuation to be shortened.

[0049] Because audio instructions that urge exit from the car 4 are announced from an onboard speaker 14 when the car 4 arrives at the evacuation floor, the car 4 can depart for the next calling floor depart earlier, enabling the time that is required for evacuation to be shortened.

[0050] Moreover, some of the functions of the elevator apparatus according to Embodiment 1 can also be used at times other than emergency evacuation.

[0051] For example, the FW controlled key switch 19 can be used in special cases where priority is given to a car 4 for emergencies, such as in hospital elevators.

[0052] The bypassing key switch 16 can also be used in elevators for exclusive use by disabled persons in special buildings in cases in which there is a waiting call even though there is no room inside the car 4. In that case, a

landing speaker 8 may also be used in combination with this bypassing key switch 16 to transmit information relating to waiting times to passengers who are waiting on the landings. That there is no room inside the car 4 can also be detected using a utilization rate detecting means 10.

[0053] In addition, in the above example, the FW controlled key switches 19 are disposed on the landing operating panels 12, but may also be disposed at locations other than the landing operating panels 12.

[0054] Furthermore, the evacuating operation inputting means may also be disposed on the landings of all of the floors, or may also be disposed only on landings of one or two or more preselected floors.

[0055] In Figure 1, a one-to-one (1:1) roping elevator apparatus is shown, but the roping method is not limited thereto, and the present invention can also be applied to two-to-one (2:1) roping elevator apparatuses, for example.

[0056] In addition, the layout of the elevator equipment (the number or position, etc., of the hoisting machine 1 or the counterweight 5) is also not limited to that of the example in Figure 1.

[0057] Furthermore, the present invention can also be applied to machine-roomless elevators that do not have a machine room, or to various other types of elevator apparatus, etc.

Claims

1. An elevator apparatus comprising:

a car that is raised and lowered through a hoistway;
 an elevator controller that controls operation of the car; and
 an evacuating operation inputting means that is disposed on at least one landing, and into which an evacuating operation command signal is inputted to make the car perform an evacuating operation,
 wherein the elevator controller makes the car perform the evacuating operation in response to the evacuating operation command signal from the evacuating operation inputting means during an emergency evacuation.

2. An elevator apparatus according to Claim 1, wherein the elevator controller moves the car between a landing on which the evacuating operation command signal is inputted and a predesignated evacuation floor as the evacuating operation in response to the inputting of the evacuating operation command signal.

3. An elevator apparatus according to Claim 2, wherein the elevator controller moves the car to the landing on which the evacuating operation command signal

is inputted after investigating whether or not the car is empty.

- 4. An elevator apparatus according to Claim 2, wherein:
 - an evacuation floor switch for moving the car to the evacuation floor is disposed inside the car; and
 - the elevator controller waits for the evacuation floor switch to be operated before moving the car to the evacuation floor if cancellation of control of the evacuating operation is inputted by the evacuating operation inputting means.

- 5. An elevator apparatus according to Claim 1, wherein the evacuating operation inputting means is configured such that only a predesignated fire warden can input the evacuating operation command signal.

- 6. An elevator apparatus according to Claim 5, wherein the elevator controller enables only the evacuating operation command signal from the evacuating operation inputting means that requests the evacuating operation first if evacuating operations are requested from the evacuating operation inputting means of two or more landings.

- 7. An elevator apparatus according to Claim 6, wherein the elevator controller saves into a memory an evacuating operation request from any evacuating operation inputting means other than the enabled evacuating operation inputting means.

- 8. An elevator apparatus according to Claim 7, wherein the elevator controller enables the evacuating operation command signal from a subsequent evacuating operation inputting means that requests the evacuating operation if cancellation of control of the evacuating operation is inputted by the enabled evacuating operation inputting means.

- 9. An elevator apparatus according to Claim 8, wherein the elevator controller investigates available room inside the car while moving the car toward the evacuation floor after cancellation of control of the evacuating operation is inputted by the evacuating operation inputting means, and determines whether or not to make the car go directly to the evacuation floor or to stop the car at a landing of a subsequently enabled evacuating operation inputting means depending on availability of room.

