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(71) Applicant: **MITSUBISHI ELECTRIC CORPORATION**
Chiyoda-ku
Tokyo 100-8310 (JP)

(72) Inventor: **HIKITA, Shiro,**
Mitsubishi Denki Kabushiki Kaisha
Tokyo 1008310 (JP)

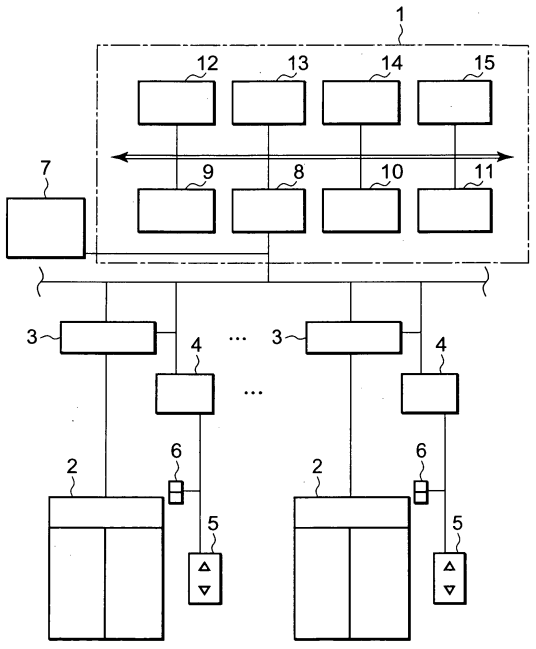
(74) Representative: **HOFFMANN EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(54) ELEVATOR GROUP MANAGEMENT AND CONTROL DEVICE

(57) An elevator group-management-control device is provided in which the device selects an elevator car, taking into account the number of floors that the elevator car skips and a passenger's walking time, when a call-register device is placed away from an elevator lobby.

The elevator group-management-control device includes: a walking-time estimating means **9** for estimating a walking time for a passenger to walk to the elevator lobby; a predictive calculating means **10** for predictively calculating a time until each elevator car **2** arrives at the lobby; a waiting-time conversion means **11** for converting into an actual waiting time or a lost time the difference between the predicted time until the elevator car **2** arrives, calculated predictively by the predictive calculating means **10,** and the estimated actual waiting time; an evaluation-value calculating means **12** for calculating an evaluation value that increases with increase in the actual waiting time or the lost time; an assigning means **13** for determining, as an assigned elevator car, an elevator car for which evaluation value has been calculated to be minimum, by the evaluation-value calculating means **12;** an operation control means **15** for instructing the assigned elevator car to move to the floor from which the call has been registered; and a door opening/closing means **14** for keeping open the door **2** of the elevator car assigned until the estimated walking time has elapsed after it is opened.

FIG. 1



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Description

Technical Field

[0001] The present invention relates to elevator group-management-control devices that efficiently manage/control transportation using a plurality of elevators.

Background Art

[0002] In conventional elevator group-management-control devices, there has been call assignment control as one of the group-management/control systems when a plurality of elevators is integrally installed. The call assignment control, immediately after an elevator lobby call is registered, determines an assigned elevator car responding to the elevator lobby call by selecting one of the elevator cars to serve the call. It can enhance transportation efficiency of elevators installed in, for example, a building to perform appropriately this call assignment control.

[0003] Here, there has also been a system in which a device that allows elevator lobby calls to be registered is placed a certain distance away from an elevator lobby as well as registers the elevator lobby calls; for example, a system in which a device that allows the elevator lobby calls to be registered is placed at the entrance of an elevator lobby, or a device, such as a card reader, is provided at the entrance of a condominium for security reasons so that an elevator car can be called, when the card reader is used, by registering the call into the elevator.

[0004] In the above cases where the device, that allows the elevator lobby calls to be registered, is placed at a remote location, it becomes necessary to take into account a walking time for a user to walk from the call-register device to the space immediately in front of the elevator. For example, when an elevator car stays at an elevator lobby with the door open, passengers who have already come to the lobby can get immediately onto the elevator car; on the other hand, because the door of the elevator car closes after a predetermined time period has elapsed, the passengers who have registered a call at the remote location sometimes cannot catch the same elevator car.

[0005] In order to eliminate to avoid above-mentioned situations, there have been such technologies as to exclude from candidate elevator cars to be assigned an elevator car that are expected to arrive at the floor sooner than a user walking from the call-register device to the space immediately in front of the elevator, or to call an elevator car in accordance with the user's walking time. In addition, there is another technology described in 'Japanese Patent Laid-Open No.1999-322205', in which for each of a plurality of elevators, walking time to the elevator or predicted arrival time of the elevator car, whichever is greater, is determined as a total evaluation-value, so that an elevator with the minimum total evaluation-value among all evaluation-values is selected.

