

GROUP MANAGEMENT CONTROL SYSTEM FOR ELEVATORS, METHOD FOR
CONTROLLING ORDER OF GUIDES FOR DESTINATION CALLS, AND
COMPUTER-READABLE STORAGE MEDIUM

5 CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the benefit
of priority from Japanese Patent Application No. 2012-
226172, filed on October 11, 2012, the entire contents of
which are incorporated herein by reference.

10

FIELD

Embodiments described herein relate to a group
management control system for elevators, a method for
controlling the order of guides for destination calls, and
15 a computer-readable storage medium.

BACKGROUND

As a method for the user to operate elevators, there
has been mainly used a method of calling a "car" by pushing
20 a button of an up-down call registration device at the hall
(elevator hall) of a departure floor (which will be
referred to as an up-down call, hereinafter), and a method
of designating a destination floor by pushing one of car
call buttons set up in the car respectively for destination
25 floors (which will be referred to as a car call method,
hereinafter).

On the other hand, there has been developed a

"destination call" method that allows the user to perform the car calling and the destination floor designation together by registering a destination floor via a hall destination floor registration device (or hall destination controller) disposed at each departure floor.

According to a group management control system for elevators, which utilizes such a hall destination floor registration manner, respective users individually make their destination calls, in general. The system works for each of the users having a destination call registration, such that it selects a car (assigned car) for the user to board and a round (allocated round) for the user to board the assigned car (i.e., a round at which the user boards the assigned car), and then gives a guide about the car to the user based on the allocation results. If the system cannot give a guide to the user when the allocation for the user is made, the system, for example, suspends the guide based on this allocation until it becomes available, or once cancels this allocation and then performs a re-allocation process.

However, when the suspension or re-allocation described above is performed, the order of guides for a plurality of destination calls may disagree with the order of the destination call registrations. Particularly, if a disagreement is caused between the registration order and the guide order at the same departure floor, the sense of fairness may be damaged.

So far, there is no effective method of performing adjustment to prevent a disagreement from being caused between the registration order and the guide order at the same departure floor in a case where giving a guide for a destination call is not permissible when the allocation for the destination call is made.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view showing an example of the structure of a group management control system according to embodiments.

FIG. 2 is a view showing an example of the structure of a hall destination floor registration device.

FIG. 3 is a view showing an example of the display screen image for giving an assigned car guide.

FIG. 4 is a view showing an example of the display screen image for giving notice of suspension.

FIG. 5 is a view showing an example of information stored in an operation schedule storage unit.

FIG. 6 is a view showing an example of information stored in an operation schedule storage unit.

FIG. 7 is a view showing an example of information stored in an in-suspension call storage unit.

FIG. 8 is a flow chart showing an example of a process performed when a new destination call is generated.

FIG. 9 is a flow chart showing an example of a process performed every time a door closing operation is completed.

FIG. 10 is a flow chart showing an example of a process performed when an allocation change is made.

FIG. 11 is a flow chart showing an example of a process performed when a destination call having an adjacent destination floor is generated.

FIG. 12 is a flow chart showing an example of a process performed when a destination call having an adjacent destination floor is generated.

FIG. 13 is a view showing an example of information stored in an operation schedule storage unit.

DETAILED DESCRIPTION

A group management control system for elevators according to embodiments of the present invention will now be described in detail with reference to the accompanying drawings. In the embodiments described below, portions performing substantially the same functions are denoted by the same reference numerals and their repetitive description will be omitted.

According to one embodiment, a group management control system for elevators, which manages operation of a plurality of cars, in reply to a destination call specifying a departure floor and a destination floor associated with each user, is provided with an allocation processing unit, a guide control unit, an in-suspension call storage unit and a call exchange unit. An allocation processing unit allocates an assigned car and an allocated

round for the destination call, the assigned car for the user to board and the allocated round at which the user boards the assigned car. A guide control unit makes judgment of whether giving an assigned car guide is
5 permissible for the destination call when the allocation processing unit allocates the assigned car and the allocated round. An in-suspension call storage unit stores information associated with a new destination call, which includes the departure floor and the destination floor
10 along with the assigned car and the allocated round, to keep the new destination call in suspension, when giving an assigned car guide is not permissible for the new destination call. A call exchange unit performs an exchange between the assigned car and the allocated round
15 for the new destination call and the assigned car and the allocated round for another destination call, the information associated with the another destination call kept in a longest time suspension in the in-suspension call storage unit and including the departure floor and the
20 destination floor same as the departure floor and the destination floor included in the information associated with the new destination call, when giving an assigned car guide is permissible for the new destination call.

According to the present embodiment, it can
25 effectively perform adjustment to prevent a disagreement from being caused between the registration order and the guide order at the same departure floor among users having

registrations of the same destination floor (or further
among users having registrations of adjacent destination
floors) in a case where giving a guide for a destination
call is not permissible when the allocation (of a car and a
5 round) for the destination call is made.

In the embodiments, an explanation will be given of a
case where the halls (elevator halls) of respective floors
to elevators are respectively equipped with a plurality of
hall destination floor registration devices, wherein
10 respective users individually perform operations to
designate destination floors via the hall destination floor
registration devices, and the respective users are
individually given guides about cars via the hall
destination floor registration devices.

15 (First embodiment)

An explanation will be given of a first embodiment.

At first, the problem mentioned previously will be
discussed further in detail.

As described above, according to a group management
20 control system for elevators, which utilizes the hall
destination floor registration manner, (particularly, in a
system including a plurality of hall destination floor
registration devices disposed at one floor), a destination
call registration is generated by a user via a hall
25 destination floor registration device, and the system
selects an assigned car and an allocated round. However,
at this time, if the system cannot give an assigned car

guide to the user, it performs suspension or re-allocation, for example. However, when the suspension or re-allocation described above is performed, assigned car guides may be given in an order different from the order of destination call registrations. Particularly, if a disagreement is
5 caused between the registration order and guide order at the same departure floor among users having registrations of the same destination floor (or among users having registrations of adjacent destination floors), the users
10 may feel mutual unfairness. For example, it is assumed that, at the hall of the 1st floor, a user "a" inputs "5th floor" via one hall destination floor registration device, and then a user "b" inputs "5th floor" via another hall destination floor registration device after 10 seconds.
15 Under this assumption, if the assigned car guides for the users "a" and "b" are once suspended and then other guides for the users "a" and "b" are given such that the assigned car guide for the user "b" is earlier than the assigned car guide for the user "a" by 8 seconds, the user "b" can go
20 forward to the hall door earlier than the user "a" by 8 seconds. In this case, the user "a" may feel like being treated unfair relative to the user "b".

It may be conceivable to use a method such that, when an assigned car and an allocated round are selected, but
25 giving a guide is not permissible for this allocation at this time, the allocation is once cancelled, and then a new allocation process is performed for destination calls in

accordance with the registration order, after a certain period of time or when another user makes a destination call registration. However, according to this method, the operation schedules of the respective cars cannot include
5 the boarding schedule of a user who has a destination call registration but cannot be given a guide at this moment. Accordingly, when an allocation process is performed for another destination call, this method cannot give consideration to the serviceability to this waiting user or
10 to the influence of this waiting user on the other users, and thus brings about a problem to impair the accuracy of future prediction.

Incidentally, in a group management control system for elevators, which utilizes the up-down call manner, there is
15 known a method of intentionally delaying the timing of displaying an assigned car for a registration of an up-down call. If it is too early to display an assigned car for a registration of an up-down call, a "prediction mistake" is caused when the car operation does not go on as expected.
20 For example, if a car call is generated in a car (B) other than the assigned car (A) and this other car (B) arrives earlier than the assigned car (A), a "prediction mistake" is caused such that the car (B) actually available to board differs from the assigned car (A) that has been displayed.
25 According to the method described above, in order to prevent prediction mistakes, an assigned car guide is provided a little while after an up-down call is

registered.