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FIG. 1

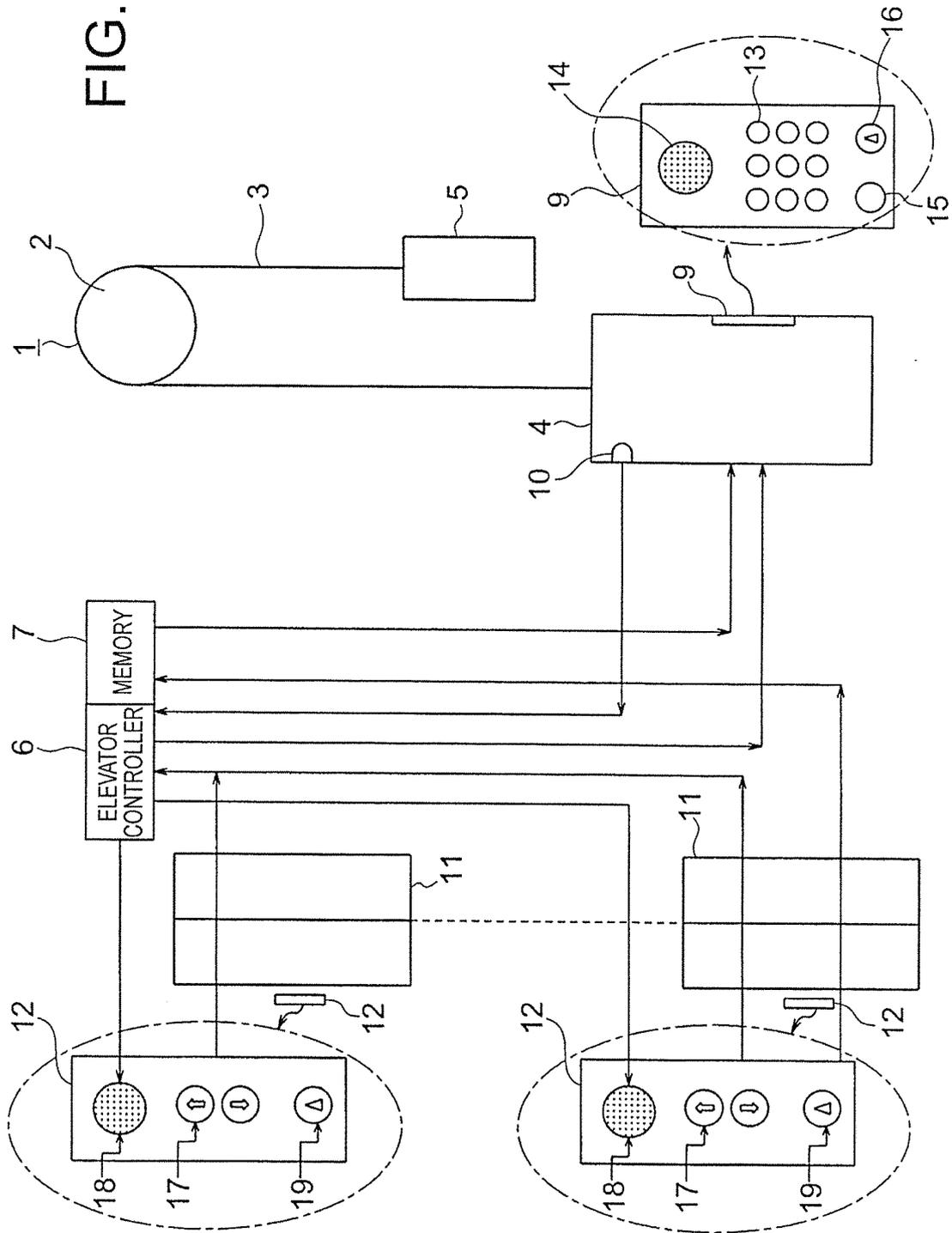
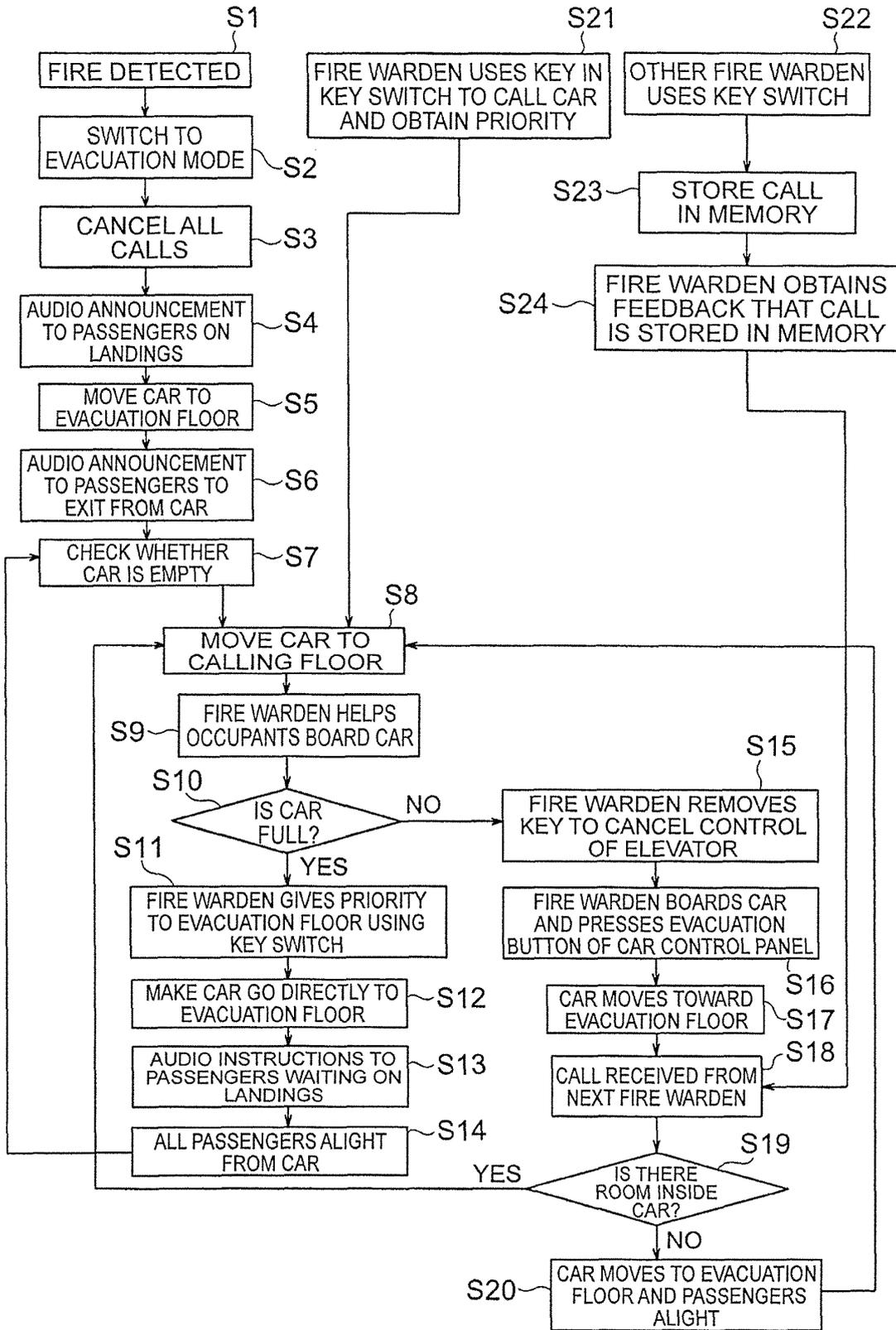