[0006] Patent Documentation 1
Japanese Patent Laid-Open No.1999-322205

Disclosure of Invention

[0007] There has been a situation in which no elevator cars are selected; however the situation is avoided by the technology described in Patent Document 1, because the elevator car having an expected arrival time until the car arrives at the lobby less than a user's walking time, from the call-register device to the space immediately in front of the elevator, is not excluded from candidate elevator cars to be assigned.

[0008] However, because the walking time to the elevator or the expected arrival time until the elevator car arrives whichever longer is determined as a total evaluation-value for each elevator, when the time until all of the elevator cars are expected to arrive is longer than the walking time to the elevator, it results in the total evaluation-value being the same for each elevator car, so that any elevator could be sometimes assigned. Then, in a building, such as a high rise one, equipped with a plurality of elevator cars, the arbitrarily assigned elevator causes a problem in that the elevator car takes, due to callings from numbers of other floors, a far much longer time before it arrives at the floor than the walking time to the elevator, although it could be more efficient to instruct an elevator near the floor, from which the call is registered, to arrive at the floor and wait for the passenger with its door open.

[0009] The present invention is made to solve the above-described problems, and aims to provide an elevator group-management-control device; the elevator group-management-control device selects an elevator car, taking into account the number of floors that the elevator car skips and the walking time of the user, when a call-register device is placed away from the elevator lobby.

[0010] The present invention takes into account a situation, where an elevator lobby call is registered from an elevator-lobby button or a call-register means placed away from the elevator lobby, as follows. That is; an elevator group-management-control device includes: a walking-time estimating means for estimating a walking time for an elevator passenger to walk to the lobby; a predictive calculating means for predictively calculating a time until each elevator car arrives at the lobby; a waiting-time conversion means for converting into an actual waiting time or a lost time the difference between the predicted time until the elevator car arrives, calculated predictively by the predictive calculating means, and the estimated waiting time; an evaluation-value calculating means for calculating, by using the actual waiting time or the lost time, an evaluation value that increases with increase in the actual waiting time or the lost time; an assigning means for determining, as an assigned elevator car, an elevator car for which evaluation value has been calculated to be minimum, by the evaluation-value

calculating means; an operation control means for instructing the assigned elevator car to move to the floor from which the call has been registered; and a door opening/closing means for keeping open the door of the elevator car assigned based on the actual waiting times or the lost times until the estimated walking time has elapsed after it is opened.

[0011] According to the above-mentioned elevator emergency halt device, because the elevator group-management-control device includes: a walking-time estimating means for estimating a walking time for an elevator passenger to walk to an elevator lobby when an elevator lobby call either from an elevator-lobby button, or from a call-register means away from the elevator lobby, has been registered; a predictive calculating means for predictively calculating a time until each elevator car arrives at the lobby; a waiting-time conversion means for converting into an actual waiting time or a lost time the difference between the predicted time until the elevator car arrives, calculated predictively by the predictive calculating means, and the estimated waiting time; an evaluation-value calculating means for calculating, by using the actual waiting time or the lost time, an evaluation value that increases with increase in the actual waiting time or the lost time; an assigning means for determining, as an assigned elevator car, an elevator car for which evaluation value has been calculated to be minimum, by the evaluation-value calculating means; an operation control means for instructing the assigned elevator car to move to the floor from which the call has been registered; and a door opening/closing means for keeping open the door of the elevator car assigned based on the actual waiting times or the lost times until the estimated walking time has elapsed after it is opened, the elevator group-management-control device selects, in a situation of some call-register devices placed away from the elevator lobby, one of the elevator cars, taking into account the users' waling time and the number of floors that each elevator car skips, in which the elevator group-management-control device can provide an efficiently transporting elevator-group management and control that makes the elevator car, being able to arrive more securely within an arrival time at the floor from which the call has been registered, arrive at the floor and its door open in a building such as a high rise one equipped with a plurality of elevator cars.

Brief Description of Drawings

[0012]

Fig. 1 is a configurational diagram illustrating an elevator group-management-control device according to Embodiment1 of the present invention;

Fig. 2 is a flow chart for illustrating the operation of the elevator group-management-control device according to Embodiment 1 of the present invention;

Fig. 3a, Fig. 3b, and Fig. 3c are evaluation-value curves with respect to a time, during which the evaluation-value calculating means **12** of the elevator group-management-control device according to Embodiment 1 of the present invention has performed evaluation calculation;

Fig. 4 is a flow chart following which the operation control means **14** of the elevator group-management-control device according to Embodiment 1 of the present invention takes control of an assigned elevator car **2.**

Reference of Numerals and Symbols

[0013] **"1"** is an elevator group-management-control device; **"2,"** an elevator car; **"3,"** a car control means; **"4,"** an elevator-lobby-guide-control means; **"5,"** an elevator-lobby button; **"6,"** a lobby lantern; **"7,"** a call-register means; **"8,"** a communication means; **"9,"** a walking-time estimating means; **"10,"** a predictive calculating means; **"11,"** a waiting-time conversion means; **"12,"** an evaluation-value calculating means; **"13,"** an assigning means; **"14,"** a door opening/closing means; **"15,"** an operation control means.