Unlike the up-down call manner, however, in the case of a group management control system for elevators, which utilizes the hall destination floor registration manner, and in which respective users individually register destination calls one by one, assigned cars to board are respectively allocated to the individual users. Thus, there is such a rule of use that, even if the other car (B) arrives earlier than the assigned car (A) about which a guide has been given to the user, the user does not board the other car (B) but waits at the hall until the assigned car (A) arrives. Accordingly, in the hall destination floor registration manner, it is unnecessary to consider prediction mistakes. However, on the other hand, passenger capacity management is utilized in allocation not to exceed the passenger capacity of each of the cars, and so the cars may be fully booked up to the passenger capacity in some instances (for example, when the number of users is large). In this case, car operation schedules may be made such that some users having destination call registrations are provided with assigned cars in the traveling of the 2nd round or thereafter. In order to prevent each user, who has a booking to board in the traveling of the 2nd round or thereafter as an "allocated round", from boarding the same assigned car in the 1st round by mistake, there is a method of not giving an assigned car guide to the user until the assigned car for the user finishes the response in a

previous round before the round in which the user is supposed to board the assigned car, for example. In the case of providing each user with a guide including, in addition to designation of an assigned car, designation of an "allocated round" to show the ordinal number of a response at which the user is supposed to board the car, it may be permissible to immediately give an allocation guide to the user having a booking to board in the traveling of the 2nd round or thereafter. It should be noted however that, in a system that provides each user with the number of responses, the user need to pay attention to the number of responses; which is not user friendly. Thus, as regards assigned car guides, for example, it is more easily understandable for each user to use a method of suspending an allocation guide until the timing for the user to be ready for correct boarding before the user boards the assigned car at the floor in the next response.

According to this embodiment, it is possible to perform adjustment of the guide order to provide users, who are the same in both departure floor and destination floor, with assigned car guides in the order of destination call registrations. Further, in future prediction about the operation of cars, it is possible to estimate the serviceability to users kept in suspension of an assigned car guide.

In summary, for example, when giving an allocation guide becomes permissible, an exchange of information of

the assigned car and allocated round is performed between a user kept in the longest suspension of an allocation guide and a user having a registration of a destination call corresponding to the permissible allocation guide, among
5 users the same in departure floor and destination floor. Consequently, without changing the operation schedules of the cars, the order of assigned car guides is prevent from causing a disagreement with the order of destination call registrations, among users the same in both departure floor
10 and destination floor.

The first embodiment performs additional control for the order of guides among users the same in both departure floor and destination floor, to cause the order of assigned car guides to be the same as the order of destination call
15 registrations. On the other hand, the second embodiment performs additional control for the order of guides by further giving consideration to users the same in departure floor and adjacent in destination floor. In either of the first and second embodiments, the structures other than
20 those for the additional control of a group management control system for elevators are not specifically limited (for example, arbitrary existing structures may be used).

Next, a detailed explanation will be given of the first embodiment.

25 FIG. 1 is a view showing an example of the structure of a group management control system for elevators according to this embodiment.

As shown in FIG. 1, a group management control system 100 for elevators according to this embodiment includes a group management control device 1, car control devices 2_1 to 2_x , cars 3_1 to 3_x , and hall destination floor registration devices $4_{1,1}$ to $4_{y,w}$.

The group management control device 1 includes an allocation processing unit 101, a future prediction unit 102, a guide control unit (determination unit) 103, an operation schedule storage unit 104, a call exchange unit 105, an in-suspension call storage unit 106, and an operation command unit 107.

Although this embodiment will be explained in a case where no consideration is given to car calls, each of the cars 3_1 to 3_x may be equipped with members for car calls inside, such as car call buttons or the like (not shown) including buttons respectively corresponding to destination floors.

In this explanation, "x" stands for the number of cars (x is 2 or more), "y" stands for the total number of floors having halls to the elevators (the total number of floors equipped with the hall destination floor registration devices), and "w" stands for the number of hall destination floor registration devices disposed at each of the floors (w is 2 or more).

In a concrete example, for example, if an office building having 15 stories above the ground (or, for example, having 3 stories under the ground and 12 stories

above the ground) is structured in relation to the elevators such that there are 6 cars and each of the floors is equipped with 3 hall destination floor registration devices, this comes to $x=6$, $y=15$, and $w=3$. As a matter of course, this embodiment is not limited to this example, and so the number "x" of cars, the number "y" of floors, and the number "w" of hall destination floor registration devices at each of the floors are optional. Further, for the elevators, the floors may differ from each other in the number of hall destination floor registration devices disposed thereon.

Further, there may be a floor having only one hall destination floor registration device. In this floor, since the registration order and the guide order cannot disagree with each other, the additional control according to this embodiment is not performed.

The cars 3_1 to 3_x are controlled respectively by the corresponding car control devices 2_1 to 2_x .

The car control devices 2_1 to 2_x are controlled by the group management control device 1.

The group management control device 1 is connected to each hall destination floor registration device $4_{i,j}$ disposed at each floor, and, in reply to a destination call registered by a user through the hall destination floor registration device, the group management control device 1 performs a process (which will be referred to as an allocation process, hereinafter) to select an "assigned

car", which is a case for the user to board and an
"allocated round", which is a round for the user to board
the assigned car. Further, the group management control
device 1 gives the user a guide, such as notice of the
5 assigned car, via the hall destination floor registration
device.

Furthermore, the group management control device 1
holds the operation schedules of the cars 3_1 to 3_x and
instructs the operation of the cars 3_1 to 3_x by giving
10 notice of the operation schedules to the car control
devices 2_1 to 2_x .

In order to respectively identify the hall destination
floor registration devices, identification information on
the hall destination floor registration devices may be
15 utilized, for example. The format of the identification
information on the hall destination floor registration
devices is not limited to a specific one. For example, it
may include floor identification information along with
identification information on respective hall destination
20 floor registration devices at each floor. For example, it
may be arranged such that the 1st hall destination floor
registration device at the 1st floor is denoted by
identification information "101", the 2nd hall destination
floor registration device at the 1st floor is denoted by
25 identification information "102", and the 3rd hall
destination floor registration device at the 15th floor is
denoted by identification information "153".

In this explanation, the "round" is defined as a value that is counted up by one, every time a car changes directions from a first direction (for example, the downward direction) to a second direction (for example, the upward direction), and the initial round is "1st round".
5 Alternatively, it may be defined such that the first direction is the upward direction and the second direction is the downward direction. Further, the "allocated round" indicates the ordinal number of a round of a car in which a user is supposed to board the car. In other words, when
10 the "allocated round" coincides with the current "round" of a car, it is time (round) for the user to board the car. For example, the operation command unit 107 is in charge of the rounds of the cars by counting out the traveling rounds
15 of each car every time the car makes one round trip through the elevator shaft.

In the following explanation, there is a case where a hall destination floor registration device (or hall destination controller) is denoted by HDC, identification
20 information on a hall destination floor registration device is denoted by HDC-ID, a departure floor (or an originating floor) is denoted by "O", and a destination floor is denoted by "D". Further, information about a destination call registration from each user, which is to be treated by
25 an allocation process, may be referred to as "registration information". The registration information includes, for example, HDC-ID, a destination call registration time, a

departure floor, and a destination floor, though they do not limit the contents. Further, an "assigned car" and an "allocated round" selected by an allocation process may be collectively referred to as "allocation information".

5 The hall destination floor registration devices $4_{1,1}$ to $4_{y,w}$ are devices configured to receive destination calls (designating destination floors) registered by users and transmit them to the group management control device 1, and further to obtain allocation results for the input
10 destination floors from the group management control device 1 and give notice of them to the users (e.g. by display).

 In this embodiment, it is assumed that respective users individually make registrations via the respective hall destination floor registration devices $4_{1,1}$ to $4_{y,w}$.
15 Accordingly, for example, even if a plurality of users at the same departure floor are the same in destination floor, these users individually register the same destination floor. Similarly, giving notice of allocation results is performed for individual users one by one.

