(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 418 236 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
13.03.2024 Bulletin 2024/11

(21) Application number: **18179330.8**

(22) Date of filing: **22.06.2018**

(51) International Patent Classification (IPC):
B66B 1/34 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B66B 1/3476; B66B 1/468; B66B 2201/4653

(54) DETERMINATION OF THE MOTION OF A PASSENGER RELATIVE TO AN ELEVATOR CAR

BESTIMMUNG DER BEWEGUNG EINES FAHRGASTES RELATIV ZU EINER AUFZUGSKABINE

DÉTERMINATION D'UN MOUVEMENT DE PASSAGER PAR RAPPORT À UNE CABINE D'ASCENSEUR

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **23.06.2017 CN 201710484948**

(43) Date of publication of application:
26.12.2018 Bulletin 2018/52

(73) Proprietor: **Otis Elevator Company**
Farmington, Connecticut 06032 (US)

(72) Inventors:
- **HUANG, Wenbo**
  Shanghai, 201206 (CN)
- **GUO, Xiaofei**
  Shanghai, 201206 (CN)

(74) Representative: **Schmitt-Nilson Schraud Waibel Wohlfrom**
Patentanwälte Partnerschaft mbB
Pelkovenstraße 143
80992 München (DE)

(56) References cited:
EP-A2- 3 116 200
CN-U- 204 980 676
JP-A- 2012 062 190

EP 3 418 236 B1

Description

[0001] The present invention belongs to the field of elevator intelligent control technologies, and relates to the determination of the movement of a passenger relative to an elevator car by utilizing wireless interaction between a wireless signal module mounted in the elevator car and a personal mobile terminal.

[0002] In an existing elevator system, one of the common modes of elevator calling operation is as follows: a passenger manually presses a certain elevator calling button on an elevator calling control panel mounted in an elevator landing area to input an elevator calling request command for traveling upwards or downwards, and then, after entering a certain elevator car, the passenger manually presses a certain floor button on a target floor registration control panel mounted in each elevator car to input a target floor. Such an elevator calling operation mode needs to be completed manually; moreover, especially when the passenger's hands are incapable of performing the above-mentioned button pressing operation freely (for example, the passenger is carrying stuff with both hands, or the passenger has difficulty in walking and is sitting in a wheelchair), the elevator calling operation becomes difficult, affecting the passenger's experience.

[0003] With the development of the automatic elevator calling operation technology, various techniques of automatically realizing elevator calling operations through smart mobile terminals such as cell phones emerge; however, ineffective elevator calling may be easily caused due to the uncertainty of action or movement of passengers.

[0004] CN 204 980 676 U discloses an elevator passenger wireless location system including elevator car and hoistway door, a wireless location recognition device, wireless location recognition device and a wireless handheld device. The wireless location recognition device discernment passenger cell -phone realizes in order to confirm the person's of taking identity that the passenger is accurate, the convenient demand of taking the elevator.

[0005] The present invention relates to an automatic elevator calling system according to claim 1, an elevator system according claim 8, a method for determining a movement of passenger according to claim 9, and a personal mobile terminal according to claim 15. Various embodiments are disclosed in dependent claims.

[0006] According to the description and accompanying drawings below, the above features and operations of the present invention will become more obvious.

[0007] The detailed description below in conjunction with the accompanying drawings will make the above-mentioned and other objects and advantages of the present invention more complete and clearer, wherein identical or similar elements are expressed with identical labels.

Fig. 1 is a schematic diagram of an automatic elevator calling system according to one embodiment of the present invention, in which an elevator system of one embodiment of the present invention is also shown.

Fig. 2 is a schematic diagram of an application scenario of a movement determination apparatus according to one embodiment of the present invention.

Fig. 3 shows a schematic structural diagram of modules of a personal mobile terminal when the movement determination apparatus of one embodiment of the present invention is at least partially implemented in the personal mobile terminal.

[0008] The present invention will now be described more completely with reference to the accompanying drawings, where exemplary embodiments of the present invention are shown. However, the present invention can be implemented in many different forms and should not be understood as being limited to the embodiments elaborated here. On the contrary, these embodiments are provided so that the present disclosure becomes more thorough and complete, and fully conveys the concept of the present invention to a person skilled in the art.

[0009] Some block diagrams shown in the accompanying drawings are functional entities and are not necessarily corresponding to physically or logically independent entities. These functional entities may be implemented in the form of software, in one or more hardware modules or integrated circuits, or in different processor apparatuses and/or microcontroller apparatuses.

[0010] For the convenience of description, the "apparatus for determining the movement of a passenger relative to an elevator car" is abbreviated as the "movement determination device" herein, and the "method for determining the movement of a passenger relative to an elevator car" is abbreviated as the "movement determination method".

[0011] Fig. 1 shows a schematic diagram of an automatic elevator calling system according to one embodiment of the present invention; Fig. 2 shows a schematic diagram of an application scenario of a movement determination apparatus according to one embodiment of the present invention; and Fig. 3 shows a schematic structural diagram of modules of a personal mobile terminal of one embodiment of the present invention. Exemplary explanation is made to the movement determination apparatus, the automatic elevator calling system and the elevator system of the embodiments of the present invention below in conjunction with Fig. 1 and Fig. 3, and at the same time exemplary explanation is made to the method for determining the movement of a passenger relative to an elevator car.

[0012] The movement determination apparatus 10 of the embodiment of the present invention is implemented in an automatic elevator calling system of an embodiment

shown in Fig. 1, so as to constitute the automatic elevator calling system of one embodiment of the present invention. The automatic elevator calling system is further applied in an elevator system 100 mounted in a building, and the elevator system 100 includes one or more elevator cars 110 traveling upwards and downwards in hoistways of the building. Fig. 1 shows two of the elevator cars of the elevator system 100, i.e., 110-1 and 110-2. The traveling or stopping of each elevator car 110 in the hoistways, namely each elevator car 110, is controlled by an elevator controller 140 in the elevator system 100, the particular control mode or control principle of the elevator controller 140 over one or more elevator cars 110 is not restrictive, and the particular structure or arrangement manner, etc. of the elevator controller 140 is not restrictive either.

[0013] It will be understood that the parts or modules included in the movement determination apparatus 10 of the following embodiment of the present invention may be included in the automatic elevator calling system of one embodiment of the present invention. For example, the automatic elevator calling system includes a first wireless signal module 130 and/or a second wireless signal module 120.

[0014] Again as shown in Fig. 1 and Fig. 2, the movement determination apparatus 10 includes one or more first wireless signal modules 130, and each first wireless signal module 130 is mounted in each elevator car 110. For example, one first wireless signal module 130-1 is arranged in the elevator car 110-1, and one first wireless signal module 130-2 is arranged in the elevator car 110-2. In one embodiment, the first wireless signal module is mounted on a target floor registration control panel in the elevator car 110 and is arranged on the target floor registration control panel by way of integration. The particular integration and arrangement manner of the first wireless signal module 130 with regard to the target floor registration control panel is not restrictive.

[0015] The first wireless signal module 130, in particular, can be a Bluetooth Low Energy (BLE) module, and correspondingly, the first wireless signal module 130 transmits or broadcasts a first wireless signal, e.g., a Bluetooth low energy signal, and the signal strength of the broadcast first wireless signal attenuates with the broadcasting distance thereof, and the particular way of attenuation thereof is not restrictive. The first wireless signal broadcast by the first wireless signal module 130 can roughly effectively cover the area in the elevator car 110 where it is mounted, and the first wireless signal can, for example, correspondingly be a bluetooth low energy signal, which can include a data signal of the first floor information about where the elevator car 110 is currently located.

[0016] It should be noted that the first wireless signal module 130 is coupled to the elevator controller 140; therefore, during the running of each elevator car 110, the first wireless signal module 130 is able to acquire desired information from the elevator controller 140 in real time, e.g., current first floor information, traveling direction information, etc. of the elevator car 110, and the first floor information and/or traveling direction information (the traveling direction information includes, for example, "traveling upwards", "traveling downwards" and "not traveled") is, for example, packaged into a bluetooth data signal and is broadcast in the form of a first bluetooth signal.

[0017] Again as shown in Fig. 1 to Fig. 3, the movement determination apparatus 10 can further be at least partially implemented through a personal mobile terminal 200 carried by a passenger 90, and the personal mobile terminals 200-1 and 200-2 respectively carried by two passengers can both respectively implement at least some functions of the movement determination apparatus 10. Each personal mobile terminal 200 is configured to be able to receive a first wireless signal broadcast by the first wireless signal module 130 when the distance condition is satisfied. As shown in Fig. 3, a wireless communication module 210 in the personal mobile terminal 200 is used to receive a first wireless signal or other wireless signals, and the wireless communication module 210 can particularly be a Bluetooth low energy module. Here, the first wireless signal can be a data signal including first floor information about where the elevator car 110 is currently located and/or current traveling direction information about the elevator car 110.

[0018] Each personal mobile terminal 200 can determine the signal strength of the first wireless signal received thereby, and in one embodiment, the signal strength determination module 230 in the personal mobile terminal 200 determines the signal strength of the received first wireless signal based on the first wireless signal. For example, the personal mobile terminal 200 is configured with a received signal strength indicator (RSSI) for determining the signal strength of the first wireless signal or any other wireless signals received thereby, that is to say, the signal strength determination module 230 is realized through the RSSI.

[0019] It should be understood that the signal strength of the first wireless signal received by the personal mobile terminal 200 is relevant to a pre-set effective broadcast distance of the first wireless signal or the strength of the broadcast signal. In one embodiment, the effective broadcast distance of a first wireless signal is pre-set. For example, when the distance from the personal mobile terminal 200 to the first wireless signal module 130 is smaller than or equal to 0.7 to 1 meter, the signal strength of the first wireless signal received by the personal mobile terminal 200 will be equal to or greater than a first predetermined value, and the RSSI can indicate the signal strength of the first wireless signal as "strong", with an effective broadcast distance correspondingly being 0.7 to 1 meter. Therefore, for the passenger 90 in the elevator car 110, the personal mobile terminal 200 carried thereby can receive a relatively "strong" first wireless signal and can also obtain first floor information broadcast in the first wireless signal at the same time; that is to say, the per-

sonal mobile terminal 200 of the passenger 90 can acquire the first floor information about the current elevator car in real time.

[0020] In one embodiment of the present invention, a movement determination module 250 of the personal mobile terminal 200 is used for determining the movement of the passenger 90 relative to the elevator car 110 based on a change in the signal strength of the received first wireless signal and the first floor information, and a change in the first floor information and/or traveling direction information.

[0021] It should be noted that it is of great meaning to determine the movement of the passenger 90 relative to the elevator car 110. This is because with the development of the intelligent control technology for elevators, the personal mobile terminal 200 carried by the passenger 90 is a smart terminal that can realize an automatic elevator calling operation, which can automatically send out various types of elevator calling operation commands, enabling the elevator controller to perform scheduling and control over the elevator car; for example, the automatic registration of a target floor in an elevator car is automatically realized, and the elevator controller will control the running of the elevator car based on the automatically registered target floor. However, the elevator controller does not know whether the passenger 90 has indeed entered the elevator car, or whether the passenger has entered a designated elevator car correctly. If the target floor corresponding to the passenger 90 is automatically registered, but the passenger 90 has not successfully entered the elevator car or has not successfully taken the elevator, then the elevator car 110 is likely to be in ineffective operation, seriously affecting the operation efficiency of the elevator system.

[0022] As shown in Fig. 2, the elevator car 110 travels upwards or downwards to a floor N and stops at the floor N, with the floor N for example corresponding to an elevator landing area 410, and the passenger 90 carrying the personal mobile terminal 200 is waiting for the elevator in the elevator landing area 410 or is moving in the elevator landing area 410; if the elevator car 110-1 is the elevator car that he/she wants to enter or is notified to be the elevator car designated by the elevator system 100, when the landing door of the elevator car 110-1 is open, a first wireless signal broadcast by a first wireless signal module 130-1 in the elevator car 110-1 will be able to be received by the personal mobile terminal 200 (if the passenger is close enough to the landing door of the elevator car 110-1); moreover, as the passenger 90 moves towards the inside of the elevator car 110-1, the signal strength of the first wireless signal (broadcast by the first wireless signal module 130-1) received by the personal mobile terminal 200 will gradually become stronger, for example, changing from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value; the first pre-determined value can indicate that, when the current distance from the passenger 90 to the first wireless signal module 130-1 is within the range of 0.7 to 1 meter, if the signal strength is equal to or greater than the first pre-determined value, the passenger 90 is likely to be located in the elevator car 110-1, and if the signal strength is smaller than or equal to the first pre-determined value, the passenger 90 is likely to be located in the elevator landing area 410.

