

Description

[Title of the Invention] Elevator control system and elevator control program

[Technical Field]

[0001]

This invention relates to an elevator control system and an elevator control program. In particular, a user's mobile device on which dedicated application software is installed and a landing area radio device at each floor of the elevator are connected wirelessly based on the wireless signal of each landing area radio device, and a user's mobile device on which dedicated application software is installed and a landing area radio device at each elevator car are connected wirelessly based on the wireless signal of each landing area radio device. The user's mobile device with dedicated application software installed is connected wirelessly to the wireless devices installed in each elevator car based on the wireless signals of the wireless devices in each elevator car, and the elevator car radio devices installed in each elevator car and the elevator car radio devices installed in each elevator car receive command data from the user's mobile device. The individual relays connected to the radio devices at the landing area on each floor and each elevator car radio devices trigger the buttons on the elevator's landing area control panel and the elevator car control panel, and the elevator control program.

[Background Technology]

[0002]

Generally, there is a landing area control panel at the landing area of each floor of an elevator, and an elevator car control panel in each elevator car. The control panels are equipped with microcomputers, microcontrollers, etc. The control boards are installed in the machine room of the elevator. The control board is connected to a control unit installed in the machine room of the elevator. The control unit of the elevator controls the entire elevator.

[0003]

In recent years, for the convenience of elevator users and to prevent the spread of viruses and other infectious agents by contact, a contactless elevator system is being considered that uses a mobile device with wireless communication functions held by the elevator user. The user can control the elevator car transition to the floor where the user is waiting without directly touching the control panel by using dedicated application software installed on the user's mobile device in advance that enables wireless communication with the elevator system. The user can also control the elevator car transition to the floor designated by the user without directly touching the control panel of the car by using the dedicated application software installed on the user's mobile device in advance that can communicate wirelessly with the elevator system.

[0004]

In the elevator system described above, radio devices are installed near the elevator landing area and in the elevator car. The wireless device has the function of transmitting and receiving wireless signals from the user's mobile device with dedicated application software installed, and is connected to the control unit that controls the elevator as a whole. When the user's mobile device and the wireless device installed in the elevator perform wireless communication, the wireless device receives the signal and transmits it to the connected control unit. Upon receiving the signal, the control unit starts controlling the elevator.

[Prior art references]

[Patent documents]

[0005]

[Patent document 1] CN-A-109110593

[Summary of Invention]

[Problem to be solved by the invention]

[0006]

By the way, recent elevator systems are controlled by electronic programs, which are becoming increasingly sophisticated and complex. Networks containing control devices that control the entire elevator are often controlled by proprietary communication protocols. Furthermore, the control boards incorporated in landing area control panels and elevator car control panel control panels may have different connectors and electronic components that make up the control boards for each network function due to changes in functions or additions of functions. Therefore, when changing or adding functions to a completed elevator system, it may be necessary to change and remake the software for each control device specification, or to re-install the program at the actual site. For hardware, it may be necessary to rebuild the entire control board, including the interface, and install it anew.

[0007]

If a completed elevator system has a pre-defined network that is designed to connect radio devices that enable wireless communication with mobile devices held by users, it is easy to install radio devices that are designed to connect to those networks. However, while a wireless device built to the standards of a particular elevator system can be easily adapted to elevators in other buildings that have the same elevator system as that particular elevator system, it cannot easily be adapted to other elevator systems that are not that particular elevator system. It is not easy to adapt the system to other elevator systems that are not same with that particular elevator system. Considering the recent sophistication and complexity of elevator systems, it is difficult to provide versatility to a wireless device that is made according to the standards of a particular elevator system. Therefore, the hurdle for renewing or refurbishing a completed elevator system, which is not a contactless system, into a contactless elevator system capable of wireless communication with a mobile device held by the user, is high. When introducing or operating a non-contact elevator system, not only are renewal and renovation costs associated with the installation of radio devices, but also maintenance work after installation, especially when repair or replacement is required due to malfunctions, is not easy to identify the location of the malfunction, which increases the downtime of the elevator due to each operation, and also increases maintenance and repair costs. This increases the downtime of the elevator as well as the cost of maintenance and repair. Furthermore, when installing a wireless device made according to the standards of a particular elevator system in an old building and elevator that is not compatible with a recent elevator system, the building itself may need to be renovated in conjunction with a major renewal of the elevator, resulting in a large financial burden. This is a problem.

[0008]

The purpose of this invention is to solve the problem of the conventional technology that a wireless device that enables wireless communication with a mobile device held by a user needs to be connected to a control unit that controls the entire elevator, and to easily support existing elevator systems that do not need to be connected to a control unit that controls the entire elevator, and to reduce installation work and The purpose is to provide an elevator control system and an elevator control program that reduces elevator downtime and costs due to maintenance work, repair work and replacement work in case of failure.

[To solve the problem]

[0009]

The present invention consists of the means described below in 1) and 2) to solve the above problems.

In other words, the

1) The user's mobile device and
a landing area radio device installed at each floor of the elevator and
an elevator car radio device installed in each elevator car and
and
the user's mobile device is

a BLE communication unit that receives radio signals and building data in a predetermined frequency band transmitted from a landing area radio device, and radio signals, building data, and floor data in a predetermined frequency band transmitted from a landing area radio device,
 a device that creates command data for destination direction, destination floor, etc. based on received radio signals, building data, and floor data; and
 a pattern storage unit that stores patterned data such as destination direction, destination floor, etc., in advance,
 a BLE UART communication unit that transmits the created command data to the landing area radio device and the elevator car radio device,
 a memory that records radio signals, building data, and floor data received from the landing area radio device and the elevator car radio device; and
 consisting of
 the landing area radio device is
 a BLE communication unit that transmits radio signals in a predetermined frequency band and building data to the user's mobile device in the landing area,
 a BLE UART communication unit that receives command data sent from the user's mobile device in the landing area, and
 a pattern storage unit that stores patterned data such as destination direction, etc., in advance,
 the device determines whether the received command data matches the patterned data stored in the pattern storage unit,
 a general-purpose IO port section that drives a relay that operates the switches on the landing area control panel when the received command data matches the patterned data stored in the pattern storage section, and
 consisting of
 the elevator car radio device is
 a BLE communication unit that transmits radio signals in a predetermined frequency band, building data, and floor data to the user's mobile device in the elevator car,
 a BLE UART communication unit that receives command data sent from the user's mobile device in the elevator car,
 a pattern storage unit where patterned data such as destination floors, etc. are stored in advance,
 the device determines whether the received command data matches the patterned data stored in the pattern storage unit,
 general-purpose IO port section and SPI IO port section that drive relays that operate the switches of the landing area control panel when the received command data matches the patterned data stored in the pattern storage section, and
 consisting of
 the user's mobile device is
 building data to be received from the landing area radio device, and
 building data, and floor data to be received from the elevator car control panel radio equipment,
 based on
 the user-created command data, such as destination direction, destination floor, etc., can be transmitted to the landing area radio device and the elevator car radio device,
 and
 the landing area radio device is
 based on the command data received from the user's mobile device, such as the destination direction, etc.,
 the general-purpose IO port section drives the relays that operate the switches on the landing area control panel,
 the elevator car ascends and descends to the floor where the user is located,
 the elevator car radio system was

based on the command data received from the user's mobile device, such as the destination floor, etc.,

the general-purpose IO port section and the SPI IO port section drive the relays that operate the switches on the elevator car control panel,

the elevator car ascends or descends to the floor that the user designates as the destination floor,

this allows the user to operate the control panel at the landing area and in the elevator car without having to operate the respective control panel,

elevator car transition to the desired floor of

an elevator control system characterized by the following features.

2) The user's mobile device is then

a BLE communication unit that receives radio signals and building data in a predetermined frequency band transmitted from a landing area radio device, and

radio signals, building data, and floor data in a predetermined frequency band transmitted from a landing area radio device,

a device that creates command data for destination direction, destination floor, etc.

based on received radio signals, building data, and floor data; and

a pattern storage unit that stores patterned data such as destination direction, destination floor, etc., in advance,

a BLE UART communication unit that transmits the created command data to the landing area radio device and the elevator car radio device,

a memory that records radio signals, building data, and floor data received from the landing area radio device and the elevator car radio device; and

the landing area radio device is designed to

a BLE communication unit that transmits radio signals in a predetermined frequency band and building data to the user's mobile device in the landing area,

a BLE UART communication unit that receives command data sent from the user's mobile device in the landing area, and

a pattern storage unit that stores patterned data such as destination direction, etc., in advance,

the device determines whether the received command data matches the patterned data stored in the pattern storage unit,

a general-purpose IO port section that drives a relay that operates the switches on the landing area control panel when the received command data matches the patterned data stored in the pattern storage section, and

the elevator car radio system is designed to

a BLE communication unit that transmits radio signals in a predetermined frequency band, building data, and floor data to the user's mobile device in the elevator car,

a BLE UART communication unit that receives command data sent from the user's mobile device in the elevator car,

a pattern storage unit where patterned data such as destination floors, etc. are stored in advance,

the device determines whether the received command data matches the patterned data stored in the pattern storage unit,

general-purpose IO port section and SPI IO port section that drive relays that operate the switches of the landing area control panel when the received command data matches the patterned data stored in the pattern storage section, and

the function of the system is to

the user's mobile device is

building data to be received from the landing area radio device, and

building data, and floor data to be received from the elevator car control panel radio equipment,

based on

the user-created command data, such as destination direction, destination floor, etc., can be transmit to the landing area radio device and the elevator car radio device, and

the landing area radio device is

based on the command data received from the user's mobile device, such as the destination direction, etc.

the general-purpose IO port section drives the relays that operate the switches on the landing area control panel,

the elevator car ascends and descends to the floor where the user is located, the elevator car radio system is

the system uses command data received from the user's mobile device, such as destination direction, destination floor, etc.,

the general-purpose IO port section and the SPI IO port section drive the relays that operate the switches on the elevator car control panel,

the elevator car ascends or descends to the floor that the user designates as the destination floor,

this allows the user to operate the control panel at the landing area and in the elevator car without having to operate the respective control panel,

elevator car transition to the desired floor of

the elevator control program is characterized by the following features.

[Effects of the Invention]

[0010]

According to the present invention, each landing area radio device and each elevator car radio device can control the elevator car without communicating with the elevator control unit that controls the elevator with its own communication protocol, which means that simple installation work is required and installation costs are reduced. The radio devices at each landing area and in each elevator car are versatile and can be easily repaired or replaced after installation due to maintenance work or malfunctions, thus achieves a non-contact elevator control system and elevator control program with a low financial burden.

[Brief description of the drawing].

[0011]

Figure 1: This figure shows an overview of the elevator, landing area radio system, and elevator car control panel radio system to be applied to the example.

Figure 2: An example of the communication method between a landing area radio device and a mobile device installed at each floor of the elevator to be applied to the example.

Figure 3: An example of the communication method between a wireless device installed at an elevator station and a user's mobile device in the elevator station applied to the example.

Figure 4: An example of the communication method between an elevator car radio device and a user's mobile device installed in the elevator car to be applied to the example.

Figure 5: A front view of an example of the image and text information displayed by the dedicated application software installed on the user's mobile device applied in the example.

Figure 6: Front view of an example of the image and text information displayed by the dedicated application software installed on the user's mobile device applied in the example.