FIG. 2



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/065086

| A. CLASSIFICATION OF SUBJECT MATTER B66B5/02(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) B66B5/02 | | |
| 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 1996-2011 Kokai Jitsuyo Shinan Koho 1971-2011 Toroku Jitsuyo Shinan Koho 1994-2011 | | |
| 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. |
| X Y A | WO 2010/082650 A1 (Mitsubishi Electric Corp.), 22 July 2010 (22.07.2010), paragraphs [0019] to [0056] (Family: none) | 1-2, 5 3-4 6-9 |
| Y A | WO 2007/037031 A1 (Mitsubishi Electric Corp.), 05 April 2007 (05.04.2007), paragraphs [0031] to [0032] & JP 2007-91379 A & EP 1930279 A1 & CN 101061052 A & KR 10-2007-0067166 A | 3 9 |
| Y | JP 2003-276964 A (Mitsubishi Electric Corp.), 02 October 2003 (02.10.2003), paragraphs [0050] to [0051] (Family: none) | 4 |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> 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 22 September, 2011 (22.09.11) | | Date of mailing of the international search report 04 October, 2011 (04.10.11) |
| Name and mailing address of the ISA/ Japanese Patent Office | | Authorized officer |
| Facsimile No. | | Telephone No. |

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/065086

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The invention in claim 1 does not make a contribution over the prior art in the light of the contents disclosed in WO 2010/082650 A1, and therefore cannot be considered to have a special technical feature.

Consequently, any same or corresponding special technical feature cannot be found between the invention in claim 1 and the inventions in claims 2-9.

In conclusion, the invention in claim 1 and the inventions in claims 2-9 are not relevant to a group of inventions which comply with the requirement of unity of invention.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2005112601 A [0003]