[0023] Therefore, in one embodiment, the first wireless signal module 130-1 keeps broadcasting the first floor information through the first wireless signal, e.g., a floor N (if the elevator stops at the Nth floor); and the personal mobile terminal 200 will be able to receive the first floor information (for example, the floor N), and at the same time the personal mobile terminal 200 determines the signal strength of the received first wireless signal through the RSSI, etc. If the signal strength of the first wireless signal received by the personal mobile terminal 200 changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value, and the first floor information in the first wireless signal received by the personal mobile terminal 200 after the change changes, for example changing to a floor (N-1) or floor (N+1), it is determined that the passenger 90 has successfully moved into the elevator car 110-1 and has successfully taken the elevator.

[0024] If the signal strength of the first wireless signal received by the personal mobile terminal 200 changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value, and the first floor information in the first wireless signal received by the personal mobile terminal 200 after the change remains unchanged or disappears, for example, remaining at the floor N for at least 3 to 10 seconds, which is likely to be the case where the passenger 90 is near the landing door of the elevator car 110-1 but has not entered the elevator car (for example, when too many passengers are in the elevator car 110-1 and it is difficult to enter the elevator car), or for example the first floor information having disappeared, which is likely to be the case where the elevator car 110-1 travels and leaves the floor N but the passenger is still in the elevator landing area 410, it is determined that the passenger 90 has failed to move into the elevator car 110-1 or has failed to take the elevator. As exemplary explanation, there are such as the following two cases where the passenger 90 fails to move into the elevator car 110-1 or fails to take the elevator in the practical process of taking an elevator: first, the passenger 90 intentionally or unintentionally moves to the vicinity of the landing door but has not successfully moved into the elevator car 110; and second, the passenger 90 steps into the elevator car 110 but temporarily changes his/her mind and returns back to the elevator landing area 410 for the reason such as the crowdedness in the elevator car 100.

[0025] In one embodiment, the personal mobile terminal 200 or the movement determination module 250 thereof is further configured to: determine that the passenger 90 has successfully moved into the elevator car 110 and has successfully taken the elevator when the

signal strength of the first wireless signal received thereby changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value and the first floor information in the first wireless signal received thereby after the change changes; and the personal mobile terminal 200 or the movement determination module 250 thereof is further configured to: determine that the passenger 90 has failed to move into the elevator car 110 and has failed to take the elevator when the signal strength of the first wireless signal received thereby changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value and the first floor information in the first wireless signal received thereby after the change does not change or disappears.

[0026] In the movement determination process or the movement determination method, whether the passenger has moved towards the elevator car 110 can be determined through the change in the signal strength of the received first wireless signal, and whether the passenger is traveling together with the first elevator car 110 can be determined through the change in the first floor information in the first wireless signal received subsequently; thus, it can be determined that the passenger has successfully moved into the elevator car 110 or whether the passenger has successfully taken the elevator. The above first floor information in the first wireless signal received after the change is received when the RRSI indicates "strong", i.e., when the signal strength remains equal to or greater than the first pre-determined value, which further indicates that the passenger 90 is receiving the changed first floor information inside the elevator car 110.

[0027] Again as shown in Fig. 1 to Fig. 3, in another embodiment, the first wireless signal module 130 is coupled to the elevator controller 140; and during the running of each elevator car 110, the first wireless signal module 130 can acquire traveling direction information about the elevator car 110 from the elevator controller 140 in real time. For example, when the elevator is traveling upwards, the traveling direction information is "traveling upwards", when the elevator is traveling downwards, the traveling direction information is "traveling downwards", and when the elevator stops at a certain floor, the traveling direction information is "not traveled"; moreover, the traveling direction information is packaged into a wireless data signal and is broadcast in the form of a first wireless signal.

[0028] The personal mobile terminal 200 or the movement determination module 250 thereof is configured to: determine the movement of the passenger 90 relative to the elevator car 110 based on the change in the signal strength of the received first wireless signal, and also determine whether the passenger has successfully moved into the elevator car and has successfully taken the elevator based on the change in the traveling direction information in the received first wireless signal. In one embodiment, the personal mobile terminal 100 or the movement determination module 250 thereof is further configured to: determine that the passenger 900 has successfully moved into the elevator car 110 and has successfully taken the elevator when the signal strength of the first wireless signal received thereby changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value and the traveling direction information in the first wireless signal received thereby changes from "not traveled" to "traveling upwards" or "traveling downwards". The personal mobile terminal 100 or the movement determination module 250 thereof is further configured to: determine that the passenger 90 has failed to move into the elevator car 110 and has failed to take the elevator when the signal strength of the first wireless signal received thereby changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value and the traveling direction information in the first wireless signal received thereby after the change remains "not traveled" or disappears.

[0029] In the movement determination process or the movement determination method, whether the passenger has moved towards the elevator car 110 can be determined through the change in the signal strength of the received first wireless signal, and whether the passenger is traveling together with the first elevator car 110 can be determined through the change in the first floor information in the first wireless signal received subsequently; thus, it can be determined that the passenger has successfully moved into the elevator car 110 or whether the passenger has successfully taken the elevator. The above first floor information in the first wireless signal received after the change is received when the RRSI indicates "strong", i.e., when the signal strength remains equal to or greater than the first pre-determined value, which further indicates that the passenger 90 is receiving the changed traveling direction information inside the elevator car 110.

[0030] Since the change in the traveling direction information is earlier than the change in the first floor information and is easy to be recognized earlier by the personal mobile terminal 100 in the process from stopping of the elevator car 110 to starting to travel, it is more timely or more effective to determine the movement of the passenger relative to the elevator car based on the change in the signal strength of the received first wireless signal and the change in the traveling direction information compared with determining the movement of the passenger relative to the elevator car based on the change in the signal strength of the received first wireless signal and the change in the first floor information.

[0031] In the above embodiment, when the passenger 90 walks to approach the first wireless signal module 130, the change in the signal strength of the first wireless signal received by the personal mobile terminal 200 increases approximately progressively; therefore, in the process where the signal strength of the above-mentioned first wireless signal changes from zero or relatively

weak to equal to or greater than a relatively strong first pre-determined value, the signal strength can be chosen to change approximately progressively, for example, changing approximately linearly or changing in an approximately curved manner. As such, the situations that do not indicate the passenger 90 moving towards the elevator car 110, such as the signal strength "suddenly changing", can be excluded, increasing the accuracy of judgement.

[0032] It should be noted that the first pre-determined value is chosen to represent a signal strength value of a first wireless signal received by a personal mobile terminal 200 when a passenger is or is likely to be in the elevator car, for example the signal strength value of the first wireless signal received by the personal mobile terminal 200 when a distance from the corresponding passenger 90 to the first wireless signal module 130 is at a certain value within the range of 0.7 to 1 meter, or the signal strength value of the first wireless signal received by the personal mobile terminal 200 when the corresponding passenger 90 is in the elevator car 110. When the landing door of the elevator car 110 opens and the passenger 90 is standing at the position of the landing door or is very close to the landing door (for example, distanced within 0.3 meter from the landing door), the signal strength of the first wireless signal received thereby is likely to be equal to or greater than the first pre-determined value. Generally, when the landing door closes, the personal mobile terminal 200 outside the elevator car 110 cannot receive the corresponding first wireless signal or receives a weak first wireless signal.

[0033] In the present application, the signal strength of the first wireless signal being weak refers to that the signal strength of the first wireless signal is at least smaller than the first pre-determined value.

[0034] Again as shown in Fig. 1 and Fig. 2, in one embodiment, the movement determination apparatus 10 further includes a second wireless signal module 120 mounted in each elevator landing area 410, for broadcasting a second wireless signal, for example, keeping broadcasting a data signal including second floor information about the elevator landing area 410 where the second wireless signal module 120 is located; as such, the personal mobile terminal 200 can keep receiving the second floor information once entering the elevator landing area 410.

[0035] The movement determination apparatus 10 of the embodiments of the present invention can be applied to an elevator system 100 described below that can automatically complete an elevator calling operation in a completely hand free mode according to the embodiments of the present invention and can effectively avoid ineffective elevator calling operations.

[0036] As shown in Fig. 1 and Fig. 2, in order to acquire an elevator calling request command from each elevator landing area 410, a second wireless signal module 120 is arranged in the elevator system 100, and the second wireless signal module 120 can be mounted in each elevator landing area 410 of the elevator system 100 (as shown in Fig. 2). It should be understood that each elevator landing area 410 can be mounted with one or more second wireless signal modules 120, so that the second wireless signal sent out by the second wireless signal module 120 can approximately effectively cover each elevator landing area 410. The second wireless signal module 120 can particularly be arranged in an elevator calling control panel of the elevator system 100 by way of integration, wherein the elevator calling control panel 12 is generally mounted at two sides of the landing door of the elevator landing area 410, and the elevator calling control panel 12 can be arranged with for example an "upward" or "downward" elevator calling button, so as to be also able to realize the manual input of an elevator calling request command based on the elevator calling control panel 12.

[0037] In one embodiment, the second wireless signal module 120 can particularly be a bluetooth low energy (BLE) module; and the second wireless signal can for example correspondingly be a BLE signal, which can include a wake-up signal for waking up the personal mobile terminal 200, and can also include identity (for example, a universally unique identifier (UUID)) of the second wireless signal module 120. The particular signal form of the second wireless signal is not restrictive. Similarly, the signal strength of the second wireless signal attenuates with the broadcast distance thereof, and therefore, the personal mobile terminal 200 that receives the second wireless signal can approximately determine the distance from the personal mobile terminal 200 to the second wireless signal module 120 according to the signal strength of the second wireless signal. It will be understood that, with the passenger walking in the elevator landing area 410, the distance dynamically changes.

[0038] Again as shown in Fig. 1 and Fig. 2, the elevator system 100 further includes multiple first wireless signal modules 130, and each first wireless signal module 130 is mounted in each elevator car 110. For example, one first wireless signal module 130-1 is arranged in the elevator car 110-1, and one first wireless signal module 130-2 is arranged in the elevator car 110-2. In one embodiment, the first wireless signal module is mounted on a target floor registration control panel in the elevator car 110 and is arranged on the target floor registration control panel by way of integration.

[0039] It should be noted that each second wireless signal module 120 and first wireless signal module 130 in the movement determination apparatus 10 or the elevator system 100 are coupled to an elevator controller 140. For example, they are indirectly coupled (for example, through an RSL bus connection) to the elevator controller 140 respectively through the elevator calling control panel and the target floor registration control panel; therefore, the elevator calling request command and the target floor registration command respectively received by the second wireless signal module 120 and the first wireless signal module 130 can be transmitted to the el-

evator controller 140.

[0040] Again as shown in Fig. 1, there may be a plurality of personal mobile terminals 200 carried by passengers 90 in the movement determination apparatus 10 or the elevator system 100, for example, personal mobile terminals 200-1 and 200-2 respectively carried by two passengers. Each personal mobile terminal 200 can establish a second wireless connection 320 with the second wireless signal module 120, and each personal mobile terminal 200 can establish a first wireless connection 330 with the first wireless signal module 130.

[0041] Again as shown in Fig. 1 to Fig. 3, the personal mobile terminal 200 can be various smart terminals with a wireless connection function that are convenient for passengers to carry; the personal mobile terminal 200 can be provided with a memory, a processor with computing function, etc., and in particular, the personal mobile terminal 200 can be a smart phone, a wearable smart device (e.g., a smart wristband), a personal digital assistant (PDA), etc., on which a corresponding application program (e.g., an APP) can be mounted to realize its function.

[0042] In the elevator system 100, when the second wireless signal module 120 broadcasts a second wireless signal, a personal mobile terminal 200 carried by a passenger near the second wireless signal module 120 will be able to automatically receive the second wireless signal, and based on the second wireless signal, the personal mobile terminal 200 automatically establishes a second wireless connection 320 with the corresponding second wireless signal module 120; moreover, when establishing the second wireless connection 320, the personal mobile terminal 200 sends an elevator calling request command regarding an elevator calling direction (e.g., an "upward" or "downward" elevator calling request command), the second wireless signal module 120 receives the elevator calling request command regarding the elevator calling direction sent over from the personal mobile terminal 200, and the second wireless signal module 120 can further send the elevator calling request command to the elevator controller 140, so that the elevator controller 140 controls the running of one or more elevator cars 110 in the elevator system 100 based on the elevator calling request command. As such, the elevator calling request command automatically sent by the personal mobile terminal 200 can replace the elevator calling request command input by manually pressing an elevator calling button; moreover, the above process can be automatically realized without the need for the passenger to operate the personal mobile terminal 200, completely realizing the automatic input of an elevator calling request command into the elevator system 100 by the passenger in a hand free mode. The implementation process is simple and convenient, greatly improving the passenger's experience.

