

ELEVATOR SYSTEM

FIELD

Embodiments described herein relate generally to an elevator system performing call registration using passenger's mobile terminal.

BACKGROUND

Generally, a hall call button to register a hall call is installed in a hall of each floor of a building. When an elevator passenger operates the hall call button, a car responds to a hall call registration floor. When the passenger gets in the car and operates a destination floor button of the car operating panel, the destination floor is registered and the car travels to the destination floor.

Recently, an elevator system performing the call registration using a mobile terminal held by a passenger (hereinafter referred to as a terminal call system) has been reviewed. Application software for call registration is installed in advance in a mobile terminal and, when a passenger arrives at a hall of any floor, the passenger activates the application software using radio waves transmitted from a radio signal device referred to as a "beacon" to automatically register the hall call and the car call (destination floor).

The terminal call system described above is configured by assuming a single car, and does not currently correspond to a group management system equipped with a plurality of cars. A group management system needs to have a configuration based on an assumption that a large number of passengers come to a hall and perform the call registration using the respective mobile terminals.

The embodiments described herein aim to provide a group management system that enables a large number of passengers to efficiently perform call registration using their own mobile terminals at halls and to smoothly travel to their destination floors.

SUMMARY

According to one embodiment, an elevator system include: a controller controlling operations of a plurality of cars; and a plurality of first radio signal devices individually installed near entrances of the respective cars at a hall so as to be communicably connected to each other. Each of the first radio signal devices include: a monitoring unit monitoring a mutual signal reception status; a connection control unit connecting, when one of the first radio signal devices is receiving a signal of a mobile terminal other than the mobile terminal, of the first radio signal devices, another first radio signal device capable of receiving a signal of the mobile terminal to the mobile terminal; and a hall call registration unit transferring the hall call signal transmitted from the mobile terminal to the controller and urging one of the cars to respond to the hall call.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view showing a configuration of an elevator system according to one of embodiments.

FIG. 2 is a block diagram showing a configuration of a group management controller provided in the elevator system.

FIG. 3 is a block diagram showing a configuration of a radio signal device used as a "hall beacon" in the elevator system.

FIG. 4 is a block diagram showing a configuration

of a radio signal device used as an "in-car beacon" in the elevator system.

FIG. 5 is a view showing an appearance configuration of a mobile terminal used in the elevator system.

FIG. 6 is a diagram showing a functional configuration of the mobile terminal.

FIG. 7 is a table showing a building ride table provided in the mobile terminal.

FIG. 8 is a view illustrating a basic configuration of a terminal call in a case of assuming a single car.

FIG. 9 is a view illustrating a configuration of a terminal call performed by a general passenger in a case of assuming a group management system.

FIG. 10 is a view illustrating a configuration of a terminal call performed by a general passenger in a case of assuming the group management system.

FIG. 11 is a view illustrating a configuration of a terminal call performed by a general passenger in a case of assuming the group management system.

FIG. 12 is a view illustrating a configuration of a terminal call performed by a general passenger in a case of assuming the group management system.

FIG. 13 is a view illustrating a configuration of a terminal call performed by a dedicated operation person in a case of assuming the group management system.

FIG. 14 is a view illustrating a configuration of a terminal call performed by a dedicated operation person in a case of assuming the group management system.

FIG. 15 is a view illustrating a configuration of

a terminal call performed by a dedicated operation person in a case of assuming the group management system.

5 FIG. 16 is a view illustrating a configuration of a terminal call performed by a dedicated operation person in a case of assuming the group management system.

10 FIG. 17 is a view illustrating a configuration of a terminal call performed by a dedicated operation person in a case of assuming the group management system.

15 FIG. 18 is a view illustrating a configuration of a terminal call performed by a dedicated operation person in a case of assuming the group management system.

FIG. 19 is a view illustrating a configuration of a terminal call performed by a dedicated operation person in a case of assuming the group management system.

20 FIG. 20 is a flowchart showing processing of the mobile terminal.

FIG. 21 is a flowchart showing processing of the hall beacon.

25 FIG. 22 is a flowchart showing processing of the in-car beacon.

DETAILED DESCRIPTION

Embodiments will be described hereinafter with reference to the accompanying drawings.

30 The disclosure is merely an example and is not limited by contents described in the embodiments described below. Modification which is easily conceivable by a person of ordinary skill in the art comes within the scope of the disclosure as a matter of

course. In order to make the description clearer, the sizes, shapes and the like of the respective parts may be changed and illustrated schematically in the drawings as compared with those in an accurate representation. Constituent elements corresponding to each other in a plurality of drawings are denoted by like reference numerals and their detailed descriptions may be omitted unless necessary.

FIG. 1 is a view showing a configuration of an elevator system according to one of embodiments. In the embodiment, a group management system equipped with a plurality of elevators is assumed as an elevator system. In the figure, 11 refers to an entire elevator system. In the example in FIG. 1, a configuration in which a group of three elevators A to C is managed is shown, and the number of elevators is not limited to three, but may be at least two or more. In addition, the term "elevator" refers mainly to a "car".

