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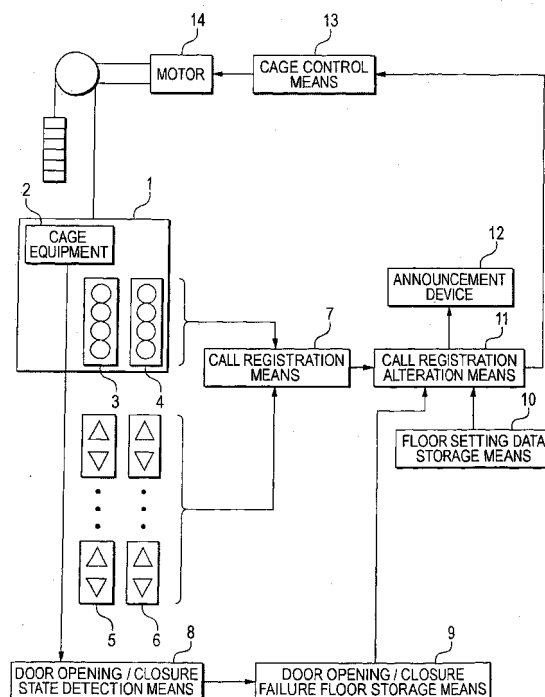
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(54) **ELEVATOR OPERATING DEVICE**

(57) When the cage call or hall call of a floor where the opening/closure failure of the gateway door of an elevator cage has been detected is registered, the gateway door direction of the floor is decided on the basis of a signal from door opening/closure failure floor storage means. If the floor is a penetrating floor on the basis of floor setting data, the cage call or hall call of a gateway door which is opposite in direction to the gateway door undergoing the opening/closure failure is automatically registered, the cage call or hall call of the gateway door undergoing the opening/closure failure is canceled, and a user is informed of the automatic registration and the cancellation. Besides, if the floor is a non-penetrating floor, the user is by guide means guided a floor other than the floor of the gateway door undergoing the opening/closure failure.

FIG. 1



Description

TECHNICAL FIELD

[0001] This invention relates to a control apparatus for an elevator which includes an elevator cage having gateway doors in the two directions of, for example, a front side and a rear side, respectively, and more particularly to a control apparatus for an elevator which permits the continuation of running even in a case where an opening/closure failure has occurred in the door of the elevator cage.

BACKGROUND ART

[0002] Heretofore, in an elevator wherein an elevator cage which has gateway doors in the two directions of a front side and a rear side, respectively, is commissioned among a multiplicity of floors in which a penetrating floor having platforms in the two directions exists, there has been proposed a control apparatus for the elevator which includes means for selecting the penetrating floor and causing the elevator cage to arrive at this floor when the door opening/closure failure of the elevator cage during an elevator travel has occurred, whereby a user can be rescued without being confined in the elevator cage (refer to, for example, Patent Document 1).

[0003] Patent Document 1: JP-A-11-314867 (Section 0007, Fig. 1)

DISCLOSURE OF THE INVENTION

PROBLEM THAT THE INVENTION IS TO SOLVE

[0004] The control apparatus for the elevator as is disclosed in Patent Document 1, however, has for its object to rescue the user without confining him/her in the elevator cage and stops a service after the user has been rescued by causing the elevator cage to arrive at the selected penetrating floor. The elevator cannot be used until the fault is repaired by a maintenance engineer, and users have been inconvenienced.

[0005] This invention has been made in view of the above problem, and it has for its object to provide a control apparatus for an elevator in which, in a case where an elevator cage having gateway doors in the two directions of, for example, a front side and a rear side, respectively, is commissioned among a multiplicity of floors that include a penetrating floor having platforms in the two directions and a non-penetrating floor having a platform in only one of the two directions, running can be continued even when the opening/closure failure of either of the gateway doors has been detected during the travel of the elevator cage.

MEANS FOR SOLVING THE PROBLEM

[0006] A control apparatus for an elevator according

to this invention consists in a control apparatus for an elevator, wherein an elevator cage having gateway doors in first and second directions, respectively, is commissioned among a multiplicity of floors which include a penetrating floor having platforms in the first and second directions, and a non-penetrating floor having a platform in only either of the two, first and second directions; comprising:

cage call means disposed in the elevator cage for originating cage calls in the respective, first and second directions;

call registration means for registering therein the cage calls by the cage call means;

door opening/closure state detection means for detecting opening/closure states of the gateway doors after the cage call registration by the cage call means;

door opening/closure failure floor storage means for judging whether or not the gateway doors of the respective floors are concluded as undergoing opening/closure failures, on the basis of signals from the door opening/closure state detection means, and for storing therein the floor where the opening/closure failure has been detected, and the gateway door direction of the opening/closure failure, in a case where the gateway door has been judged as undergoing the opening/closure failure;

floor setting data storage means for storing therein floor setting data in which distinctions of the respective floors between the penetrating floor and the non-penetrating floor are set;

call registration alteration means for altering the registration to a call of the optimum floor on the basis of the data items from the call registration means, the door opening/closure failure floor storage means and the floor setting data storage means; and guide means for informing a user of the opening/closure failure of the gateway door undergoing the opening/closure failure.