[0043] It should be noted that each second wireless signal module 120 establishes a second wireless connection 320 with only one personal mobile terminal 200 at a certain moment, and each second wireless signal module 120 can successively establish a second wireless connection 320 with personal mobile terminals 200 carried by a plurality of passengers near the second wireless signal module 120. After establishing a second wireless connection 320 with the second wireless signal module 120 and sending a corresponding elevator calling request command, each personal mobile terminal 200 will actively disconnect the second wireless connection 320 so as to make preparation for the automatic establishment of a second wireless connection 320 between the second wireless signal module 120 and the personal mobile terminal 200 of the next passenger. In one embodiment, the second wireless signal module 120 is configured to return a second confirmation message to a corresponding personal mobile terminal 200 after receiving an elevator calling request command, and the second confirmation message indicates that the elevator calling request command is successfully accepted by the elevator system 100; and the personal mobile terminal 200 is configured to actively disconnect the second wireless connection 320 based on the received second confirmation message.

[0044] It should be noted that the "elevator calling request command regarding an elevator calling direction" in the present invention does not contain the target floor information about the passenger, or the target floor information is not recognized or used by the elevator controller 140 even if it is contained. Therefore, in the embodiments of the present invention, a first wireless connection 330 with the personal mobile terminal 200 is also established in dependence on the first wireless signal module 130.

[0045] Again as shown in Fig. 1, in the elevator system 100 or the movement determination apparatus 10, when the first wireless signal module 130 broadcasts a first wireless signal, a personal mobile terminal 200 carried by a passenger 90 near the first wireless signal module 130 (for example, when the passenger 90 moves towards the interior of the elevator car) will continue to be able to automatically receive the first wireless signal (at this moment, the second wireless connection 320 previously established between the personal mobile terminal 200 and the second wireless signal module 120 has already been disconnected), and based on the first wireless signal, the personal mobile terminal 200 automatically establishes a first wireless connection 330 with the corresponding first wireless signal module 130; moreover, when establishing the first wireless connection 330, the personal mobile terminal 200 sends a target floor registration command about target floor information, the first wireless signal module 130 receives an elevator calling request command regarding an elevator calling direction sent over from the personal mobile terminal 200, and the first wireless signal module 130 can further send the target floor registration command to the elevator controller 140, so that the elevator controller 140 controls the running of one or more elevator cars 110 in the elevator system 100

based on the target floor registration command. As such, the target floor registration command automatically sent by the personal mobile terminal 200 can replace the target floor registration command input by manually pressing a floor button; moreover, the above process can be automatically realized without the need for the passenger to operate the personal mobile terminal 200, completely realizing the automatic input of a target floor registration command into the elevator system 100 by the passenger in a hand free mode. The implementation process is simple and convenient, greatly improving the passenger's experience.

[0046] It should be noted that each first wireless signal module 130 establishes a first wireless connection 330 with only one personal mobile terminal 200 at a certain moment, and each first wireless signal module 130 can successively establish a first wireless connection 330 with personal mobile terminals 200 carried by a plurality of passengers 90 near the first wireless signal module 130. After establishing a first wireless connection 330 with the first wireless signal module 130 and sending a corresponding target floor registration command, each personal mobile terminal 200 will actively disconnect the first wireless connection 330 so as to make preparation for the establishment of a first wireless connection 330 between the first wireless signal module 130 and the personal mobile terminal 200 of the next passenger 90. In one embodiment, the first wireless signal module 130 is configured to return a first confirmation message to a corresponding personal mobile terminal 200 after receiving the target floor registration command, and the first confirmation message indicates that the target floor registration command is successfully accepted by the elevator system 100; and the personal mobile terminal 200 is configured to actively disconnect the first wireless connection 330 based on the received first confirmation message.

[0047] It should be understood that the above-mentioned process from establishing a second wireless connection 320 to disconnecting the second wireless connection 320 can be completed in a short time, and likewise, the above-mentioned process from establishing a first wireless connection 330 to disconnecting the first wireless connection 330 can also be completed in a short time, for example in a time range on the order of magnitude of milliseconds, so that one second wireless signal module 120 or first wireless signal module 130 can successively achieve a second wireless connection 320 or a first wireless connection 330 with many personal mobile terminals 200 in a short time, and many personal mobile terminals 200 can complete an elevator calling operation approximately simultaneously in a short time period.

[0048] The elevator system 100 or the movement determination apparatus 10 of the above embodiments can realize the completion of an automatic elevator calling operation in a completely hand free mode; for example, in the process from some passenger 90 entering the lobby of a building to reaching a target floor, he/she can take an elevator to the target floor without any operation as long as a personal mobile terminal 200 is carried thereby. As shown in Fig. 2, if the passenger 90 is moving towards the interior of the elevator car 110, when the distance from the personal mobile terminal 200 to the first wireless signal module 130-1 in the elevator car 110-1 is smaller than or equal to a first distance threshold, with the signal strength of the received first wireless signal changing from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value, a first wireless connection 330 will be established and a target floor registration command will be automatically sent, the connection status information changes from "Off" to "On", and the elevator controller 140 will control the traveling of the elevator car 110-1 based on the target floor registration command, for example stopping at a floor corresponding to the target floor registration command. However, if the passenger 90 fails to enter the elevator car 110-1 when moving towards the interior of the elevator car 110-1 or temporarily changes his/her mind and leaves the elevator car 110-1 after entering it, or if the passenger 90 just walks by the landing door of the stopped elevator car 110-1, the personal mobile terminal 200 carried by the passenger 90 is likely to send a target floor registration command to the first wireless signal module 130 and automatically register a target floor for the passenger through the first wireless signal module 130; apparently, the target floor registration command may easily cause ineffective running of the elevator car 110-1, affecting the operation efficiency of the elevator system 100.

[0049] In the movement determination apparatus 10 and the movement determination method thereof according to the embodiments of the present invention, a determination result of the movement of the passenger relative to the elevator car 110 can be sent to the elevator system 100 at the same time. In the elevator system 100 of one embodiment of the present invention, the above-mentioned determination result can be sent to the elevator controller 140. For example, when it is determined that the passenger 90 has failed to move into the elevator car 110 or has failed to take the elevator, the personal mobile terminal 200 is generally still located in the elevator landing area 410; therefore, by means of a wireless communication module 210 of the personal mobile terminal 200, a wireless connection can be actively established with the second wireless signal module 120, and the determination result can be sent to the elevator controller 140. Similarly, when it is determined that the passenger 90 has successfully moved into the elevator car 110 and has successfully taken the elevator, the personal mobile terminal 200 must be located in the elevator car 110; therefore, by means of the wireless communication module 210 of the personal mobile terminal 200, a first wireless connection can be actively established with the first wireless signal module 130, and the determination result can be sent to the first wireless signal module 130 and then transferred to the elevator controller 140. The elevator controller 140 is further configured to select a

determination result sent from the movement determination apparatus 10 about the movement of the passenger 90 relative to the elevator car 110 as a judgement condition, to judge whether to cancel a target floor registration command which is registered in the elevator car 110 and corresponds to the personal mobile terminal 200 of the passenger 90. By way of examples, the personal mobile terminal 200 of the passenger 90 automatically sends a target floor registration command corresponding to floor M to a first wireless signal module 130-1 of the elevator car 110-1, and when the elevator controller 140 acknowledges that the passenger 90 has successfully moved into the elevator car 110-1 and has successfully taken the elevator, the elevator controller 140 will not cancel the target floor registration command for the floor M, and the elevator car 110-1 will stop at the Mth floor; when the elevator controller 140 acknowledges that the passenger 90 has failed to move into the elevator car 110-1 or has failed to take the elevator, the elevator controller 140 will judge, by taking the determination result into consideration, whether to cancel the target floor registration command for the floor M. For example, when no other passenger registers the target floor registration command for the floor M, the stop of the elevator car 110-1 at the Mth floor will be canceled. For example, when no other passenger enters the elevator car 110-1, the traveling of the elevator car 110-1 from the current floor to the Mth floor will be canceled.

[0050] It should be understood that the condition for the elevator controller 140 to judge whether to cancel the target floor registration command corresponding to the passenger 90 is not limited to the condition of the determination result sent over from the personal mobile terminal 200, but can also include many other conditions as judgement factors, for example, the target floor registration command corresponding to other passengers, the current operation situation of the elevator car, etc.

[0051] In yet another embodiment, the first wireless signal module 130 also broadcasts connection status information about a first wireless connection 330 between same and the personal mobile terminal 200, and if the above-mentioned first wireless connection 330 is automatically established, then the connection status information corresponds to "On", otherwise the connection status information corresponds to "Off'; the wireless communication module 210 of the personal mobile terminal 200 will receive the connection status information; for example, when the personal mobile terminal 200 is located in the elevator landing area 410, the connection status information received thereby corresponds to "Off'; and in the process of the personal mobile terminal moving to the elevator car 110-1, there is a certain moment or time period where the connection status information received thereby corresponds to "On" (which is used for sending a target floor registration command at this time); and in the process of the elevator car 110-1 closing the landing door and operating, the connection status information received by the personal mobile terminal 200 of the passenger 90 therein corresponds to "Off'. Therefore, the process of the passenger 90 walking into the elevator car 110-1 from the elevator landing area 410 generally corresponds to the process of the connection status information changing from "Off" to "On".

[0052] Therefore, in one embodiment, the personal mobile terminal 200 or the movement determination module 250 thereof is configured to: determine that the passenger 90 has successfully moved into the elevator car 110 and has successfully taken the elevator when the connection status information about the first wireless connection 330 received thereby changes from "Off" to "On" and the traveling direction information in the first wireless signal received thereby after the change changes from "not traveled" to "traveling upwards" or "traveling downwards". The personal mobile terminal 200 or the movement determination module 250 thereof is further configured to: determine that the passenger 90 has failed to move into the elevator car 110 or has failed to take the elevator when the connection status information about the first wireless connection 330 received thereby changes from "Off' to "On" and the traveling direction information in the first wireless signal received thereby after the change remains "not traveled" or disappears.

[0053] In yet another embodiment, the personal mobile terminal 200 or the movement determination module 250 thereof is configured to: determine that the passenger 90 has successfully moved into the elevator car 110 and has successfully taken the elevator when the connection status information about the first wireless connection 330 received thereby changes from "Off" to "On" and the first floor information in the first wireless signal received thereby after the change changes. The personal mobile terminal 200 or the movement determination module 250 thereof is further configured to: determine that the passenger 90 has failed to move into the elevator car 110 or has failed to take the elevator when the connection status information about the first wireless connection 330 received thereby changes from "Off" to "On" and the first floor information in the first wireless signal received thereby after the change does not change or disappears.

[0054] It will be understood that, in the above embodiments, based on the fundamental principle of establishing the first wireless connection 330, the connection status information about the first wireless connection 330 received by the personal mobile terminal 200 changing from "Off" to "On" is also caused by the change in the signal strength of the first wireless signal received by the personal mobile terminal 200; that is to say, it is a way of representing the signal strength changing from weak to strong.

[0055] It should be noted that the movement determination apparatus 10 and the movement determination method thereof according to the embodiments of the present invention are not limited to be the elevator system 100 capable of realizing elevator calling operations in a completely hand free mode in the above embodiments. For example, the movement determination apparatus 10

and the movement determination method thereof can also be applied in an elevator system which is based on another automatic elevator calling operation mode. In said another elevator calling operation mode, the personal mobile terminal can, once at the same time, automatically send or automatically input an elevator calling request command including an elevator calling direction and target floor information to the elevator system, and the elevator system will designate a corresponding elevator car (there are a plurality of elevator cars in the elevator system) for the passenger based on the command, and automatically register the target floor of the passenger in the elevator car. In such an elevator system, if the passenger has failed to move into the elevator car or has failed to take the elevator, then the problem that the designated elevator car ineffectively operates similarly exists, affecting the operation efficiency of the entire elevator system as well. The elevator controller 140 of such an elevator system can similarly be configured to: select a determination result sent over from the movement determination apparatus 10 about the movement of the passenger 90 relative to the elevator car 110 as a judgement condition, to judge whether to cancel a target floor registration command which is registered in the designated elevator car 110 and corresponds to the personal mobile terminal 200 of the passenger 90, thus avoiding the ineffective running of the designated elevator car 110.