Figure 7: Front view of an example of the image and text information displayed by the dedicated application software installed on the user's mobile device applied in the example.

Figure 8: An example of a pattern table programmed in the pattern storage section of the user's mobile device, the pattern storage section of the landing area radio device, and the pattern storage section of the elevator car radio device to be applied to the example.

Figure 9: An example of a destination floor table that is preconfigured in the elevator car radio system applied to the example.

Figure 10: Block diagram showing the functional configuration of the mobile device, landing area radio device, landing area control panel, and alarm applied to the example.

Figure 11: Block diagram showing the functional configuration of the mobile device, elevator car radio device, extended SPI IO port, elevator car control panel, and alarm applied to the example.

Figure 12: Flowchart for explaining the outline of the operation of the landing area radio system and the elevator car radio system applied to the example.

Figure 13: Flowchart to outline the operation of the user's mobile device applied in the example.

[Forms for carrying out the invention]

[0012]

The following is an example of an elevator control system and elevator control program in accordance with the accompanying drawings. In each drawing, identical or equivalent parts are marked with the same symbol. Duplicate explanations will be simplified or omitted as appropriate.

[0013]

Figure 1 shows an overview of the elevator, the landing area radio system 12, and the elevator car control panel radio system 14, as applied to the example.

[0014]

As shown in Figure 1, an elevator is installed in a building. The elevator is equipped with a lift-way 1, a balancing weight 2, a rope 3, a hoist 4, a control unit 5, an elevator car 6, a landing area door 7, and a landing area platform 8. The elevator track 1, for example, is formed to penetrate each floor of a building.

[0015]

The hoist 4 is installed, for example, in a machine room (no given number). Rope 3 is wound around hoist 4. The control unit 5 is installed, for example, in the elevator 1 or in a machine room. The control unit 5 controls the entire elevator, including the opening and closing of the landing area doors 7 and the operation control of the elevator car 6, using the elevator's own protocols. The control unit 5 may, for example, be a device that controls the raising and lowering of a single elevator car 6. The controller 5 may be, for example, a group control device that controls the raising and lowering of multiple elevator carriages 6. The hoist 4 and the balancing weight 2 are raised and lowered by the hoist 4 driven by the control unit 5.

[0016]

Each of the multiple landing areas 8 are located on each floor in the building. A landing area control panel 11 and an emergency alarm A10 are installed near the landing area doors 7 of the landing area 8 on each floor.

[0017]

The destination direction buttons are located on the landing area control panel 11 to specify the destination direction. The destination direction buttons are, for example, the UP button 11a and DOWN button 11b shown in Figure 10 below. Normally, when an elevator user presses a destination direction button (UP button 11a and DOWN button 11b), the destination direction buttons (UP button 11a and DOWN button 11b) on the landing area control panel 11 are switched on. The signal that the destination direction buttons (UP button 11a and DOWN button 11b) are switched on is transmitted to the control unit 5, which performs control using the elevator's own communication protocol. Then, the elevator 6 ascends or descends to the floor where the user is located under the control of the control unit 5.

[0018]

The alarm A10 is equipped with a bell A button 10a, for example, as shown in Figure 10 below. Normally, when an elevator user presses the bell A button 10a, the switch of the bell A button 10a on the alarm A10 is triggered. The signal that the switch of the Bell A button 10a is triggered is transmitted to the control unit 5, which performs control using the elevator's own communication protocol. The alarm A10 then rings under the control of the control unit 5.

[0019]

Within a lift-way 1 in the building, there is an elevator car 6. An elevator car control panel 13 is installed in the elevator car 6.

[0020]

The destination floor buttons are located on the elevator car control panel 13 to specify the destination floor. The destination floor buttons are numbered buttons, such as the 5 buttons (13a) shown in Figure 11 below. Normally, when an elevator user presses a destination floor button (numbered button), the destination floor buttons (numbered buttons) on the elevator car control panel 13 trigger. The signal that the destination floor button (numbered button) is switched on is transmitted to the control unit 5, which controls the elevator using its own communication protocol. Then, the elevator 6 ascends or descends to the floor designated by the user under the control of the control unit 5.

[0021]

In addition, the elevator car control panel 13 is equipped with open/close buttons for opening and closing the landing area door 7. The open/close buttons are, for example, the OPEN button 19 and CLOSE button 20 shown in Figure 11 below. Normally, when an elevator user presses the open/close buttons (OPEN button 19 and CLOSE button 20), the switches of the open/close buttons (OPEN button 19 and CLOSE button 20) located on the elevator car control panel 13 of the boarding ramp are turned on. The signal that the switches of the open/close buttons (OPEN button 19 and CLOSE button 20) are turned on is transmitted to the control unit 5, which controls the elevator using its own communication protocol. Then the landing area door 7 opens or closes.

[0022]

In addition, an emergency alarm B18 is installed on the elevator car control panel 13 of the boarding ramp. The alarm B18 is equipped with, for example, the bell B button 18a shown in Figure 11 below. Normally, when an elevator user presses the Bell B button 18a, the switch of the Bell B button 18a on the alarm B18 turns on. The signal that the switch of the Bell B button 18a is pressed is transmitted to the control unit 5, which performs control using the elevator's own communication protocol. The alarm B18 then sounds under the control of the control unit 5.

[0023]

The user carries a mobile device 9 with Bluetooth (registered trademark) wireless communication capability. The mobile device 9 consists of a small terminal device, for example, a cell phone or a smart phone.

[0024]

In the example, the user can operate the mobile device 9 to control the elevator car 6 transition to the floor where the user is located. The user can also operate the mobile device 9 to control the elevator car 6 to transition to the designated floor. In order for the user to operate the mobile device 9 to transition the elevator car 6 to the floor where the user is, or to transition the elevator car 6 to a floor designated by the user, it is necessary to install special application software on the mobile device 9. The dedicated application software for controlling the elevator car 6 to transition to the floor where the user is, or transitioning the elevator car 6 to the floor designated by the user, was developed for Bluetooth (registered trademark) communication. 12 and between the user's mobile device 9 and the landing area radio device 14. The dedicated application software can be freely downloaded and installed from a website that depends on the operating system (OS) of the mobile device 9.

[0025]

In the following description, the dedicated application software for controlling the elevator car 6 to transition to the floor where the user is located or to the floor specified by the user is referred to as the dedicated APP. The dedicated APP is assumed to be already installed on the mobile device 9 carried by the user. Various images and textual information are displayed on the screen of the user's mobile device 9 by the dedicated APP.

[0026]

The dedicated APP is turned on by the user carrying the mobile device 9. The dedicated APP has a range 900 to detect certain radio signals while it is on. The dedicated APP constantly scans to detect certain radio signals while it is on.

[0027]

In the example, a landing area radio device 12 with wireless communication capability is installed in the landing area control panel 11 at the landing area 8 on each floor. The Bluetooth (registered trademark) short-range wireless communication standard is used for the wireless communication method. The landing area radio device 12 transmits radio signals in a predetermined frequency band. In the following description, the landing area radio device 12 is referred to as landing area radio device A12.

[0028]

In the example, an elevator car radio device 14 with a wireless communication function is installed in the elevator car control panel 13 of the elevator car 6. The Bluetooth (registered trademark) short-range wireless communication standard is used as the wireless communication method. The 14 radio devices transmit radio signals in a predetermined frequency band. In the following description, the elevator car radio device 14 is referred to as elevator car radio device B14.

[0029]

In the example, the range 900 of user's mobile device 9 continues scanning to detect radio signals in a predetermined frequency band transmitted by landing area radio device A12 and radio signals in a predetermined frequency band transmitted by elevator car radio device B14.

[0030]

Short-range wireless communication standards for indoor use such as Bluetooth (registered trademark) generally have a range within which Bluetooth (registered trademark) communication is possible, and the characteristic that Bluetooth (registered trademark) communication is disconnected when the device leaves the range within which Bluetooth (registered trademark) communication is possible is used in the example. The example also makes use of this characteristic. Therefore, while the dedicated APP is on, Bluetooth (registered trademark) communication is disconnected when the user's mobile device 9 leaves the range where Bluetooth (registered trademark) communication with the landing area radio device A12 and the elevator car radio device B14 is possible. Bluetooth (registered trademark) communication is disconnected when the dedicated APP is turned off, even if the mobile device 9 is within the range where Bluetooth (registered trademark) communication with the landing area radio device A12 and the elevator car radio device B14 is possible while the dedicated APP is on.

[0031]

Next, Figures 2 through 4 are explained.

[0032]

Figure 2 shows an example of the communication method between the landing area radio device A12 and the mobile device 9 installed in the landing area 8 on each floor of the elevator applied in the example.

[0033]

Each of the 8 landing area has a landing area control panel 11. A landing area radio device A12 is installed in the landing area control panel 11. In the example, the landing area radio device A12 and the mobile device 9 carried by the user perform Bluetooth (registered trademark) communication in accordance with the Bluetooth (registered trademark) short-range wireless communication standard. The landing area radio device A12 is preprogrammed as shown in Figure 10 below.

[0034]

The landing area radio device A12 transmits a radio signal in a predetermined frequency band when it is on. The radio signal in the predetermined frequency band transmitted by the landing area radio device A12 is a radio signal that includes the identification information of the landing area radio device A12 and is used to notify the user's mobile device 9 of its own presence.

[0035]

The radio signals in the predetermined frequency band transmitted by the landing area radio device A12 have different strengths. In the following description, the radio signals in the predetermined frequency band with different strengths are denoted as signal A120, signal AA121, and signal AAA122.

[0036]

The radio device A12 is always on and continues to transmit signals A120, AA121 and AAA122 to the landing area 8. Signal A120, Signal AA121 and Signal AAA122 have different strengths of radio signals in a given frequency band. For example, the strength of signal A120, which is closer to landing area radio device A12, is stronger than signal AA121 and signal AAA122. For example, the strength of signal AA121 is weaker than signal A120 and stronger than signal AAA122. For example, the strength of signal AAA122 is weaker than signal A120 and signal AA121. Thus, the closer to the landing area radio device A12, the stronger the strength of the radio signal in the predetermined frequency band transmitted by the landing area radio device A12, and the further from the landing area radio device A12, the weaker the strength of the radio signal in the predetermined frequency band transmitted by the landing area radio device A12.

[0037]

There is an elevator car control panel 13 in the elevator car 6. An elevator car radio device B14 is installed in the elevator car control panel 13. In the example, the elevator car radio device B14 and the mobile device 9 carried by the user perform Bluetooth (registered trademark) communication in accordance with the Bluetooth (registered trademark) short-range wireless communication standard. The elevator car radio device B14 is preprogrammed as shown in Figure 11 below.

[0038]

The elevator car radio device B14 transmits a radio signal in a predetermined frequency band when it is on. The radio signal in the predetermined frequency band transmitted by the elevator car radio device B14 is a radio signal that includes the identification information of the elevator car radio device B14 and is used to notify the user's mobile device 9 of its own presence.

[0039]

The radio signals in the predetermined frequency band transmitted by the elevator car radio device B14 have different strengths. In the following description, the radio signals in the predetermined frequency band with different strengths are denoted as signal B140, signal BB141, and signal BBB142, respectively.