20 As regards the "destination floor" in each destination call, the "destination floor" designated by the user may be transmitted from each of the hall destination floor registration devices $4_{1,1}$ to $4_{y,w}$ to the group management control device 1.

25 Further, as regards the "departure floor", the "departure floor" may be identified with a floor equipped with corresponding one of the hall destination floor

registration devices $4_{1,1}$ to $4_{y,w}$, through which a registration operation is made by the user. The group management control device 1 can identify the "departure floor" by use of any method. For example, the hall destination floor registration devices $4_{1,1}$ to $4_{y,w}$ may transmit the "departure floor" to the group management control device 1. Alternatively, for example, the group management control device 1 may contain a correlation table between the HDC-ID and departure floors so that the group management control device 1 can identify the "departure floor" with reference to the correlation table based on HDC-ID transmitted from the hall destination floor registration devices $4_{1,1}$ to $4_{y,w}$. Alternatively, another method may be used.

Further, the mutual relationship between the "destination floor" and "departure floor" in the vertical direction can be used to identify the "call direction" as the upward direction or downward direction.

Further, in a case where the group management control device 1 uses a time at which a destination call is registered (destination call registration time), the group management control device 1, for example, may use, as the call registration time, a time at which a destination call registration is transmitted from the hall destination floor registration devices $4_{1,1}$ to $4_{y,w}$. Alternatively, for example, a destination call registration (e.g., with a time at which a registration operation is completed by the user)

may be transmitted from the hall destination floor registration devices $4_{1,1}$ to $4_{y,w}$ to the group management control device 1, or another method may be used.

5 Further, as needed, other information is transmitted from the hall destination floor registration devices $4_{1,1}$ to $4_{y,w}$ to the group management control device 1 and/or other information is obtained by the group management control device 1.

10 In this embodiment, the group management control device 1 supervises the number of users to be allocated to each of the cars 3_1 to 3_x to prevent users to board each of the cars from exceeding the passenger capacity. Accordingly, when the number of allocated users reaches the passenger capacity of a car, additional users cannot be
15 allocated to the car in this round. However, even in such a case, a operation schedule can be made not to exceed the passenger capacity by allocating users to the car in the 2nd round or thereafter.

20 FIG. 2 is a view showing an example of the structure of each of the hall destination floor registration devices $4_{1,1}$ to $4_{y,w}$.

As shown in FIG. 2, each of the hall destination floor registration devices $4_{1,1}$ to $4_{y,w}$ includes a destination call input unit 41 for users to input destination floors,
25 and an allocation guide display unit 42 to provide users with guides, such as notice of the assigned car.

The input method of the destination call input unit 41

can be any method. For example, the input method may utilize a touch panel displaying the numeric keys and enter key thereon by means of soft keys, so that the user inputs a destination floor by the numeric keys and confirms it by the enter key. Alternatively, for example, a touch panel may be designed to display selection buttons thereon corresponding to destination floors, so that the user touches one of the selection buttons corresponding to a required destination floor. Additionally or alternatively, hard keys may be used to form the numeric keys and enter key, or hard keys may be used to form selection buttons corresponding to destination floors.

Further, for example, it may be arranged for office buildings or the like that a hall destination floor registration is accepted after the user accesses one of the hall destination floor registration devices $4_{1,1}$ to $4_{y,w}$ by use of the ID card to input his or her ID.

Other than the modifications mentioned above, various variations may be adopted.

It should be noted that, since the departure floor can be identified by the system, there is not need to prepare a function for users to input departure floors.

Further, in this embodiment, it is assumed that each hall destination floor registration device is used such that, after a guide about allocation results for a destination call registration from one user u_1 is completed, a destination call registration from another

user u2 can be received. In other words, the user u2 can perform a registration operation of a destination call after a guide about allocation results for the user u1 is completed.

5 When the number of users is large, they need to form a waiting line or lines. The method of arranging the waiting lines is not limited to a specific one. For example, a plurality of hall destination floor registration devices may respectively receive waiting lines formed thereon.
10 Alternatively, only one waiting line is formed to let the first user of the waiting line move to a hall destination floor registration device that has become available, or another method may be used.

 In this embodiment, each of the guides for users is
15 arranged, in terms of allocation information, to give notice of the "assigned car" to board and not to give notice of the "allocated round" to board the car. This is so because it is very inconvenient for users that they need to remember both of the assigned car and allocated round.

20 Further, in this embodiment, when a registration is generated and an allocation process is performed, it is not necessarily permissible to immediately give a guide to a user. According to this embodiment, if immediately giving a guide is permissible, notice of the assigned car is given
25 to the user. If immediately giving a guide is not permissible, for example, notice of a waiting request (to suspend the allocation) is given to the user.

An example of the case where giving a guide is permissible is a case where the timing at which the assigned car for a user responds next time at the relevant floor (while it travels in the traveling direction (call direction) required by the user) corresponds to the boarding timing of the user. Specifically, for example, there is a case where it renders the "allocated round" = "the first round", and a case where it renders the "allocated round" = "the second round" but the assigned car (while it travels in the traveling direction required by the user) does not respond at the relevant floor in the first round (i.e., skips the relevant floor).

In other words, it should be arranged to give an assigned car guide for the first time when such a condition is satisfied, for example, that, if the guide is given to the user, "the time at which the assigned car opens the door next time while displaying the same direction as the direction (call direction) required by the user" is "the timing to be the round for the user to board the car".

In the case of the above-described manner being used, when the user receives an assigned car guide, the user can go forward immediately thereafter to the waiting position to board the car, so as to correctly board the car in the allocated round set by the group management control system without paying attention to the allocated round.

In order to make it unnecessary for the users to pay attention to the traveling directions of the cars, the case

where giving a guide is permissible may be defined by a case, for example, where the timing at which the assigned car opens the door next time at the relevant floor corresponds to the boarding timing of the user, regardless
5 of the traveling direction of the car. In this case, for example, even if it renders the "allocated round" = "the first round", the guide should not be given in a case where the assigned car opens the door earlier at the relevant floor while it travels in a direction different from the
10 traveling direction required by the user.

In other words, it should be arranged to give an assigned car guide for the first time when such a condition is satisfied, for example, that, if the guide is given to the user, "the time at which the assigned car opens the
15 door next time" is "the timing to be the round for the user to board the car".

In order to give an assigned car guide, for example, the allocation guide display unit 42 of the hall destination floor registration device uses its display
20 screen image, which may display only the car number or a guiding note including the car number, or may display a hall layout illustration showing the route from the hall destination floor registration device to the assigned car. Alternatively, the image may display a combination of them,
25 or another method may be used. Further, in any of these examples, notice may be given along with audio guidance.

FIG. 3 is a view showing an example of the display

screen image for giving an assigned car guide on the allocation guide display unit 42. In this example, a message "please board the car A" is displayed along with a guiding illustration showing the route to the car A.

5 FIG. 4 is a view showing an example of the display screen image for giving notice of suspension on the allocation guide display unit 42. While the condition for giving a guide is not satisfied (for example, in a case where the car will respond next time in a certain direction
10 in a round earlier than the allocated round), a message "please wait for a while" or the like is displayed, as shown in FIG. 4, to ask the user to wait at the current place. When the user receives the suspension guide, the user waits there until the allocation guide display unit 42
15 shows a display screen image for giving an assigned car guide, such as that shown in FIG. 3.

As described above, according to a group management control system for elevators, which utilizes a manner of providing individual users with respective allocations, it
20 is possible to perform the running operation in accordance with an operation schedule made in advance to prevent the cars from exceeding the passenger capacity. However, in the rush hours, there may be a period in which it is not permissible to give an assigned car guide to a user.

25 Each of the floors may be equipped with a plurality of hall destination floor registration devices. For example, the 1st floor may be equipped with three hall destination

floor registration devices. In this case, when an assigned car guide is suspended, a disagreement may be caused between "the order of registering destination calls" and "the order of receiving assigned car guides", as described above. For example, it is assumed that, at the 1st floor, users "x", "y", and "z", who are making one queue for the hall destination floor registration devices, respectively register destination calls in this order respectively via the hall destination floor registration devices "a", "b", and "c".