[0056] Further, in order to determine whether the elevator car into which the passenger has moved is the corresponding designated elevator car, in one embodiment, the personal mobile terminal 200 or the movement determination module 250 thereof is further configured to: compare the traveling direction information in the first wireless signal received thereby with an elevator calling direction in an elevator calling request command sent by the personal mobile terminal 200, so as to determine whether the passenger has correspondingly moved into the designated elevator car. If the elevator calling direction in the elevator calling request command sent by the personal mobile terminal 200 does not correspond to the currently received traveling direction information, then it can be determined that the passenger 90 has failed to move into the designated elevator car.

[0057] By way of examples, as shown in Fig. 2, if the elevator car 110-2 is an elevator car designated by the elevator system based on the elevator calling request command of the passenger 90, and the target floor Y of the passenger 90 has been registered in the elevator car 110-2, a corresponding elevator calling direction is "upwards"; normally, the elevator car 110-2 will stop at the current floor of the passenger 90, and after the passenger 90 enters the elevator car 110-2, the elevator car 110-2 will automatically travel upwards to the Yth floor. However, there exists the situation where the passenger 90 enters the elevator car 110-1 by mistake when the elevator car 110-1 reaches and stops at the floor where the passenger 90 is currently located; at this time, the personal mobile terminal 200 will be able to receive traveling direction information, for example "traveling downwards", sent by the first wireless signal module 130-1 in the elevator car 110-1, and compare the traveling direction information with for example an "upward" elevator calling direction previously sent by the personal mobile terminal 200, so as to be able to determine that the passenger 90 has failed to move into the designated elevator car 110-2. Further, based on the determination result of failure, the wireless communication module 210 of the personal mobile terminal 200 is triggered to establish a wireless connection with the first wireless signal module 130-1 in the elevator car 110-1 and send the determination result of failure to the elevator controller 140; and based on the determination result of failure, the elevator controller 140 can automatically cancel the target floor registration command registered at the Yth floor in the designated elevator car 110-2. As such, the elevator car 110-2 will stop operating based on the above-mentioned normal way, avoiding ineffective operation.

[0058] As another alternative embodiment, the first wireless signal module 130 mounted in each elevator car also broadcasts identity information, e.g., a UUID, about the first wireless signal module 130 or the elevator car 110 on which it is mounted. The personal mobile terminal 200 or the movement determination module 250 thereof is further configured to: compare the identity information in the first wireless signal received thereby with identity information about the elevator car 110 which is designated for the personal mobile terminal 200, so as to determine whether the passenger 90 has correspondingly moved into the designated elevator car. The personal mobile terminal 200 or the movement determination module 250 thereof is further configured to: determine that the passenger 90 has failed to move into the designated elevator car 110 when the identity information in the first wireless signal received thereby is inconsistent with the identity information about the elevator car which is designated for the personal mobile terminal 200.

[0059] In the movement determination apparatus 10 or the elevator system 100 according to the above embodiments, the first wireless signal module 130 in each elevator car 110 can keep broadcasting a first wireless signal, and the first wireless signal comprises one or more of: first floor information, connection status information about the first wireless connection 330, traveling direction information, etc. It will be understood that these pieces of information are changing in real time. The personal mobile terminal 200 or the movement determination module 250 thereof can comprehensively determine the movement of the passenger 90 relative to the elevator car 110 based on the change in a plurality of: the first floor information, the connection status information about the first wireless connection 330 and the traveling direction information, and the determination result of the movement may be more accurate.

[0060] It will be understood that the "wireless connection" herein includes "wireless communication", for example, bluetooth communication based on a certain blue-

tooth protocol.

[0061] It will be understood that each block or combination of blocks in the block diagram of Fig. 3 can be implemented by computer program instructions, for example, by a dedicated APP. These computer program instructions can be provided to a processor of a general-purpose computer, of a special-purpose computer or of other programmable data processing devices to construct a machine, so that the processor of the computer or other programmable data processing devices executes these instructions to create a component for implementing a function/operation specified in the one or more block diagrams.

Claims

1. An automatic elevator calling system, comprising:

a first wireless signal module (130-1, 130-2) mounted in an elevator car (110-1, 110-2) and configured to broadcast a first wireless signal, the first wireless signal being a data signal comprising first floor information about where the elevator car (110-1, 110-2) is currently located and current traveling direction information about the elevator car (110-1, 110-2), wherein the traveling direction information comprises: "traveling upwards", "traveling downwards" and "not traveled",

wherein the first wireless signal module (130-1, 130-2) is further configured to receive and determine information about the movement of the passenger relative to the elevator car (110-1, 110-2), and the information about the movement is determined based on a change in the signal strength of the first wireless signal received by a personal mobile terminal (200-1, 200-2) carried by the passenger and a change in the first floor information and traveling direction information,

wherein the first wireless signal module (130-1, 130-2) is further configured to automatically establish a first wireless connection with the personal mobile terminal (200-1, 200-2) based on the first wireless signal, and receive a target floor registration command sent over from the personal mobile terminal (200-1, 200-2) when establishing the first wireless connection.

2. The automatic elevator calling system as claimed in claim 1,

wherein the information about the movement comprises that the passenger has successfully moved into the elevator car (110-1, 110-2) and has successfully taken the elevator, which is determined in any of the following situations:

the signal strength of the received first wireless signal changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value, and the traveling direction information in the received first wireless signal changes from "not traveled" to "traveling upwards" or "traveling downwards";

the signal strength of the received first wireless signal changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value, and the first floor information in the first wireless signal received after the change changes; and

wherein the information about the movement comprises that the passenger has failed to move into the elevator car (110-1, 110-2) or has failed to take the elevator, which is determined in any of the following situations:

the signal strength of the received first wireless signal changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value, and the traveling direction information in the first wireless signal received after the change remains "not traveled" or disappears;

the signal strength of the received first wireless signal changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value, and the first floor information in the first wireless signal received after the change does not change or disappears.

3. The automatic elevator calling system as claimed in claim 1 or 2,

wherein the first wireless signal further comprises connection status information about the first wireless connection, wherein when the signal strength of the first wireless signal received by the personal mobile terminal (200-1, 200-2) is equal to or greater than a first pre-determined value, it correspondingly indicates that a distance from the personal mobile terminal (200-1, 200-2) to the first wireless signal module (130-1, 130-2) is smaller than or equal to a first distance threshold, and the first wireless connection is automatically established and the connection status information changes from "Off" to "On";

wherein the information about the movement comprises that the passenger has successfully moved into the elevator car (110-1, 110-2) and has successfully taken the elevator, which is determined in any of the following situations:

the received connection status information

about the first wireless connection changes from "Off" to "On", and the traveling direction information in the first wireless signal received after the change changes from "not traveled" to "traveling upwards" or "traveling downwards";
the received connection status information about the first wireless connection changes from "Off" to "On", and the first floor information in the first wireless signal received after the change changes; and

wherein the information about the movement comprises that the passenger has failed to move into the elevator car (110-1, 110-2) or has failed to take the elevator, which is determined in any of the following situations:

the received connection status information about the first wireless connection changes from "Off' to "On", and the traveling direction information in the first wireless signal received after the change remains "not traveled" or disappears;
the received connection status information about the first wireless connection changes from "Off" to "On", and the first floor information in the first wireless signal received after the change does not change or disappears.

4. The automatic elevator calling system as claimed in any of claims 1 to 3, wherein the system further comprises:
a second wireless signal module mounted in an elevator landing area, which is configured to broadcast a second wireless signal and automatically establish a second wireless connection with the personal mobile terminal (200-1, 200-2) based on the second wireless signal, and receive an elevator calling request command regarding an elevator calling direction sent over from the personal mobile terminal (200-1, 200-2) when establishing the second wireless connection.

5. The automatic elevator calling system as claimed in any of claims 1 to 4,

wherein the first wireless signal module (130-1, 130-2) is configured to receive movement result information about whether the passenger has correspondingly moved into a designated elevator car (110-1, 110-2), and the movement result information is determined based on comparison of the traveling direction information in the first wireless signal received by the personal mobile terminal (200-1, 200-2) with the elevator calling direction in the elevator calling request command sent out by the personal mobile terminal (200-1, 200-2);
wherein the movement result information is that the passenger has failed to move into the designated elevator car (110-1, 110-2), which is determined in the following situation:
the traveling direction information in the received first wireless signal is inconsistent with the elevator calling direction in the elevator calling request command sent out by the personal mobile terminal (200-1, 200-2).

6. The automatic elevator calling system as claimed in any of claims 1 to 5,

wherein the first wireless signal further comprises identity information corresponding to the first wireless signal module (130-1, 130-2) or the elevator car (110-1, 110-2) on which it is mounted;
and the first wireless signal module (130-1, 130-2) is further configured to receive movement result information about whether the passenger has correspondingly moved into a designated elevator car (110-1, 110-2), and the movement result information is determined based on comparison of the identity information in the first wireless signal received by the personal mobile terminal (200-1, 200-2) with the identity information about the elevator car (110-1, 110-2) designated for the personal mobile terminal (200-1, 200-2);
wherein the movement result information is that the passenger has failed to move into the designated elevator car (110-1, 110-2), which is acquired in the following situation:
the identity information in the received first wireless signal is inconsistent with the identity information about the elevator car (110-1, 110-2) designated for the personal mobile terminal (200-1, 200-2).

7. The automatic elevator calling system as claimed in any of claims 1 to 6, wherein the second wireless signal module and the first wireless signal module (130-1, 130-2) are bluetooth low energy modules/a bluetooth low energy module.

8. An elevator system, **characterized by** comprising:

the automatic elevator calling system as claimed in any one of claims 1 to 7; and
an elevator controller (140) for controlling running of one or more elevator cars (110-1, 110-2) in the elevator system (100);
wherein the elevator controller (140) is configured to judge, based on the information about the movement, whether to cancel a target floor registration command registered in the elevator

car (110-1, 110-2) and corresponding to the personal mobile terminal (200-1, 200-2) of the passenger.

9. A method for determining a movement of a passenger relative to an elevator car (110-1, 110-2) by a personal mobile terminal (200-1, 200-2) carried by the passenger, the method **characterized by** comprising:

receiving, by the personal mobile terminal (200-1, 200-2), a first wireless signal broadcast from the elevator car (110-1, 110-2) when a distance condition is satisfied, wherein the first wireless signal is a data signal comprising first floor information about where the elevator car (110-1, 110-2) is currently located and current traveling direction information about the elevator car (110-1, 110-2), wherein the traveling direction information comprises: "traveling upwards", "traveling downwards" and "not traveled";
determining, by the personal mobile terminal (200-1, 200-2), the signal strength of the received first wireless signal; and
determining, by the personal mobile terminal (200-1, 200-2), the movement of the passenger relative to the elevator car (110-1, 110-2) based on a change in the signal strength of the received first wireless signal and the first floor information and a change in the first floor information and traveling direction information.

10. The method as claimed in claim 9,

wherein in the step of determining the movement, it is determined that the passenger has successfully moved into the elevator car (110-1, 110-2) and has successfully taken the elevator in case:

the signal strength of the received first wireless signal changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value and the traveling direction information in the received first wireless signal changes from "not traveled" to "traveling upwards" or "traveling downwards"; or
the signal strength of the received first wireless signal changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value and the first floor information in the first wireless signal received after the change changes; and

wherein in the step of determining the movement, it is determined that the passenger has failed to move into the elevator car (110-1, 110-2) or has failed to take the elevator in case:

the signal strength of the received first wireless signal changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value and the traveling direction information in the first wireless signal received after the change remains "not traveled" or disappears; or
the signal strength of the received first wireless signal changes from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value and the first floor information in the first wireless signal received after the change does not change or disappears;

wherein the signal strength of the first wireless signal changing from zero or relatively weak to equal to or greater than a relatively strong first pre-determined value refers to approximately gradually changing from zero or relatively weak to equal to or greater than the relatively strong pre-determined value.