[0040]

The elevator car radio device B14 is always on and continues to transmit signals B140, signal BB141 and signal BBB142 to the elevator car 6. Signal B140, signal BB141 and signal BBB142 have different strengths of radio signals in a given frequency band. For example, the strength of signal B140, which is closer to elevator car radio device B14, is stronger than signal BB141 and signal BBB142. For example, the strength of signal BB141 is weaker than signal B140 and stronger than signal BBB142. For example, the strength of signal BBB142 is weaker than signal B140 and signal BB141. Thus, the closer to elevator car radio device B14, the stronger the strength of the radio signal in a given frequency band transmitted by elevator car radio device B14, and the further away from elevator car radio device B14, the weaker the strength of the radio signal in a given frequency band transmitted by elevator car radio device B14.

[0041]

In Figure 2, the dedicated APP installed on the user's mobile device 9 is turned on and the user's mobile device 9 has range 900.

[0042]

The range 900 of user's mobile device 9 detects landing area radio device A12 by scanning for radio signals in one of the predetermined frequency bands: signal A120, signal AA121, and signal AAA122, which are emitted from landing area radio device A12.

[0043]

Similarly, the range 900 of user's mobile device 9 detects elevator car radio device B14 by scanning for radio signals in one of the predetermined frequency bands: signal B140, signal BB141, and signal BBB142, which are transmitted from elevator car radio device B14.

[0044]

In Figure 2, the range 900 of mobile device 9 has not yet detected any of the radio signals in the predetermined frequency band emitted from landing area radio device A12 or any of the radio signals in the predetermined frequency band emitted from elevator car radio device B14. Therefore, Bluetooth (registered trademark) communication between landing area radio device A12 and user's mobile device 9 or between elevator car radio device B14 and user's mobile device 9 has not yet been established.

[0045]

In the example, when the range 900 of the mobile device 9 scans and detects radio signals in a predetermined frequency band transmitted by multiple radio devices A12 simultaneously, the mobile device 9 is programmed to automatically establish Bluetooth (registered trademark) communication by prioritizing radio signals in the stronger predetermined frequency band from among the multiple detected radio signals in the predetermined frequency band. (registered trademark) communication is programmed to be established automatically.

[0046]

Similarly, if the range 900 of user's mobile device 9 scans and detects radio signals in a predetermined frequency band transmitted by multiple radio devices B14 at the same time, user's mobile device 9 automatically prioritizes the radio signal in the predetermined frequency band with stronger strength from among the multiple detected radio signals in the predetermined frequency band to establish Bluetooth (registered trademark) communication is programmed to be established automatically.

[0047]

Furthermore, if the range 900 of user's mobile device 9 scans and detects simultaneously a radio signal in a predetermined frequency band transmitted by landing area radio device A12 and a radio signal in a predetermined frequency band transmitted by elevator car radio device B14, user's mobile device 9 gives priority to the radio signal in the predetermined frequency band transmitted by elevator car radio device B14 and automatically establishes Bluetooth (registered trademark) communication is programmed to be established automatically.

[0048]

While the range 900 of the mobile device 9 scans and detects the radio signal in the predetermined frequency band of the landing area radio device A12 and the mobile device 9 establishes Bluetooth (registered trademark) communication with the landing area radio device A12, if the range 900 of the mobile device 9 scans and detects the radio signal in the predetermined frequency band of the elevator car radio device B14 Bluetooth (registered trademark) communication between the mobile device 9 and the landing area radio device A12 is disconnected and Bluetooth (registered trademark) communication between the mobile device 9 and the elevator car radio device B14 is automatically established.

[0049]

In the example, a user who does not carry a mobile device 9 with the dedicated APP installed can move the elevator car 6 to the floor where the user is by pressing each of the destination direction buttons (UP button 11a and DOWN button 11b) on the landing area control panel 11 as in the past. Users who do not carry a mobile device 9 with the dedicated APP installed can sound the alarm A10 by pressing the bell A button 10a on the alarm A10 as before.

[0050]

In addition, a user who is not carrying a mobile device 9 with the dedicated APP installed can move the elevator car 6 to the designated floor by pressing each destination

floor button (numbered buttons) on the elevator car control panel 13 as in the past. Users who do not carry a mobile device 9 with the dedicated APP installed can sound the alarm B18 by pressing the bell B button 18a on the alarm B18 on the elevator car control panel 13, and can open and close the landing area door 7 by pressing the respective open and close buttons (OPEN button 19 and CLOSE button 20) as before. The landing area door 7 can be opened and closed by pressing the respective open and close buttons (OPEN button 19 and CLOSE button 20).

[0051]

Figure 3 shows an example of the communication method between the landing area radio device A12 and the mobile device 9 installed in the elevator landing area 8 applied in the example.

[0052]

In Figure 3, the dedicated APP installed on the user's mobile device 9 carried by the user is turned on, and the range 900 of the user's mobile device 9 scans and detects the signal A122 transmitted by the landing area radio device A12. This indicates that Bluetooth (registered trademark) communication between the mobile device 9 and the landing area radio device A12 is established. With Bluetooth (registered trademark) communication established between the mobile device 9 and the landing area radio device A12, the user can operate the mobile device 9 to control the elevator car 6 to transition to the floor where the user is.

[0053]

In the example, the landing area radio device A12 is equipped with a multiple of relays A15, as shown in Figure 10 below. The individual relays A15 turn the electrical circuit on and off. The individual relays A15 are individually assigned and connected to the switches of the respective destination direction buttons (UP button 11a and DOWN button 11b) on the landing area control panel 11 and the bell A button 10a on the alarm A10. After Bluetooth (registered trademark) communication between the mobile device 9 and the landing area radio device A12 is established, when the user operates the mobile device 9, the mobile device 9 and the landing area radio device A12 communicate wirelessly and the individual relays A15 based on the program of the landing area radio device A12 are driven.

[0054]

For example, a user at landing area 8 on a certain floor selects the UP symbol 91 shown in Figure 6 below by operating user's mobile device 9 in order to go to the floor above. The user's mobile device 9 transmits data to the landing area radio device A12 according to the program of the dedicated APP, indicating that the UP symbol 91 has been selected. When the landing area radio device A12 receives the data that the UP symbol 91 has been selected, it drives the relay A15 corresponding to the UP symbol 91 based on the program of the landing area radio device A12. The relay A15 corresponding to the UP symbol 91 is connected to the switch of the UP button 11a located on the landing area control panel 11. When the relay A15 corresponding to the UP symbol 91 is driven, the switch of the UP button 11a triggered. This is the same as when the UP button 11a located on the landing area control panel 11 is pressed by the user. The switch of the UP button 11a is controlled by the control unit 5, which controls the elevator using the elevator's own communication protocol. When the switch of the UP button 11a is pressed, a signal that the switch of the UP button 11a is pressed is sent to the controller 5. When the control unit 5 receives the signal that the switch of the UP button 11a is triggered, it controls the elevator car 6 to ascend or descend to the floor where the user is located.

[0055]

Similarly, for example, a user at landing area 8 on a certain floor operates user's mobile device 9 to select the DOWN symbol 92 shown in Figure 6 below in order to go to the floor below. The user's mobile device 9 transmits data to the landing area radio device A12 according to the program of the dedicated APP that the DOWN symbol 92 has been selected. When the landing area radio device A12 receives the data that DOWN

symbol 92 below has been selected, it drives the relay A15 corresponding to DOWN symbol 92 below based on the program of the landing area radio device A12. Relay A15 corresponding to DOWN symbol 92 below is connected to the switch of the DOWN button 11b on the landing area control panel 11. When relay A15 corresponding to DOWN symbol 92 below is driven, the switch of the DOWN button 11b is triggered. This is the same as when the DOWN button 11b located on the landing area control panel 11 is pressed by the user. The switch of the DOWN button 11b is controlled by the control unit 5, which controls the elevator using the elevator's own communication protocol. When the DOWN button 11b is pressed, a signal that the DOWN button 11b is pressed is sent to the controller 5. When the control unit 5 receives the signal that the switch of the DOWN button 11b is pressed, it controls the elevator car 6 to ascend or descend to the floor where the user is located.

[0056]

Similarly, for example, a user operates user's mobile device 9 to select bell A symbol 90 shown in Figure 6 below to ring the alarm. Mobile device 9 transmits data to landing area radio device A12 that bell A symbol 90 has been selected according to the program of the dedicated APP. When the landing area radio device A12 receives the data that the bell A symbol 90 has been selected, it drives the relay A15 corresponding to the bell A symbol 90 based on the program of the landing area radio device A12. The relay A15 corresponding to bell A symbol 90 is connected to the switch of the bell A button 10a located on the alarm A10. When relay A15 corresponding to bell A symbol 90 is driven, the switch of bell A button 10a is triggered. This is the same as when the bell A button 10a located on the alarm A10 is pressed by the user. The switch of the bell A button 10a is controlled by the control unit 5, which controls the elevator using the elevator's own communication protocol. When the switch of the Bell A button 10a is pressed, a signal that the switch of the Bell A button 10a is triggered is sent to the controller 5. When the control unit 5 receives the signal that the switch of the Bell A button 10a is triggered, it controls the alarm A10 and sounds the alarm A10.

[0057]

As described above, the landing area radio device A12 interacts with the controller 5 via the switches of the UP button 11a, DOWN button 11b and bell A button 10a. When the switches of the UP button 11a, DOWN button 11b and bell A button 10a are triggered by driving their respective relays A15, the UP button 11a, DOWN button 11b and bell A button 10a are controlled by the elevator's own communication protocol. The landing area radio device A12 controls the switches of the UP button 11a, DOWN button 11b and bell A button 10a. Therefore, there is no need to connect the landing area radio device A12 to the control unit 5 as in the past. Therefore, there is no need to consider wiring or connections from the landing area radio device A12, which is installed near each of the landing area doors 7 on each floor, to the control unit 5, which is usually installed in the elevator shaft 1 or in a machine room (no given number), etc., and the installation and maintenance work of the landing area radio device A12 can be performed easily.

[0058]

The installation location of the landing area radio device A12 may be anywhere where radio signals in a predetermined frequency band transmitted by the landing area radio device A12 are capable of Bluetooth (registered trademark) communication with the range 900 of the mobile device 9. Furthermore, the landing area radio device A12 may be installed anywhere where wiring to the switches of the UP button 11a, DOWN button 11b and bell A button 10a is possible. For example, the landing area radio device A12 may be installed at a location within the landing area control panel 11. For example, the landing area radio device A12 may be installed in a location near the landing area door 7 in a corridor in the building. For example, the landing area radio device A12 may be installed in a location in a corridor in the building, away from the landing area door 8.

[0059]

Figure 4 shows an example of the communication method between the elevator car radio device B14 and the mobile device 9 in the elevator car 6, which is applied in the example.

[0060]

In Figure 4, the dedicated APP installed on the user's mobile device 9 is turned on and the range 900 of the user's mobile device 9 scans and detects the signal AAA122 transmitted by the landing area radio device A12, and the range 900 of the user's mobile device 9 also scans and detects the signal BBB142, signal BB141 and signal B 140 are being scanned and detected.