The elevator system 11 comprises a group management controller 12, and elevator controllers 13a, 13b, and 13c connected to the group management controller 12. Each of the group management controller 12 and the elevator controllers 13a, 13b, and 13c is constituted by a computer comprising CPU, ROM, RAM, and the like. The group management controller 12 is installed as a main controller to control group management of operations of cars 14a, 14b, and 14c of the respective elevators. The elevator controllers 13a, 13b, and 13c are provided for the respective elevators, and control operations of the cars 14a, 14b, and 14c under control of the group management controller 12. More specifically, the elevator A controller 13a performs control of a motor (traction

machine) (not shown) for moving up and down the car 14a, door open/close control, and the like. The elevator B controller 13b and the elevator C controller 13c perform the same control.

5 Each of the cars 14a, 14b, and 14c is supported to freely move up and down by a pair of guide rails provided in a hoistway, and travels to each floor in response to a hall call or a car call. The "hall call" refers to a signal of a call registered in a hall of
10 each floor, and includes information on a registration floor and a destination direction. The "car call" refers to a signal of a call registered inside the car, and includes information on a destination floor. The "registration floor" refers to a floor where the
15 passenger registers the hall call at the hall, and indicates a floor at which the car responding to the hall call arrives. The "destination floor" is a floor which a passenger registers as a car call in a car, and indicates a target floor to which the car departing
20 from the registration floor travels. As described below, the hall call and the car call can be registered using a passenger's mobile terminal 23, and button operations in the hall and the car are unnecessary, in the system. The "registration of car call" is also
25 referred to as "registration of destination floor".

 A car operating panel 15a is provided inside the car 14a of elevator A. Various operation buttons including destination floor buttons 16a corresponding to respective floors of the building are arranged on
30 the car operating panel 15a. The car 14b of elevator B and the car 14c of elevator C have the same structure. A car operating panel 15b on which various operation buttons including a destination floor button 16b are

arranged is provided inside the car 14b. A car operating panel 15c on which various operation buttons including a destination floor button 16c are arranged is provided inside the car 14c.

5 The car 14c of elevator C is used as a dedicated operation car when a dedicated operation person arrives. The "dedicated operation" is also called "VIP operation", and refers to a mode of allowing the only
10 traveling to a destination floor of the dedicated operation person. The dedicated operation persons include specific passengers registered in advance as important persons, customers, and the like. A speaker (announcement unit) 17c for informing that the car is
15 under dedicated operation is provided inside the car 14c of elevator C used as the dedicated operation car.

 Hall operating panels 21a, 21b, and 21c are provided near entrances of the elevators, in the halls
20 20 of the floors, respectively. Hall buttons 22a for registering the hall call are provided on the hall operating panel 21a. The hall buttons 22a are composed of an up direction button and a down direction button for designating a passenger's destination direction (or
25 constituted by the only up direction button on the lowest floor or by the down direction button on the highest floor). The hall operating panels 21b and 21c have the same structure, and hall buttons 22b and 22c for registering the hall calls are provided.

 In the embodiment, for example, radio signal
30 devices 25a, 25b, and 25c of Bluetooth (registered trademark) or the like are installed individually near the entrances of the elevators in the halls (20), respectively. The radio signal devices 25a, 25b, and

25c are used as "hall beacons", which transmit radio signals of a predetermined frequency band. The locations of installation of the radio signal devices 25a, 25b, and 25c are walls near the hall doors or the like, but are not particularly limited and may be any locations in a range in which the radio signals reach the mobile terminals 23 held by the passengers near the entrances of the respective elevators.

The radio signal devices 25a, 25b, and 25c are communicably connected to each other, and each of them constructs a wireless network for accepting the hall calls transmitted from the mobile terminal 23. In the example shown in FIG. 1, three radio signal devices 25a, 25b, and 25c are arranged side by side for the respective elevators, and at least two or more radio signal devices including the radio signal device used during the dedicated operation may be installed.

The radio signal devices 25a, 25b, and 25c are installed in the halls 20 of the respective floors including a reference floor. The radio signal device 25a is connected to the group management controller 12 and the hall operating panel 21a in a wired or wireless manner, and comprises a function of transmitting information necessary for the registration of the hall calls by radio waves of a predetermined frequency band. The information necessary for the registration of the hall calls includes "building information", "current floor", and the like. The radio signal devices 25b and 25c have the same structure. The radio signal device 25b is connected to the group management controller 12 and the hall operating panel 21b in a wired or wireless manner, and comprises a function of transmitting information necessary for the registration of the hall

calls by radio waves of a predetermined frequency band. The radio signal device 25c is connected to the group management controller 12 and the hall operating panel 21c in a wired or wireless manner, and comprises a
5 function of transmitting information necessary for the registration of the hall calls by radio waves of a predetermined frequency band. In addition, these radio signal devices 25a, 25b, and 25c comprise not only a
10 signal transmitting function, but also a signal receiving function of receiving radio signals (hall call signals) transmitted from the mobile terminals 23 held by the passengers.

In contrast, the radio signal devices 26a, 26b, and 26c are individually installed in the cars 14a,
15 14b, and 14c of the respective elevators. The radio signal devices 26a, 26b, and 26c are used as "in-car beacons", which comprise a function of transmitting the information necessary for registration of the car calls by radio waves of a predetermined frequency band. The
20 locations of installation of the radio signal devices 26a, 26b, and 26c are, for example, walls near the car doors or the like, but are not particularly limited and may be any locations in a range in which the radio signals reach the mobile terminals 23 held by the
25 passengers getting in the cars.