11. The method as claimed in claim 9 or 10,

wherein the first wireless signal further comprises connection status information about a first wireless connection used for sending a target floor registration command, wherein the first wireless connection is automatically established and the connection status information changes from "Off" to "On" when the signal strength of the received first wireless signal is equal to or greater than a first pre-determined value;
wherein in the step of determining the movement, it is determined that the passenger has successfully moved into the elevator car (110-1, 110-2) and has successfully taken the elevator in case:

the received connection status information about the first wireless connection changes from "Off" to "On" and the traveling direction information in the first wireless signal received after the change changes from "not traveled" to "traveling upwards" or "traveling downwards"; or
the received connection status information about the first wireless connection changes from "Off" to "On" and the first floor information in the first wireless signal received after the change changes; and

wherein in the step of determining the movement, it is determined that the passenger has failed to move into the elevator car (110-1,

110-2) or has failed to take the elevator in case:

the received connection status information about the first wireless connection changes from "Off" to "On" and the traveling direction information in the first wireless signal received after the change remains "not traveled" or disappears; or
the received connection status information about the first wireless connection changes from "Off' to "On" and the first floor information in the first wireless signal received after the change does not change or disappears.

12. The method as claimed in any of claims 9 to 11, further comprising a step of:
when it is determined that the passenger has failed to move into the elevator car (110-1, 110-2) or has failed to take the elevator, actively establishing a fourth wireless connection with a corresponding second wireless signal module mounted in an elevator landing area so as to send a determination result that the passenger has failed to move into the elevator car (110-1, 110-2) or has failed to take the elevator.

13. The method as claimed in any of claims 9 to 12,

wherein in the step of determining the movement, the traveling direction information in the received first wireless signal is compared with the elevator calling direction in an elevator calling request command sent out by the passenger, and if the traveling direction information in the received first wireless signal is inconsistent with the elevator calling direction in the elevator calling request command sent out by the passenger, it is determined that the passenger has failed to move into a designated elevator car (110-1, 110-2); and
wherein the first wireless signal further comprises identity information corresponding to the elevator car (110-1, 110-2); and in the step of determining the movement, the received identity information is compared with identity information about a designated elevator car (110-1, 110-2), and if the received identity information in the first wireless signal is inconsistent with the identity information about the designated elevator car (110-1, 110-2), it is determined that the passenger has failed to move into the designated elevator car.

14. The method as claimed in any of claims 9 to 13, further comprising a step of:
when it is determined that the passenger has failed to move into the elevator car (110-1, 110-2) or has failed to take the elevator, actively establishing a third wireless connection with a corresponding first wireless signal module (130-1, 130-2) so as to send a determination result that the passenger has failed to move into the designated elevator car.

15. A personal mobile terminal (200-1, 200-2) for determining a movement of a passenger relative to an elevator car (110-1, 110-2), the personal mobile terminal (200-1, 200-2) comprising:

a wireless communication module (210) for receiving a first wireless signal broadcast from the elevator car (110-1, 110-2) when a distance condition is satisfied, wherein the first wireless signal is a data signal comprising first floor information about where the elevator car (110-1, 110-2) is currently located and current traveling direction information about the elevator car (110-1, 110-2), wherein the traveling direction information comprises: "traveling upwards", "traveling downwards" and "not traveled";
a signal strength determination module (230) for determining the signal strength of the received first wireless signal; and
a movement determination module (250) for determining the movement of the passenger relative to the elevator car (110-1, 110-2) based on a change in the signal strength of the received first wireless signal and the first floor information and a change in the first floor information and traveling direction information.

Patentansprüche

1. Automatisches Aufzugsrufsystem, umfassend:

ein erstes drahtloses Signalmodul (130-1, 130-2), das in einer Aufzugskabine (110-1, 110-2) montiert und dazu konfiguriert ist, ein erstes drahtloses Signal zu übertragen, wobei das erste drahtlose Signal ein Datensignal ist, das erste Stockwerkinformationen darüber, wo sich die Aufzugskabine (110-1, 110-2) gerade befindet, und aktuelle Fahrtrichtungsinformationen über die Aufzugskabine (110-1, 110-2) umfasst, wobei die Fahrtrichtungsinformationen Folgendes umfassen: "aufwärts fahrend", "abwärts fahrend" und "nicht gefahren",
wobei das erste drahtlose Signalmodul (130-1, 130-2) ferner dazu konfiguriert ist, Informationen über die Bewegung des Fahrgastes relativ zu der Aufzugskabine (110-1, 110-2) zu empfangen und zu bestimmen, und die Informationen über die Bewegung basierend auf einen Wechsel der Signalstärke des ersten drahtlosen Signals, das von einem persönlichen mobilen Endgerät (200-1, 200-2), das von dem Fahrgast

getragen wird, empfangen wird, und einem Wechsel der ersten Stockwerkinformationen und Fahrtrichtungsinformationen bestimmt werden,
wobei das erste drahtlose Signalmodul (130-1, 130-2) ferner dazu konfiguriert ist, automatisch eine erste drahtlose Verbindung mit dem persönlichen mobilen Endgerät (200-1, 200-2) basierend auf dem ersten drahtlosen Signal einzurichten und einen Zielstockwerk-Registrierungsbefehl zu empfangen, der von dem persönlichen mobilen Endgerät (200-1, 200-2) bei dem Einrichten der ersten drahtlosen Verbindung gesendet wird.

2. Automatisches Aufzugsrufsystem nach Anspruch 1, wobei die Informationen über die Bewegung umfassen, dass der Fahrgast erfolgreich in die Aufzugskabine (110-1, 110-2) eingestiegen ist und den Aufzug erfolgreich genommen hat, was in einer der folgenden Situationen bestimmt wird:

die Signalstärke des empfangenen ersten drahtlosen Signals wechselt von Null oder relativ schwach auf gleich oder größer als ein relativ starker erster vorbestimmter Wert, und die Fahrtrichtungsinformationen in dem empfangenen ersten drahtlosen Signal wechseln von "nicht gefahren", auf "aufwärts fahrend" oder "abwärts fahrend";
die Signalstärke des empfangenen ersten drahtlosen Signals wechselt von Null oder relativ schwach auf gleich oder größer als ein relativ starker erster vorbestimmter Wert, und die ersten Stockwerkinformationen in dem nach dem Wechsel empfangenen ersten drahtlosen Signal wechseln; und
wobei die Informationen über die Bewegung umfassen, dass der Fahrgast nicht in die Aufzugskabine (110-1, 110-2) eingestiegen ist oder den Aufzug nicht genommen hat, was in einer der folgenden Situationen bestimmt wird:

die Signalstärke des empfangenen ersten drahtlosen Signals wechselt von Null oder relativ schwach auf gleich oder größer als ein relativ starker erster vorbestimmter Wert, und die Fahrtrichtungsinformationen in dem nach dem Wechsel empfangenen ersten drahtlosen Signal verbleiben "nicht gefahren" oder verschwinden;
die Signalstärke des empfangenen ersten drahtlosen Signals wechselt von Null oder relativ schwach auf gleich oder größer als ein relativ starker erster vorbestimmter Wert, und die ersten Stockwerkinformationen in dem nach dem Wechsel empfangenen ersten drahtlosen Signal wechseln nicht oder verschwinden.

3. Automatisches Aufzugsrufsystem nach Anspruch 1 oder 2,
wobei das erste drahtlose Signal ferner Verbindungsstatusinformationen über die erste drahtlose Verbindung umfasst, wobei, wenn die Signalstärke des ersten drahtlosen Signals, das von dem persönlichen mobilen Endgerät (200-1, 200-2) empfangen wird, gleich oder größer als ein erster vorbestimmter Wert ist, es entsprechend anzeigt, dass ein Abstand von dem persönlichen mobilen Endgerät (200-1, 200-2) zu dem ersten drahtlosen Signalmodul (130-1, 130-2) kleiner als oder gleich einem ersten Abstandsschwellenwert ist, und die erste drahtlose Verbindung automatisch eingerichtet wird und die Verbindungsstatusinformationen von "Aus" zu "Ein" wechseln; wobei die Informationen über die Bewegung umfassen, dass der Fahrgast erfolgreich in die Aufzugskabine (110-1, 110-2) eingestiegen ist und den Aufzug erfolgreich genommen hat, was in einer der folgenden Situationen bestimmt wird:

die empfangenen Verbindungsstatusinformationen über die erste drahtlose Verbindung wechselt von "Aus" auf "Ein", und die Fahrtrichtungsinformationen in dem ersten drahtlosen Signal, das nach dem Wechsel empfangen wird, wechseln von "nicht gefahren" auf "aufwärts fahrend" oder "abwärts fahrend";
die empfangenen Verbindungsstatusinformationen über die erste drahtlose Verbindung wechseln von "Aus" auf "Ein", und die ersten Stockwerkinformationen in dem ersten drahtlosen Signal, das nach dem Wechsel empfangen wird, wechseln; und
wobei die Informationen über die Bewegung umfassen, dass der Fahrgast nicht in die Aufzugskabine (110-1, 110-2) eingestiegen ist oder den Aufzug nicht genommen hat, was in einer der folgenden Situationen bestimmt wird:

die empfangenen Verbindungsstatusinformationen über die erste drahtlose Verbindung wechseln von "Aus" auf "Ein", und die Fahrtrichtungsinformationen im ersten drahtlosen Signal, das nach dem Wechsel empfangen wird, verbleiben "nicht gefahren" oder verschwinden;
die empfangenen Verbindungsstatusinformationen über die erste drahtlose Verbindung wechseln von "Aus" auf "Ein", und die ersten Stockwerkinformationen in dem ersten drahtlosen Signal, das nach dem Wechsel empfangen wird, wechseln nicht oder verschwinden.

4. Automatisches Aufzugsrufsystem nach einem der

Ansprüche 1 bis 3, wobei das System ferner Folgendes umfasst:
ein zweites drahtloses Signalmodul, das in einem Aufzug-Stockwerkbereich montiert ist, das dazu konfiguriert ist, ein zweites drahtloses Signal auszustrahlen und automatisch eine zweite drahtlose Verbindung mit dem persönlichen mobilen Endgerät (200-1, 200-2) basierend auf dem zweiten drahtlosen Signal einzurichten, und einen Aufzugsrufanforderungsbefehl bezüglich einer Aufzugsrufrichtung zu empfangen, der von dem persönlichen mobilen Endgerät (200-1, 200-2) gesendet wird, wenn die zweite drahtlose Verbindung eingerichtet wird.

5. Automatisches Aufzugsrufsystem nach einem der Ansprüche 1 bis 4,
wobei das erste drahtlose Signalmodul (130-1, 130-2) dazu konfiguriert ist, Bewegungsergebnisinformationen darüber zu empfangen, ob sich der Fahrgast entsprechend in eine bestimmte Aufzugskabine (110-1, 110-2) bewegt hat, und die Bewegungsergebnisinformationen basierend auf einem Vergleich der Fahrtrichtungsinformationen in dem ersten drahtlosen Signal, das von dem persönlichen mobilen Endgerät (200-1, 200-2) empfangen wird, mit der Aufzugsrufrichtung in dem Aufzugsrufanforderungsbefehl, der von dem persönlichen mobilen Endgerät (200-1, 200-2) ausgesendet wird, bestimmt werden; wobei die Bewegungsergebnisinformationen besagen, dass der Fahrgast nicht in die bestimmte Aufzugskabine (110-1, 110-2) eingestiegen ist, was in der folgenden Situation bestimmt wird:
die Fahrtrichtungsinformationen in dem empfangenen ersten Signal stimmen nicht mit der Aufzugsrufrichtung in dem von dem persönlichen mobilen Endgerät (200-1, 200-2) gesendeten Aufzugsrufbefehl überein.

6. Automatisches Aufzugsrufsystem nach einem der Ansprüche 1 bis 5,

wobei das erste drahtlose Signal ferner Identitätsinformationen umfasst, die dem ersten drahtlosen Signalmodul (130-1, 130-2) oder der Aufzugskabine (110-1, 110-2), an der es montiert ist, entsprechen; und das erste drahtlose Signalmodul (130-1, 130-2) ferner dazu konfiguriert ist, Bewegungsergebnisinformationen darüber zu empfangen, ob sich der Fahrgast entsprechend in eine bestimmte Aufzugskabine (110-1, 110-2) bewegt hat, und die Bewegungsergebnisinformationen basierend auf einem Vergleich der Identitätsinformationen in dem ersten drahtlosen Signal, das von dem persönlichen mobilen Endgerät (200-1, 200-2) empfangen wird, mit den Identitätsinformationen über die Aufzugskabine (110-1, 110-2), die für das persönliche mobile Endgerät (200-1, 200-2) bestimmt ist, bestimmt werden;
wobei die Bewegungsergebnisinformationen besagen, dass der Fahrgast nicht in die bestimmte Aufzugskabine (110-1, 110-2) eingestiegen ist, was in der folgenden Situation erfasst wird:
die Identitätsinformationen stimmen nicht mit den Identitätsinformationen über die Aufzugskabine (110-1, 110-2) überein, die für das persönliche mobile Endgerät (200-1, 200-2) bestimmt sind.