[0061]

In the example, if the range 900 of the mobile device 9 scans and detects the radio signal of the predetermined frequency band of the landing area radio device A12 and the radio signal of the predetermined frequency band of the elevator car radio device B14 simultaneously, the mobile device 9 gives priority to the radio signal of the predetermined frequency band of the elevator car radio device B14 to automatically establish Bluetooth (registered trademark) communication. Bluetooth (registered trademark) communication is established. Therefore, Figure 4 shows the state in which Bluetooth (registered trademark) communication is established between user's mobile device 9 and elevator car radio device B14. With Bluetooth (registered trademark) communication established between the mobile device 9 and the elevator car radio device B14, the user on board the elevator car 6 can operate the mobile device 9 to control the elevator car 6 to transition to the designated floor.

[0062]

In the example, the elevator car radio device B14 is equipped with a multiple of relays B16, as shown in Figure 11 below. The individual relays B16 turn the electrical circuit on and off. The individual relays B16 are individually assigned and connected to the switches of the respective open and close buttons (OPEN button 19 and close button 20) located on the elevator car control panel 13 and the bell B button 18a located on the alarm B18 of the elevator car control panel 13. After Bluetooth (registered trademark) communication between the mobile device 9 and the elevator car radio device B14 is established, when the user operates the mobile device 9, the mobile device 9 and the elevator car radio device B14 communicate wirelessly and the individual relays B16 based on the program of the elevator car radio device B14 are driven.

[0063]

For example, a user operates user's mobile device 9 to ring the alarm and selects bell B symbol 93 shown in Figure 7 below. Mobile device 9 transmits data to elevator car radio device B14 that bell B symbol 93 has been selected according to the program of the dedicated APP. When the elevator car radio device B14 receives the data that bell B symbol 93 has been selected, it drives the relay B16 corresponding to bell B symbol 93 based on the program of the elevator car radio device B14. The relay B16 corresponding to bell B symbol 93 is connected to the switch of the bell B button 18a located on the alarm B18. When the relay B16 corresponding to bell B symbol 93 is driven, the switch of bell B button 18a is triggered. This is the same as when the Bell B button 18a located on the alarm B18 is pressed by the user. The switch of the Bell B button 18a is controlled by the control unit 5, which is controlled by the elevator's own communication protocol. When the switch of the Bell B button 18a is pressed, a signal is sent to the controller 5 that the switch of the Bell B button 18a is pressed. When the control unit 5 receives the signal that the switch of the Bell B button 18a is pressed, it controls the alarm B18 and sounds the alarm B18.

[0064].

Similarly, for example, the user operates the mobile device 9 to select the opening symbol 95 shown in Figure 7 below. The user's mobile device 9 transmits data to the elevator car radio device B14 that the OPEN symbol 95 has been selected according to the program of the dedicated APP. When the elevator car radio device B14 receives the data that the OPEN symbol 95 has been selected, it drives the relay B16 corresponding

to the OPEN symbol 95 based on the program of the elevator car radio device B14. The relay B16 corresponding to the OPEN symbol 95 is connected to the switch of the OPEN button 19 located on the elevator car control panel 13 of the boarding ramp. When the relay B16 corresponding to the OPEN symbol 95 is driven, the switch of the OPEN button 19 is triggered. This is the same state as when the OPEN button 19 on the elevator car control panel 13 is pressed by the user. The switch of the OPEN button 19 is controlled by the control unit 5, which controls the elevator using the elevator's own communication protocol. When the switch of the OPEN button 19 is pressed, a signal that the switch of the OPEN button 19 is pressed is sent to the controller 5. When the control unit 5 receives the signal that the switch of the OPEN button 19 is pressed, it controls the landing area door 7 to open the landing area door 7.

[0065]

Similarly, for example, the user operates the user's mobile device 9 to select the CLOSE symbol 96 shown in Figure 7 below. The user's mobile device 9 transmits data to the elevator car radio device B14 that the closing symbol 96 has been selected according to the program of the dedicated APP. When the elevator car radio device B14 receives the data that the CLOSE symbol 96 has been selected, it drives the relay B16 corresponding to the CLOSE symbol 96 based on the program of the elevator car radio device B14. The relay B16 corresponding to the CLOSE symbol 96 is connected to the switch of the CLOSE button 20 located on the elevator car control panel 13. When relay B16 corresponding to CLOSE symbol 96 is driven, the switch of CLOSE button 20 is triggered. This is the same state as when the CLOSE button 20 on the elevator car control panel 13 is pressed by the user. The switch of the CLOSE button 20 is controlled by the control unit 5, which controls the elevator using the elevator's own communication protocol. When the CLOSE button 20 is pressed, a signal is sent to the controller 5 that the CLOSE button 20 has been pressed. When the control unit 5 receives the signal that the switch of the CLOSE button 20 is pressed, it controls the landing area door 7 to close the landing area door 7.

[0066]

In the example, an extended SPI IO port 14l is connected to elevator car radio device B14, as shown in Figure 11 below. The extended SPI IO port 14l has a multiple of relays C17. The individual relays C17 turn the electrical circuit on and off. Each relay C17 is individually assigned to and connected to the switch of each destination floor button (numbered button) on the elevator car control panel 13. After Bluetooth (registered trademark) communication is established between the mobile device 9 and the elevator car radio device B14, when the user operates the mobile device 9, the mobile device 9 and the elevator car radio device B14 communicate wirelessly, and the individual relays C17 are driven based on the program of the elevator car radio device B14.

[0067]

For example, a user on board the elevator car 6 operates the mobile device 9 to transition the elevator car 6 to the 5th floor, and selects the 5 symbol 94 shown in Figure 7 below. The user's mobile device 9 transmits data to the elevator car radio device B14 that the 5-symbol 94 has been selected according to the program of the dedicated APP. When the elevator car radio device B14 receives the data that 5-symbol 94 has been selected, it drives the relay C17 corresponding to 5-symbol 94 based on the program of the elevator car radio device B14. The relay C17 corresponding to 5-symbol 94 is connected to the switch of the 5-button 13a located on the elevator car control panel 13 of the boarding ramp. 5 When the relay C17 corresponding to the 5 symbol 94 is driven, the switch of the 5-button 13a is triggered. When the switch of the 5-button 13a is triggered, a signal that the switch of the 5-button 13a is triggered is sent to the controller 5. When the control unit 5 receives the signal that the switch of the 5-button 13a is triggered, it controls the elevator car 6 to ascend or descend to the fifth floor.

[0068]

As described above, the elevator car radio device B14 interacts with the control unit 5 via the switches of the bell B button 18a, the OPEN button 19, the CLOSE button 20 and

the 5-button 13a. When the switches of the bell B button 18a, OPEN button 19 and CLOSE button 20 are turned on by driving their respective relays B16, the bell B button 18a, OPEN button 19 and CLOSE button 20 are controlled by the elevator's own communication protocol. In addition, each destination floor button (numbered button), such as 5-button 13a, is controlled by the elevator's own communication protocol when the switch of the respective destination floor button (numbered button), such as 5-button 13a, is turned on by driving the respective relay C17. Elevator car radio device B14 controls the switches of each destination floor button (numbered buttons) such as bell B button 18a, OPEN button 19, CLOSE button 20, and 5-button 13a. Therefore, there is no need to connect the elevator car radio device B14 to the control unit 5 as in the past. Therefore, there is no need to consider wiring and connections from the elevator car radio device B14 installed in the elevator car 6 to the control unit 5, which is usually installed in the elevator shaft 1 or in a machine room (no given number), etc. and installation and maintenance work of the elevator car radio device B14 can be performed easily.

[0069]

The installation location of the elevator car radio device B14 may be anywhere within the range where radio signals in a predetermined frequency band transmitted by the elevator car radio device B14 can communicate by Bluetooth (registered trademark) with the range 900 of the mobile device 9. Furthermore, the elevator car radio device B14 may be installed anywhere where wiring to the switches of the respective destination floor buttons (numbered buttons), Bell B button 18a and the respective open and close buttons (OPEN button 19 and CLOSE button 20) is possible. For example, the elevator car radio device B14 may be installed in a side location in the elevator car 6. For example, the elevator car radio device B14 may be installed in a side location outside of the elevator car 6.

[0070]

As explained in Figures 2, 3, and 4, the radio devices A12 and B14 are easy to install and maintain, and the easy access to the installation sites of the radio devices A12 and B14 makes it easy to locate the point of abnormality or failure in the event of an abnormality or failure in the radio devices A12 and B14. This makes it easy to locate the point of occurrence and reduces elevator downtime and costs due to repair work for abnormalities and malfunctions.

[0071]

Next, the display of the dedicated APP will be explained using Figures 5 through 7. Figure 5 is a front view of an example of the image and text information displayed by the dedicated APP installed on the user's mobile device 9 used in the example.

[0072]

The screen of the mobile device 9 is marked "Searching". When the dedicated APP installed in user's mobile device 9 is turned on by the user, it starts scanning the radio signals in the predetermined frequency band transmitted by landing area radio device A12 and the radio signals in the predetermined frequency band transmitted by elevator car radio device B14 in order to detect them. While the user's mobile device 9 detects either the radio signal of the predetermined frequency band transmitted by the landing area radio device A12 or the radio signal of the predetermined frequency band transmitted by the elevator car radio device B14, the screen of the user's mobile device 9 will indicate that it is searching.

[0073]

Figure 6 is a front view showing an example of the image and text information displayed by the dedicated APP installed on the user's mobile device 9 applied to the example.

[0074]

When Bluetooth (registered trademark) communication is established between user's mobile device 9 and landing area radio device A12, the dedicated APP displays the image and text information shown in Figure 6 on the screen of user's mobile device 9. The

image and text information include the building name, Bell A symbol 90, UP symbol 91 above, DOWN symbol 92 below, etc. The display of the dedicated APP is the image and character information that is composed of the Bluetooth (registered trademark) broadcast data that the BLE communication section T9a receives from the BLE communication section A12a and the patterns that the creation section T9b draws from the pattern storage section T9f, as described below in Figure 10.

[0075]

For example, if a user selects bell A symbol 90 displayed on the screen of mobile device 9, the user can ring the alarm A10 without pressing the bell A button 10a located on the alarm A10. For example, if a user at landing area 8 on a certain floor selects the UP symbol 91 displayed on the screen of mobile device 9, the user can move the elevator car 6 to the floor where the user is without pressing the UP button 11a located on the landing area control panel 11. For example, if a user in the landing area 8 on a certain floor selects the DOWN symbol 92 displayed on the screen of the mobile device 9, the user can control the elevator car 6 to transition to the floor where the user is without pressing the DOWN button 11b on the landing area control panel 11.

[0076]

Figure 7 is a front view of an example of the image and text information displayed by the APP for exclusive use installed on the user's mobile device 9 applied to the example.

[0077]

When Bluetooth (registered trademark) communication between user's mobile device 9 and elevator car radio device B14 is established, the dedicated APP displays the image and text information shown in Figure 7 on the screen of user's mobile device 9. The image and text information include the name of the building, each numbered symbol such as the Bell B symbol 93, the 5 symbol 94, the OPEN symbol 95, the CLOSE symbol 96, and so on. The display of the dedicated APP is the image and text information, which is composed based on the Bluetooth (registered trademark) broadcast data that the BLE communication section T9a receives from the BLE communication section B14a and the patterns that the creation section T9b pulls from the pattern storage section T9f, as described below in Figure 11.

[0078].