Best Mode for Carrying Out the Invention

[0014] The best mode for carrying out the invention is explained in Embodiment 1 below.

Embodiment 1.

[0015] Fig. 1 is a configurational diagram illustrating an elevator group-management-control device according to Embodiment1 of the present invention.

An elevator group-management-control device **1** that effectively manages a plurality of elevator cars, which is enclosed by the alternate long and short dash line, is connected for communication with the car control means **3** that controls each elevator car **2.** The group-management-control device **1** is also connected for communication with an elevator-lobby-guide-control means **4.** The elevator-lobby-guide-control means **4** is electrically connected with an elevator-lobby button **5** that is located in an elevator lobby, and by which elevator lobby calls from passengers are registered, and a lobby lantern **6** that indicates a guide to the arriving of each elevator and the car-pre-assignment to the call.

[0016] Also, the elevator group-management-control device **1** is connected for communication with a call-register means that is placed away from the elevator lobby. The call-register means **7** may be the same as the elevator-lobby button **5** or any device, such as a card reader or a security gate, as long as the device can detect passenger's arrival and transmit to the elevator group-management-control device **1** information as an elevator-lobby call.

[0017] Details of the elevator group-management-control device **1** will be explained as follows.

The elevator group-management-control device **1** is provided with a communication means **8** that can communicate with the car control means **3** for each car, the elevator-lobby-guide-control means **4,** and the call-register means **7.**

[0018] The elevator group-management-control device **1** also includes: a walking-time estimating means **9** for estimating a walking time for an elevator passenger to walk to the elevator lobby, when a call has been registered by either the elevator-lobby button **5** or the call-register means **7;** a predictive calculating means **10** for predictively calculating such as how long it takes thereafter before each elevator car **2** arrives at the lobby; a waiting-time conversion means **11** for converting into an actual waiting time or a lost time the predicted waiting time, by comparing the waiting time, being an estimated result of a walking-time estimating time **9,** to a predictively calculated result by the predictive calculating means **10;** an evaluation-value calculating means **12** for calculating, in response to a new elevator-lobby call, an evaluation value for each elevator car, based on the result of the waiting-time conversion means **11;** an assigning means **13** for determining the elevator car **2** that is assigned on the basis of the evaluation values calculated for each elevator car; a door opening/closing means **14** for determining, when the elevator car **2** assigned responds to the elevator-lobby call, a period for the door of the elevator car to keep open; and an operation control means **15** for operating/controlling each elevator car **2** on the basis of determinations and the like made by the assigning means **13** and the door opening/closing means **14.** Every component of the elevator group-management-control device **1** is connected for communication with each other, so as to be able to exchange information with each other.

[0019] The operations will be explained as follows.

Fig. 2 is a flow chart illustrating the operation of the elevator group-management-control device according to Embodiment 1 of the present invention.

At Step 100, once an elevator lobby call is registered from the elevator-lobby button **5** or from the call-register means **7,** the registered information on the call is inputted through the communication means **8** in the elevator group-management-control device **1,** into the walking-time estimating time **9** and into the predictive calculating means **10,** in which the information includes at least one as to from which floor the call has been registered with the elevator-lobby button **5** or the call-register means **7,** and which movement the passenger wants, upward or downward.

[0020] Next, at Step 101, the predictive calculating means **10** calculates predictively, on the basis of the registered call information, a time until the *I*-th elevator car (*I* is a natural number from 1 to N) out of N elevator cars (where N is a natural number of two or more), arrives at the floor from which the call-register information has been registered. The procedure of the predictive calculation is given in such a method as described in 'Japanese Patent Laid-Open No. 1979-102745' and has been used generally as conventional group-management-control.

[0021] Next, at Step 102, the walking-time estimating means **9** first estimates a walking time for the passenger, who has registered the call, to walk therefrom to the space immediately in front of the elevator car **2** in the elevator lobby. For example, the estimation of the walking time can be performed by dividing the distance between the location where the call is registered with the elevator-lobby button **5** or the call-register means **7** and the elevator lobby, by the walking speed of the passenger. That is, the walking time equals the distance therefrom to the lobby divided by the walking speed. As for the distance to the lobby, a value being stored in advance by the walking-time estimating means **9,** based on the call-register information, may be used. Also as for the walking speed, a value being stored in advance by the walking-time estimating means **9** may be used, in which the value may be set to a speed of such as 4 km/h taking into account an ordinary walking speed of a human being. Therefore, the walking-time estimating means **9** may also store in advance on the basis of call-register information. When a call is registered from the elevator-lobby button **5** just in front of the elevator lobby, either the distance or the walking time to the lobby, both of which are stored by the walking-time estimating means **9,** could in some cases take zero.