The radio signal device 26a is connected to the group management controller 12 and the car operating panel 15a in a wired or wireless manner, and comprises
30 a function of transmitting the information necessary for registration of the car calls by radio waves of a predetermined frequency band. The information necessary for registration of the car calls includes "building information", "current floor", "destination

information", and the like. The radio signal devices 26b and 26c have the same structure. The radio signal device 26b is connected to the group management controller 12 and the car operating panel 15b in a wired or wireless manner, and comprises a function of transmitting the information necessary for registration of the car calls by radio waves of a predetermined frequency band. The radio signal device 26c is connected to the group management controller 12 and the car operating panel 15c in a wired or wireless manner, and comprises a function of transmitting the information necessary for registration of the car calls by radio waves of a predetermined frequency band. In addition, these radio signal devices 26a, 26b, and 26c comprise not only a signal transmitting function, but also a signal receiving function of receiving radio signals (car call signals) transmitted from the passengers' mobile terminals 23.

The mobile terminals 23 held by the passengers are general cell phones, smartphones, and the like. Application software 24 for call registration is installed in the mobile terminals 23 in advance. The application software 24 for call registration has been developed by a company associated with elevators, and can be freely downloaded from a web site depending on the operating system (OS) of the mobile terminals 23.

The passenger's ride information can be set for each of a plurality of buildings by the application software 24. The "building" refers to a building in which the elevator comprising this system is installed. As described below, the passenger's ride information includes a ride floor, a destination floor, and attribute information for each building (see FIG. 7).

When a passenger comes to the hall 20 with the mobile terminal 23, the mobile terminal 23 receives the radio signal transmitted from the radio signal device closest to the passenger among the radio signal devices 25a, 25b, and 25c. The application software 24 for call registration is thereby activated such that the passenger's hall call and the call can be automatically registered. When the hall call is registered, one of the cars 14a, 14b, and 14c responds. As described below, however, if the passenger is a dedicated operation person, the car 14c of elevator C, which is set as the dedicated operation car, responds. A dedicated operation lamp 27 is installed near the entrance of elevator C in the hall 20 to clearly indicate that the operation of the car 14 of elevator C is switched to dedicated operation.

FIG. 2 is a block diagram showing a configuration of the group management controller 12 provided in the system.

The group management controller 12 comprises a control unit 31, a storage unit 32, and a communication unit 33. The control unit 31 is a part that executes the operation control of each elevator by activating the program, and includes an assignment control unit 31a and a dedicated operation unit 31b as functions related to this system.

When a general passenger registers a hall call using the mobile terminal 23, the assignment control unit 31a selects a car which the hall call is to be assigned (referred to as an assigned car) from among the cars 14 a, 14b, and 14c, and performs control of making the assigned car travel to the call registration floor. Examples of the method of assignment control

include, for example, a method of selecting a car that can respond most quickly as the allocated car, and the like. When the dedicated operation person registers a hall call using the mobile terminal 23, the dedicated operation unit 31b assigns the hall call to the car 14c of elevator C, which is set as the dedicated operation car, and performs control of making the car travel to the call registration floor.

The storage unit 32 stores information on the hall call and the car call, and the like as well as programs necessary for the control of the control unit 31. The communication unit 33 performs the processing of communication with the mobile terminal 23 and the elevator controllers 13a, 13b, and 13c.

The configuration of the elevator controllers 13a, 13b, and 13c is not particularly shown in the figures, but comprises a control unit, a storage unit, and a communication unit similarly to the group management controller 12. The elevator controllers 13a, 13b, and 13c control the operations of the cars 14a, 14b, and 14c corresponding to the respective elevator controllers after receiving commands from the group management controller 12.

FIG. 3 is a block diagram showing a configuration of the radio signal devices 25a, 25b, and 25c used as "hall beacons".

The radio signal devices 25a, 25b, and 25c have basically the same configuration and comprise a control unit 41 and a communication unit 42. The communication unit 42 performs transmission/reception processing of radio signals in a preset frequency band. The control unit 41 performs processing of radio signals related to the registration of the hall call. This control unit

41 is equipped with a monitoring unit 41a, a connection control unit 41b, a hall call registration unit 41c, and a dedicated operation support unit 41d as functions related to the system.

5 The monitoring unit 41a monitors signal reception status among the radio signal devices 25a, 25b, and 25c. When registering a hall call by the passenger's mobile terminal 23, in a case where a radio signal device among the radio signal devices 25a, 25b, and 25c
10 is receiving signals of a mobile terminal other than the mobile terminal 23, the connection control unit 41b connects a radio signal device which can receive the signals of the mobile terminal 23 (i.e., a free radio signal device) to the mobile terminal 23. The hall
15 call registration unit 41c transfers the hall call signals received by the radio signal device which can receive the signals to the group management controller 12, and makes one of the cars 14a, 14b, and 14c respond to the hall call.

20 When the passenger is a dedicated operation person, the dedicated operation support unit 41d disconnects the radio signal device 25c that is set for the dedicated operation, among the radio signal devices 25a, 25b, and 25c, from the radio signal devices 25a
25 and 25b. "Separating the radio signal device 25c from the radio signal devices 25a and 25b" indicates separating the radio signal device 25c from the group management group and switching the radio signal device 25c to a state of being independently available for the
30 dedicated operation.