7. Automatisches Aufzugsrufsystem nach einem der Ansprüche 1 bis 6, wobei das zweite drahtlose Signalmodul und das erste drahtlose Signalmodul (130-1, 130-2) Bluetooth-Low-Energy-Module/ein Bluetooth-Low-Energy-Modul sind/ist.

8. Aufzugssystem, **dadurch gekennzeichnet, dass** es Folgendes umfasst:

das automatische Aufzugsrufsystem nach einem der Ansprüche 1 bis 7; und
eine Aufzugssteuerung (140) zum Steuern des Fahrens einer oder mehrerer Aufzugskabinen (110-1, 110-2) in dem Aufzugssystem (100) ;
wobei die Aufzugssteuerung (140) dazu konfiguriert ist, basierend auf den Informationen über die Bewegung zu beurteilen, ob ein in der Aufzugskabine (110-1, 110-2) registrierter und dem persönlichen mobilen Endgerät (200-1, 200-2) des Fahrgastes entsprechender Zielstockwerk-Registrierungsbefehl aufgehoben werden soll.

9. Verfahren zum Bestimmen einer Bewegung eines Fahrgastes relativ zu einer Aufzugskabine (110-1, 110-2) durch ein persönliches mobiles Endgerät (200-1, 200-2), das von dem Fahrgast getragen wird, wobei das Verfahren **dadurch gekennzeichnet ist, dass** es Folgendes umfasst:

Empfangen eines ersten drahtlosen Signals, das von der Aufzugskabine (110-1, 110-2) übertragen wird, durch das persönliche mobile Endgerät (200-1, 200-2), wenn eine Abstandsbedingung erfüllt ist, wobei das erste drahtlose Signal ein Datensignal ist, das erste Stockwerkinformationen darüber, wo sich die Aufzugskabine (110-1, 110-2) gerade befindet, und aktuelle Fahrtrichtungsinformationen über die Aufzugskabine (110-1, 110-2) umfasst, wobei die Fahrtrichtungsinformationen Folgendes umfassen: "aufwärts fahrend", "abwärts fahrend" und "nicht gefahren";
Bestimmen der Signalstärke des empfangenen ersten drahtlosen Signals durch das persönliche mobile Endgerät (200-1, 200-2); und
Bestimmen der Bewegung des Fahrgastes re-

lativ zu der Aufzugskabine (110-1, 110-2) durch das persönliche mobile Endgerät (200-1, 200-2) basierend auf einer Änderung in der Signalstärke des empfangenen ersten drahtlosen Signals und der ersten Stockwerkinformationen und einer Änderung in den ersten Stockwerkinformationen und Fahrtrichtungsinformationen.

10. Verfahren nach Anspruch 9,
wobei in dem Schritt des Bestimmens der Bewegung bestimmt wird, dass sich der Fahrgast erfolgreich in die Aufzugskabine (110-1, 110-2) bewegt hat und den Aufzug in den Fällen erfolgreich genommen hat:

die Signalstärke des empfangenen ersten drahtlosen Signals wechselt von Null oder relativ schwach auf gleich oder größer als ein relativ starker erster vorbestimmter Wert, und die Fahrtrichtungsinformationen in dem empfangenen ersten drahtlosen Signal wechseln von "nicht gefahren", auf "aufwärts fahrend" oder "abwärts fahrend"; oder
die Signalstärke des empfangenen ersten drahtlosen Signals wechselt von Null oder relativ schwach auf gleich oder größer als ein relativ starker erster vorbestimmter Wert, und die ersten Stockwerkinformationen in dem nach dem Wechsel empfangenen ersten drahtlosen Signal wechseln; und
wobei in dem Schritt des Bestimmens der Bewegung bestimmt wird, dass der Fahrgast nicht in die Aufzugskabine (110-1, 110-2) eingestiegen ist oder den Aufzug in den Fällen nicht genommen hat:

die Signalstärke des empfangenen ersten drahtlosen Signals wechselt von Null oder relativ schwach auf gleich oder größer als ein relativ starker erster vorbestimmter Wert, und die Fahrtrichtungsinformationen in dem nach dem Wechsel empfangenen ersten drahtlosen Signal verbleiben "nicht gefahren" oder verschwinden; oder
die Signalstärke des empfangenen ersten drahtlosen Signals wechselt von Null oder relativ schwach auf gleich oder größer als ein relativ starker erster vorbestimmter Wert, und die ersten Stockwerkinformationen in dem nach dem Wechsel empfangenen ersten drahtlosen Signal wechseln nicht oder verschwinden;
wobei die Signalstärke des ersten drahtlosen Signals, die von Null oder relativ schwach auf gleich oder größer als ein relativ starker erster vorbestimmter Wert wechselt, sich auf eine allmähliche Änderung von Null oder relativ schwach auf gleich oder größer als der relativ starke vorbestimmte Wert bezieht.

11. Verfahren nach Anspruch 9 oder 10,
wobei das erste drahtlose Signal weiterhin Verbindungsstatusinformationen über eine erste drahtlose Verbindung umfasst, die zum Senden eines Zielgeschoss-Registrierungsbefehls verwendet wird, wobei die erste drahtlose Verbindung automatisch hergestellt wird und die Verbindungsstatusinformationen von "Aus" auf "Ein" wechseln, wenn die Signalstärke ansteigt des empfangenen ersten drahtlosen Signals gleich oder größer als ein erster vorgegebener Wert ist; wobei in dem Schritt des Bestimmens der Bewegung bestimmt wird, dass sich der Fahrgast erfolgreich in die Aufzugskabine (110-1, 110-2) bewegt hat und den Aufzug in den Fällen erfolgreich genommen hat:

die empfangenen Verbindungsstatusinformationen über die erste drahtlose Verbindung von "Aus" auf "Ein" wechseln, und die Fahrtrichtungsinformationen in dem ersten drahtlosen Signal, das nach dem Wechsel empfangen wird, von "nicht gefahren" auf "aufwärts fahrend" oder "abwärts fahrend" wechseln; oder
die empfangenen Verbindungsstatusinformationen über die erste drahtlose Verbindung von "Aus" auf "Ein" wechseln, und die ersten Stockwerkinformationen in dem ersten drahtlosen Signal, das nach dem Wechsel empfangen wird, wechseln; und
wobei in dem Schritt des Bestimmens der Bewegung bestimmt wird, dass der Fahrgast nicht in die Aufzugskabine (110-1, 110-2) eingestiegen ist oder den Aufzug in den Fällen nicht genommen hat:

die empfangenen Verbindungsstatusinformationen über die erste drahtlose Verbindung von "Aus" auf "Ein" wechselen, und die Fahrtrichtungsinformationen im ersten drahtlosen Signal, das nach dem Wechsel empfangen wird, "nicht gefahren" verbleiben oder verschwinden; oder
die empfangenen Verbindungsstatusinformationen über die erste drahtlose Verbindung von "Aus" auf "Ein" wechseln, und die ersten Stockwerkinformationen in dem ersten drahtlosen Signal, das nach dem Wechsel empfangen wird, wechseln nicht oder verschwinden.

12. Verfahren nach einem der Ansprüche 9 bis 11, das ferner einen folgenden Schritt umfasst:
wenn bestimmt wird, dass der Fahrgast nicht in die Aufzugskabine (110-1, 110-2) eingestiegen ist oder den Aufzug nicht genommen hat, aktives Einrichten einer vierten drahtlosen Verbindung mit einem ent-

sprechenden zweiten drahtlosen Signalmodul, das in einem Aufzug-Stockwerkbereich montiert ist, um ein Bestimmungsergebnis zu senden, dass der Fahrgast nicht in die Aufzugskabine (110-1, 110-2) eingestiegen ist oder den Aufzug nicht genommen hat.

13. Verfahren nach einem der Ansprüche 9 bis 12,

wobei in dem Schritt des Bestimmens der Bewegung die Fahrtrichtungsinformationen in dem empfangenen ersten drahtlosen Signal mit der Aufzugsrufrichtung in einem von dem Fahrgast ausgesandten Aufzugsrufanforderungsbefehl verglichen werden, und wenn die Fahrtrichtungsinformationen in dem empfangenen ersten drahtlosen Signal nicht mit der Aufzugsrufrichtung in dem von dem Fahrgast ausgesandten Aufzugsrufanforderungsbefehl übereinstimmen, bestimmt wird, dass der Fahrgast nicht in eine bestimmte Aufzugskabine (110-1, 110-2) eingestiegen ist; und
wobei das erste drahtlose Signal ferner Identitätsinformationen umfasst, die der Aufzugskabine (110-1, 110-2) entsprechen; und in dem Schritt des Bestimmens der Bewegung die empfangenen Identitätsinformationen mit Identitätsinformationen über eine bestimmte Aufzugskabine (110-1, 110-2) verglichen werden, und wenn die empfangenen Identitätsinformationen in dem ersten drahtlosen Signal nicht mit den Identitätsinformationen über die bestimmte Aufzugskabine (110-1, 110-2) übereinstimmen, bestimmt wird, dass der Fahrgast nicht in die bestimmte Aufzugskabine eingestiegen ist.

14. Verfahren nach einem der Ansprüche 9 bis 13, das ferner einen folgenden Schritt umfasst:
wenn bestimmt wird, dass der Fahrgast nicht in die Aufzugskabine (110-1, 110-2) eingestiegen ist oder den Aufzug nicht genommen hat, aktives Einrichten einer dritten drahtlosen Verbindung mit einem entsprechenden ersten drahtlosen Signalmodul (130-1, 130-2), um ein Bestimmungsergebnis zu senden, dass der Fahrgast nicht in die bestimmte Aufzugskabine eingestiegen ist.

15. Persönliches mobiles Endgerät (200-1, 200-2) zum Bestimmen einer Bewegung eines Fahrgastes relativ zu einer Aufzugskabine (110-1, 110-2), wobei das persönliche mobile Endgerät (200-1, 200-2) Folgendes umfasst:

ein drahtloses Kommunikationsmodul (210) zum Empfangen eines ersten drahtlosen Signals, das von der Aufzugskabine (110-1, 110-2) übertragen wird, wenn eine Abstandsbedingung erfüllt ist, wobei das erste drahtlose Signal ein Datensignal ist, das erste Stockwerkinformationen darüber, wo sich die Aufzugskabine (110-1, 110-2) gerade befindet, und aktuelle Fahrtrichtungsinformationen über die Aufzugskabine (110-1, 110-2) umfasst, wobei die Fahrtrichtungsinformationen Folgendes umfassen: "aufwärts fahrend", "abwärts fahrend" und "nicht gefahren";
ein Signalstärkebestimmungsmodul (230) zum Bestimmen der Signalstärke des empfangenen ersten Signals; und
ein Bewegungsbestimmungsmodul (250) zum Bestimmen der Bewegung des Fahrgastes relativ zu der Aufzugskabine (110-1, 110-2) basierend auf einer Änderung in der Signalstärke des empfangenen ersten drahtlosen Signals und der ersten Stockwerkinformationen und einer Änderung in den ersten Stockwerkinformationen und Fahrtrichtungsinformationen.

Revendications

1. Système d'appel automatique d'ascenseur, comprenant :

un premier module de signal sans fil (130-1, 130-2) monté dans une cabine d'ascenseur (110-1, 110-2) et configuré pour diffuser un premier signal sans fil, le premier signal sans fil étant un signal de données comprenant des premières informations d'étage concernant l'emplacement actuel de la cabine d'ascenseur (110-1, 110-2) et des informations de direction de déplacement actuelle concernant la cabine d'ascenseur (110-1, 110-2), dans lequel les informations de direction de déplacement comprennent : « déplacement vers le haut », « déplacement vers le bas » et « pas de déplacement »,
dans lequel le premier module de signal sans fil (130-1, 130-2) est en outre configuré pour recevoir et déterminer des informations concernant le mouvement du passager par rapport à la cabine d'ascenseur (110-1, 110-2), et les informations concernant le mouvement sont déterminées sur la base d'un changement de l'intensité de signal du premier signal sans fil reçu par un terminal mobile personnel (200-1, 200-2) transporté par le passager et d'un changement des premières informations d'étage et des informations de direction de déplacement,
dans lequel le premier module de signal sans fil (130-1, 130-2) est en outre configuré pour établir automatiquement une première connexion sans fil avec le terminal mobile personnel (200-1, 200-2) sur la base du premier signal sans fil, et recevoir une commande d'enregistrement

d'étage cible envoyée depuis le terminal mobile personnel (200-1, 200-2) lors de l'établissement de la première connexion sans fil.