[0022] Next, the walking-time estimating means **9** outputs into the waiting-time conversion means **11** the estimated walking time, and the predictive calculating means **10** outputs into the waiting-time conversion means **11** the time until elevator cars arrive, being predictively calculated for each elevator car. The waiting-time conversion means **11** compares the estimated walking time with the time until each elevator car arrives. Specifically, the waiting-time conversion means **11** determines for each elevator car whether or not the time until the elevator car arrives is longer than the estimated walking time.

[0023] When the estimated walking time is shorter, at S103 the waiting-time conversion means **11** converts into an actual waiting time the time until each elevator car arrives. An actual waiting time can be obtained by subtracting a walking time from a time until each elevator car arrives. The reason why the actual waiting time is defined as the difference between a time until each elevator car arrives and a walking time is as follows; passengers, while doing something such as walking, usually have less feeling of being kept waiting, therefore the actual waiting time is defined as the difference between them. The waiting-time conversion means **11** outputs into an evaluation-value calculating means **12** the actual waiting time.

[0024] When the estimated walking time is longer, at S104 the waiting-time conversion means **11** calculates a lost time for each elevator car. Because the lost time is a period during which each elevator car cannot help but halt its moving, the lost time can be obtained by subtracting a time until each elevator car arrives from a walking time. The waiting-time conversion means **11** outputs

into the evaluation-value calculating means **12** the actual waiting time.

[0025] At S105, the evaluation-value calculating means **12** performs evaluation calculation on the basis of the actual waiting time calculated at S103 or the lost time calculated at S104. For example, an evaluation value is calculated by using Formula 1 given below.

[0026]

Formula 1.

$$J(I) = \Sigma\ w_i \cdot f_i(x_i)$$

where

$J(I)$: evaluation value when the *I*-th elevator car is assigned · · · (1)
w_i : weight
x_i : an actual waiting time or lost time

[0027] Fig. 3a, Fig. 3b, and Fig. 3c show evaluation-value curves with respect to a time, during which the evaluation-value calculating means **12** of the elevator group-management-control device according to Embodiment 1 of the present invention has performed evaluation calculation. In Fig. 3a, the vertical coordinate axis indicates the evaluation value J1, and the horizontal coordinate axis indicates only actual waiting time. In Fig. 3b, the vertical coordinate axis indicates the evaluation value J2, and the horizontal coordinate axis indicates only lost time. In Fig. 3c, the vertical coordinate axis indicates evaluation values, and the horizontal coordinate axis indicates actual waiting time added with lost time.

[0028] The evaluation value for an actual waiting time calculated at S103 in Fig. 2 is given in Fig. 3a. The evaluation value J1, evaluated therefrom, increases with the increase in actual waiting time, and so does the slope of the evaluation value J1. It is because dissatisfaction of passengers increases dramatically with increase in the actual waiting time.

In addition, the reason why the evaluation value J1 is multiplied by, as a coefficient, the weight w_i that is the weight of passengers on board the *I*-th elevator car is that, because the passengers probably get on/off the elevator car at other floors with increase in the number of those on board the elevator car, the weight w_i is used as a coefficient, considering expected arrival delay for a some time by those. Therefore, transportation efficiency of the elevator can be prevented by that much from reducing.

[0029] The evaluation value J2 with respect to a lost time calculated at S104 in Fig. 2 is given in Fig. 3b. The evaluation value J2 evaluated therefrom increases with increase in the lost time, and so does the slope of the evaluation value J2. This is because it is taken into account that the elevators' transportation efficiency dramatically reduces with increase in the lost time, therefore transportation efficiency of elevators can be prevented from reducing.

In addition, the reason why the evaluation value J2 is multiplied by, as a coefficient, the weight w_i that is the weight of passengers having got on the *I*-th elevator car is that because passengers probably get on/off the elevator car at other floors with increase in the number of passengers on board the elevator car, the weight w_i is used as a coefficient, considering expected arrival delay. Therefore, transportation efficiency of the elevators can be prevented by that much from reducing.

Comparing the evaluation value J2 in Fig. 3b with the evaluation value J1 in Fig. 3a, the slope of the value J2 with respect to time becomes as a whole greater. That is, in order to take into account the fact that overall transportation efficiency including all elevator cars **2** reduces more when the *I*-th elevator car **2** halts than when the passenger waits, evaluation value J1 in which the passengers are kept waiting in the lobby is made as a whole smaller.