FIG. 4 is a block diagram showing a configuration of the radio signal devices 26a, 26b, and 26c used as "in-car beacons".

The radio signal devices 26a, 26b, and 26c have basically the same configuration and comprise a control unit 45 and a communication unit 46. The communication unit 46 performs transmission/reception processing of radio signals in a preset frequency band. The control unit 45 performs processing of radio signals related to the car call registration. This control unit 45 is equipped with a car call registration unit 45a, a wrong ride detection unit 45b, and a notification unit 45c as functions related to the system.

The call registration unit 45a transfers the car call signal transmitted from the mobile terminal 23 to the group management controller 12 and registers the destination floor included in the car call signal. The wrong ride detection unit 45b compares the destination floor and attribute information included in the call signals transmitted from the mobile terminal 23 with the destination floor and attribute information included in the hall call signals assigned to the car in which the passenger is getting, and detects a wrong ride caused by the difference in destination floor or a wrong ride caused by the difference in attribute. When the passenger makes a wrong ride, the notification unit 45c notifies the passenger's mobile terminal 23 that the passenger makes a wrong ride.

FIG. 5 is a view showing an example of an external configuration of the mobile terminal 23.

The passenger's mobile terminal 23 is, for example, a cell phone, a smartphone, or the like, and consists of a small terminal device comprising a communication function. The above-described application software 24 for call registration is installed in the mobile terminal 23. In the figure,

24a denotes an icon indicating that the application software 24 is installed. As described above, when the mobile terminal 23 receives radio signals from one of the radio signal devices 25a, 25b, and 25c, the application software 24 is activated.

FIG. 6 is a block diagram showing an example of a functional configuration of the mobile terminal 23.

The mobile terminal 23 held by the passenger is equipped with an input unit 51, a display unit 52, a control unit 53, a voice input/output unit 54, a storage unit 55, a global positioning system (GPS) module 56, a communication unit 57, a radio field intensity measuring unit 58, and the like.

The input unit 51 is composed of various types of keys and buttons, and the like, to input data and issue instructions. The display unit 52 is composed of, for example, an LCD to display the data. For example, a transparent touch panel may be used as the input unit 51 to allow data input and instruction to be performed on the screen of the display unit 52.

The control unit 53 is composed of a CPU to perform various types of functions by activating a predetermined program. The control unit 53 performs the registration processing of the hall call and the car call by activating the application software 24 for call registration. The voice input/output unit 54 is composed of a microphone to input voices and a speaker to output voices. The storage unit 55 is composed of a memory device such as a ROM or a RAM to store various types of programs including the application software 24. In addition, a building ride table T1 is provided in the storage unit 55.

As shown in FIG. 7, passenger ride information

that is arbitrarily set for each building is stored in advance in the building ride table T1 by using the application software 24. The ride information includes the information on the passenger's ride floor and destination floor. In the table, buildings a, b, and c are, for example, residential condominiums, head office buildings, branch buildings, or the like, and are buildings in which elevators daily used by the passengers are installed. Furthermore, the ride information includes attribute information indicating that the passenger is a "general passenger" or a "dedicated operation person (VIP)".

In the example in FIG. 7, the ride information of buildings a and c includes the attribute information indicating that the passenger is a general passenger. The ride information of building b includes the attribute information indicating that the passenger is a dedicated operation person. When the passenger is a general passenger, one of the cars 14a, 14b, and 14c responds to a hall call (normal call) and drives normally, carrying the passenger from the ride floor registered in advance to the destination floor, while responding to the other passengers' hall calls and car calls. In contrast, when the passenger is a dedicated operation person, the dedicated operation car (car 14c in this example) among the cars 14a, 14b, and 14c responds to the hall call (dedicated call), carries the passenger and drives directly from the ride floor registered in advance to the destination floor.

The GPS module 56 is used to detect a current position. The communication unit 57 is a general-purpose interface to perform wireless communications with the outside, and enables long-distance wireless

communication using public line networks and near-field communication such as Bluetooth (registered trademark) and Wi-Fi. The radio field intensity measuring unit 58 measures the intensity (reception intensity) of the radio waves generated from the radio signal devices 25a, 25b, and 25c installed in the hall 20.

In the following descriptions, the radio signal devices 25a, 25b, and 25c installed in the hall 20 are referred to as "hall beacons 25a, 25b, and 25c", and the radio signal devices 26a, 26b, and 26c installed in the cars 14a, 14b, and 14c are referred to as "in-cabin beacons 26a, 26b, and 26c". In addition, the "registration of the hall call" may also be referred to as "registration of the destination direction", and the "registration of the car call" may also be referred to as "registration of the destination floor".

(a) Basic configuration of terminal call

First, a basic configuration of the terminal call in a case of assuming a single car is described to facilitate understanding.

FIG. 8 is a view illustrating a basic configuration of a terminal call in a case of assuming a single car. In the figure, numbers in parentheses indicate a procedure of terminal call. In the figure, 25 denotes the hall beacon, and 26 denotes the in-car beacon. In addition, 14 denotes the car, 15 and 16 denote the car operating panel and the destination floor buttons installed in the car 14, and 21 and 22 denote the hall operating panel and the hall buttons.