Under this assumption, assigned car guides are not necessary noticed in the order of the hall destination floor registration devices "a", "b", and "c". This is so because, for example, although the hall destination floor registration device "a", "b", and "c" may respectively have allocations for the users to board different cars in the 2nd round, the timings at which the respective cars finish the response in the 1st round at the 1st floor are not yet settled when the allocations are made, but may vary back and forth depending on a destination call generated thereafter and fluctuation in time necessary for users to board and deboard cars.

As described above, if "the order of destination call registrations" and "the order of assigned car guides" disagree with each other, the users may feel unfairness. If the order of assigned car guides for users at the same destination floor is disturbed, the users feel particularly

large stress.

This embodiment performs additional control so that, among users, who are the same in both departure floor and destination floor, the order of assigned car guides becomes
5 the same as the order of destination call registrations.

Next, an explanation will be given of the respective portions of the group management control device 1.

The allocation processing unit 101 is configured to work for generated destination call registrations, based on
10 the departure floor and destination floor included in the registration information, by performing a process (i.e., allocation process) of selecting an "assigned car" and an "allocated round". The method for the allocation process is not limited to a specific one.

15 The future prediction unit 102 is configured to predict the traveling track of each of the cars in the case of the car continuously traveling in accordance with the current operation schedule, and to estimate the waiting time and boarding time for each of the destination calls.
20 The estimation results thus obtained are used in allocation processes. The method for this estimation is not limited to a specific one.

The operation schedule storage unit 104 is configured to record operation schedule information that indicates the
25 future operation schedules of the respective cars. This record includes a schedule about the car to sequentially make stops in accordance with the allocation.

The in-suspension call storage unit 106 is configured to store information concerning the destination call registration in suspension. The destination calls for which assigned car guides are given are removed from the
5 in-suspension call storage unit 106.

The guide control unit 103 is configured to make judgment of whether it is permissible to give a user a guide about the allocation determined by the allocation processing unit 101 when the allocation processing unit 101
10 allocates the assigned car and the allocated round (i.e., immediately when the allocation is made), with reference to the operation schedule information. If giving the guide is permissible, the guide control unit 103 gives notice of the guide to the hall destination floor registration devices
15 4_{1,1} to 4_{1,3}, and if giving the guide is not permissible, it instructs suspension to the hall destination floor registration devices 4_{1,1} to 4_{1,3}. Further, if giving the guide is not permissible, the registration information (for example, the departure floor and destination floor) and the
20 allocation information (for example, the assigned car and allocated round) associated with the destination call registration in suspension are stored in the in-suspension call storage unit 106.

The operation command unit 107 is configured to give
25 instructions to the car control devices 2₁ to 2_x, so that the cars are caused to travel in accordance with the operation schedules of the respective cars recorded in the

operation schedule storage unit 104.

5 The call exchange unit 105 is configured to perform additional control to prevent a disagreement from being caused between the registration order and guide order for destination calls.

10 The call exchange unit 105 is configured to perform an exchange between the assigned car and the allocated round for the new destination call and the assigned car and the allocated round for another destination call, the information associated with the another destination call kept in a longest time suspension in the in-suspension call storage unit 106 and including the departure floor and the destination floor same as the departure floor and the destination floor included in the information associated with the new destination call, when giving an assigned car
15 guide is permissible for the new destination call, for example.

20 In this embodiment, when the guide control unit 103 makes judgment that giving an allocation guide is permissible, the call exchange unit 105 checks whether the in-suspension call storage unit 106 stores other destination call registrations having the same departure floor and destination floor as those of the destination call registration (a) for which the allocation has been
25 performed. If such other destination call registrations are stored, the call exchange unit 105 selects a destination call registration (b) kept in the longest

suspension among the other destination call registrations, and exchanges their pieces of allocation information with each other between the hall destination floor registration device (B) with the destination call registration (b) registered therein and the hall destination floor registration device (A) with the destination call registration (a) registered therein on which the judgment has been made such that giving a guide is permissible. Consequently, assigned car guides can be given in the same order as the order of destination call registrations.

On the other hand, if such other destination call registrations are not stored, the above-described allocation information exchange is not performed, but the guide is given for the destination call registration (a) on which the judgment has been made such that giving a guide is permissible.

FIGS. 5 and 6 are views each showing an example of operation schedule information recorded in the operation schedule storage unit 104. For the sake of simplicity, they show information only for two cars. The passenger capacity of each car is 10.

In the example shown in FIG. 5, the car A is recorded to have a operation schedule for transporting 10 users from the 1st floor to the 6th floor in the 1st round and a operation schedule for transporting 9 users from the 2nd floor to the 7th floor in the 2nd floor round. Further, the car B is recorded to have a operation schedule for

transporting 10 users from the 1st floor to the 8th floor
in the 1st round and a operation schedule for transporting
9 users from the 3rd floor to the 4th floor in the 2nd
round. The schedule parts in the 2nd round exist because
5 they cannot transport all the users in the 1st round.

In this state, it is assumed that additional two users
heading from the 1st floor to the 5th floor are generated.
These users respectively operate the hall destination floor
registration devices $4_{1,1}$ and $4_{1,2}$ at the 1st floor in this
10 order. Then, because of allocation processes for the new
destination call registrations, the operation plan changes
as shown in FIG. 6. The car A responds to the user at the
hall destination floor registration device $4_{1,1}$, and the
car B responds to the user at the hall destination floor
15 registration device $4_{1,2}$. Since the two new users are
given allocations in the 2nd round, the assigned car guides
cannot be given at this time, and so the allocation guide
display units 42 of the hall destination floor registration
devices $4_{1,1}$ and $4_{1,2}$ display a suspension guide (for
20 example, the image shown in FIG. 4), respectively.

FIG. 7 is a view showing an example of the contents
stored in the in-suspension call storage unit 106 at the
moment. In the example shown in FIG. 7, two destination
call registrations for heading from the 1st floor to the
25 5th floor are recorded. The example shown in FIG. 7 holds
the destination call registration time, and it may further
hold and update the suspension period of time. Further,

the contents in the in-suspension call storage unit 106 may be sorted in the order of early destination call registration.

5 In this embodiment, the timings of assigned car guides respectively given to the two destination call registrations recorded therein are prevented from causing a disagreement with the order of these destination call registrations. Specifically, when it becomes permissible earlier to give a guide to the hall destination floor registration device 4_{1,2} for the HDC-ID=102, an allocation
10 information exchange is performed to give a guide about the car B to the hall destination floor registration device 4_{1,1} for the HDC-ID=101. On the other hand, when it becomes permissible earlier to give a guide to the hall
15 destination floor registration devices 4_{1,1} for the HDC-ID=101, no exchange process is performed, so as to give a guide about the car A to the hall destination floor registration device 4_{1,1} for the HDC-ID=101 as it is.

20 In this embodiment, even if guides are kept in suspension, the operation schedules for suspended users (such as the two operation schedules shown in FIG. 7) are recorded in the operation schedule storage unit 104. Accordingly, when other users further register destination calls, the future prediction unit 102 can predict car stop
25 floors and estimate the waiting time and boarding time for each of users, in consideration of the car operation for these suspended users as well.

Consequently, as compared with a method of immediately cancelling allocations when there is no car to guide about, it is possible to realize allocations to reflect more user schedules, and thereby to more efficiently transport users.

5 Next, an explanation will be given of a procedure to guarantee the order of assigned car guides in the group management control device 1 when a new destination call registration is generated.

FIG. 8 shows an example of this procedure.

10 In step S1, it waits until a new destination call is generated. When a new destination call is generated, it proceeds to step S2.