[0030] Furthermore, the evaluation value J3 in Fig. 3c represents the sum of the value J1 in Fig. 3a and the value J2 in Fig. 3b after the positive/negative sign of its lost time has been reversed;therefore by using the function described above, the evaluation can be performed without distinguishing the actual waiting time from the lost time at S103 and S104.

[0031] At S106, the assigning means **13** checks whether or not the evaluation for each elevator car, from the first elevator car to the Nth elevator car, has been finished. When not yet finished, the steps from S101 to S105 are performed on the next elevator car. When finished, an elevator car to be assigned is determined at S107 by selecting the *I*-th elevator car having a minimum evaluation value of J1 and J2, or J3. Finally, the assigning means **13** issues at S108 to the assigned elevator car **2** an assignment instruction.

[0032] For the assigned elevator car **2,** the operation control means **15** takes movement control of the car **2** based on its waiting time or lost time that has been stored in the waiting-time conversion means **11** or the evaluation-value calculating means **12.**

Fig. 4 is a flow chart following which the operation control means **14** of the elevator group-management-control device according to Embodiment 1 of the present invention takes control of the assigned elevator car **2.**

[0033] First, at S200 the operation control means **15** issues to the assigned elevator car **2** an instruction to move to the floor from which the call has been registered. Then the instruction is transmitted to the car control means **3,** through the communication means **8,** so that the car control means **3** takes control of the location and speed of the assigned elevator car **2.**

When the elevator car **2** arrives at the destination floor, the door opening/closing means **14** outputs through the communication means **8** an instruction to open the door, so that the car control means **3** takes control of the po-

sition and speed of the door. Then, the door becomes open.

[0034] Next, at S201 the door opening/closing means **14** checks whether or not the passenger's walking time has elapsed since the elevator lobby call was registered. When it has elapsed, at S202 the door opening/closing means **14** instructs, through the communication means **8,** the car control means **3** to close the door, so that the car control means **3** takes control of the position and speed of the door. When the passenger's walking time has not yet elapsed since the elevator lobby call was registered, at S203 the door opening/closing means **14** instructs the car control means **3** to keep the door open. Those operations described above are performed repeatedly at predetermined intervals. S203 is aimed at preventing the door from closing before the passenger's walking time has not yet elapsed since the elevator lobby call was registered, and the elevator car from moving to another floor.

[0035] Therefore, because an elevator group-management-control device according to Embodiment 1 includes: a walking-time estimating means **9** for estimating a walking time for an elevator passenger to walk to the elevator lobby; a predictive calculating means **10** for predictively calculating a time until each elevator car **2** arrives at the lobby; a waiting-time conversion means **11** for converting into an actual waiting time or a lost time the difference between the predicted time until the elevator car **2** arrives, calculated predictively by the predictive calculating means **10,** and the estimated actual waiting time; an evaluation-value calculating means **12** for calculating, by using the actual waiting time or the lost time, an evaluation value that increases with increase in the actual waiting time or the lost time; an assigning means **13** for determining, as an assigned elevator car, an elevator car for which evaluation value has been calculated to be minimum, by the evaluation-value calculating means **12;** an operation control means **15** for instructing the assigned elevator car to move to the floor from which the call has been registered; and a door opening/closing means **14** for keeping open the door of the elevator car **2** assigned based on the actual waiting times or the lost times until the estimated walking time has elapsed after it is opened, excellent transportation efficiency can be obtained when an elevator lobby call is registered from an elevator-lobby button 5 or a call-register means **7** placed away from the lobby. That is, in the elevator group-management-control device, one of the elevator cars is selected, taking into account a users' walking time and the number of floors that the elevator car skips, so that in a building such as a high rise one equipped with a plurality of elevator cars, the elevator group-management-control device can make an elevator car, being able to arrive more securely within an arrival time at the floor from which the call has been registered, arrive at the floor and open its door open, resulting in an elevator group-management-control device of excellent transportation efficiency.

[0036] In addition, the evaluation of elevator cars is conducted in such a way that providing a reference where the actual waiting time or lost time is zero, the evaluation value grows from the reference, and an elevator car having a minimum evaluation value is determined as an assigned elevator car, resolving such problems described below. That is, in cases where elevator cars are not subject to evaluation at all because of its lost-time as in conventional devices, and as described in Japanese Patent Laid-Open No.1999-322205, a walking time to the elevator or an expected arrival time until the elevator car arrives at the floor whichever greater is determined as a total evaluation value for the elevator, when the expected time until all of the elevator cars arrive is shorter than the passenger's walking time to the elevator, it results in the total evaluation-value for each elevator car being the same, so that any elevator can be assigned; therefore, in a building such as a high rise one equipped with a plurality of elevator cars, it is sometimes more efficient to instruct an elevator car near the floor from which a call has been registered, to arrive at the floor and wait for the passenger with its door open, meanwhile, arbitrarily assigning an elevator car can cause problems in that the elevator car takes, due to callings from numbers of other floors, a far much longer time before it arrives at the floor than the passenger's walking time to the elevator.