ADVANTAGE OF THE INVENTION

[0007] According to this invention, there is the advantage that, even when the opening/closure failure of the gateway door in either of the first and second directions has been detected during an elevator travel, the elevator can be thereafter commissioned by the best running, to attain enhancement in a service for the user.

BEST MODE FOR CARRYING OUT THE INVENTION

[0008] Now, preferred embodiments will be described in connection with a control apparatus for an elevator according to this invention, with reference to the accompanying drawings.

EMBODIMENT 1:

[0009] Fig. 1 is a functional block diagram showing the configuration of a control apparatus for an elevator in order to explain Embodiment 1 of this invention.

Referring to Fig. 1, cage equipment 2 such as door switches and a cage load detector are disposed in an elevator cage 1. Further, front-side cage call buttons (destination call buttons in the cage) 3 being cage call means in a first direction, for example, cage call means on a front side, and rear-side cage call buttons 4 being cage call means in a second direction, for example, cage call means on a rear side are disposed inside the elevator cage 1.

[0010] Besides, front-side hall call buttons (destination call buttons in a hall) 5 being hall call means in the first direction, for example, hall call means on the front side, and rear-side hall call buttons 6 being hall call means in the second direction, for example, hall call means on the rear side are disposed at each floor. Call inputs which are based on the front-side cage call buttons 3 and rear-side cage call buttons 4 disposed in the elevator cage 1, and the front-side hall call buttons 5 and rear-side hall call buttons 6 disposed at each floor are registered by call registration means 7.

[0011] Door opening/closure state detection means 8 detects a door opening/closure state on the basis of door state information from the cage equipment 2 disposed in the elevator cage 1. Door opening/closure failure floor storage means 9 judges whether or not any gateway door of the elevator cage 1 at each floor is concluded as undergoing an opening/closure failure, on the basis of a signal from the door opening/closure detection means 8, and subject to the judgment that the gateway door undergoes the opening/closure failure, this means 9 stores therein the floor where the opening/closure failure has been detected, and whether the direction of the gateway door with its opening/closure failure detected is the front side or the rear side. That is, data which are exemplified in Fig. 2 and which are obtained by a method to be explained later are stored in the door opening/closure failure floor storage means 9. The example of Fig. 2 indicates that the opening/closure failures have been detected in the front-side gateway door of the 2nd floor and the rear-side gateway door of the 18th floor, and that this state is stored in the door opening/closure failure floor storage means 9.

[0012] As exemplified in Fig. 3, floor setting data indicating which floors are penetrating floors and non-penetrating floors, and which of the directions of the front side and the rear side of the elevator cage 1 platforms exist in at the non-penetrating floors are stored in floor setting data storage means 10. The example of Fig. 3 indicates that the 1st floor, 3rd floor and 18th floor are the non-penetrating floors, and that the platforms of the non-penetrating floors of the 1st floor and 18th floor exist on the front side of the elevator cage 1, while the platform of the non-penetrating floor of the 3rd floor exists on the

rear side, and such data are stored in the floor setting data storage means 10.

[0013] Besides, call registration alteration means 11 is such that, when the cage call of the floor where the gateway door opening/closure failure of the elevator cage has been detected is registered in the call registration means 7, this means 11 decides the direction of the gateway door at the pertinent floor, on the basis of a signal from the door opening/closure failure floor storage means 9, and that, if the pertinent floor is the penetrating floor, on the basis of the floor setting data storage means 10, this means 11 automatically registers the cage call of the gateway door which is opposite in the direction to the gateway door undergoing the opening/closure failure and cancels the cage call of the gateway door undergoing the opening/closure failure. The user is informed of the optimum call registration of the call registration means 11 by guide means, for example, an announcement device 12.

[0014] Incidentally, cage control means 13 controls the elevator cage 1 in response to the call registered by the call registration alteration means 11, and a motor 14 is operated by a signal from this cage control means 13, so that the elevator cage 1 is driven in accordance with the registered content of the call registration alteration means 11.

[0015] The control apparatus for the elevator according to Embodiment 1 is configured as stated above, and the operation thereof will now be described in conjunction with the flowchart of Fig. 4.

Fig. 4 is the flow chart showing the operation in which the opening/closure state of the gateway door of the elevator cage 1 is detected by the door opening/closure state detection means 8, and in which, in the existence of the opening/closure in the gateway door, the corresponding state is stored in the door opening/closure failure floor storage means 9.

[0016] Referring to Fig. 4, whether or not a door opening command has been outputted to, for example, the 2nd-floor front-side gateway door is decided in response to a cage call (step S40), and if the door opening command has not been outputted to the 2nd-floor front-side gateway door, the process is ended. If the door opening command has been outputted to the 2nd-floor front-side gateway door, whether or not the 2nd-floor front-side gateway door is fully opened within a predetermined time period is judged on the basis of a signal from the door opening/closure state detection means 8 (step S41), and if the door has been fully opened within the predetermined time period, respective flags are cleared (step S45), whereupon the process is ended.

[0017] If the 2nd-floor front-side gateway door has not been fully opened within the predetermined time period, this 2nd-floor front-side gateway door is concluded as undergoing the opening failure, to update the 2nd-floor front-side gateway door opening failure counter and to output the door closure command and door opening command of the 2nd-floor front-side gateway door (step S42).