In step S2, the allocation processing unit 101 determines an "assigned car" and an "allocated round" for this destination call. Various methods can be utilized for a concrete method of determining them, which is not limited to a specific one. For example, the assigned car selection may be performed to minimize the mean value of the sums of the waiting time and boarding time for the new destination call and already registered destination calls. The allocated round selection may be performed to select the earliest round of each of the cars as long as the passenger capacity is not exceeded. When the assigned car and allocated round are determined, it proceeds to step S3.

25 In step S3, the allocation information is stored in the operation schedule storage unit 104, and then it proceeds to step S4.

In step S4, the guide control unit 103 makes judgment of whether giving a guide is permissible for the new allocation. If giving a guide is permissible, it proceeds to step S5. If giving a guide is not permissible, the
5 registration information and allocation information are stored in the in-suspension call storage unit 106, and then it proceeds to step S8.

In step S5, it makes judgment of whether destination call registrations having the same departure floor and
10 destination floor as those of the new allocation are stored in the in-suspension call storage unit 106. If such registrations are stored, it proceeds to step S6. If such registrations are not stored, it proceeds to step S9.

In step S9, without performing any exchange process,
15 the guide control unit 103 instructs the hall destination floor registration device $4_{i,j}$, through which the new destination call has been registered, to give an assigned car guide. The hall destination floor registration device $4_{i,j}$ gives the assigned car guide, as shown in FIG. 3, for
20 example.

In step S6, it selects a registration kept in the longest suspension (i.e., the earliest registration) from the destination call registrations recorded in the in-suspension call storage unit 106 and having the same
25 departure floor and destination floor as those of the new allocation. Then, it performs an exchange between the allocation information for this selected destination call

registration recorded at the hall destination floor
registration device $4_{i',j'}$ and the allocation information
for the new destination call registration at the hall
destination floor registration device $4_{i,j}$, and then it
5 proceeds to step S7.

In step S7, the guide control unit 103 instructs the
hall destination floor registration device $4_{i',j'}$ found in
step S6, through which the earliest registration has been
made, to give an assigned car guide in accordance with the
10 exchanged allocation information (i.e., the assigned car
allocated to the new destination call registration), and
then it proceeds to step S8. The hall destination floor
registration device $4_{i',j'}$ gives an assigned car guide, as
shown in FIG. 3, for example.

15 In step S8, it instructs the hall destination floor
registration device $4_{i,j}$, through which the new destination
call registration has been made, to display a sign for
suspending the assigned car guide. The hall destination
floor registration device $4_{i,j}$ gives a suspension guide, as
20 shown in FIG. 4, for example.

As described above, according to the process shown in
FIG. 8, when a new destination call is registered, and the
destination call can be given an assigned car guide when
the allocation for the destination call is made, it
25 searches for users kept in suspension of a guide. If such
users exist, it performs an allocation information exchange
between the user having the new destination call

registration and the user kept in the longest time
suspension. Consequently, it can give an assigned car
guide to the user kept in the longest suspension, so that
the order of assigned car guides agrees with the order of
5 destination call registrations.

Next, an explanation will be given of an operation to
be performed when giving a guide becomes permissible, due
to the progress of car operation, for an allocation with a
guide kept in suspension.

10 FIG. 9 shows an example of this operation.

In step S21, it waits until a door closing operation
is completed in any one of the cars. When the door closing
operation is completed, it moves to step S22 to develop a
process for allocations at the floor where the car closed
15 the door.

In step S22, with reference to the in-suspension call
storage unit 106, it checks as to whether there are hall
destination floor registration devices $4_{i,j}$ kept in
suspension of assigned car guides for destination call
20 registrations that have, as the "departure floor", the
floor where the car with the door closing detected in step
S21 closed the door and that are scheduled to board in a
direction the same as the traveling direction of the car
when closing the door (i.e., when the car traveling
25 direction is upward, it considers a floor above the
departure floor as the "destination floor", and, when the
car traveling direction is downward, it considers a floor

blow the departure floor as the "destination floor"). If
such a device does not exist, there is no need to make
judgment of whether giving a guide becomes permissible, and
so it finishes this process. If such a device or devices
5 exist, it moves to step S23.

In step S23, it extracts and sets one by one the
destination floors (only floors present in a direction the
same as the direction indicated by the car closing the
door) of destination calls corresponding to the hall
10 destination floor registration devices $4_{i,j}$ found in step
S22. Specifically, since the order of allocation guides is
maintained for users the same in both departure floor and
destination floor, it performs processes respectively for
destination floors.

15 Then, in step S24, in order to process pieces of
allocation information, each of which has a departure floor
defined by the floor where the car stopped when closing the
door in step S21 and has a destination floor scheduled to
deboard at a floor set in step S23, in the order of early
20 destination call registration, it sequentially selects
processing object allocations one by one.

Then, in step S25, it makes judgment of whether giving
guides becomes permissible for the processing object
allocations. The process contents are the same as those in
25 step S4 of FIG. 8 such that, for example, it makes judgment
that giving a guide is permissible if the "allocated round"
is equal to the round scheduled for the assigned car to

open the door next time in the requested direction. If giving a guide is permissible, it proceeds to step S26. If giving a guide is not permissible, it proceeds to step S29.

5 In step S26, with reference to the in-suspension call storage unit 106, it makes judgment of whether a hall destination floor registration device $4_{i,j}$ for a destination call registration associated with an allocation for which giving a guide is permissible is the same as a hall destination floor registration device $4_{i',j'}$ for
10 destination call registration kept in the longest suspension among the destination call registrations kept in suspension of a guide and having combinations of the departure floor and destination floor to be processed. If they are the same, there is no need to perform an order
15 exchange, and so it proceeds to step S28. If they are not the same, it proceeds to step S27 to perform an allocation information exchange.

In step S27, it exchanges allocation information recorded in the hall destination floor registration device
20 $4_{i',j'}$ kept in the longest time suspension of an assigned car guide, among those with combinations of the departure floor and destination floor in process, with allocation information recorded in the hall destination floor registration device $4_{i,j}$ selected in step S24.
25 Consequently, the allocation information for the user kept in the longest time suspension is changed to allocation information for which a guide can be given.

Then, in step S28, it instructs the hall destination floor registration device $4_{i,j}$ for the user kept in the longest time suspension to give an assigned car guide. The hall destination floor registration device $4_{i,j}$ gives the assigned car guide, as shown in FIG. 3, for example.

Then, in step S29, it makes judgment of whether the process is finished for all the pieces of allocation information kept in suspension of an assigned car guide at the destination floor. If the process is finished for all of them, it moves to step S30. If the process is not yet finished for all of them, it moves to step S24 to perform the process for the next piece of allocation information. When an assigned car guide is given for a certain piece of allocation information during the process, this piece is excluded from the processing objects.

In step S30, it makes judgment of whether the process is finished for all the destination floors kept in suspension of an assigned car guide found in step S22. If the process is finished for all of them, the flow chart is completed. If the process is not yet finished for all of them, it moves to step S23 to perform the process for the next destination floor.

As described above, according to the process shown in FIG. 9, if there are a plurality of users kept in suspension of allocations and having combinations of the same departure floor and destination floor, it exchanges pieces of allocation information between a user to which

giving a guide is permissible and a user kept in the longest suspension of a guide, among those with combinations of the same departure floor and destination floor, when the assigned car finishes a response in a previous round before the allocated round. Consequently, it can give an assigned car guide to the user kept in the longest suspension, so that the order of assigned car guides agrees with the order of destination call registrations.

If a combination of the process of FIG. 8 and the process of FIG. 9 is used, the order of guides can be the same as the order of destination call registrations for either of the cases when a new destination call is generated and when giving a guide becomes permissible for a destination call in suspension. Consequently, it is possible to realize a group management control system as a whole to cause the order of assigned car guides to agree with the order of destination call registrations.

This system has an advantage in that a schedule to use an elevator for a user kept in suspension of an allocation guide is reflected on future prediction in an allocation process performed on a destination call registered by another user. For example, when a new user makes destination call registration for heading the 1st floor to the 2nd floor, in addition to the state shown in FIG. 6, it is possible to perform future prediction reflecting the schedules of the two users kept in suspension of a guide

(the schedules having the 1st floor as the departure floor and the 5th floor as the destination floor).