For example, if a user on board the elevator car 6 selects the 5 symbol 94 displayed on the screen of the mobile device 9, the user can control the elevator car 6 to transition to the 5th floor without pressing the 5-button 13a located on the elevator car control panel 13 of the elevator car. For example, if a user on board the elevator car 6 selects the bell B symbol 93 displayed on the screen of the mobile device 9, the user can ring the alarm B18 without pressing the bell B button 18a located on the alarm B18. For example, if a user gets on the elevator car 6 but selects the OPEN symbol 95 displayed on the screen of the mobile device 9, the user can open the landing area door 7 without pressing the OPEN button 19 located on the elevator car control panel 13. For example, if the user gets on board 6 and selects the CLOSE symbol 96 displayed on the screen of the mobile device 9, the user can close the landing area door 7 without pressing the CLOSE button 20 on the elevator car control panel 13.

[0079]

The screen of user's mobile device 9 may be able to display the building name, bell A symbol 90, UP symbol 91, and DOWN symbol 92 shown in Figure 6, as well as the building name, bell B symbol 93, 5 symbol 94 shown in Figure 7, each numbered symbol, OPEN symbol 95, CLOSE symbol 96, and other images and text information.

[0080]

The screen of user's mobile device 9 may display, for example, a welcome message, elevator names, directions to each floor, floor maps, public notices of tenants, weather forecasts, etc.

[0081]

For example, the screen of user's mobile device 9 may display a specific destination floor that only users with a certain authority can get off. If the elevator has a specific

destination floor to which only certain authorized users can get off, such as a VIP floor to which only VIP have access, users with a specific authority to use the specific destination floor will be informed of their PIN in advance. The user with the specific authority can select the specific destination floor by entering the PIN number that the dedicated APP displays on the screen of user's mobile device 9. The specific destination floor that the dedicated APP displays on the screen of user's mobile device 9 may, for example, be displayed in the PIN input field when the user selects the symbol for the specific destination floor. The specific destination floor that the dedicated APP displays on the screen of user's mobile device 9 may, for example, be hidden from view, so that the user touches a certain part of the screen of user's mobile device 9 to bring up the display of the PIN entry field. If the elevator is set to a specific destination floor where only users with a certain authority can get off, a user with a certain authority may be able to select a specific destination floor without entering the PIN next time once he/she has entered the PIN.

[0082]

The screen of the mobile device 9 may, for example, show an indication to operate the elevator by entering the PIN. If there is a specific elevator set up that can only be used by users with a certain authority, such as a VIP elevator that can only be used by VIP, users with a certain authority are informed of their PIN in advance. The user with the specific authority can use the specific elevator by entering the PIN number that the dedicated APP displays on the screen of the user's mobile device 9. If a specific elevator that can only be used by a user with a certain authority is set, the user with a certain authority may be able to operate the specific elevator without entering the PIN the next time once he/she has entered the PIN.

[0083]

The language of the content displayed on the screen of user's mobile device 9 by the dedicated APP may be changed to another language.

[0084]

The user can operate any elevator with one dedicated APP, as long as the elevator is equipped with radio devices A12 and B14 according to the example. The mobile device 9 stores patterned data in the pattern storage section T9f, as shown in Figures 10 and 11 below. Therefore, each time the mobile device 9 receives Bluetooth (registered trademark) broadcast data containing building data and floor data from the radio devices A12 and B14, it can display images and text information on the dedicated APP and can send the command data it has created to the radio devices A12 and B14. Users can save time and effort by not having to install different types of application software for each elevator on their mobile device 9. The user also avoids the hassle of having to use several different types of application software for each elevator. Therefore, a dedicated APP does not need to be developed for each elevator where radio devices A12 and B14 are installed.

[0085]

Figure 8 is an example of a pattern table T1, programmed in the pattern storage section T9f of user's mobile device 9, pattern storage section A12i of landing area radio device A12, and pattern storage section B14i of elevator car radio device B14, which are applied in the example.

[0086]

The pattern storage section T9f, pattern storage section A12i, and pattern storage section B14i, shown in Figures 10 and 11 below, store various buttons on the elevator's landing area control panel 11, alarm A10, elevator car control panel 13, and alarm B18 on elevator car control panel 13 as patterned the various buttons are stored as patterned data. The various buttons are divided into basic and special types of patterns. Each of the destination direction buttons (UP button 11a and DOWN button 11b), bell A button 10a, bell B button 18a, and each open/close button (OPEN button 19 and CLOSE button 20) on the landing area control panel 11 and the elevator car control panel 13 are of the basic pattern type. Each of the destination floor buttons (numbered buttons) on elevator

car control panel 13 are a specific type of pattern. Pattern storage section T9f stores patterns of basic and special types. Pattern storage section A12i stores some patterns of basic types. Pattern storage section B14i stores some of the basic types and patterns of special types.

[0087]

As shown in Pattern Table T1 in Figure 8, Pattern A is the data of the UP symbol 91 and matches the UP button 11a on the landing area control panel 11. Pattern B is the data of the DOWN symbol 92, and is applied to the DOWN button 11b on the landing area control panel 11. Pattern C is the data of the Bell A symbol, and matches the Bell A button 10a on the A10 alarm. Pattern D is the data of the Bell B symbol, which matches Bell B button 18a on Alarm B18. Pattern E is the data of the OPEN symbol 95 and matches the OPEN button 19 located on the elevator car control panel 13. Pattern F has the CLOSE symbols 96 and matches the CLOSE button 20 on the elevator car control panel 13. Pattern LVL consists of data for each numbered symbol, such as 5, symbols 94, and applies to each destination floor button (numbered button), such as 5, buttons 13a on the elevator car control panel 13.

[0088]

Some elevators have VIP floors that can only be accessed by so-called VIPs or VIP elevators that can only be used by so-called VIPs, as explained in Figure 7. For security reasons, even if the destination direction buttons (UP button 11a and DOWN button 11b) to the VIP floor are not provided on the landing area control panel 11, if a user with a certain authority operates the user's mobile device 9 on which the dedicated APP is installed and inputs his/her PIN, the landing area radio device A12 will send the respective destination direction The landing area radio device A12 can trigger the switch of each destination direction button (UP button 11a and DOWN button 11b) by driving the relay A15 corresponding to the switch of the button (UP button 11a and DOWN button 11b).

[0089]

Similarly, even if the destination floor buttons (numbered buttons) to the VIP floor are not provided on the elevator car control panel 13 for security reasons, if a user with a certain authority operates a user's mobile device 9 on which a dedicated APP is installed and enters his/her PIN, the elevator car radio device B14 can trigger each of the destination floor If a user with a certain authority enters the PIN number by operating the user's mobile device 9 on which the dedicated APP is installed, the elevator car radio device B14 can trigger the relay C17 corresponding to each destination floor button (numbered button).

[0090]

Figure 9 is an example of a destination floor table T2, which is pre-set in the elevator car radio device B14 applied to the example.

[0091]

The BLE communication section A12a of landing area radio device A12, described later in Figure 10, and the BLE communication section B14a of elevator car radio device B14, described later in Figure 11, send Bluetooth (registered trademark) broadcast data to user's mobile device 9. The Bluetooth (registered trademark) broadcast data includes floor data consisting of the destination floor of the building, as well as data about the building in which each of the radio devices A12 and B14 are installed. The building data includes various buttons and PIN numbers other than the destination floor, welcome messages, elevator names, information on each floor, floor maps, tenant advertisements, weather forecasts, etc., which are located on the landing area control panel 11 and elevator car control panel 13.

[0092]

The Bluetooth (registered trademark) broadcast data transmitted by the BLE communication section A12a of the landing area radio device A12 includes building data.

[0093]

The Bluetooth (registered trademark) broadcast data transmitted by the BLE communication section B14a of the elevator car radio device B14 includes, in addition to building data, floor data consisting of destination floors, such as the destination floor table T2 shown in Figure 9.

[0094]

For example, suppose that there is a building named XYZ Building; the data named XYZ Building is pre-set in the BLE communication section A12a of the landing area radio device A12 and the BLE communication section B14a of the elevator car radio device B14 as part of the building data. When the mobile device 9 receives Bluetooth (registered trademark) broadcast data containing the data of the name "XYZ Building" from the landing area radio device A12 or the elevator car radio device B14, it displays on its screen the text information "XYZ Building" as shown in Figures 6 and 7, based on the data of the name "XYZ Building". Figure 6 and Figure 7.

[0095]

For example, assume that there is a building named XYZ Building from the 1st floor to the 6th floor, and the destination floors of the building from the 1st floor to the 6th floor are configured as floor data as shown in destination floor table T2. The destination floor table T2 is set in advance in the BLE communication section B14a of the elevator car radio device B14. When the mobile device 9 receives the Bluetooth (registered trademark) broadcast data containing the data of the name XYZ building and the floor data from the elevator car radio device B14, it displays the character information of XYZ building on the screen as shown in Figure 7 based on the data of the name XYZ building and the floor data. Based on the floor data, the destination floors from the first to the sixth floor are displayed on the screen with images and text information as shown in Figure 7.

[0096]

Figure 10 is a block diagram showing the functional configuration of mobile device 9, landing area radio device A12, landing area control panel 11, and alarm A10 applied to the example. First, each block diagram is explained according to Figure 10.

[0097]

As shown in Figure 10, user's mobile device 9 has a BLE communication section T9a, a processor T (no given number), a BLE UART communication section T9d, a memory T9e, a pattern storage section T9f and a real-time clock section T9g.

[0098]

Mobile device 9 incorporates a creation section T9b and a transmitter/receiver section T9c in processor T (no given number). Mobile device 9 incorporates an encryption/decryption section T (no given number), in the creation section T9b.

[0099]

The landing area radio device A12 has a BLE communication section A12a, a BLE UART communication section A12b, a processor A (no given number), a general-purpose IO port section A12g, a memory A12h, a pattern storage section A12i and a real-time clock section A12j.

[0100].

The landing area radio device A12 incorporates a transmitter/receiver section A12c, a decision section A12d, an encryption/decryption section A, a creation section A12e, and a transmission section A12f in the processor A (no given number).

[0101].

The landing area radio device A12 is equipped with a multiple of relays A15. The individual relays A15 are individually assigned and connected to the switches of the respective destination direction buttons (UP button 11a and DOWN button 11b) on the landing area control panel 11 and the bell A button 10a on the alarm A10.

[0102]

The BLE communication section T9a constantly scans to detect radio signals in the predetermined frequency band transmitted by the landing area radio device A12. The BLE communication section A12a transmits radio signals in a predetermined frequency

band as described in Figure 2. The state in which Bluetooth (registered trademark) communication between mobile device 9 and landing area radio device A12 is established as explained in Figure 3 is the same as the state in which BLE communication section T9a shown in Figure 10 is scanning, detects the radio signal in the predetermined frequency band transmitted by BLE communication section A12a, and automatically establishes Bluetooth (registered trademark) communication. This is the same as the state in which Bluetooth (registered trademark) communication has been established. [0103].

When Bluetooth (registered trademark) communication between mobile device 9 and landing area radio device A12 is established, BLE communication section A12a sends Bluetooth (registered trademark) broadcast data to BLE communication section T9a. As explained in Figure 9, the Bluetooth (registered trademark) broadcast data includes the building data of the elevator in which the landing area radio device A12 is installed. The building data is set in advance as the Bluetooth (registered trademark) broadcast data transmitted by the BLE communication section A12a, and the Bluetooth (registered trademark) broadcast data including the building data received by the BLE communication section T9a is stored in the memory T9e.