It is assumed that passenger P arrives at a hall 20 on any floor (see step (1)). When the passenger P approaches a hall beacon 25, application software 24 for call registration in the mobile terminal 23 held by

the passenger P is activated by the radio signal transmitted from the hall beacon 25. The application software 24 may also be activated by manual operations before the passenger P comes to the hall 20.

5 The application software 24 has a "hall call registration mode" and a "car call registration mode". In an initial state, the mobile terminal 23 is set to the "hall call registration mode". In the "hall call registration mode", when the mobile terminal 23
10 receives the signal from the hall beacon 25, the ride information (ride floor and destination floor) of the passenger corresponding to the current building is read from the building ride table T1 shown in FIG. 7, based on the building information transmitted from the hall
15 beacon 25.

 In the "hall call registration mode", the mobile terminal 23 transmits the passenger's ride information as a hall call signal to the group management controller 12 via the hall beacon 25. As a result, the
20 passenger's destination direction (upward direction in this example) is registered on the hall operating panel 21, and the hall call button 22 corresponding to this destination direction lights up (see step (2)).

 When the registration of the hall call is
25 completed and the passenger P gets in the car 14, the "hall call registration mode" is switched to the "car call registration mode" (see step (3)). In the "car call registration mode", the mobile terminal 23 performs the registration processing of the car call
30 via the in-car beacon 26. More specifically, the mobile terminal 23 transmits the passenger's destination floor as a car call signal to the group management controller 12 via the in-car beacon 26. As

a result, the passenger's destination floor is registered on the car operating panel 15, and the destination floor button 16 corresponding to the destination floor lights up (see step (4)).

5 (b) Configuration of terminal call by general passenger in a case of assuming the group management system

FIG. 9 to FIG. 12 are views illustrating the configuration of the terminal call by a general passenger in a case of assuming the group management system. A configuration in which a group of three elevators (cars) indicated by elevator A, elevator B, and elevator C, is managed is shown. In the figure, Pa indicates a general passenger, and 23a indicates a general passenger's mobile terminal.

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The registration of the hall call will be focused.

As shown in FIG. 9, the hall beacons 25a, 25b, and 25c are installed in the hall 20 to correspond to the respective elevators. The hall beacons 25a, 25b, and 25c are communicably connected to each other, and each of them constructs a wireless network for receiving hall calls. As shown in FIG. 10, the mobile terminal 23a held by the general passenger Pa is connected to one of the hall beacons 25a, 25b, and 25c by a wireless manner to transmit the hall call signal. This hall call signal includes the ride information (ride floor and destination floor) of the passenger corresponding to the current building, which is read from the building ride table T1 in FIG. 7, and the attribute information indicating the general passenger Pa.

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Normally, the hall beacon closest to the mobile terminal 23a among the hall beacons 25a, 25b, and 25c is a connection target. For example, if the general

passenger Pa is located near the entrance of elevator A, the hall beacon 25a is the connection target.

However, if a large number of passengers appear near the entrance of elevator A, the hall call signals of the passengers are concentrated on the hall beacon 25a of elevator A, which may cause a delay in the response to the hall calls.

To solve the response delay caused by such signal concentration, this system is configured such that the hall beacons 25a, 25b, and 25c mutually monitor the signal reception status and, if the hall beacon near the general passenger Pa is receiving a signal, the other hall beacon receives the hall call signal transmitted from the mobile terminal 23a. If a plurality of hall beacons that can receive the signals exist, one of the hall beacons having the strongest radio field intensity to the mobile terminal 23a is the connection target. If there is no difference in radio field intensity, the hall beacon with a higher priority assigned in advance is the connection target.

In the example in FIG. 11, the mobile terminal 23a connects to the hall beacon 25b of elevator B and transmits the hall call signal to the group management controller 12 via the hall beacon 25b of elevator B.

As shown in FIG. 12, when the hall call is registered, the same status as that of the case where the passenger P presses the hall button 22b is formed by a registration completion signal output from the group management controller 12. In other words, all of the hall call buttons 22a, 22b, and 22c light up to indicate that the hall call has been registered. When the car approaches the registration floor of the ride call of the elevator (car) to which the hall call has

been assigned, an arrival lamp (not shown) corresponding to this elevator lights up. The passenger Pa can recognize the elevator to which the own hall call has been assigned, by the lighting of the arrival lamp.

(c) Configuration of terminal call by dedicated operation person in a case of assuming the group management system

FIG. 13 to FIG. 19 illustrate the configuration of a terminal call by a person for dedicated operation in the case of a group management control system. A configuration in which a group of three elevators (cars) indicated by elevator A, elevator B, and elevator C, is managed is shown. It is assumed that elevator C is set for the dedicated operation. In the figure, Pb indicates a dedicated operation person, and 23b indicates a mobile terminal of the dedicated operation person.

The registration of the hall call will be focused.