Industrial Applicability

[0037] An elevator group-management-control device according to the present invention is applicable to operation of elevator cars.

Claims

1. An elevator group-management-control device comprising: a walking-time estimating means for estimating a walking time for an elevator passenger to walk to an elevator lobby when an elevator lobby call either from an elevator-lobby button, or from a call-register means away from the elevator lobby, has been registered;

a predictive calculating means for predictively calculating a time until each elevator car arrives at the lobby;
a waiting-time conversion means for converting into an actual waiting time or a lost time the difference between the predicted time until the elevator car arrives, calculated predictively by the predictive calculating means, and the estimated waiting time estimated by the estimating means;
an evaluation-value calculating means for calculating, by using the actual waiting time or the lost time, an evaluation value that increases with increase in the actual waiting time or lost time;
an assigning means for determining, as an as-

signed elevator car, an elevator car for which evaluation value has been calculated to be minimum, calculated by the evaluation-value calculating means;
an operation control means for instructing the assigned elevator car to move to the floor from which the call has been registered; and
a door opening/closing means for keeping open the door of the elevator car assigned based on the actual waiting time or the lost time until the estimated walking time has elapsed after it is opened.

2. An elevator group-management-control device according to claim 1, wherein the slope of the evaluation value increases in accordance with increase in the actual waiting time or the lost time.

3. An elevator group-management-control device according to claim 1, wherein the evaluation value for each elevator car is multiplied by a coefficient that is the weight of passengers who have got on the elevator car.

4. An elevator group-management-control device according to claim 1, wherein the evaluation value for the actual waiting time is less than that for the lost time.