Whether or not the 2nd-floor front-side gateway door opening failure counter has measured, at least, a prescribed number of times (for example, two times) is decided (step S43), and if the counter is, at least, the prescribed number of times, the 2nd floor is concluded as undergoing the opening/closure failure in the front-side gateway door, to store the 2nd-floor front side as the opening/closure failure floor of the gateway door (step S44) as exemplified in Fig. 2 by way of example, whereupon the process is ended.

[0018] By the way, in the above, the case where the cage call has been originated for the front side of the elevator cage 1 has been illustrated and described, but a case where a cage call has been originated for the rear side is similar and shall therefore be omitted from illustration and description.

[0019] Next, a case where a cage call has been originated for the 2nd floor stored as the door opening/closure failure floor in the door opening/closure failure floor storage means 9 will be described in conjunction with the flow chart of Fig. 5.

Referring to Fig. 5, whether or not the cage call button of the 2nd-floor front side has been pushed is decided (step S50), and if the cage call button of the 2nd-floor front side has not been pushed, the process is ended. If the cage call button of the 2nd-floor front side has been pushed, the resulting signal is compared with a signal from the door opening/closure failure floor storage means 9, so as to decide whether or not the door of the 2nd-floor front side correspond to the door opening/closure failure storage floor (step S51), and if the door is not stored in the door opening/closure failure floor storage means 9, the cage call of the 2nd-floor front side is registered as usual (step S58), whereupon the process is ended.

[0020] In a case where the door is stored in the door opening/closure failure floor storage means 9, whether or not the pertinent floor is the penetrating floor is decided on the basis of a signal from the floor setting data storage means 10 (step S52). If the pertinent floor is not the penetrating floor, the call is invalidated, and the invalidation is announced to the user by the announcement device 12 (step S57). The announcement is, for example, "The pertinent floor is unserviceable on account of the door failure. Please push the call of another floor." Thereafter, the cage call of the 2nd-floor front side is canceled (step S56), whereupon the process is ended.

[0021] If the pertinent floor is the penetrating floor at the step S52, whether or not the 2nd-floor rear side corresponds to the door opening/closure failure storage floor is decided (step S53). If the 2nd-floor rear side does not correspond to the door opening/closure failure storage floor, the cage call of this side is automatically registered (step S54), and an announcement is made to the user (step S55). The announcement is, for example, "The call of the opposite side has been automatically registered on account of the door failure." Thereafter, the cage call of the 2nd-floor front side is canceled (step S56), whereupon the process is ended.

[0022] If the 2nd-floor rear side corresponds to the door opening/closure failure storage floor at the step S53, the process shifts to the step S57, at which the information is given to the user by the announcement device 12 similarly to the above.

[0023] By the way, in the above, the case where the cage call has been originated for the front side of the elevator cage 1 has been illustrated and described, but a case where a cage call has been originated for the rear side of the elevator cage 1 is similar and shall therefore be omitted from illustration and description.

[0024] As described above, according to Embodiment 1, even when the gateway door of either of the front side and the rear side of the elevator cage 1 has undergone the opening/closure failure during the elevator travel, the user is informed of the gateway door of the other side or the cage call of another floor, whereby the elevator is thereafter commissioned by the best running, and a service for the user can be enhanced.

EMBODIMENT 2:

[0025] Fig. 6 is a flow chart for explaining Embodiment 2 of this invention, and explains an operation in the case where a hall call has been originated. Incidentally, the functional configuration of a control apparatus for an elevator is the same as in Fig. 1 referred to in Embodiment 1. Besides, it is identical to the operation of Fig. 4 in Embodiment 1 that the opening/closure states of the gateway doors of the elevator cage 1 are detected by the door opening/closure state detection means 8 in Fig. 1, and that, in the existence of any opening/closure failure in the gateway door, the corresponding state is stored in the door opening/closure failure floor storage means 9, and the operation shall be omitted from description.

[0026] More specifically, Fig. 6 is the flow chart showing a case where the hall call has been pushed for a floor which is stored in the door opening/closure failure floor storage means 9 as a door opening/closure failure storage floor, for example, for the 2nd floor. Referring to Fig. 6, whether or not the hall call button of the 2nd-floor front side has been pushed is decided (step S60), and if the hall call button of the 2nd-floor front side has not been pushed, this process is ended. If the hall call button of the 2nd-floor front side has been pushed, the resulting signal is compared with a signal from the door opening/closure failure floor storage means 9, so as to decide whether or not the 2nd-floor front-side door corresponds to the door opening/closure failure storage floor (step S61). If the door is not stored in the door opening/closure failure floor storage means 9, the hall call of the 2nd-floor front side is registered as usual (step S67), whereupon the process is ended.

[0027] In a case where the door is stored in the door opening/closure failure floor storage means 9, whether or not the pertinent floor is the penetrating floor is decided on the basis of a signal from the floor setting data storage means 10 (step S62). If the pertinent floor is not the

penetrating floor, it is announced to a user that the call has been invalidated (step S66). The announcement is, for example, "The pertinent floor is unserviceable on account of the door failure. Please go round to another floor." Thereafter, the hall call of the 2nd-floor front side is canceled (step S65), whereupon the process is ended.