[0104].

The creation section T9b draws a pattern from the pattern storage section T9f. A pattern is the patterned data shown in the pattern table T1 described in Figure 8. The pattern is preprogrammed in the pattern storage section T9f. The creation section T9b creates command data by combining the Bluetooth (registered trademark) broadcast data received from the BLE communication section A12a stored in the memory T9e and the patterns preprogrammed in the pattern storage section T9f. The created command data includes a command code and subsequent data.

[0105]

For example, assume that there is a building named XYZ Building, with floors 1 through 6. The pattern programmed in advance in the pattern storage section T9f is the pattern table T1 described in Figure 8. Suppose that an elevator user selects the UP symbol 91 shown in Figure 6 on the screen display of the mobile device 9 at the boarding point 8 on a certain floor. The UP symbol 91 is pattern A when applied to pattern table T1. The creation section T9b combines Pattern A and the UP symbol 91 and creates the command data {A: UP}, which is replaced by a character string. Suppose that an elevator user selects the DOWN symbol 92 shown in Figure 6 on the screen display of mobile device 9 at boarding point 8 on a certain floor. If the DOWN symbol 92 is applied to the pattern table T1, it becomes pattern B. The creation section T9b combines pattern B and DOWN symbol 92 below and creates the command data {B: DOWN}, which is replaced by a character string. Suppose that an elevator user selects Bell A symbol 90 shown in Figure 6 on the screen display of mobile device 9 at boarding point 8 on a certain floor. Bell A symbol 90 is pattern C when applied to pattern table T1. The creation section T9b combines pattern C and the Bell A symbol 90 and creates the command data {C: Bell A}, which is replaced by a character string.

[0106]

The encryption/decryption section T (no given number) of mobile device 9, and the encryption/decryption section A (no given number) of radio device A12, encrypt and decrypt the command data. In cases such as those described in Figure 7, where only users with a certain authority can get off the elevator and a certain destination floor is set for the elevator, or where only users with a certain authority can use a certain elevator, etc., the encryption/decryption section T (no given number) of the mobile device 9, and the encryption/decryption section A (no given number) of the mobile device A12, use a PIN code, so that the encryption/decryption section T (no given number) of the mobile device 9 and the encryption/decryption section A (no given number) of the mobile device A12 are used. The real-time clock section T9g is used for encryption and decryption of the command data created by the creation section T9b of user's mobile device 9. The real-time clock section A12j is used for the compounding and encryption of

the command data created by the creation section A12e of the landing area radio device A12 to set and read the date and time.

[0107]

The creation section T9b sends the created command data to the transmitter/receiver section T9c. When encrypting the command data created by the creation section T9b, encryption is performed by the encryption/decryption section T (no given number), of the mobile device 9. The encryption/decryption section T (no given number), may also receive the encrypted command data sent by the transmitter/receiver section A12c of the radio device A12 and decrypt it.

[0108]

As described above, the real-time clock section T9g is used to encrypt the command data created by the creation section T9b. The creation section T9b sends the created or encrypted command data to the transmitter/receiver section T9c.

[0109]

The transmitter/receiver section T9c receives the command data created or encrypted by the creation section T9b and sends it to the BLE UART communication section T9d.

[0110]

The BLE UART communication section T9d sends command data or encrypted command data received from the transmitter/receiver section T9c to the BLE UART communication section A12b.

[0111]

The BLE UART communication section A12b receives command data or encrypted command data from the BLE UART communication section T9d, stores it in the memory A12h, and simultaneously sends it to the transmitter/receiver section A12c.

[0112]

The transmitter/receiver section A12c receives command data or encrypted command data from the BLE UART communication section A12b and sends it to the decision section A12d.

[0113]

When the decision section A12d receives command data or encrypted command data from the transmitter/receiver section A12c, it decides on the availability of the command data or encrypted command data. The decision section A12d draws out the patterned data shown in the pattern table T1 described in Figure 8, which is pre-programmed in the pattern storage section A12i. The decision section A12d analyzes whether the command data or encrypted command data received from the transmitter/receiver section A12c matches the patterned data preprogrammed in the pattern storage section A12i, and makes an availability determination. If the command data is acceptable, decision section A12d sends the command data to creation section A12e. If the result of the encrypted command data is acceptable, the decision section A12d sends the encrypted command data to the encryption/decryption section A (no given number) of the landing area radio device A12. When the encryption/decryption section A (no given number) of landing area radio device A12, receives the encrypted command data, it decrypts it using the real-time clock section A12j. The command data encrypted by the encryption/decryption section T (no given number) of the mobile device 9 received by the landing area radio device A12 becomes the command data decrypted by the encryption/decryption section A (no given number) of the mobile device 9. The encryption-decryption section A (no given number) of the mobile device 9 may also encrypt the command data created by the creation section A12e.

[0114]

The decision section A12d sends the command data or decoded command data to the creation section A12e. If the result of the command data is rejected, the decision section A12d does not send the command data to the creation section A12e. If the result of the encrypted command data is rejected, the decision section A12d does not send the encrypted command data to the encryption/decryption section A (no given number) of the landing area radio device A12.

[0115]

When the creating section A12e receives command data or decoded command data from the decision section A12d, it creates signals for the general-purpose IO port section A12g based on the command data or decoded command data. The creating section A12e sends the created signal for the general-purpose IO port section A12g to the transmitting section A12f.

[0116]

The transmitter A12f sends signals for the general-purpose IO port section A12g received from the creation section A12e to the general-purpose IO port section A12g.

[0117]

When the general-purpose IO port section A12g receives a signal for the general-purpose IO port section A12g from the transmitter section A12f, it sends an electrical signal to the individual relays A15 to drive them.

[0118]

For example, when relay A15 corresponding to UP button 11a is driven, the switch of UP button 11a turns on. When the switch of the UP button 11a turns on, a signal that the switch of the UP button 11a has triggered, which is controlled by the elevator's own communication protocol, is sent to the control unit 5. When the control unit 5 receives the signal that the switch of the UP button 11a is triggered, it controls the elevator car 6 to ascend or descend to the floor where the user is located.

[0119]

For example, when relay A15 corresponding to DOWN button 11b is driven, the switch of DOWN button 11b is triggered. When the switch of the DOWN button 11b is triggered, a signal that the switch of the DOWN button 11b is triggered, which is controlled by the elevator's own communication protocol, is sent to the control unit 5. When the control unit 5 receives the signal that the switch of the DOWN button 11b is triggered, it controls the elevator car 6 to ascend or descend to the floor where the user is located.

[0120]

For example, when relay A15 corresponding to bell A button 10a is driven, the switch of bell A button 10a is triggered. When the switch of bell A button 10a is triggered, a signal that the switch of bell A button 10a, which is controlled by the elevator's own communication protocol, turns on is sent to the controller 5. When the control unit 5 receives the signal that the switch of the Bell A button 10a is triggered, it controls the alarm A10 to sound the alarm A10.

[0121]

Mobile device 9 and landing area radio device A12 control the elevator and alarm A10 by driving individual relays A15 and turning on the respective destination direction buttons (UP button 11a and DOWN button 11b) and bell A button 10a switches based on the program as described above. Therefore, the landing area radio device A12 does not need to be connected to the control unit 5, which controls the entire elevator.

[0122]

Figure 11 is a block diagram showing the functional configuration of the mobile device 9, elevator car radio device B14, extended SPI IO port, elevator car control panel 13, and alarm B18 applied to the example. First, each block diagram is explained according to Figure 11.

[0123]

As shown in Figure 11, user's mobile device 9 has a BLE communication section T9a, a processor T (no given number), a BLE UART communication section T9d, a memory T9e, a pattern storage section T9f and a real-time clock section T9g.

[0124]

Mobile device 9 incorporates a creation section T9b and a transmitter/receiver section T9c in processor T (no given number). Mobile device 9 incorporates an encryption/decryption section T (no given number), in the creation section T9b.

[0125]

The elevator car radio device B14 has a BLE communication section B14a, a BLE UART communication section B14b, a processor B (no given number), a general-purpose IO port section B14g, a memory B14h, a pattern storage section B14i, a real-time clock section B14j and an SPI IO port section B14k.

[0126]

The elevator car radio device B14 incorporates a transmitter/receiver B14c, a decision section B14d, an encryption/decryption section B(no given number), a device B14e, and a transmission section B14f in the processor B (no given number).

[0127]

The elevator car radio device B14 is equipped with a multiple of relays B16. Each relay B16 is individually assigned to and connected to a switch on the bell B button 18a on the alarm B18 of the elevator car control panel 13, the OPEN button 19 on the elevator car control panel 13, and the CLOSE button 20 on the elevator car control panel 13.

[0128]

An extended SPI IO port 14l is connected to the SPI IO port section B14k provided by the elevator car radio device B14. The extended SPI IO port 14l is connected in a daisy-chain fashion. The extended SPI IO port 14l is equipped with a multiple of relays C17. Each relay C17 in the extended SPI IO port 14l is individually assigned and connected to the switch of each destination floor button (numbered button) on the elevator car control panel 13. There may be more than one extended SPI IO port 14l. The number of expansion SPI IO ports 14l can be added according to the number of destination floors of the building in which the elevator car radio device B14 is installed.

[0129]

The BLE communication section T9a constantly scans to detect radio signals in the predetermined frequency band transmitted by the elevator car radio device B14. The BLE communication section B14a transmits radio signals in the specified frequency band, as described in Figure 4. The state in which Bluetooth (registered trademark) communication between mobile device 9 and elevator car radio device B14 is established as explained in Figure 4 is the same as the state in which Bluetooth (registered trademark) communication is established automatically by detecting the radio signal in the predetermined frequency band transmitted by BLE communication section B14a while BLE communication section T9a is scanning as shown in Figure 11. This is the same as the state in which Bluetooth (registered trademark) communication has been established.

[0130]

When Bluetooth (registered trademark) communication between the mobile device 9 and the elevator car radio device B14 is established, the BLE communication section B14a sends Bluetooth (registered trademark) broadcast data to the BLE communication section T9a. As explained in Figure 9, the Bluetooth (registered trademark) broadcast data includes the floor data in the destination floor table T2 as well as the building data of the elevator in which the elevator car radio device B14 is installed. The building data including the floor data in the destination floor table T2 is set in advance in the elevator car radio device B14; the Bluetooth (registered trademark) broadcast data including the building data and the floor data in the destination floor table T2 received by the BLE communication section T9a is stored in the memory T9e.

[0131]

The creation section T9b draws a pattern from the pattern storage section T9f. A pattern is the patterned data shown in the pattern table T1 described in Figure 8. The pattern is preprogrammed in the pattern storage section T9f. The creation section T9b creates command data by combining the Bluetooth (registered trademark) broadcast data received from the BLE communication section B14a, which is stored in the memory T9e, and the patterns that are preprogrammed in the pattern storage section T9f. The created command data includes a command code and subsequent data.