On the other hand, in a manner of cancelling the allocation itself if giving an assigned car guide is not
5 permissible at the time when the allocation is made, the two users shown in FIG. 7 are subjected to cancellation, and the schedules of the two users having the 5th floor as the destination floor are cancelled and not recorded in the operation schedule storage unit 104. In this case, future
10 prediction is performed, based on the operation schedules shown in FIG. 5, which exclude the schedules of the two users heading to the 5th floor, and by further adding an allocation for a new destination call registration.

This embodiment can combine such two advantages that,
15 even if there is a destination call for which giving an assigned car guide is not permissible, future prediction is performed by reflecting it as a booked schedule on a operation plan to more accurately perform the future prediction; and that bookings once made are treated without
20 causing a disagreement between the order of assigned car guides and the order of destination call registrations among users, who are the same in both departure floor and destination floor, by suitably exchanging guides to the users as long as car responding floors are not changed.

25 An allocation change process to reset an allocation receiving no response for a long time to another car or round is adopted in a lot of existing group management

control systems for elevators in which call registration buttons for the upward direction and downward direction are disposed at each of the halls. In the case of a group management control system for elevators, which utilizes a manner of inputting destination floors at halls, assigned car guides are given individually to users, and so, after once giving an assigned car guide, giving a guide again to a specific user is difficult, and thus, after once giving an assigned car guide, changing the assigned car is also difficult. On the other hand, if giving an assigned car guide is not permissible, the user waits in front of the hall destination floor registration device until receiving notice of an assigned car. In this case, even if the allocation (one or both of the assigned car and allocated round) is changed in the group management control device, an assigned car guide thus changed can be reliably given to the user. However, in a case where an allocation change is performed and the change brings about an allocation for which giving a guide is permissible, an assigned car guide needs to be given not to a hall destination floor registration device corresponding the allocation for which giving a guide has become permissible, but to a user kept in the longest suspension and having a combination of the same departure floor and destination floor. Otherwise, a disagreement may be caused between the order of destination call registrations and the order of assigned car guides.

FIG. 10 shows an example of a process performed when

an allocation change is made. This example shows a procedure to give assigned car guides in the order of destination call registrations by exchanging pieces of allocation information, as needed.

5 In step S41, it waits until a cyclical period for starting a search process for pieces of allocation information to be processed by the allocation change. For example, this cyclical period may be set at 10 seconds, so that it proceeds to step S42 every 10 seconds.

10 In step S42, with reference to the in-suspension call storage unit 106, it searches as to whether there are hall destination floor registration devices $4_{i,j}$ kept in suspension of an allocation guide (a destination call registration in suspension). If such devices exist, it
15 proceeds to step S43. If such devices do not exist, no allocation change can be performed, and so it finishes the flow chart

 In step S43, it sets pieces of allocation information for destination call registrations kept in suspension of
20 guides one by one to be a processing object.

 In step S44, it checks as to whether the pieces of allocation information selected in step S43 are with an elapse of long time since the allocation. For example, it makes judgment of whether 30 seconds or more has elapsed
25 since the allocation. The time corresponding to "long time" is not limited 30 seconds but is set at a suitable value. If the long time has elapsed, it proceeds to step

S45. If not, there is no allocation changing object, and so it moves to step S52.

5 In step S45, it once deletes the pieces of allocation information selected as processing objects from the operation schedule storage unit 104. Further, it once deletes the pieces of allocation information selected as processing objects also from the in-suspension call storage unit 106.

10 Then, in step S46, it performs an allocation process on the pieces of registration information of destination calls corresponding to the deleted pieces of allocation information. The contents of the allocation process are the same as those in step S2 of FIG. 8. However, the allocation process may be performed such that, when there is at least one case for which immediately giving a guide is permissible, the allocation may be performed while giving a priority to this car. In this case, the possibility of giving guides becoming permissible by allocation changes is improved.

20 Then, in step S47, based on new allocation information, it adds the future operation schedules of the respective cars into the operation schedule storage unit 104. This process is the same as those of step S3 of FIG. 8.

25 Then, in step S48, it makes judgment of whether immediately giving a guide is permissible for the new allocation. The contents of this judgment are the same as

those of step S4 of FIG. 8. If giving a guide is permissible, it moves to step S49. If giving a guide is not permissible, it adds the new registration information and allocation information into the in-suspension call storage unit 106, and then it moves to step S52.

In step S49, it makes judgment of whether the destination call registration corresponding to the allocation, for which giving a guide is permissible this time, is a registration kept in the longest suspension among the destination call registrations kept in suspension and having the same departure floor and destination floor. If this is a registration kept in the longest suspension, giving a guide is permissible as it is without exchanging the allocation information, and so it moves to step S51. If there is another destination call registration kept in longer suspension, it moves to step S50 to perform an allocation information exchange.

In step S50, it performs an allocation information exchange between the destination call registration kept in the longest suspension of a guide detected in step S49 and the processing object destination call registration.

In step S51, it gives notice of the assigned car associated with the change to the hall destination floor registration device corresponding to the destination call registration kept in the longest suspension, among the pieces of allocation information in suspension, which have the same departure floor and destination floor.

In step S52, it makes judgment of whether the process is finished for all the allocations kept in suspension of a guide. If the process is finished for all of them, it finishes the flow chart. If the process is not yet
5 finished for all of them, it moves to step S43. When a guide is given for a certain allocation during the process, this allocation is excluded from the processing objects thereafter.

As described above, according to the process shown in
10 FIG. 10, even when an allocation kept in long time suspension of a guide is changed, the order of assigned car guides can agree with the order of destination call registrations among users the same in both departure floor and destination floor.

15 According to the first embodiment, as explained above, users, who are the same in departure floor and destination floor, can be treated such the order of assigned car guides agrees with the order of destination call registrations. Consequently, it is possible to realize a group management
20 control system for elevators, which prevents users from feeling mutual unfairness.

(Second embodiment)

Next, an explanation will be given of a second embodiment.

25 In the following explanation, differences from the first embodiment will be mainly explained.

An example of the structure of a group management

control system for elevators according to this embodiment is the same as that shown in FIG. 1.

5 The arrangements other than the group management control device 1 are the same as those of the first embodiment.

Inside the group management control device 1, the arrangements other than the call exchange unit 105 are the same as those of the first embodiment.

10 FIGS. 11 and 12 show an example of a process according to this embodiment.

In this embodiment, the process of FIG. 9 and the process of FIG. 10 may be utilized.

15 The first embodiment is arranged to cause the order of assigned car guides to agree with the order of destination call registrations among users the same in both departure floor destination floor.

20 In a group management control system for elevators using hall destination floor registration devices, even when destination floors are different to some extent, if the order of destination call registrations agrees with the order of assigned car guides, the sense of fairness is improved, thereby providing a more comfortable system.

25 In light of this, the second embodiment is arranged not only to work for users, who are the same in both departure floor destination floor, to cause the order of assigned car guides to agree with the order of destination call registrations, but also to consider a situation where

a user kept in suspension of an assigned car guide exists and a new destination call registration is further generated to have a destination floor adjacent to the destination floor of the user kept in suspension, and to
5 increase the possibility of giving an assigned car guide to the user kept in suspension before giving an assigned car guide for the new destination call, in this situation.

For example, the meaning of "two floors are adjacent to each other" is defined by a case where the floor
10 difference between the two floors is not larger than a predetermined threshold value. For example, it may be determined that the two floors are adjacent to each other when $0 < |f1 - f2| \leq fd$ is satisfied, where fd is the threshold value and $f1$ and $f2$ are two floors, and that the two floors
15 are not adjacent to each other when $fd < |f1 - f2|$ is satisfied.

In the case of users the same in departure floor and mutually different in destination floor, there may be a case where a car is available to give a guide to one of
20 them but no car is available to give a guide to the other of them.