As shown in FIG. 13 and FIG. 14, the hall beacons 25a, 25b, and 25c are installed in the hall 20 so as to correspond to the respective elevators, and are communicably connected to each other. As described above, the hall beacons 25a, 25b, and 25c mutually monitor the signal reception status, and if any hall beacon is receiving a signal, the hall beacon that can receive a signal receives the hall call signal. The mobile terminal 23b held by the dedicated operation person Pb is connected to one of the hall beacons 25a, 25b, and 25c to transmit the hall call signal. This hall call signal includes the ride information (ride floor and destination floor) of the passenger corresponding to the current building, which is read

from the building ride table T1 shown in FIG. 7, and the attribute information of the dedicated operation person Pb.

5 As shown in FIG. 15, when one of the hall beacons 25a, 25b, and 25c receives the hall call signal of the dedicated operation person Pb, the hall beacon 25c of elevator C set for the dedicated operation is disconnected from the other hall beacons 25a and 25b. However, the hall button 22c of elevator C remains
10 connected to the other hall buttons 22a and 22b.

As shown in FIG. 16, for example, if the general passenger Pa comes to the same hall 20 in a state in which the hall beacon 25c of elevator C is disconnected, the connection target of the mobile
15 terminal 23 held by the general passenger Pa is the hall beacon 25a or the hall beacon 25b. In contrast, the mobile terminal 23b held by the dedicated operation person Pb is only the hall beacon 25c. At this time, the signal transmitted from the hall beacon 25c may be
20 changed to a signal for the dedicated operation. When the dedicated operation person Pb comes near the entrance of elevator C, the hall beacon 25c receives the hall call signal of the dedicated operation person Pb.

25 As shown in FIG. 17, the hall call signal of the general passenger Pa received by the hall beacon 25a or the hall beacon 25b is supplied to the group management controller 12 as a "normal call signal". In contrast, the hall call signal of the dedicated operation person
30 Pb, which is received by the hall beacon 25c, is supplied to the group management controller 12 as a "dedicated call signal". As a result, as shown in FIG. 18, the car of elevator A or elevator B, which is

selected by the normal assignment control, responds to the "normal call signal". The car of elevator C responds to the "dedicated call signal". At this time, the dedicated operation lamp 27 of elevator C lights up to indicate that the operation has been switched to the dedicated operation.

Thus, when the dedicated operation person Pb comes to the hall 20, the hall beacon 25c of elevator C is disconnected from the other hall beacons 25a and 25b and can be used independently as the hall beacon for the dedicated operation. Therefore, a specific button to switch the hall beacon to the hall beacon for the dedicated operation is unnecessary, and the dedicated call can easily be registered via the hall beacon 25c. The connection between the mobile terminal 23b and the hall beacon 25c is continued until the mobile terminal 23b receives a signal from the in-car beacon 26c installed in the car 14c.

FIG. 19 shows a state in which the general passenger Pa rides in elevator A or B and the dedicated operation person Pb rides in elevator C and then the cars depart. The disconnection of the hall beacon 25c is canceled, and the hall beacons 25a, 25b, and 25c return to a state of being communicably connected to each other.

In the following descriptions, the operations of this system will be divided into processing on the mobile terminal side, processing on the hall beacon side, and processing on the in-car beacon side.

(Processing on the mobile terminal side)

FIG. 20 is a flowchart showing the processing of the mobile terminal 23 of this system. The processing shown in this flowchart is performed by urging the

control unit 53 provided in the mobile terminal 23 to read a predetermined program.

It is assumed that the passenger arrives at the hall 20 of the ride floor set in advance for each building while holding the mobile terminal 23. The application software 24 for the call registration is installed in the mobile terminal 23 in advance. In the initial state, the mobile terminal 23 is set to the "hall call registration mode" (step S11).

In the "hall call registration mode", the control unit 53 provided in the mobile terminal 23 scans the signal of the hall beacon with the highest radio field intensity among the hall beacons 25a, 25b, and 25c installed at the hall 20 (step S12). When the signal of one of the hall beacons 25a, 25b, and 25c is received (Yes in step S13), the control unit 53 performs the hall call registration processing (step S14).

More specifically, the control unit 53 reads the ride information (ride floor and destination floor) and the attribute information of the passenger corresponding to the current building from the building ride table T1 shown in FIG. 7, based on the building information included in the hall beacon signal. The control unit 53 generates the passenger's ride information and the attribute information as the hall call signal, and transmits the hall call signal to the group management controller 12 via one of the hall beacons 25a, 25b, and 25c. As a result, the destination direction (upward direction or downward direction) obtained from the relationship between the passenger's ride floor and the destination floor is registered as the hall call on the hall operating

panels 21a, 21b, and 21c. The processing on the hall beacon side at this time will be described later with reference to FIG. 21.

When the registration of the hall call is
5 completed, the "hall call registration mode" is switched to the "car call registration mode" (step S15). In the "car call registration mode", the control unit 53 scans the signal of the in-car beacon installed in the car in which the passenger rides (step S16).
10 When the signal of the in-car beacon is received (Yes in step S17), the control unit 53 performs the car call registration process via the in-car beacon (step S18).

For example, it is assumed that a passenger rides in the car 14a. In this case, the control unit 53
15 generates the destination floor and the attribute information of the passenger corresponding to the current building, which are obtained from the building boarding table T1, as the car call signal and transmits the car call signal to the group management controller
20 12 via the in-cage beacon 26a. As a result, the passenger's destination floor is registered on the car operating panel 15a as the car call. The processing on the intra-car beacon side at this time will be described later with reference to FIG. 22.