2. Système d'appel automatique d'ascenseur selon la revendication 1,
dans lequel les informations concernant le mouvement comprennent le fait que le passager est entré avec succès dans la cabine d'ascenseur (110-1, 110-2) et a pris l'ascenseur avec succès, ce qui est déterminé dans l'une des situations suivantes :

l'intensité de signal du premier signal sans fil reçu passe de zéro ou relativement faible à supérieure ou égale à une première valeur prédéterminée relativement forte, et les informations de direction de déplacement dans le premier signal sans fil reçu passent de « pas de déplacement » à « déplacement vers le haut » ou « déplacement vers le bas » ;
l'intensité de signal du premier signal sans fil reçu passe de zéro ou relativement faible à supérieure ou égale à une première valeur prédéterminée relativement forte, et les premières informations d'étage dans le premier signal sans fil reçu après le changement changent ; et
dans lequel les informations concernant le mouvement comprennent le fait que le passager n'est pas entré dans la cabine d'ascenseur (110-1, 110-2) ou n'a pas pris l'ascenseur,
ce qui est déterminé dans l'une des situations suivantes :

l'intensité de signal du premier signal sans fil reçu passe de zéro ou relativement faible à supérieure ou égale à une première valeur prédéterminée relativement forte, et les informations de direction de déplacement dans le premier signal sans fil reçu après le changement restent « pas de déplacement » ou disparaissent ;
l'intensité de signal du premier signal sans fil reçu passe de zéro ou relativement faible à supérieure ou égale à une première valeur prédéterminée relativement forte, et les premières informations d'étage dans le premier signal sans fil reçu après le changement ne changent pas ou disparaissent.

3. Système d'appel automatique d'ascenseur selon la revendication 1 ou 2,

dans lequel le premier signal sans fil comprend également des informations d'état de connexion concernant la première connexion sans fil, dans lequel lorsque l'intensité de signal du premier signal sans fil reçu par le terminal mobile personnel (200-1, 200-2) est supérieure ou égale à une première valeur prédéterminée, cela indique en conséquence qu'une distance entre le terminal mobile personnel (200-1, 200-2) et le premier module de signal sans fil (130-1, 130-2) est inférieure ou égale à un premier seuil de distance, et la première connexion sans fil est automatiquement établie et les informations d'état de connexion passent de « Désactivé » à « Activé » ;
dans lequel les informations concernant le mouvement comprennent le fait que le passager est entré avec succès dans la cabine d'ascenseur (110-1, 110-2) et a pris l'ascenseur avec succès, ce qui est déterminé dans l'une des situations suivantes :

les informations d'état de connexion reçues concernant la première connexion sans fil passent de « Désactivé » à « Activé », et les informations de direction de déplacement dans le premier signal sans fil reçu après le changement passent de « pas de déplacement » à « déplacement vers le haut » ou « déplacement vers le bas » ;
les informations d'état de connexion reçues concernant la première connexion sans fil passent de « Désactivé » à « Activé », et les premières informations d'étage dans le premier signal sans fil reçu après le changement changent ; et dans lequel les informations concernant le mouvement comprennent le fait que le passager n'est pas entré dans la cabine d'ascenseur (110-1, 110-2) ou n'a pas pris l'ascenseur, ce qui est déterminé dans l'une des situations suivantes :

les informations d'état de connexion reçues concernant la première connexion sans fil passent de « Désactivé » à « Activé », et les informations de direction de déplacement dans le premier signal sans fil reçu après le changement restent « pas de déplacement » ou disparaissent ;
les informations d'état de connexion reçues concernant la première connexion sans fil passent de « Désactivé » à « Activé », et les premières informations d'étage dans le premier signal sans fil reçu après le changement ne changent pas ou disparaissent.

4. Système d'appel automatique d'ascenseur selon l'une quelconque des revendications 1 à 3, dans lequel le système comprend également :
un second module de signal sans fil monté dans un

palier d'ascenseur, qui est configuré pour diffuser un second signal sans fil et établir automatiquement une deuxième connexion sans fil avec le terminal mobile personnel (200-1, 200-2) sur la base du second signal sans fil, et recevoir une commande de demande d'appel d'ascenseur concernant une direction d'appel d'ascenseur envoyée depuis le terminal mobile personnel (200-1, 200-2) lors de l'établissement de la deuxième connexion sans fil.

5. Système d'appel automatique d'ascenseur selon l'une quelconque des revendications 1 à 4,

dans lequel le premier module de signal sans fil (130-1, 130-2) est configuré pour recevoir des informations de résultat de mouvement indiquant si le passager est bien entré dans une cabine d'ascenseur (110-1, 110-2) désignée, et les informations de résultat de mouvement sont déterminées sur la base d'une comparaison des informations de direction de déplacement dans le premier signal sans fil reçu par le terminal mobile personnel (200-1, 200-2) avec la direction d'appel d'ascenseur dans la commande de demande d'appel d'ascenseur envoyée par le terminal mobile personnel (200-1, 200-2) ;
dans lequel les informations de résultat de mouvement sont que le passager n'est pas entré dans la cabine d'ascenseur (110-1, 110-2) désignée, ce qui est déterminé dans la situation suivante :
les informations de direction de déplacement dans le premier signal sans fil reçu sont incompatibles avec la direction d'appel d'ascenseur dans la commande de demande d'appel d'ascenseur envoyée par le terminal mobile personnel (200-1, 200-2) .

6. Système d'appel automatique d'ascenseur selon l'une quelconque des revendications 1 à 5,

dans lequel le premier signal sans fil comprend également des informations d'identité correspondant au premier module de signal sans fil (130-1, 130-2) ou à la cabine d'ascenseur (110-1, 110-2) sur laquelle il est monté ; et le premier module de signal sans fil (130-1, 130-2) est en outre configuré pour recevoir des informations de résultat de mouvement indiquant si le passager était bien entré dans une cabine d'ascenseur (110-1, 110-2) désignée, et les informations de résultat de mouvement sont déterminées sur la base d'une comparaison des informations d'identité dans le premier signal sans fil reçu par le terminal mobile personnel (200-1, 200-2) avec les informations d'identité concernant la cabine d'ascenseur (110-1, 110-2) désignée pour le terminal mobile personnel (200-1, 200-2) ;
dans lequel les informations de résultat de mouvement sont que le passager n'est pas entré dans la cabine d'ascenseur (110-1, 110-2) désignée, ce qui est acquis dans la situation suivante :
les informations d'identité dans le premier signal sans fil reçu sont incompatibles avec les informations d'identité concernant la cabine d'ascenseur (110-1, 110-2) désignée pour le terminal mobile personnel (200-1, 200-2).

7. Système d'appel automatique d'ascenseur selon l'une quelconque des revendications 1 à 6, dans lequel le second module de signal sans fil et le premier module de signal sans fil (130-1, 130-2) sont des modules Bluetooth basse consommation/un module Bluetooth basse consommation.

8. Système d'ascenseur,**caractérisé en ce qu'**il comprend :

le système d'appel automatique d'ascenseur selon l'une quelconque des revendications 1 à 7 ; et
un dispositif de commande d'ascenseur (140) pour commander le fonctionnement d'une ou plusieurs cabines d'ascenseur (110-1, 110-2) dans le système d'ascenseur (100) ;
dans lequel le dispositif de commande d'ascenseur (140) est configuré pour juger, sur la base des informations concernant le mouvement, s'il convient d'annuler une commande d'enregistrement d'étage cible enregistrée dans la cabine d'ascenseur (110-1, 110-2) et correspondant au terminal mobile personnel (200-1, 200-2) du passager.

9. Procédé de détermination d'un mouvement d'un passager par rapport à une cabine d'ascenseur (110-1, 110-2) par un terminal mobile personnel (200-1, 200-2) transporté par le passager, le procédé étant **caractérisé en ce qu'**il comprend :

la réception, par le terminal mobile personnel (200-1, 200-2), d'un premier signal sans fil diffusé depuis la cabine d'ascenseur (110-1, 110-2) lorsqu'une condition de distance est satisfaite, dans lequel le premier signal sans fil est un signal de données comprenant des premières informations d'étage concernant l'emplacement actuel de la cabine d'ascenseur (110-1, 110-2) et des informations de direction de déplacement actuelle concernant la cabine d'ascenseur (110-1, 110-2), dans lequel les informations de direction de déplacement comprennent : « déplacement vers le haut », « déplacement vers le bas » et « pas de

déplacement » ;
la détermination, par le terminal mobile personnel (200-1, 200-2), de l'intensité de signal du premier signal sans fil reçu ; et
la détermination, par le terminal mobile personnel (200-1, 200-2), du mouvement du passager par rapport à la cabine d'ascenseur (110-1, 110-2) sur la base d'un changement de l'intensité de signal du premier signal sans fil reçu et des premières informations d'étage et d'un changement des premières informations d'étage et des informations de direction de déplacement.

10. Procédé selon la revendication 9,
dans lequel, lors de l'étape de détermination du mouvement, il est déterminé que le passager est entré avec succès dans la cabine d'ascenseur (110-1, 110-2) et a pris l'ascenseur avec succès dans le cas où :

l'intensité de signal du premier signal sans fil reçu passe de zéro ou relativement faible à supérieure ou égale à une première valeur prédéterminée relativement forte et les informations de direction de déplacement dans le premier signal sans fil reçu passent de « pas de déplacement » à « déplacement vers le haut » ou « déplacement vers le bas » ; ou
l'intensité de signal du premier signal sans fil reçu passe de zéro ou relativement faible à supérieure ou égale à une première valeur prédéterminée relativement forte et les premières informations d'étage dans le premier signal sans fil reçu après le changement changent ; et
dans lequel, lors de l'étape de détermination du mouvement, il est déterminé que le passager n'est pas entré dans la cabine d'ascenseur (110-1, 110-2) ou n'a pas pris l'ascenseur dans le cas où :

l'intensité de signal du premier signal sans fil reçu passe de zéro ou relativement faible à supérieure ou égale à une première valeur prédéterminée relativement forte, et les informations de direction de déplacement dans le premier signal sans fil reçu après le changement restent « pas de déplacement » ou disparaissent ; ou
l'intensité de signal du premier signal sans fil reçu passe de zéro ou relativement faible à supérieure ou égale à une première valeur prédéterminée relativement forte et les premières informations d'étage dans le premier signal sans fil reçu après le changement ne changent pas ou disparaissent ; dans lequel le passage de l'intensité de signal du premier signal sans fil de zéro ou relativement faible à supérieure ou égale à une première valeur prédéterminée relativement forte fait référence à un passage approximativement progressif de zéro ou relativement faible à supérieure ou égale à la valeur prédéterminée relativement forte.

11. Procédé selon la revendication 9 ou 10,

dans lequel le premier signal sans fil comprend également des informations d'état de connexion concernant une première connexion sans fil utilisée pour envoyer une commande d'enregistrement d'étage cible, dans lequel la première connexion sans fil est automatiquement établie et les informations d'état de connexion passent de « Désactivé » à « Activé » lorsque l'intensité de signal du premier signal sans fil reçu est supérieure ou égale à une première valeur prédéterminée ;
dans lequel, lors de l'étape de détermination du mouvement, il est déterminé que le passager est entré avec succès dans la cabine d'ascenseur (110-1, 110-2) et a pris l'ascenseur avec succès dans le cas où :

les informations d'état de connexion reçues concernant la première connexion sans fil passent de « Désactivé » à « Activé », et les informations de direction de déplacement dans le premier signal sans fil reçu après le changement passent de « pas de déplacement » à « déplacement vers le haut » ou « déplacement vers le bas » ; ou
les informations d'état de connexion reçues concernant la première connexion sans fil passent de « Désactivé » à « Activé » et les premières informations d'étage dans le premier signal sans fil reçu après le changement changent ; et dans lequel, lors de l'étape de détermination du mouvement, il est déterminé que le passager n'est pas entré dans la cabine d'ascenseur (110-1, 110-2) ou n'a pas pris l'ascenseur dans le cas où :
les informations d'état de connexion reçues concernant la première connexion sans fil passent de « Désactivé » à « Activé » et les informations de direction de déplacement dans le premier signal sans fil reçu après le changement restent « pas de déplacement » ou disparaissent ; ou
les informations d'état de connexion reçues concernant la première connexion sans fil passent de « Désactivé » à « Activé », et les premières informations d'étage dans le premier signal sans fil reçu après le changement ne changent pas ou disparaissent.