[0028] If the pertinent floor is the penetrating floor at the step S62, whether or not the 2nd-floor rear side corresponds to the door opening/closure failure storage floor is decided (step S63). If the 2nd-floor rear side does not correspond to the door opening/closure failure storage floor, an announcement is made to the user (step S64). The announcement is, for example, "The front side is unserviceable on account of the door failure. Please go round to the hall of the opposite side." Thereafter, the hall call of the 2nd-floor front side is canceled (step S65), whereupon the process is ended.

[0029] If the 2nd-floor rear side corresponds to the door opening/closure failure storage floor at the step S63, the process shifts to the step S66, at which the information is given to the user by the announcement device 12 similarly to the above.

[0030] By the way, in the above, the case where the hall call has been originated for the front side of the elevator cage 1 has been illustrated and described, but a case where a hall call has been originated for the rear side of the elevator cage 1 is similar and shall therefore be omitted from illustration and description.

[0031] As described above, according to Embodiment 2, even when the gateway door of either of the front side and the rear side of the elevator cage 1 has undergone the opening/closure failure during the elevator travel, the user is informed of the hall in the other gateway door direction or the hall of another floor, whereby the elevator is thereafter commissioned by the best running, and a service for the user can be enhanced.

[0032] By the way, in each of the embodiments, the case where the information for the user is announced by the announcement device has been illustrated and described, but the information may, of course, be given by, for example, displaying the information with characters etc. on a display device, and this invention shall cover various modifications which do not depart from the purport of the invention.

INDUSTRIAL APPLICABILITY

[0033] As described above, even when any opening/closure failure has been detected in the gateway door of an elevator cage during the travel of an elevator, a control apparatus for the elevator according to this invention can thereafter commission the elevator by the best running and attain enhancement in a service for a user, and the industrial applicability thereof is great.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034]

[Fig. 1] It is a functional block diagram for explaining Embodiment 1 of this invention, and showing the configuration of a control apparatus for an elevator.

[Fig. 2] It is a diagram for explaining the states of the gateway doors of an elevator cage as are stored in door opening/closure failure floor storage means for use in Embodiment 1 of this invention.

[Fig. 3] It is a diagram showing floor setting data in which the distinction between the penetrating floor and non-penetrating floor of each floor and the direction of the platform of each non-penetrating floor are set, and which are stored in floor setting data storage means for use in Embodiment 1 of this invention.

[Fig. 4] It is a flow chart for explaining Embodiment 1 of this invention, and showing the operation of detecting and storing a door opening/closure failure floor in the apparatus of Fig. 1.

[Fig. 5] It is a flow chart for explaining Embodiment 1 of this invention, and for explaining an operation in the case where a cage call button has been pushed for the stored door opening/closure failure floor in the apparatus of Fig. 1.

[Fig. 6] It is a flow chart showing Embodiment 2 of this invention, and for explaining an operation in the case where a hall call button has been pushed for a door opening/closure failure storage floor in the apparatus of Fig. 1.

Claims

1. A control apparatus for an elevator in which an elevator cage 1 having gateway doors in first and second directions, respectively, is commissioned among a multiplicity of floors which include a penetrating floor having platforms in the first and second directions, and a non-penetrating floor having a platform in only either of the two, first and second directions, comprising:

cage call means 3,4 disposed in the elevator cage for originating cage calls in the respective, first and second directions;

call registration means 7 for registering therein the cage calls by said cage call means;

door opening/closure state detection means 8 for detecting opening/closure states of the gateway doors after the cage call registration by said cage call means;

door opening/closure failure floor storage means 9 for judging whether or not the gateway doors of the respective floors are concluded as undergoing opening/closure failures, on the basis of signals from said door opening/closure state detection means, and for storing therein the floor where the opening/closure failure has been detected, and the gateway door direction

- of the opening/closure failure, in a case where the gateway door has been judged as undergoing the opening/closure failure;
 floor setting data storage means 10 for storing therein floor setting data in which distinctions of the respective floors between the penetrating floor and the non-penetrating floor are set;
 call registration alteration means 11 for altering the registration to a call of the optimum floor on the basis of the data items from said call registration means, said door opening/closure failure floor storage means and said floor setting data storage means; and
 guide means 12 for informing a user of the opening/closure failure of the gateway door undergoing the opening/closure failure.
2. A control apparatus for an elevator as defined in claim 1, wherein, when the cage call of the floor where the opening/closure failure of the gateway door of the elevator cage has been detected is registered, said call registration alteration means decides the gateway door direction of the floor on the basis of a signal from said door opening/closure failure floor storage means, and if the floor is the penetrating floor on the basis of the floor setting data, said call registration alteration means automatically registers a cage call of the gateway door which is opposite in direction to the gateway door undergoing the opening/closure failure, cancels the cage call of the gateway door undergoing the opening/closure failure and informs the user of the opening/closure failure of the gateway door undergoing the opening/closure failure, by said guide means, so as to guide the user to the gateway door opposite in direction to the gateway door undergoing the opening/closure failure.
3. A control apparatus for an elevator as defined in claim 1, wherein, when the cage call of the floor where the opening/closure failure of the gateway door of the elevator cage has been detected is registered, said call registration alteration means decides the gateway door direction of the floor on the basis of a signal from said door opening/closure failure floor storage means, and if the floor is the non-penetrating floor on the basis of the floor setting data, said call registration alteration means cancels the cage call of the floor of the gateway door undergoing the opening/closure failure and informs the user of the opening/closure failure of the gateway door undergoing the opening/closure failure, by said guide means, so as to guide the floor other than the floor of the gateway door undergoing the opening/closure failure.
4. A control apparatus for an elevator in which an elevator cage having gateway doors in first and second