[0132]

For example, assume that there is a building named "XYZ Building" with floors 1 to 6. Each floor of the building from the first to the sixth floor is configured as floor data as shown in the destination floor table T2 in Figure 9. The pattern programmed in advance in the pattern storage section T9f is the pattern table T1 shown in Figure 8. Suppose that an elevator user selects the Bell B symbol 93 shown in Figure 7 on the screen display of the mobile device 9 in the elevator car 6. Bell B symbol 93 is pattern D when applied to pattern table T1. The creation section T9b combines pattern D and the Bell B symbol 93 and creates the command data {D: Bell B}, which is replaced by a character string. Suppose that an elevator user selects the OPEN symbol 95 shown in Figure 7 on the screen display of mobile device 9 in the elevator car 6. The OPEN symbol 95 is pattern E when applied to pattern table T1. The creation section T9b combines pattern E and the OPEN symbol 95 and creates the command data {E: OPEN}, which is replaced by a character string. Suppose that an elevator user selects the closing symbol 96 shown in Figure 7 on the screen display of the mobile device 9 in the elevator car 6. The closing symbol 96 is pattern F when applied to the pattern table T1. The creation section T9b combines the pattern F and the closing symbol 96 and creates the command data {F: CLOSE}, which is replaced by a character string. Suppose that an elevator user selects the 5 symbols 94 shown in Figure 7 on the screen display of the mobile device 9 in the elevator car 6. 5 symbols 94, when applied to pattern table T1, becomes pattern LVL. The creation section T9b combines the pattern LVL and the 5-symbol 94 and creates the command data {LVL: 5}, which is replaced by a character string.

[0133]

The encryption/decryption section T (no given number) of mobile device 9, and the encryption/decryption section B (no given number) of wireless terminal B14, encrypt and decrypt the command data. In cases such as those described in Figure 7, where only users with a certain authority can get off and a certain destination floor is set for the elevator, or where only users with a certain authority can use a certain elevator, the encryption/decryption section T (no given number) of the mobile device 9 and the encryption/decryption section B (no given number) of the wireless terminal B14, encrypt and decrypt command data in order to use PINs. and the encryption/decryption section B (no given number) of the wireless terminal B14 are used. The real-time clock section T9g is used for encryption and decryption of the command data created by the creation section T9b of the mobile device 9. The real-time clock section B14j is used for encryption and compounding of the command data created by the creation section B14E of the elevator car radio device B14 to set and read the date and time.

[0134]

The creation section T9b sends the created command data to the transmitter/receiver section T9c. When encrypting the command data created by the creation section T9b, encryption is performed by the encryption/decryption section T (no given number) of the mobile device 9. The encryption/decryption section T (no given number) may also receive the encrypted command data sent by the transmitter/receiver section B14c of the wireless terminal B14 and decrypt it.

[0135]

As described above, the real-time clock section T9g is used to encrypt the command data created by the creation section T9b. The creation section T9b sends the created or encrypted command data to the transmitter/receiver section T9c.

[0136]

The transmitter/receiver section T9c receives the command data created or encrypted by the creation section T9b and sends it to the BLE UART communication section T9d.

[0137]

The BLE UART communication section T9d sends command data or encrypted command data received from the transmitter/receiver section T9c to the BLE UART communication section B14b.

[0138]

BLE UART communication section B14b receives command data and encrypted command data from BLE UART communication section T9d, stores them in memory B14h, and simultaneously sends them to transmitter/receiver section B14c.

[0139]

The transmitter/receiver B14c receives command data or encrypted command data from the BLE UART communication section B14b and sends it to the decision section B14d.

[0140]

When the decision section B14d receives command data or encrypted command data from the transmitter/receiver section B14c, it decides on the availability of the command data or encrypted command data. The decision section B14d draws out patterned data that is pre-programmed in the pattern storage section B14i and shown in the pattern table T1 described in Figure 8. The decision section B14d analyzes whether the command data or encrypted command data received from the transmitter/receiver section B14c matches the patterned data preprogrammed in the pattern storage section B14i, and makes an availability determination. If the command data is acceptable, decision section B14d sends the command data to B14e. If the result of the encrypted command data is acceptable, the decision section B14d sends the encrypted command data to the encryption/decryption section B (no given number) of the elevator car radio device B14. When the encryption/decryption section B (no given number) of elevator car radio device B14, receives the encrypted command data, it decrypts it using real-time clock section B14j. The command data received by the elevator car radio device B14 and encrypted by the encryption/decryption section T (no given number) of the mobile device 9 is the command data decrypted by the encryption/decryption section B (no given number). The encryption-decryption section B (no given number) may also encrypt the command data created by the creation section B14e.

[0141]

The decision section B14d sends the command data or decoded command data to the creation section B14e. If the result of the command data is rejected, the decision section B14d does not send the command data to the creation section B14e. If the result of the encrypted command data is rejected, the decision section B14d does not send the encrypted command data to the encryption/decryption section B (no given number) of the elevator car radio device B14.

[0142]

When the creating section B14e receives command data or decoded command data from the decision section B14d, it creates signals for the general-purpose IO port section B14g or the SPI IO port section B14k based on the command data or decoded command data. The creating section B14e sends the created signal for the general-purpose IO port section B14g or the signal for the SPI IO port section B14k to the transmitting section B14f.

[0143]

Transmission section B14f transmits signals for general-purpose IO port section B14g received from creation section B14e to general-purpose IO port section B14g. The transmitter section B14f also transmits the signal for SPI IO port section B14k received from the creating section B14e to the SPI IO port section B14k.

[0144]

When the general-purpose IO port section B14g receives a signal for the general-purpose IO port section B14g from the transmitter section B14f, it sends an electrical signal to the individual relays B16 to drive them.

[0145]

For example, when relay B16 corresponding to bell B button 18a is driven, the switch of bell B button 18a triggered. When the switch of bell B button 18a triggered, a signal that the switch of bell B button 18a has triggered, which is controlled by the elevator's own communication protocol, is sent to controller 5. When the control unit 5 receives the

signal that the switch of the Bell B button 18a is triggered, it controls the alarm B18 and sounds the alarm B18.

[0146]

For example, when relay B16 corresponding to OPEN button 19 is driven, the switch of OPEN button 19 is triggered. When the switch of the OPEN button 19 is triggered, a signal that the switch of the OPEN button 19 is triggered, which is controlled by the elevator's own communication protocol, is transmitted to the control unit 5. When the control unit 5 receives the signal that the switch of the OPEN button 19 is triggered, it controls the landing area door 7 and opens the landing area door 7.

[0147]

For example, when relay B16 corresponding to CLOSE button 20 is driven, the switch of CLOSE button 20 is triggered. When the switch of the CLOSE button 20 is triggered, a signal that the switch of the CLOSE button 20 is triggered, which is controlled by the elevator's own communication protocol, is sent to the control unit 5. When the control unit 5 receives the signal that the switch of the CLOSE button 20 is triggered, it controls the landing area door 7 and closes the landing area door 7.

[0148]

When SPI IO port section B14k receives a signal for SPI IO port section B14k from transmitter section B14f, it sends a signal for SPI IO port section B14k to extended SPI IO port 14l, which is connected in a daisy chain system.

[0149]

When the extended SPI IO port 14l receives signals for SPI IO port section B14k from SPI IO port section B14k, it sends electrical signals to individual relays C17 to drive them.

[0150]

For example, when relay C17 corresponding to 5-button 13a is driven, the switch of 5-button 13a is triggered. When the switch of 5-button 13a is triggered, a signal that the switch of 5-button 13a is triggered, controlled by the elevator's own communication protocol, is sent to control unit 5. When the control unit 5 receives the signal that the switch of the 5-button 13a is triggered, it controls the elevator car 6 and raises and lowers the elevator car 6 to the fifth floor.

[0151]

Mobile device 9 and elevator car radio device B14 drive the individual relays of relay B16 based on the program as described above and switch on bell B button 18a and the respective open/close buttons (OPEN button 19 and CLOSE button 20) to control the elevator and alarm B18. Similarly, user's mobile device 9 and elevator car radio device B14 control the elevator by driving individual relays of relay C17 based on the program as described above and turning on the switch of each destination floor button (numbered buttons). Therefore, the elevator car radio device B14 does not need to be connected to the control unit 5, which controls the entire elevator.

[0152]

As illustrated in Figures 10 and 11, the example is achieving by a combination of hardware, software and firmware. The software and firmware of the hardware, landing area radio device A12, is preprogrammed and works with the user's mobile device 9 on which the dedicated APP is installed. Similarly, the software and firmware of the hardware elevator car radio device B14 is preprogrammed to work with the user's mobile device 9 on which the dedicated APP is installed. As a result, it is possible to create the same situation as when each of the buttons on landing area control panel 11, alarm A10, elevator car control panel 13, and alarm B18 are pressed. The individual relays connected to the radio devices A12 and B14 are connected to the switches of the corresponding buttons, so that the installation of the radio devices A12 and B14 does not require any modification of the control boards of the landing area control panel 11, alarm A10, elevator car control panel 13, and alarm B18. No software modification or hardware rework is required due to functional modification or addition of functions. In addition, the radio devices A12 and B14 can control the elevator without communicating with the

control unit 5 for controlling the elevator, so they do not interfere with the existing network of the elevator system. Therefore, landing area radio device A12 and elevator car radio device B14 can be easily installed without changing or adding functions to the existing elevator system, and maintenance work, repair in case of failure, and replacement in case of malfunction are easy. For these reasons, the radio devices A12 and B14 are versatile and can be used not only for recent elevator systems, but also for elevators in older facilities that are not accompanied by recent elevator systems.

[0153]

Next, the operation of landing area radio device A12 and elevator car radio device B14 in the example is described using Figure 12.

[0154]

Figure 12 is a flowchart to outline the operation of landing area radio device A12 and elevator car radio device B14 as applied to the example.

[0155]

The radio devices A12 and B14 are always on after installation in the elevator. Landing area radio device A12 and elevator car radio device B14 are constantly transmitting radio signals in a predetermined frequency band (S1000).

[0156]

As described in Figures 2 through 4, a radio signal in a predetermined frequency band originating from landing area radio device A12 or elevator car radio device B14 is detected in range 900 of user's mobile device 9 (S1001). If neither landing area radio device A12, elevator car radio device B14, or both are detected in range 900 of user's mobile device 9 (NO in S1001), the process returns to step S1000.

[0157]

On the other hand, if landing area radio device A12, elevator car radio device B14, or both are detected in range 900 of user's mobile device 9 in step S1001 (YES in S1001), landing area radio device A12 or elevator car radio device B14 establishes communication with user's mobile device 9 (S1002).

[0158]

When communication is established between landing area radio device A12 or elevator car radio device B14 and user's mobile device 9 in step S1002, landing area radio device A12 or elevator car radio device B14 sends Bluetooth (registered trademark) broadcast data to user's mobile device 9 (S1003).

[0159]

The mobile device 9 that receives the Bluetooth (registered trademark) broadcast data as described in Figure 10 and Figure 11 displays the image and text information on the screen as described in Figure 5 through Figure 7. When the user operates the mobile device 9, the mobile device 9 sends command data to the landing area radio device A12 or the elevator car radio device B14. In step S1004, the command data processing performed by the landing area radio device A12 or the elevator car radio device B14 corresponds to the decision of acceptability described in Figure 10 and Figure 11. If the landing area radio device A12 or the elevator car radio device B14 does not process the command data received from the user's mobile device 9 (NO in S1004), it returns to step S1000.