25 (Processing on the hall beacon side)

FIG. 21 is a flowchart showing the processing of the hall beacons 25a, 25b, and 25c in this system. The processing shown in this flowchart is performed by urging the control unit 41 provided in each of the hall
30 beacons 25a, 25b, and 25c to read a predetermined program.

As described with reference to FIG. 9, the radio beacons 25a, 25b, and 25c installed at the hall 20

mutually monitor the signal reception status (step S21). If any of the hall beacons is receiving a signal when the hall call signal is transmitted from the passenger's mobile terminal 23 (Yes in step S22), the control unit 41 controls the communication unit 42 to receive the hall call signal by the hall beacon that can receive the signal (step S23).

If a plurality of hall beacons that can receive the signals exist, the control unit 41 connects the hall beacon having the highest signal field intensity to the mobile terminal 23 to the mobile terminal 23, and controls the communication unit 42 to receive the hall call signal transmitted from the mobile terminal 23. If the radio field intensity is the same, the hall beacon having the higher priority assigned in advance is set to be connected to the portable terminal 23.

If all of the hall beacons 25a, 25b, and 25c are in a status of being able to receive the signal (No in step S22), the control unit 41 controls the communication unit 42 such that the hall beacon close to the passenger, i.e., the beacon having the highest signal field intensity to the mobile terminal 23 receives the hall call signal (step S24).

The control unit 41 provided in any hall beacon that receives the hall call signal determines whether or not the passenger is a dedicated operation person, based on the attribute information included in the hall call signal (step S25). If the passenger is a dedicated operation person (Yes in step S25), the control unit 41 disconnects the hall beacon 25c of elevator C from the other hall beacons 25a and 25b (step S26). As a result, the hall beacon 25c of elevator C becomes independent as a hall beacon for the

dedicated operation. In this case, the control unit 41 provided in the hall beacon 25c acquires the hall call signal (dedicated signal) from the mobile terminal 23, transfers the hall call signal to the group management controller 12 and performs the registration of the call for dedicated operation (step S27). At this time, as shown in FIG. 18, the dedicated operation lamp 27 lights up to clearly indicate that the operation has been switched to the dedicated operation.

In contrast, if the passenger is a general passenger (No in step S25), the control unit 41 transfers the hall call signal (normal call signal) received in step S23 or S24 to the group management controller 12, and performs a normal call registration (step S28).

(Processing on the in-car beacon side)

FIG. 22 is a flowchart showing the processing of the in-car beacons 26a, 26b, and 26c in this system. The processing shown in this flowchart is performed by urging the control unit 45 provided in each of the in-car beacons 26a, 26b, and 26c to read a predetermined program.

It is assumed that a passenger currently rides in one of the cars 14a, 14b, and 14c. For example, when a passenger rides in the car 14a, the car call transmitted from the passenger's mobile terminal 23 is received by the in-car beacon 26a (step S31).

The control unit 45 provided in the in-car beacon 26a checks the passenger's destination floor and attribute information included in the car call (step S32). As a result, in a case described below, the control unit 45 determines that the passenger is getting in a wrong car (Yes in step S33) and notifies

the passenger's mobile terminal 23 of this determination (step S33).

5 (1) When the destination floor included in the car call is different from the destination floor included in the signal of the hall call assigned to the car in which the passenger is getting: wrong ride due to wrong destination floor

10 (2) When the attribute information included in the car call is different from the attribute information included in the signal of the hall call assigned to the car in which the passenger is getting: wrong ride due to wrong attribute

15 The "signal of the hall call assigned to the car in which the passenger is getting" is supplied from the group management controller 12 to the in-car beacon via the elevator controller corresponding to the car.

20 As for the notification method, the notification may be made by displaying a message that the passenger is making a wrong ride on the mobile terminal 23 or activating a sound or vibration function of the mobile terminal 23. In particular, when a general passenger detects making a wrong ride in the car 14c in dedicated operation from the passenger's attribute information, notification of a wrong ride is desirably continued
25 until the passenger manually cancels the notification. The detection of a wrong ride in the car 14c in dedicated operation is performed when the in-car beacon 26c receives the car call signal transmitted from the mobile terminal 23.

30 In addition, if the destination floor and attribute information included in the car call match the destination floor and attribute information included in the signal of the hall call assigned to the

car in which the passenger is getting, the control unit
45 determines that the passenger does not make a wrong
ride (No in step S33). In this case, the control unit
45 transfers the destination floor included in the car
5 call to the group management controller 12 and
registers the destination floor in the car operating
panel in the car (step S35). In this case, the car 14c
carrying the dedicated operation person operates
directly to the passenger's destination floor.

10 Thus, according to this embodiment, a large number
of passengers can efficiently register the hall call
via the hall beacons 25a, 25b, and 25c installed at the
hall 20 and smoothly travel to the own destination
floor, in the group management system. In addition, by
15 distinguishing the general passenger from the dedicated
operation person and disconnecting the hall beacon 25c
for dedicated operation from the other hall beacons 25a
and 25b for the dedicated operation person, it is
possible to register the dedicated call without
20 requiring the call button for dedicated operation, and
to travel to the destination floor while carrying the
only dedicated operation person in the dedicated
operation car.