directions is commissioned among a multiplicity of floors which include a penetrating floor having platforms in the first and second directions, and a non-penetrating floor having a platform in only either of the two, first and second directions, comprising:

hall call means 5, 6 disposed at a hall of each floor for originating hall calls in the respective, first and second directions;
 call registration means 7 for registering therein the hall calls by said hall call means;
 door opening/closure state detection means 8 for detecting opening/closure states of the gateway doors after the hall call registration by said hall call means;
 door opening/closure failure floor storage means 9 for judging whether or not the gateway doors of the respective floors are concluded as undergoing opening/closure failures, on the basis of signals from said door opening/closure state detection means, and for storing therein the floor where the opening/closure failure has been detected, and the gateway door direction of the opening/closure failure, in a case where the gateway door has been judged as undergoing the opening/closure failure;
 floor setting data storage means 10 for storing therein floor setting data in which distinctions of the respective floors between the penetrating floor and the non-penetrating floor are set;
 call registration alteration means 11 for altering the registration to a call of the optimum floor on the basis of the data items from said call registration means, said door opening/closure failure floor storage means and said floor setting data storage means; and
 guide means 12 for informing a user of the opening/closure failure of the gateway door undergoing the opening/closure failure.

5. A control apparatus for an elevator as defined in claim 4, wherein, when the hall call of the floor where the opening/closure failure of the gateway door of the elevator cage has been detected is registered, said call registration alteration means decides the gateway door direction of the floor on the basis of a signal from said door opening/closure failure floor storage means, and if the floor is the penetrating floor on the basis of the floor setting data, said call registration alteration means automatically registers a hall call of the gateway door which is opposite in direction to the gateway door undergoing the opening/closure failure, cancels the hall call of the gateway door undergoing the opening/closure failure and informs the user of the opening/closure failure of the gateway door undergoing the opening/closure failure, by said guide means, so as to guide the hall of the gateway door opposite in direction to the gateway

door undergoing the opening/closure failure.

6. A control apparatus for an elevator as defined in claim 4, wherein, when the hall call of the floor where the opening/closure failure of the gateway door of the elevator cage has been detected is registered, said call registration alteration means decides the gateway door direction of the floor on the basis of a signal from said door opening/closure failure floor storage means, and if the floor is the non-penetrating floor on the basis of the floor setting data, said call registration alteration means cancels the hall call of the floor of the gateway door undergoing the opening/closure failure and informs the user of the opening/closure failure of the gateway door by said guide means, so as to guide the user to the hall of the different floor.