This will be explained by use of a case where operation schedules recorded in the operation schedule storage unit 104 have contents illustrated in the example
25 shown in FIG. 13. For the sake of simplicity, FIG. 13 shows information only for two cars. The passenger capacity of each car is 10. In the situation shown in

FIG. 13, the allocation scheduled to head from the 1st floor to 4th floor is kept in suspension of a guide.

In this case, if a destination floor generated by a new user at the 1st floor is 3rd floor, the user can be
5 given a guide about the 1st round of the car A or the car B. However, if a destination floor generated by the user at the 1st floor is 5th floor, either of the cars exceeds the passenger capacity in the 1st round, and so the 2nd round of either of the cars needs to be allocated, i.e.,
10 there is no assigned car available to give a guide at this time.

In consideration of a case where a user to head to the 3rd floor is generated in the situation shown in FIG. 13 with a user to head to the 4th floor kept in suspension,
15 there may be a thought that guarantees the order of guides even in this case. However, in order to realize this though, it is necessary not to give a guide to the user having the 3rd floor as the destination, although giving an assigned car guide is permissible, but to make the user
20 wait in front of the hall destination floor registration device. If allocations permissible to give guides are suspended like this to guarantee the order of guides, the number of users to board each of the cars becomes insufficient and so the transport efficiently of the entire
25 group management control system may be significantly deteriorated.

Accordingly, this embodiment does not perform control

of suspending a guide to users to whom the guide can be given by the consequence of the allocation. Alternatively, when a destination call is newly generated, if there is an allocation kept in suspension of an assigned car guide, among allocations the same in departure floor and adjacent in destination floor relative to the new destination call, it tries an allocation change for the allocation kept in suspension, and if giving a guide becomes permissible, it gives the guide, and then performs an allocation process on the new destination call. Consequently, users the same in departure floor and adjacent in destination floor are treated by decreasing the possibility of a disagreement between the order of allocation guides and the order of destination call registrations.

FIGS. 11 and 12 show an example of a process for this method. FIGS. 11 and 12 respectively show the first and second halves of one flow chart. The contents of FIG. 12 are the same as those from the step S2 of FIG. 8, and thus their detailed explanation will be omitted here.

In step S61, it waits until a new destination call is generated. When a new destination call is generated, it shifts to step S62.

In step S62, it searches as to whether there are allocations stored in the in-suspension call storage unit 106, which is the same in departure floor and adjacent in destination floor relative to the destination call registration newly generated. If such allocations are

stored, it proceeds to step S63. If such allocations are not stored, there is no need to perform a special process, and so it proceeds to step S2 of FIG. 12 to perform an ordinary process for a new allocation. The contents of the process from the step S2 of FIG. 12 are the same as those of FIG. 8, and thus their explanation will be omitted.

In step S63, it sets the allocations detected in step S62 (i.e., allocations, which are the same in departure floor and adjacent in destination floor relative to the destination call newly generated), among the allocations stored in the in-suspension call storage unit 106, one by one to be a processing object.

The flow from the step S45 to the step S51 is the same as that of the allocation change process explained with reference to FIG. 10, and so its detailed explanation will be omitted. Step S46 is conceived to give an assigned car guide at this time as far as possible by performing an allocation change. Thus, for example, if there are cars mixed up such that one is available to immediately give a guide and another is not available to immediately give a guide, it may use only a car available to immediately give a guide as an option in an allocation to select an assigned car and an allocated round, so as to select a car available to immediately give a guide more easily as compared to step S2. After the allocation change process thus performed, it proceeds to step S71.

In step S71, it makes judgment of whether the process

is finished for all the allocations detected in step S62. When a guide is given for a certain allocation, the process is regarded as completed on this allocation. When the process is completed for all the allocations, it finishes
5 the process to give guides for adjacent floors, and it shifts to step S2 of FIG. 12 to perform an ordinary allocation process for a new destination call. If a processing object allocation is left, it moves to step S63 and sets the allocation as the next processing object.

10 As described above, according to the process shown in FIGS. 11 and 12, if there are allocations kept in suspension of an assigned car guide and being the same in departure floor and adjacent in destination floor relative to a destination call registration newly generated, it
15 further performs an allocation change process to give guides for the allocations in suspension before the ordinary allocation process. Consequently, users adjacent in destinations are treated such that the order of guides becomes closer to the order of destination call
20 registrations.

It should be noted that the first and second embodiments described above may be implemented with suitable modifications.

For example, there is a case where a group of users
25 may request allocations with the same assigned car and allocated round for all of them. In order to answer a request of this kind, for example, the allocation guide

display unit 42 may be equipped with a group button and buttons to input the number of members by use of soft keys or hard keys. This modification may be arranged to respond to an input of an instruction about a group along with the number of members and to allocate the same assigned car and allocated round to the group as a whole. Further, the modification may be arranged, when it is difficult to allocate the same assigned car and allocated round to the group as a whole, to make the group wait as a whole until an allocation becomes available. Further, where each floor is equipped with a plurality of hall destination floor registration devices, one of them may be exclusively used for such groups.

As described above, according to the second embodiment, users having the same departure floor and adjacent destination floors are treated by decreasing the possibility of a disagreement between the order of assigned car guides and the order of destination call registrations, without greatly deteriorating the efficiency of group management control. Consequently, it is possible to realize a group management control system for elevators, which further prevents users from feeling mutual unfairness.

Also, instructions described in the processing sequences in the aforementioned embodiment can be executed based on a program as software. A general-purpose computer system may store this program in advance, and may load this

program, thereby obtaining the same effects as those of the group management control system for elevators of the aforementioned embodiment. Instructions described in the aforementioned embodiment are recorded, as a

5 computer-executable program, in a magnetic disk (flexible disk, hard disk, etc.), an optical disk (CD-ROM, CD-R, CD-RW, DVD-ROM, DVD±R, DVD±RW, etc.), a semiconductor memory, or a recording medium equivalent to them. The storage format is not particularly limited as long as the

10 recording medium is readable by a computer or embedded system. When the computer loads the program from this recording medium, and controls a CPU to execute the instructions described in the program based on that program, the same operations as those of the group

15 management control system for elevators of the aforementioned embodiment can be implemented. Of course, the computer may acquire or load the program via a network.

Based on the instruction of the program installed from the recording medium in the computer or embedded system, an

20 OS (Operating System), database management software, MW (middleware) of a network, or the like, which runs on the computer may execute some of processes required to implement this embodiment.

Furthermore, the recording medium of this embodiment

25 is not limited to a medium independent of the computer or embedded system, and includes that which stores or temporarily stores a program downloaded from a LAN or the

Internet.

The number of recording media is not limited to one. The recording medium of this embodiment also includes a case in which the processes of this embodiment are executed from a plurality of media, and the configurations of the media are not particularly limited.

Note that the computer or embedded system of this embodiment executes respective processes of this embodiment based on the program stored in the recording medium, and may be any of an apparatus including one of a personal computer, microcomputer, and the like, or a system obtained by connecting a plurality of apparatuses via a network.

The computer of this embodiment is not limited to a personal computer, and includes an arithmetic processing device, microcomputer, or the like included in an information processing apparatus. Hence, the computer of this embodiment is a generic name of a device or apparatus which can implement the functions of this embodiment by means of the program.

While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the inventions. The accompanying claims

and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions.

WHAT IS CLAIMED IS:

1. A group management control system for elevators,
which manages operation of a plurality of cars, in reply to
5 a destination call specifying a departure floor and a
destination floor associated with each user, the system
comprising:

an allocation processing unit configured to allocate
an assigned car and an allocated round for the destination
10 call, the assigned car for the user to board and the
allocated round at which the user boards the assigned car;

a guide control unit configured to make judgment of
whether giving an assigned car guide is permissible for the
destination call when the allocation processing unit
15 allocates the assigned car and the allocated round;

an in-suspension call storage unit configured to store
information associated with a new destination call, which
includes the departure floor and the destination floor
along with the assigned car and the allocated round, to
20 keep the new destination call in suspension, when giving an
assigned car guide is not permissible for the new
destination call; and

a call exchange unit configured to perform an exchange
between the assigned car and the allocated round for the
25 new destination call and the assigned car and the allocated
round for another destination call, the information
associated with the another destination call kept in a

longest time suspension in the in-suspension call storage unit and including the departure floor and the destination floor same as the departure floor and the destination floor included in the information associated with the new destination call, when giving an assigned car guide is permissible for the new destination call.