12. Procédé selon l'une quelconque des revendications 9 à 11, comprenant également une étape consistant à :
lorsqu'il est déterminé que le passager n'est pas entré dans la cabine d'ascenseur (110-1, 110-2) ou n'a pas pris l'ascenseur, établir activement une quatrième connexion sans fil avec un second module de signal sans fil correspondant monté dans un palier d'ascenseur de manière à envoyer un résultat de détermination selon lequel le passager n'est pas entré dans la cabine d'ascenseur (110-1, 110-2) ou n'a pas pris l'ascenseur.

13. Procédé selon l'une quelconque des revendications 9 à 12,

dans lequel, lors de l'étape de détermination du mouvement, les informations de direction de déplacement dans le premier signal sans fil reçu sont comparées à la direction d'appel d'ascenseur dans une commande de demande d'appel d'ascenseur envoyée par le passager, et si les informations de direction de déplacement dans le premier signal sans fil reçu sont incompatibles avec la direction d'appel d'ascenseur dans la commande de demande d'appel d'ascenseur envoyée par le passager, il est déterminé que le passager n'est pas entré dans une cabine d'ascenseur (110-1, 110-2)désignée ; et
dans lequel le premier signal sans fil comprend également des informations d'identité correspondant à la cabine d'ascenseur (110-1, 110-2) ; et lors de l'étape de détermination du mouvement, les informations d'identité reçues sont comparées aux informations d'identité concernant une cabine d'ascenseur (110-1, 110-2) désignée, et si les informations d'identité reçues dans le premier signal sans fil sont incompatibles avec les informations d'identité concernant la cabine d'ascenseur (110-1, 110-2) désignée, il est déterminé que le passager n'est pas entré dans la cabine d'ascenseur désignée.

14. Procédé selon l'une quelconque des revendications 9 à 13, comprenant également une étape consistant à :
lorsqu'il est déterminé que le passager n'est pas entré dans la cabine d'ascenseur (110-1, 110-2) ou n'a pas pris l'ascenseur, établir activement une troisième connexion sans fil avec un premier module de signal sans fil (130-1, 130-2) correspondant de manière à envoyer un résultat de détermination indiquant que le passager n'est pas entré dans la cabine d'ascenseur désignée.

15. Terminal mobile personnel (200-1, 200-2) pour déterminer un mouvement d'un passager par rapport à une cabine d'ascenseur (110-1, 110-2), le terminal mobile personnel (200-1, 200-2) comprenant :

un module de communication sans fil (210) pour recevoir un premier signal sans fil diffusé depuis la cabine d'ascenseur (110-1, 110-2) lorsqu'une condition de distance est satisfaite, dans lequel le premier signal sans fil est un signal de données comprenant des premières informations d'étage concernant l'emplacement actuel de la cabine d'ascenseur (110-1, 110-2) et des informations de direction de déplacement actuelle concernant la cabine d'ascenseur (110-1, 110-2), dans lequel les informations de direction de déplacement comprennent : « déplacement vers le haut », « déplacement vers le bas » et « pas de déplacement » ;
un module de détermination d'intensité de signal (230) pour déterminer l'intensité de signal du premier signal sans fil reçu ; et
un module de détermination de mouvement (250) pour déterminer le mouvement du passager par rapport à la cabine d'ascenseur (110-1, 110-2) sur la base d'un changement de l'intensité de signal du premier signal sans fil reçu et des premières informations d'étage et d'un changement des premières informations d'étage et des informations de direction de déplacement.

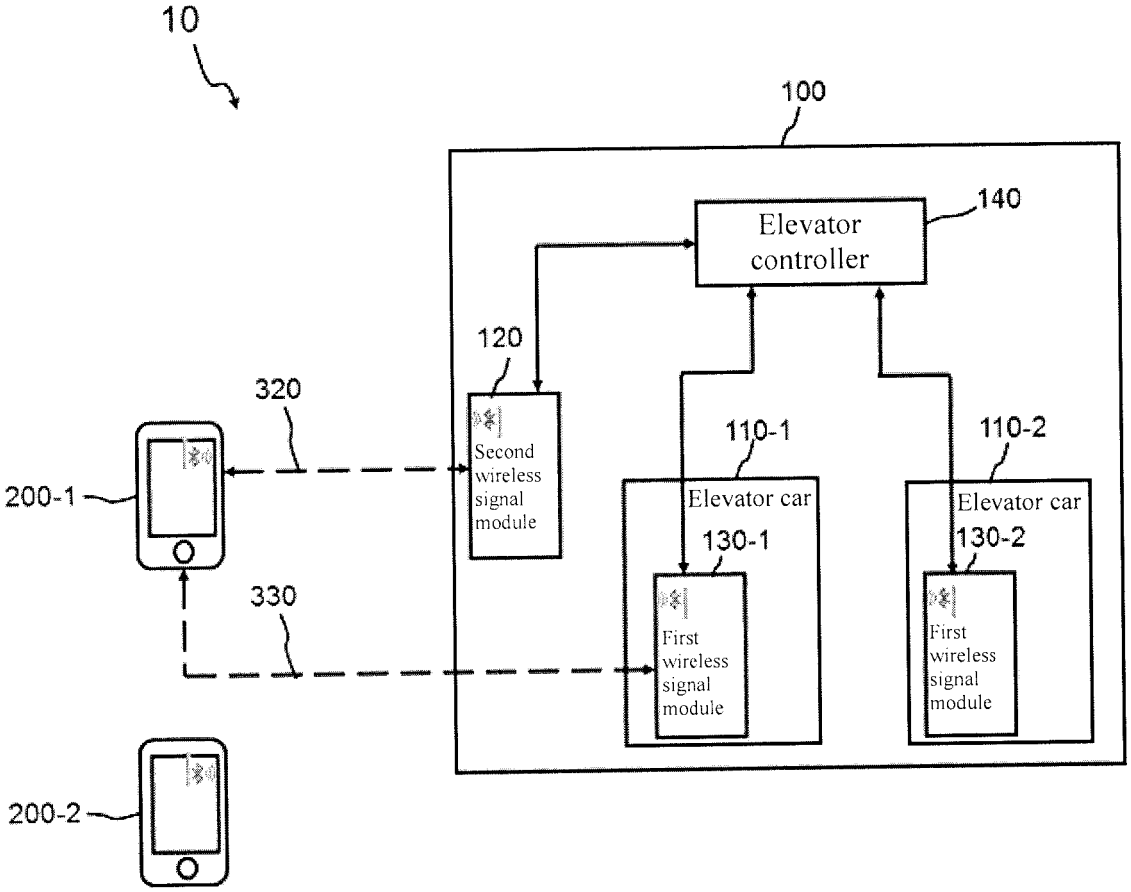
10
100
Elevator controller
140
120
320
Second wireless signal module
110-1
110-2
Elevator car
Elevator car
130-1
130-2
200-1
330
First wireless signal module
First wireless signal module
200-2

Fig. 1

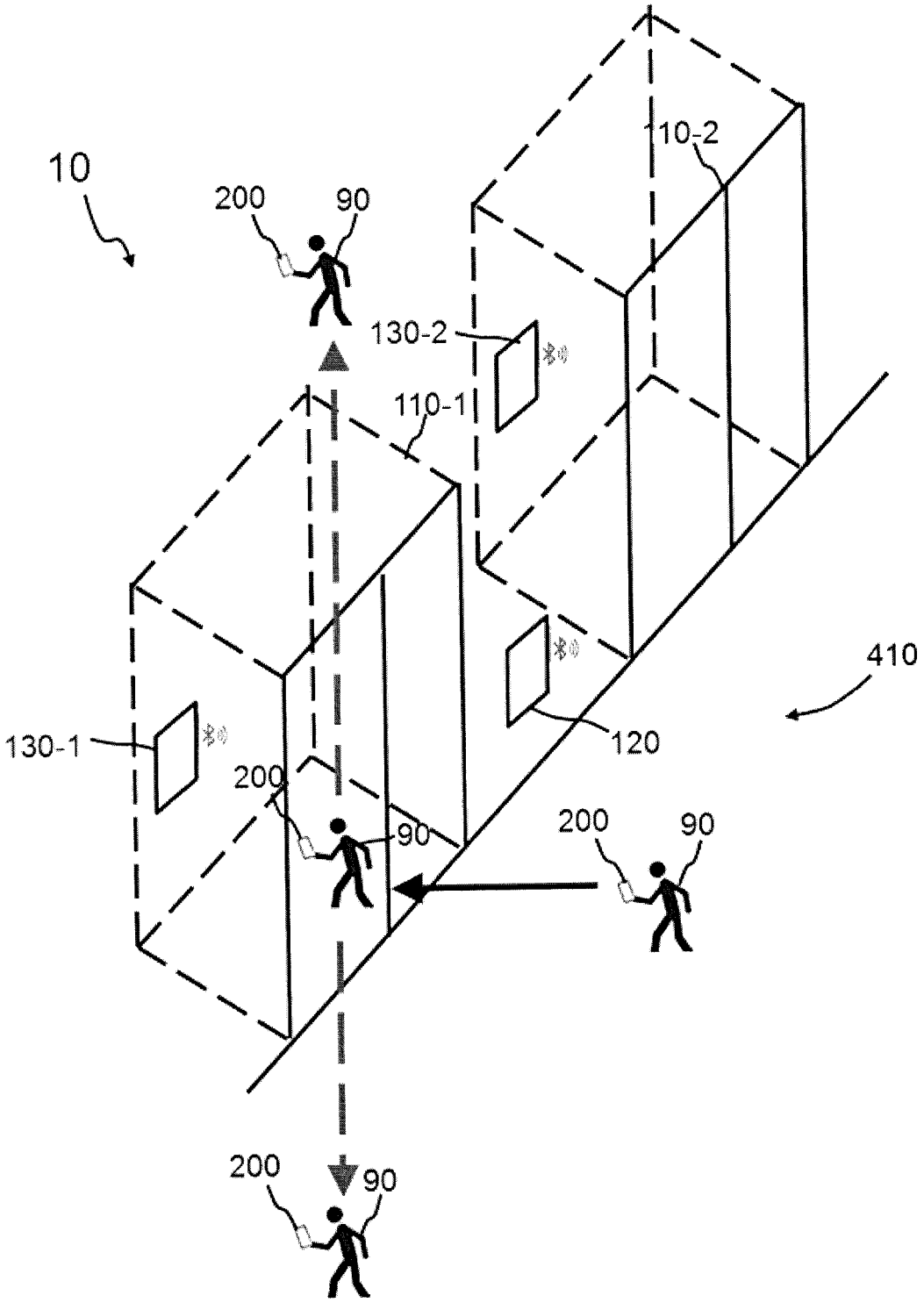

Fig. 2

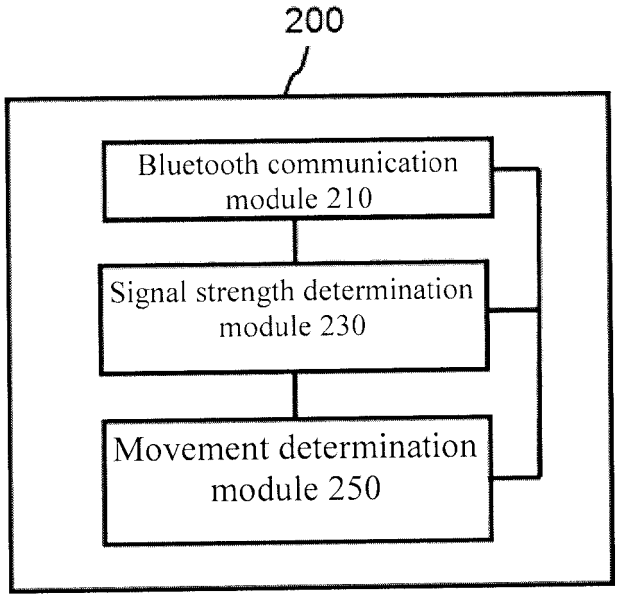
200
Bluetooth communication module 210
Signal strength determination module 230
Movement determination module 250

Fig. 3

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 204980676 U **[0004]**