Furthermore, the passenger's wrong ride can be
25 detected by the in-cabin beacons 26a, 26b, and 26c of
the respective elevators. Thus, for example, when a
general passenger makes a wrong ride in the dedicated
operation car, it is possible to make the only
dedicated operation person ride in the dedicated
30 operation car and travel by urging the general
passenger to get off the car soon.

(Modified Example)

The following measures may be taken when the car

14c of elevator C performs dedicated operation.

(1) The radio field intensity of the hall beacon 25c of elevator C is adjusted to be lower than that of the other hall beacons 25a and 25b and is set such that
5 the hall call (dedicated call) cannot be registered unless the mobile terminal approaches the hall beacon 25c of elevator C. As a result, it is possible to prevent the car 14c of elevator C from responding to the hall call and arriving at the hall 20 while the
10 dedicated operation person moves to the entrance of elevator C.

(2) When the door of the car 14c of elevator C is opened at the hall 20 in response to the dedicated call, an announcement is made through a speaker 17c in
15 the car 14c that the car is performing the dedicated operation. As a result, it is possible to prevent a general passenger from accidentally getting in the dedicated operation car.

(3) When the door of the car 14c of elevator C is
20 opened at the hall 20 in response to the dedicated call, and when the in-car beacon 26c of elevator C receives a radio signal from a passenger other than the dedicated operation person, i.e., when a general passenger's wrong ride is detected by the attribute
25 information included in the hall call signal, an announcement is made through the speaker 17c in the car 14c that the car is performing the dedicated operation. As a result, it is possible to urge the general passenger making a wrong ride in the dedicated
30 operation car to get off the car.

According to at least one of the embodiments described above, the elevator system that enables a large number of passengers to efficiently perform call

registration using their own mobile terminals at the hall and smoothly travel to the destination floors, in the group management system, can be provided.

While certain embodiments have been described,
5 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
10 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
15 of the inventions.

WHAT IS CLAIMED IS:

1. An elevator system performing call registration using a passenger's mobile terminal, the elevator system comprising:

5 a controller controlling operations of a plurality of cars; and

 a plurality of first radio signal devices individually installed near entrances of the respective cars at a hall so as to be communicably connected to
10 each other,

 each of the first radio signal devices comprising:
 a monitoring unit monitoring a mutual signal reception status;

 a connection control unit connecting, when one of
15 the first radio signal devices is receiving a signal of a mobile terminal other than the mobile terminal, of the first radio signal devices, another first radio signal device capable of receiving a signal of the mobile terminal to the mobile terminal; and

20 a hall call registration unit transferring a hall call signal transmitted from the mobile terminal to the controller and urging one of the cars to respond to the hall call.

2. The elevator system of claim 1, wherein
25 when more than one of the first radio signal devices are capable of receiving the signal of the mobile terminal, the connection control unit connects the first radio signal device having a highest radio field intensity for the mobile terminal to the mobile
30 terminal.

3. The elevator system of claim 1, wherein
 when more than one of the first radio signal devices are capable of receiving the signal of the

mobile terminal and are the same in radio field intensity, the connection control unit connects the first radio signal device having a higher priority assigned in advance to the mobile terminal.

5 4. The elevator system of claim 1, wherein
each of the first radio signal devices comprises a dedicated operation support unit disconnecting the first radio signal device set for dedicated operation, of the first radio signal devices, from the first radio
10 signal devices when the passenger is a dedicated operation person, and

the hall call registration unit transfers a hall call signal received by the first radio signal device for dedicated operation to the controller, and urges a
15 car set as a dedicated operation car, of the cars, to respond to the hall call signal.

5. The elevator system of claim 4, wherein
the dedicated operation support unit determines whether or not the passenger is a dedicated operation
20 person, based on attribute information included in the hall call signal.

6. The elevator system of claim 4, wherein
a radio field intensity of the radio first signal device set for dedicated operation, of the first radio
25 signal devices, is set to be lower than radio field intensities of the other first radio signal devices.

7. The elevator system of claim 4, further comprising:
an announcement unit announcing that the car set
30 as the dedicated operation car is performing a dedicated operation.

8. The elevator system of claim 1, further comprising:

a plurality of second radio signal devices
individually installed in the cars, wherein

each of the second radio signal devices comprises:

a car call registration unit transferring a car
5 call signal transferred from the mobile terminal to the
controller and registering a destination floor included
in the car call signal;

a wrong ride detection unit comparing the
destination floor included in the car call signal with
10 a destination floor included in the hall call signal
assigned to a car in which the passenger is getting, of
the cars, and detecting the passenger's wrong ride; and

a communication unit notifying the mobile terminal
of the wrong ride when the passenger's wrong ride is
15 detected.

9. The elevator system of claim 8, wherein

the wrong ride detection unit compares attribute
information included in the car call signal with
attribute information included in the hall call signal
20 assigned to a car in which the passenger is getting, of
the cars, and detects that a passenger other than the
dedicated operation person makes a wrong ride in the
car set as the dedicated operation car, of the cars.

10. The elevator system of claim 9, further
25 comprising:

an announcement unit which announces that the car
set as the dedicated operation car is performing a
dedicated operation when the wrong ride of the
passenger other than the dedicated operation person is
30 detected.