2. The system according to claim 1, wherein the system receives the destination call via each of a plurality of hall destination floor registration devices disposed at halls, and wherein the guide control unit is further configured to instruct the hall destination floor registration device corresponding to the new destination call to give a guide for notice of a waiting request to the corresponding user, when giving an assigned car guide is not permissible for the new destination call.

3. The system according to claim 1 or 2, wherein the system receives the destination call via each of a plurality of hall destination floor registration devices disposed at halls, and wherein the guide control unit is further configured to instruct the hall destination floor registration device corresponding to said another destination call kept in a longest time suspension among said other destination calls to give a guide for notice of the assigned car to the corresponding user, and to instruct a destination floor registration device corresponding to the new destination call to give a guide for notice of a waiting request to the corresponding user, when giving an

assigned car guide is permissible for the new destination call and the exchange is performed.

4. The system according to any one of claims 1 to 3, wherein the system receives the destination call via each
5 of a plurality of hall destination floor registration devices disposed at halls, and wherein the guide control unit is further configured to instruct the hall destination floor registration device corresponding to the new destination call to give a guide for notice of the assigned
10 car to the corresponding user, when giving an assigned car guide is permissible for the new destination call and the exchange is not performed.

5. The system according to any one of claims 1 to 4, wherein the guide control unit is further configured to
15 make judgment that giving an assigned car guide is permissible for the destination call, when the allocated round for the destination call is equal to a round in which the assigned car for the destination call responds next time at the departure floor for the destination call, and
20 to make judgment that giving an assigned car guide is not permissible for the destination call, when the allocated round for the destination call is a round after a round in which the assigned car for the destination call responds next time at the departure floor for the destination call.

25 6. The system according to any one of claims 1 to 5, wherein the system receives the destination call via each of a plurality of hall destination floor registration

devices disposed at halls, and wherein, when a plurality of destination calls same in departure floor and destination floor are stored in the in-suspension call storage unit and giving an assigned car guide becomes permissible for one of the plurality of destination calls, the in-suspension call storage unit is further configured to perform an exchange between the assigned car and the allocated round for the destination call, for which giving an assigned car guide has become permissible, and the assigned car and the allocated round for a certain other destination call kept in a longest time suspension among the plurality of destination calls, and to instruct the hall destination floor registration device corresponding to the certain other destination call to give a guide for notice of the assigned car to the corresponding user.

7. The system according to any one of claims 1 to 6, wherein, when the in-suspension call storage unit stores a certain other destination call kept in suspension for a period of time longer than a predetermined period of time, the system is further configured to once cancel an allocation of a car for the certain other destination call, and cause the allocation processing unit to perform a re-allocation of an assigned car and an allocated round for the certain other destination call.

8. The system according to any one of claims 1 to 7, wherein, when a new destination call is generated and the in-suspension call storage unit stores a certain other

destination call same in departure floor and different in destination floor within a predetermined range relative to this new destination call, the system is further configured to once cancel an allocation of a car for the certain other destination call before an allocation for this new destination call, and cause the allocation processing unit to perform a re-allocation of an assigned car and an allocated round for the certain other destination call.

9. The system according to claim 7 or 8, wherein the allocation processing unit is further configured to perform an allocation process of the assigned car and the allocated round in the re-allocation while giving a priority to a combination for which giving a guide is permissible.

10. The system according to any one of claims 7 to 9, wherein the system receives the destination call via each of a plurality of hall destination floor registration devices disposed at halls, and wherein, when the re-allocation process is performed, and the destination call treated by the re-allocation is not a destination call kept in a longest time suspension among a plurality of destination calls same in departure floor and destination floor stored in the in-suspension call storage unit, the call exchange unit is further configured to perform an exchange between the assigned car and the allocated round for the destination call treated by the re-allocation and the assigned car and the allocated round for a destination call kept in a longest time suspension among the plurality

of destination calls, and to instruct the hall destination floor registration device corresponding to the destination call kept in a longest time suspension to give a guide for notice of the assigned car to the corresponding user.

5 11. The system according to claim 1 or 10, further comprising;

 an operation schedule storage unit configured to store operation schedule information showing operation schedules of respective cars based on the assigned car and the
10 allocated round; and

 an operation command unit configured to give instructions to car control devices, so that the cars are caused to travel in accordance with the operation schedules of the respective cars recorded in the operation schedule
15 storage unit.

 12. A guide order control method for controlling a order of guides for destination calls in a group management control system for elevators, which manages operation of a plurality of cars, in reply to a destination call
20 specifying a departure floor and a destination floor associated with each user, the method comprising:

 causing an allocation processing unit to allocate an assigned car and an allocated round for the destination call, the assigned car for the user to board and the
25 allocated round at which the user boards the assigned car;

 causing a guide control unit to make judgment of whether giving an assigned car guide is permissible for the

destination call when the allocation processing unit
allocates the assigned car and the allocated round;

causing an in-suspension call storage unit to store
information associated with a new destination call, which
5 includes the departure floor and the destination floor
along with the assigned car and the allocated round, to
keep the new destination call in suspension, when giving an
assigned car guide is not permissible for the new
destination call; and

10 causing a call exchange unit to perform an exchange
between the assigned car and the allocated round for the
new destination call and the assigned car and the allocated
round for another destination call, the information
associated with the another destination call kept in a
15 longest time suspension in the in-suspension call storage
unit and including the departure floor and the destination
floor same as the departure floor and the destination floor
included in the information associated with the new
destination call, when giving an assigned car guide is
20 permissible for the new destination call.

13. The method according to claim 12,
further comprising;

causing an operation schedule storage unit to store
operation schedule information showing operation schedules
25 of respective cars based on the assigned car and the
allocated round; and

causing an operation command unit configured to give

instructions to car control devices, so that the cars are caused to travel in accordance with the operation schedules of the respective cars recorded in the operation schedule storage unit.

5 14. A computer-readable storage medium storing a computer program for a computer to implement a group management control system for elevators, which manages operation of a plurality of cars, in reply to a destination call specifying a departure floor and a destination floor
10 associated with each user, wherein the program, when executed, causes the computer to implement:

 an allocation processing unit configured to allocate an assigned car and an allocated round for the destination call, the assigned car for the user to board and the
15 allocated round at which the user boards the assigned car;

 a guide control unit configured to make judgment of whether giving an assigned car guide is permissible for the destination call when the allocation processing unit allocates the assigned car and the allocated round;

20 an in-suspension call storage unit configured to store information associated with a new destination call, which includes the departure floor and the destination floor along with the assigned car and the allocated round, to keep the new destination call in suspension, when giving an
25 assigned car guide is not permissible for the new destination call; and

 a call exchange unit configured to perform an exchange

between the assigned car and the allocated round for the
new destination call and the assigned car and the allocated
round for another destination call, the information
associated with the another destination call kept in a
5 longest time suspension in the in-suspension call storage
unit and including the departure floor and the destination
floor same as the departure floor and the destination floor
included in the information associated with the new
destination call, when giving an assigned car guide is
10 permissible for the new destination call.

15. The computer-readable storage medium according to
claim 14, wherein the program, when executed, further
causes the computer to implement:

an operation schedule storage unit to store operation
15 schedule information showing operation schedules of
respective cars based on the assigned car and the allocated
round; and

an operation command unit configured to give
instructions to car control devices, so that the cars are
20 caused to travel in accordance with the operation schedules
of the respective cars recorded in the operation schedule
storage unit.