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FIG. 1

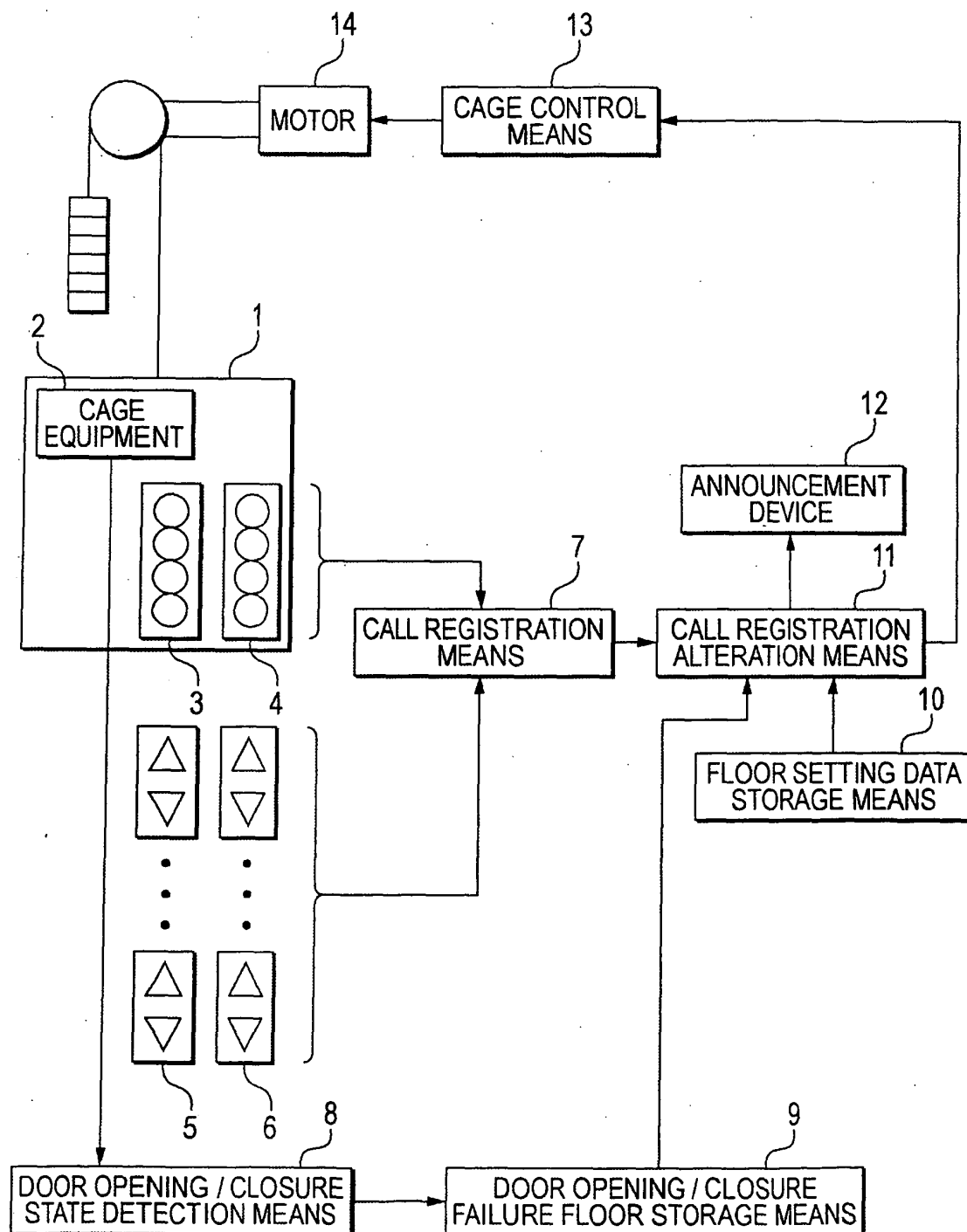


FIG. 2

FLOOR	FRONT SIDE GATEWAY DOOR OF ELEVATOR CAGE	REAR SIDE GATEWAY DOOR OF ELEVATOR CAGE
1	-	-
2	ABNORMAL	-
3		-
• • •	• • •	• • •
18	-	ABNORMAL
19	-	-
20	-	-

FIG. 3

FLOOR	DISTINCTION BETWEEN PENETRATING FLOOR AND NON - PENETRATING FLOOR	PLATFORM DIRECTION OF FLOOR
1	NON - PENETRATING FLOOR	FRONT SIDE OF ELEVATOR CAGE
2	PENETRATING FLOOR	-
3	NON - PENETRATING FLOOR	REAR SIDE OF ELEVATOR CAGE
• • •	• • •	• • •
18	NON - PENETRATING FLOOR	FRONT SIDE
19	PENETRATING FLOOR	-
20	PENETRATING FLOOR	-