[0160]

On the other hand, if landing area radio device A12 or elevator car radio device B14 processes the command data received from user's mobile device 9 in step S1004 (YES in S1004), landing area radio device A12 drives relay A15 connected to landing area radio device A12 corresponding to the command data, and elevator car radio device B14 drives relay B16 or relay C17 connected to the elevator car radio device B14 corresponding to the data (S1005). This completes the operation of landing area radio device A12 and elevator car radio device B14.

[0161]

Next, the operation of user's mobile device 9 in the example is described using Figure 13.

[0162]

Figure 13 is a flowchart to outline the operation of the 9 user's mobile devices applied in the example.

[0163]

The dedicated APP pre-installed on the user's mobile device 9 is turned on by the user (S2000).

[0164]

As described in Figures 2 through 4, the range 900 of the mobile device 9 detects radio signals in a predetermined frequency band emitted from the landing area radio device A12 or the elevator car radio device B14 (S2001). If user's mobile device 9 does not detect landing area radio device A12, elevator car radio device B14, or both (NO in S2001), it returns to step S2000.

[0165]

On the other hand, if in step S2001, user's mobile device 9 detects landing area radio device A12, elevator car radio device B14, or both (YES in S2001), user's mobile device 9 establishes communication with landing area radio device A12 or elevator car radio device B14 (S2002).

[0166]

When communication is established between mobile device 9 and landing area radio device A12 or between mobile device 9 and elevator car radio device B14 in step S2002, Bluetooth (registered trademark) broadcast data is received from landing area radio device A12 or elevator car radio device B14 with which communication is established (S2003).

[0167]

In step S2003, user's mobile device 9 receives Bluetooth (registered trademark) broadcast data sent by landing area radio device A12 or elevator car radio device B14.

[0168]

After receiving the Bluetooth (registered trademark) broadcast data as described in Figure 10 and Figure 11, the mobile device 9 displays the image and text information on the screen as described in Figure 5 through Figure 7. When the user operates the mobile device 9, the mobile device 9 sends command data to the landing area radio device A12 or the elevator car radio device B14. As illustrated in Figure 1, the mobile device 9 is turned on for a certain period of time. After a certain period of time, the mobile device 9 is automatically turned off (S2004). If a certain amount of time on has passed without the user operating the mobile device 9 (YES in S2004), the operation of the mobile device 9 is terminated.

[0169]

On the other hand, if a certain time of being on has not yet elapsed in step S2004 (NO in S2004), user's mobile device 9 continues to wait for the user's operation.

[0170]

As described in Figure 10 and Figure 11, when the user operates the mobile device 9 and selects the image and text information displayed in the dedicated APP described in Figure 5 to Figure 7, the mobile device 9 sends command data to the landing area radio device A12 or the elevator car radio device B14. If, in step 2005, the mobile device 9 does not send command data to the landing area radio device A12 or the elevator car radio device B14 while it is on for a certain period of time (NO in S2005), it returns to step S2004.

[0171]

On the other hand, if user's mobile device 9 sends command data to landing area radio device A12 or elevator car radio device B14 (YES in S2005), the operation of user's mobile device 9 is terminated.

[0172]

The elevator control system described above allows each landing area radio device A12 and each elevator car radio device B14 to control an elevator without having to communicate with the elevator's control unit, which controls the elevator using its own

communication protocol, so installation at each landing area platform 8 and each elevator car 6 is a simple task. Installation of each landing area radio device A12 and each elevator car radio device B14 does not involve renewal or renovation of the elevator, and installation costs can be reduced. The versatility of each landing area radio device A12 and B14 also facilitates maintenance work after installation, repairs due to malfunctions, and replacement, etc., and achieves an elevator control system with less financial burden.

[0173]

In recent years, it has been pointed out that elevator control panels 11 and 13, which are used by many people, are at risk of contact infection. Due to concerns about contact infection, there have been reports of elevator control panels 11 and 13 being sprayed with disinfectant, and of buttons being pressed with sharp objects such as keys or pens. These cases also lead to elevator malfunctions and failures. By installing each landing area radio device A12 and each elevator car radio device B14, such as the elevator control system described above, in existing elevators, which can communicate wirelessly with the mobile device 9 carried by the user and which is easy to install and maintain and versatile, the elevators can be remotely operated by the user. This will lead to a reduction in the number of times that each of the elevator's control panels 11 and 13 are sprayed with disinfectant or the buttons on which they are located are pressed with keys, pens, or other sharp objects. This will also reduce the number of factors that cause elevator malfunctions and defects, and provide a safe and secure environment for elevator use and non-contact elevators that take into consideration the public health of the users.

[Description of symbol].

[0174]

1...Elevator shaft, 2...Balancing weight, 3...Rope, 4...Hoisting machine, 5...Control unit, 6...Elevator car, 7...Landing area door, 8...Landing area platform, 9...User's mobile device, 9a...BLE communication section T, 9b...Creation section T, 9c...Transmission and reception section T, 9d...BLE UART communication section T 10a...Bell button A, 11...Landing area control panel, 11a...UP button, 11b...DOWN button, 12...Landing area radio device, 12a... BLE communication section A, 12b...BLE UART communication section A, 12c...Transmission and reception section A, 12d...Accessibility decision section A, 12e...Creation section A 12f... Transmission section A, 12g... General-purpose IO port section A, 13... Elevator car control panel, 13a... 5 buttons, 14...Elevator car radio device, 14a... BLE communication section B, 14b... BLE UART communication section B, 14c... Transmission/reception section B, 14d... Availability decision section B, 14e... Creation section B, 14f... UART communication section B, 14f...Transmitting section B, 14g...General purpose IO port section B, 14k...SPI IO port section B, 14l...Extended SPI IO port, 15...Relay A, 16...Relay B, 17...Relay C, 18...Alarm B, 18a...Bell button B, 19...OPEN button, 20 90... CLOSE button, 90...Bell A symbol, 91...UP symbol, 92... DOWN symbol, 93...Bell B symbol, 94...5 symbol, 95...OPEN symbol, 96 · · · CLOSE symbol, 120...Radio signal A in a given frequency band, 140...Radio signal B in a given frequency band

Claims

[Claim 1]

The user's mobile device and
 a landing area radio device installed at each floor of the elevator and
 an elevator car radio device installed in each elevator car and
 and

the user's mobile device is

- a BLE communication unit that receives radio signals and building data in a predetermined frequency band transmitted from a landing area radio device, and radio signals, building data, and floor data in a predetermined frequency band transmitted from a landing area radio device,
- a device that creates command data for destination direction, destination floor, etc. based on received radio signals, building data, and floor data; and
- a pattern storage unit that stores patterned data such as destination direction,

destination floor, etc., in advance,

- a BLE UART communication unit that transmits the created command data to the landing area radio device and the elevator car radio device,
- a memory that records radio signals, building data, and floor data received from the landing area radio device and the elevator car radio device; and

consisting of

the landing area radio device is

- a BLE communication unit that transmits radio signals in a predetermined frequency band and building data to the user's mobile device in the landing area,
- a BLE UART communication unit that receives command data sent from the user's mobile device in the landing area, and
- a pattern storage unit that stores patterned data such as destination direction, etc., in advance,
- the device determines whether the received command data matches the patterned data stored in the pattern storage unit,
- a general-purpose IO port section that drives a relay that operates the switches on the landing area control panel when the received command data matches the patterned data stored in the pattern storage section, and

consisting of

the elevator car radio device is

- a BLE communication unit that transmits radio signals in a predetermined frequency band, building data, and floor data to the user's mobile device in the elevator car,
- a BLE UART communication unit that receives command data sent from the user's mobile device in the elevator car,
- a pattern storage unit where patterned data such as destination floors, etc. are stored

in advance,

- the device determines whether the received command data matches the patterned data stored in the pattern storage unit,
- general-purpose IO port section and SPI IO port section that drive relays that operate the switches of the landing area control panel when the received command data matches the patterned data stored in the pattern storage section, and

consisting of

the user's mobile device is

- building data to be received from the landing area radio device, and
- building data, and floor data to be received from the elevator car control panel radio equipment,

based on

the user-created command data, such as destination direction, destination floor, etc., can be transmitted to the landing area radio device and the elevator car radio device, and

the landing area radio device is

- based on the command data received from the user's mobile device, such as the destination direction, etc.,

- the general-purpose IO port section drives the relays that operate the switches on the landing area control panel,

- the elevator car ascends and descends to the floor where the user is located,
- the elevator car radio system was

- based on the command data received from the user's mobile device, such as the destination floor, etc.,

- the general-purpose IO port section and the SPI IO port section drive the relays that operate the switches on the elevator car control panel,

- the elevator car ascends or descends to the floor that the user designates as the destination floor,

- this allows the user to operate the control panel at the landing area and in the elevator car without having to operate the respective control panel,

- elevator car transition to the desired floor of

- an elevator control system characterized by the following features.

[Claim 2]

The user's mobile device is then

- a BLE communication unit that receives radio signals and building data in a predetermined frequency band transmitted from a landing area radio device, and

- radio signals, building data, and floor data in a predetermined frequency band transmitted from a landing area radio device,

- a device that creates command data for destination direction, destination floor, etc.

- based on received radio signals, building data, and floor data; and

- a pattern storage unit that stores patterned data such as destination direction, destination floor, etc., in advance,

- a BLE UART communication unit that transmits the created command data to the landing area radio device and the elevator car radio device,

- a memory that records radio signals, building data, and floor data received from the landing area radio device and the elevator car radio device; and

the landing area radio device is designed to

- a BLE communication unit that transmits radio signals in a predetermined frequency band and building data to the user's mobile device in the landing area,

- a BLE UART communication unit that receives command data sent from the user's mobile device in the landing area, and

- a pattern storage unit that stores patterned data such as destination direction, etc., in advance,

- the device determines whether the received command data matches the patterned data stored in the pattern storage unit,

- a general-purpose IO port section that drives a relay that operates the switches on the landing area control panel when the received command data matches the patterned data stored in the pattern storage section, and

the elevator car radio system is designed to

- a BLE communication unit that transmits radio signals in a predetermined frequency band, building data, and floor data to the user's mobile device in the elevator car,

- a BLE UART communication unit that receives command data sent from the user's mobile device in the elevator car,

- a pattern storage unit where patterned data such as destination floors, etc. are stored in advance,

- the device determines whether the received command data matches the patterned data stored in the pattern storage unit,

general-purpose IO port section and SPI IO port section that drive relays that operate the switches of the landing area control panel when the received command data matches the patterned data stored in the pattern storage section, and
 the function of the system is to
 the user's mobile device is
 building data to be received from the landing area radio device, and
 building data, and floor data to be received from the elevator car control panel radio equipment,
 based on
 the user-created command data, such as destination direction, destination floor, etc., can be transmit to the landing area radio device and the elevator car radio device, and the landing area radio device is
 based on the command data received from the user's mobile device, such as the destination direction, etc.
 the general-purpose IO port section drives the relays that operate the switches on the landing area control panel,
 the elevator car ascends and descends to the floor where the user is located,
 the elevator car radio system is
 the system uses command data received from the user's mobile device, such as destination direction, destination floor, etc.,
 the general-purpose IO port section and the SPI IO port section drive the relays that operate the switches on the elevator car control panel,
 the elevator car ascends or descends to the floor that the user designates as the destination floor,
 this allows the user to operate the control panel at the landing area and in the elevator car without having to operate the respective control panel,
 elevator car transition to the desired floor of
 the elevator control program is characterized by the following features.