FIG. 1

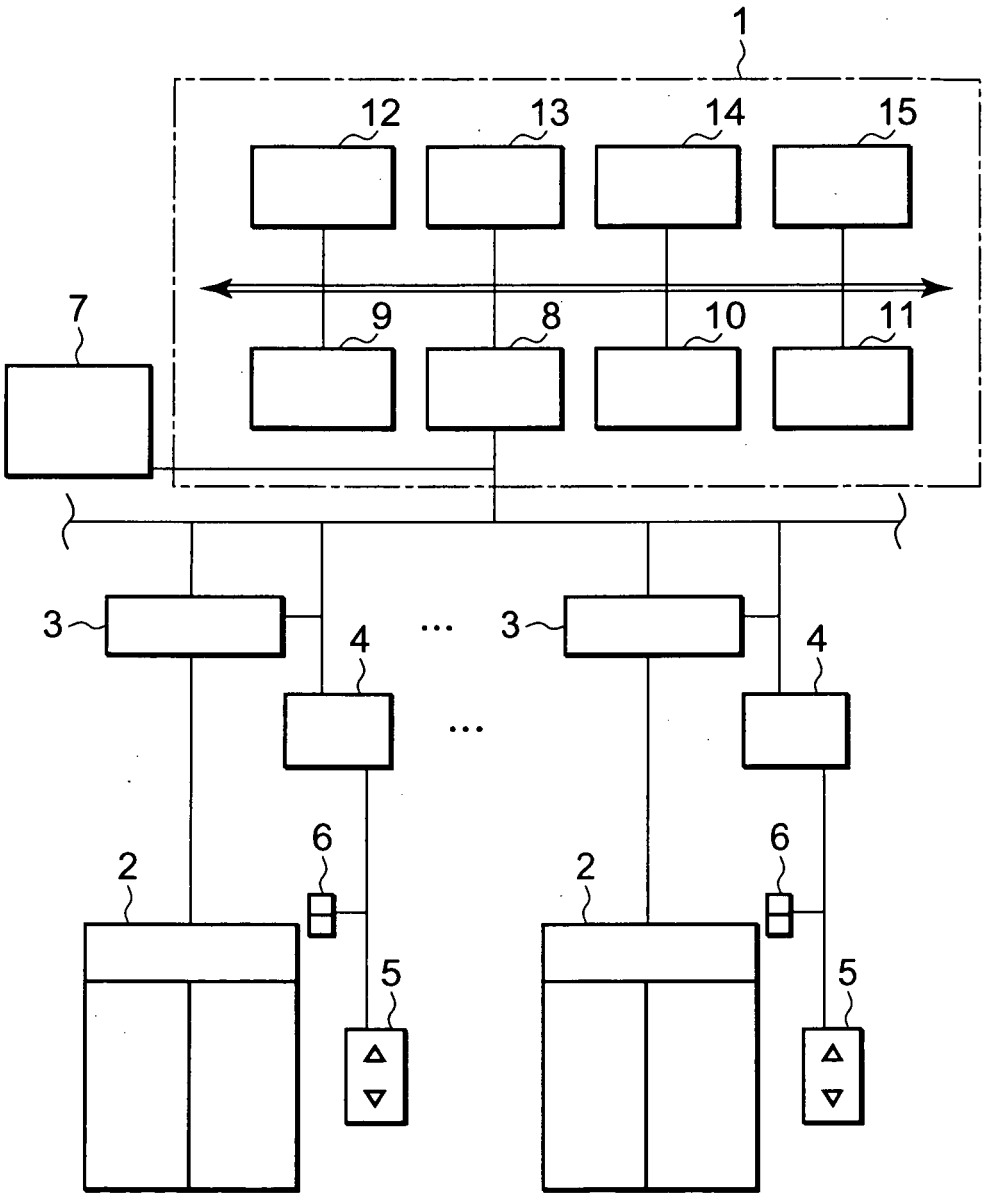


FIG. 2

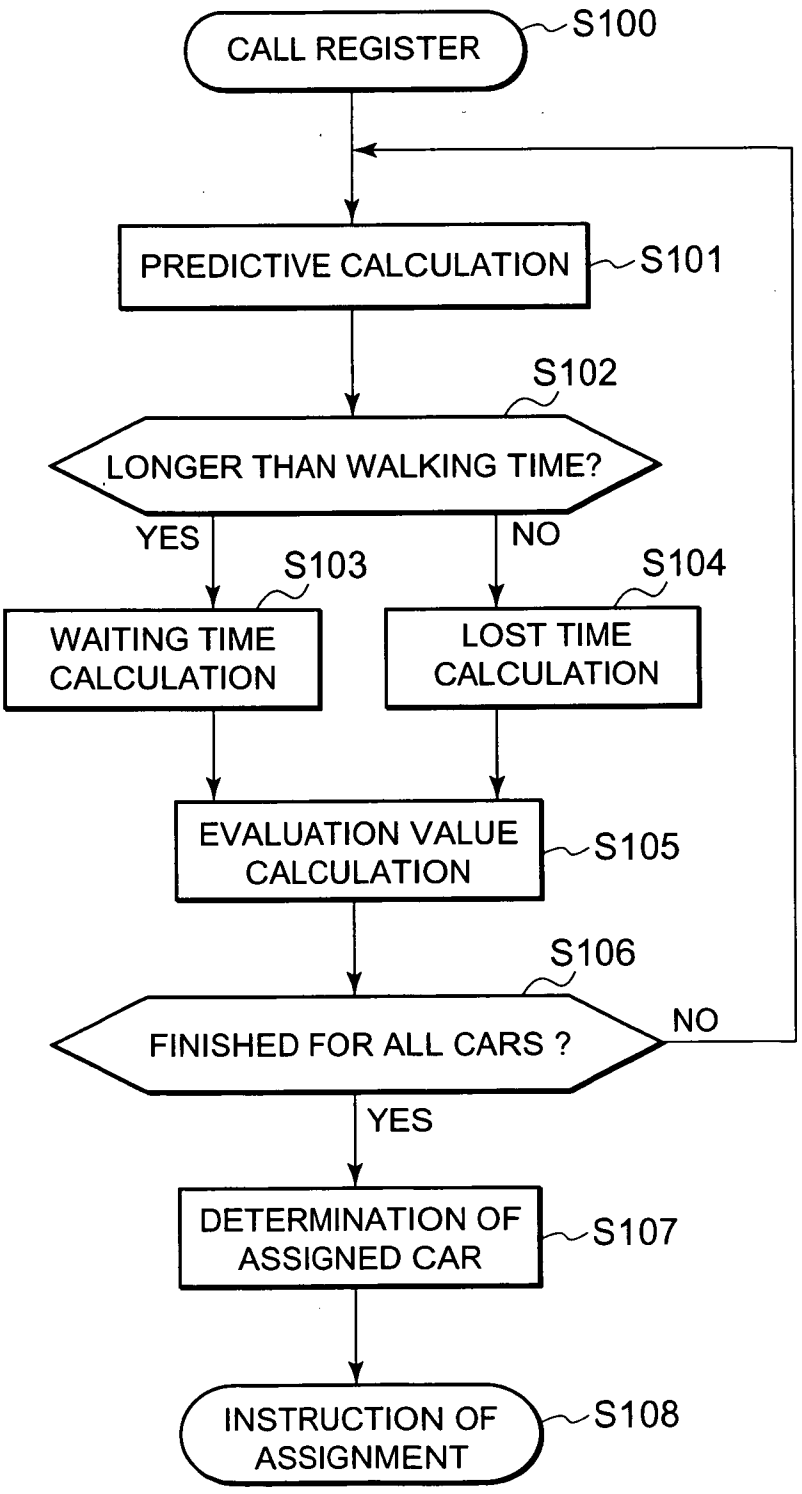

CALL REGISTER
S100
PREDICTIVE CALCULATION
S101
S102
LONGER THAN WALKING TIME?
YES
NO
S103
S104
WAITING TIME CALCULATION
LOST TIME CALCULATION
EVALUATION VALUE CALCULATION
S105
S106
FINISHED FOR ALL CARS ?
NO
YES
DETERMINATION OF ASSIGNED CAR
S107
INSTRUCTION OF ASSIGNMENT
S108