FIG. 4

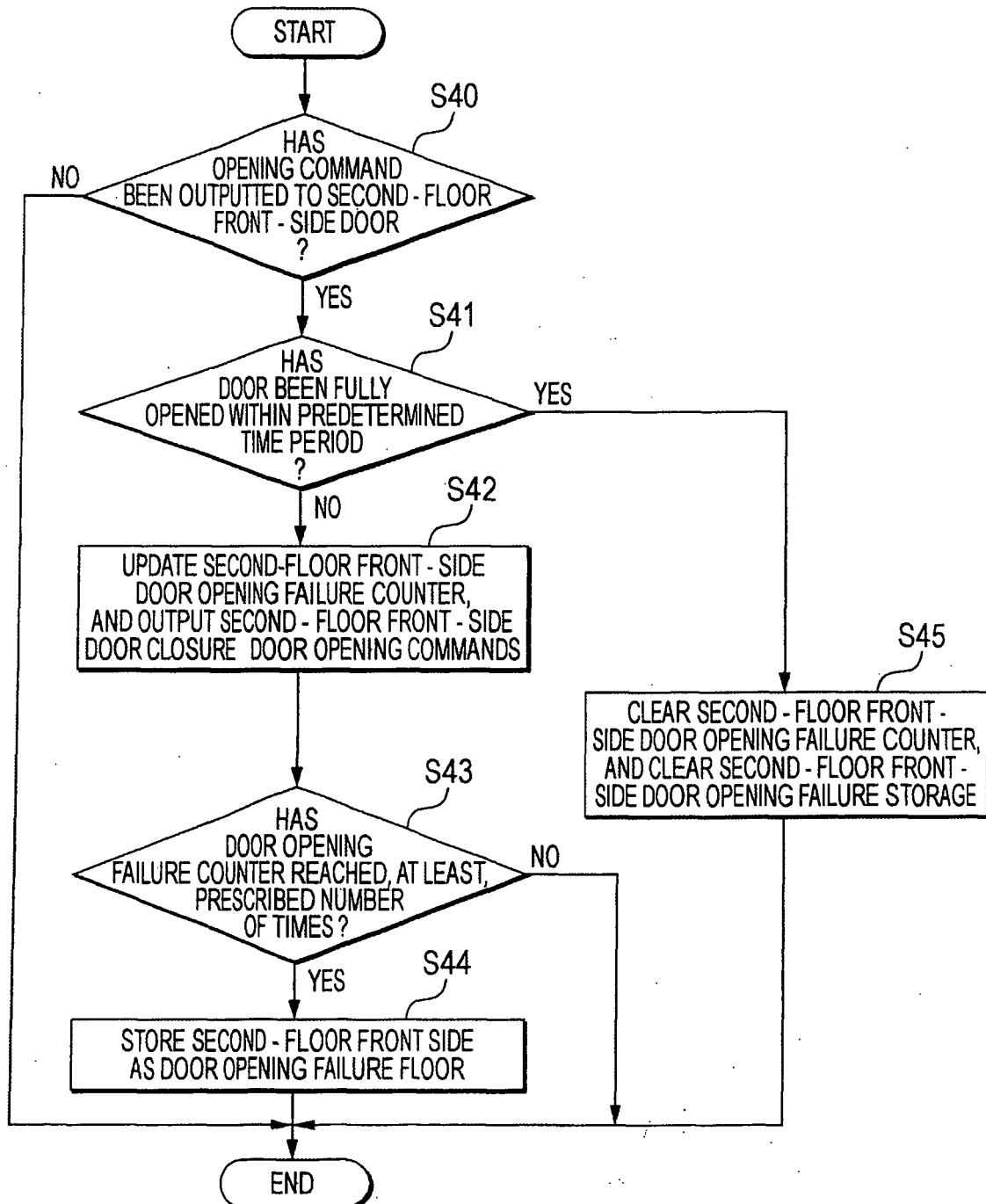


FIG. 5

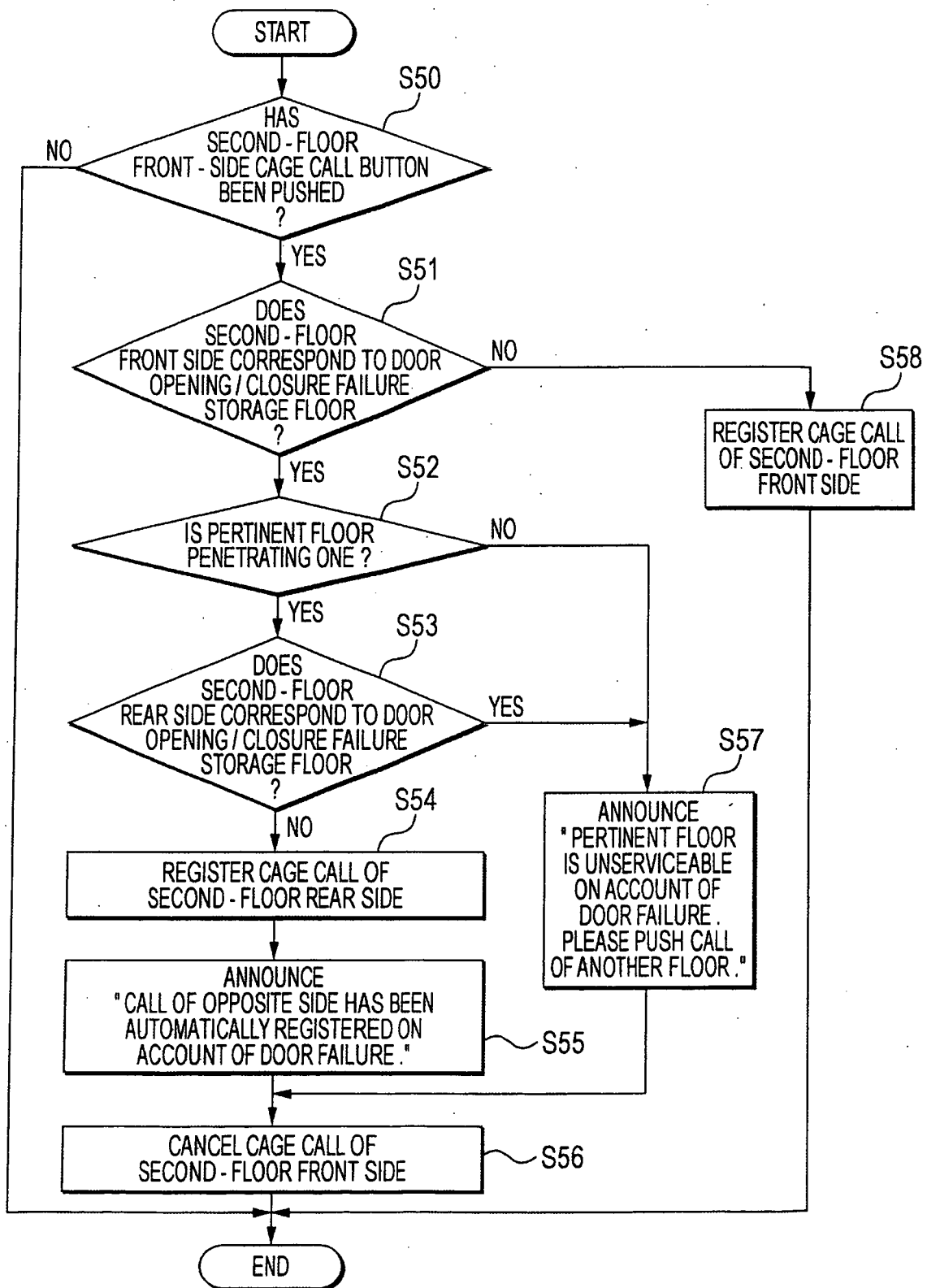
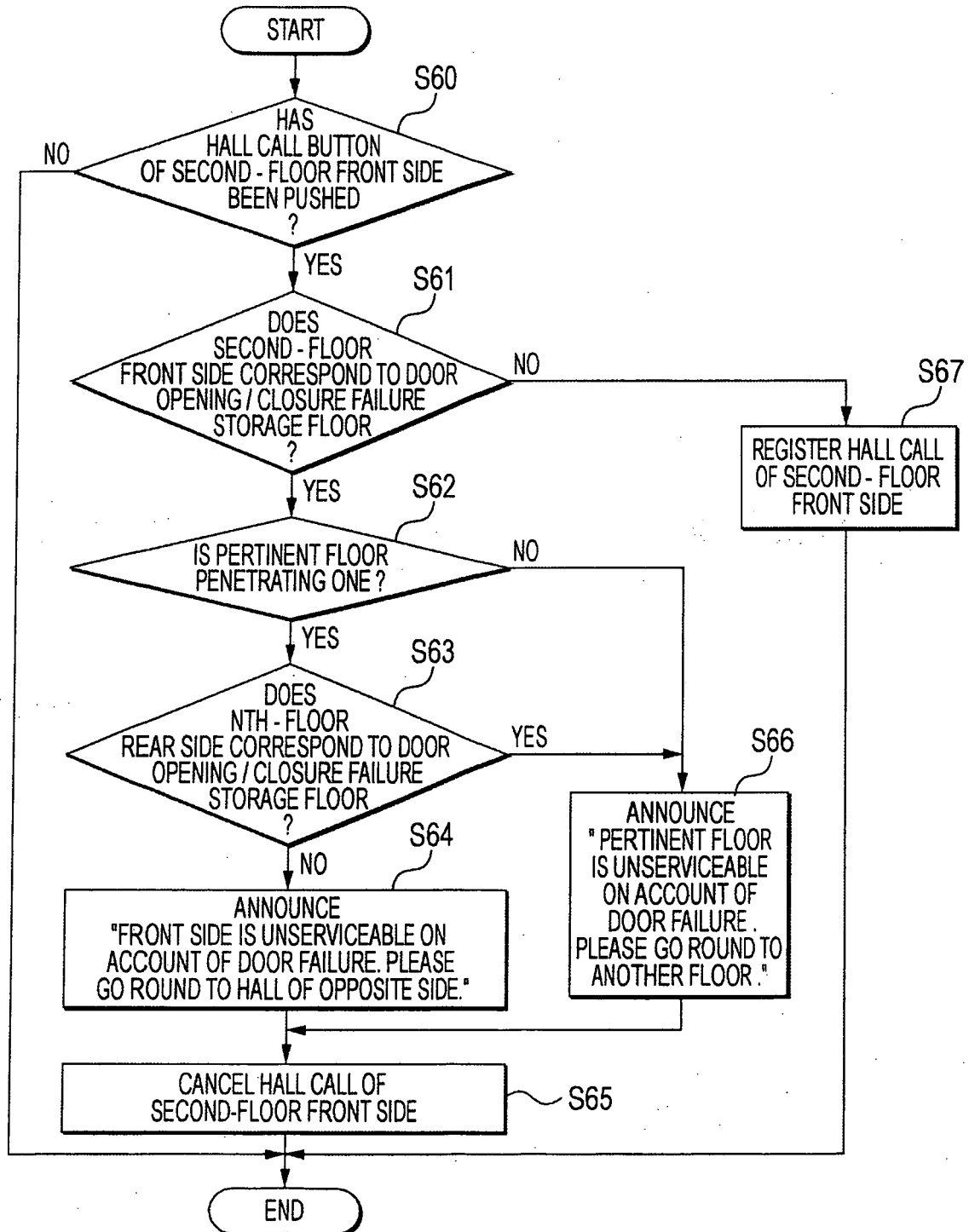


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/304617

A. CLASSIFICATION OF SUBJECT MATTER

B66B5/02 (2006.01), **B66B3/00** (2006.01), **B66B13/14** (2006.01)

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 (2006.01) - **B66B13/30** (2006.01)

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.
Y	JP 7-277642 A (Hitachi, Ltd.), 24 October, 1995 (24.10.95), (Family: none)	1-6
Y	JP 5-139634 A (Mitsubishi Electric Corp.), 08 June, 1993 (08.06.93), Claims 1, 3 (Family: none)	1-6
Y	JP 11-314867 A (Toshiba FA System Engineering Kabushiki Kaisha), 16 November, 1999 (16.11.99), Abstract; Fig. 1 (Family: none)	1-6

☐ 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
19 June, 2006 (19.06.06)Date of mailing of the international search report
27 June, 2006 (27.06.06)Name and mailing address of the ISA/
Japanese Patent Office

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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