FIG. 3A

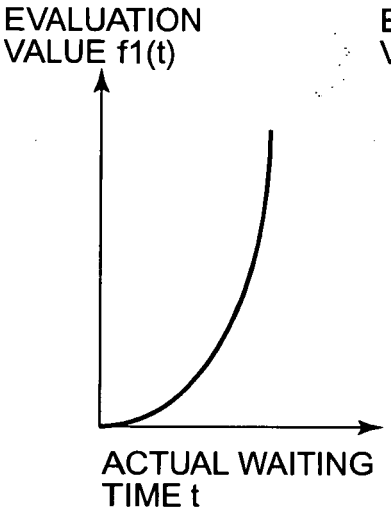


FIG. 3B

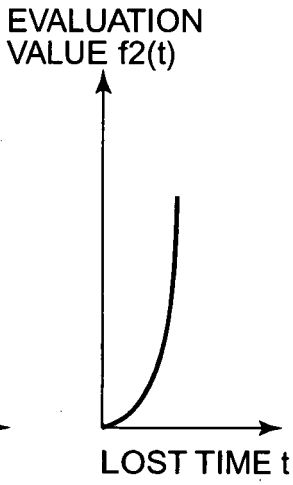


FIG. 3C

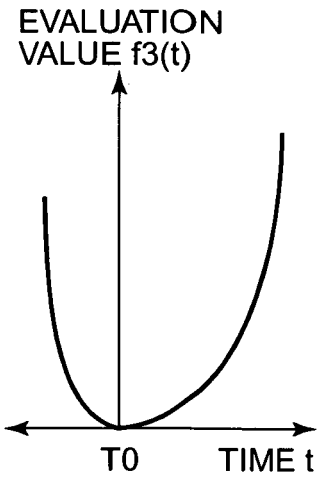
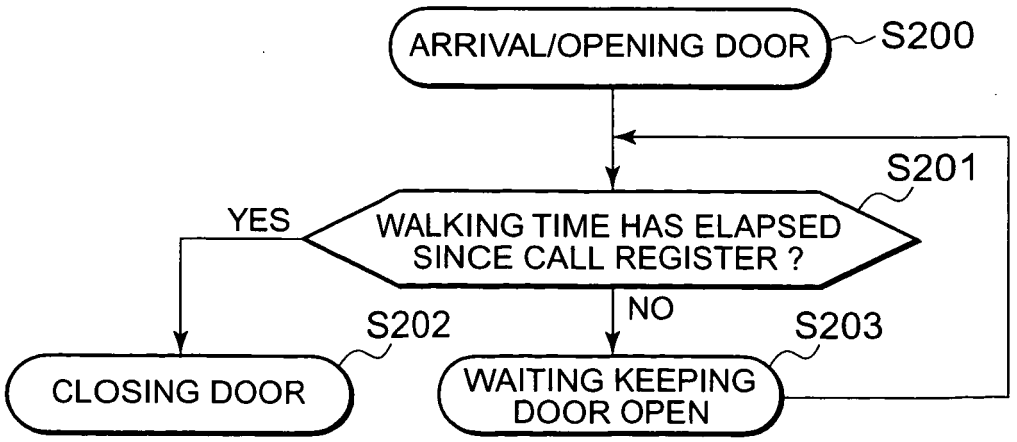


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/007610

A. CLASSIFICATION OF SUBJECT MATTER
B66B1/18(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.
X Y	JP 60-19673 A (Mitsubishi Electric Corp.), 31 January, 1985 (31.01.85), Claim 1; page 3, upper left column, line 4 to page 4, upper right column, line 10; Figs. 1 to 5 (Family: none)	1,4 2-3
Y	JP 53-55847 A (Mitsubishi Electric Corp.), 20 May, 1978 (20.05.78), Page 1, lower right column, line 12 to page 2, upper left column; Figs. 1 to 2 (Family: none)	2
Y	JP 61-136883 A (Mitsubishi Electric Corp.), 24 June, 1986 (24.06.86), Page 1, lower left column, lines 5 to 15 & CN 85108014 A	3

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

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
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"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	Date of mailing of the international search report
18 January, 2006 (18.01.06)	24 January, 2006 (24.01.06)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 11322205 A **[0005] [0006] [0036]**
- JP 54102745 A **[0020]**