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(54) **ELEVATOR SYSTEM WITH RESTRICTED TRAVEL OPTIONS**

(57) An elevator system (1) has an elevator controller (12), an elevator car (6) movable under control of the elevator controller (12) between a plurality of floors (L1, L2, L3) of a building, and an operating terminal (4) communicatively coupled to the elevator controller (12) and configured to receive an elevator call for a trip from a boarding floor to a destination floor. The elevator controller (12) is configured to determine a floor difference between the boarding floor and the destination floor, and to restrict servicing the elevator call to at least one predetermined user group in response to the floor difference being less than three. The elevator system (1) stores a specification of the at least one predetermined user group.

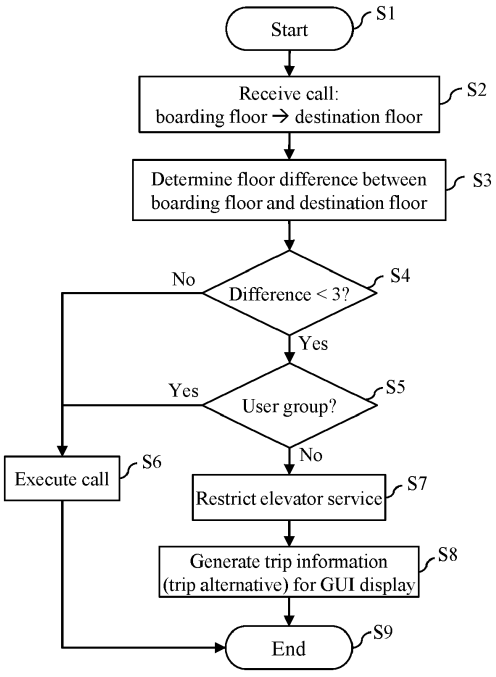

Fig. 4

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Description

[0001] The technology described herein relates generally to an elevator system. More particularly, exemplary embodiments of the technology relate to an elevator system operable in consideration of its energy efficiency. Exemplary embodiments of the technology further relate to a method for operating the elevator system according to these considerations.

[0002] An elevator system may be controlled with an objective to optimize its energy efficiency. Various approaches are known to address the energy consumption of an elevator system. For example, US 9,212,030 B2 discloses an elevator system that obtains energy settings for a user upon the user entering an elevator call. The energy settings determine, for example, movement of an elevator car depending on factors that affect energy consumption, and thus the energy efficiency, of an elevator trip, such as acceleration of the elevator car during a trip, occupancy rate of the car, and settings for car components that consume power, such as car fans, car climate control, and car lighting. According to an approach disclosed in US 9,016,440 B2, the elevator system determines several possible trips for a given destination, displays them together with energy consumption values, allows selection of one of the trips or energy consumption values, and upon selection, operates the elevator car according to the selection.

[0003] Although these approaches achieve the objective of optimizing the energy efficiency of an elevator system, for certain buildings these approaches may be too complex, for example, because several possible trips may not be available or individual user-specific settings may not be desired. There is, therefore, a need for an alternative approach for optimizing the energy efficiency that is less complex and usable for a broader spectrum of buildings.

[0004] One aspect of the technology described herein relates to an elevator system having an elevator controller, an elevator car movable under control of the elevator controller between a plurality of floors of a building, and an operating terminal communicatively coupled to the elevator controller. Controlled by the elevator controller, the elevator car is movable between the floors of the building in response to an elevator call for a trip from a boarding floor to a destination floor. The elevator controller is configured to determine a floor difference between the boarding floor and the destination floor, and to restrict servicing the elevator call to a predetermined user group in response to the floor difference being less than three. The elevator system is configured to store a specification of the at least one predetermined user group.

[0005] Another aspect relates to a method of operating an elevator system having an elevator controller, elevator operating terminals, and an elevator car, and an elevator car movable under control of the elevator controller between a plurality of floors of a building. The method includes receiving an elevator call for a trip from a boarding floor to a destination floor, and determining, by the elevator controller, a floor difference between the boarding floor and the destination floor. Further, the method includes restricting servicing the elevator call to a predetermined user group in response to the floor difference being less than three. The elevator system is configured to store a specification of the at least one predetermined user group.

[0006] The various aspects of the technology disclosed herein optimize the energy efficiency of an elevator system by reducing the number of short-distance elevator trips. A short-distance elevator trip is defined as an elevator trip for which the floor difference between the boarding floor and the destination floor is one or two. In one embodiment, the short-distance trip is set to have a floor difference of one. Unless the user belongs to a predetermined group (e. g., users with reduced mobility, building management personnel, and/or robots), it is assumed that a trip alternative for reaching the destination floor is acceptable to the user who ultimately may get used to taking stairs instead of an elevator to get to a neighboring floor. In one embodiment, such a trip alternative includes a path that leads through a building's stairwell, e. g., a user will have to walk one flight of stairs up or down to get to the destination floor. Therefore, in response to determining that an elevator call involves a short-distance elevator trip, in one embodiment, the elevator system is controlled to present trip information to the user that includes the trip alternative, and to disable execution of the elevator call or to process its execution with a low priority. Such low-priority processing may prolong the time a user has to wait until the elevator car arrives on the boarding floor or reaches the entered destination floor. Such longer travel time may be communicated to the user by means of the trip information; the trip information may inform the user that taking the stairs is faster which may encourage the user to take the stairs instead of waiting for the elevator.

[0007] In one embodiment, which may be applicable in connection with one or more of the embodiments described herein, the trip information may query the user whether the call is to be canceled, e. g., because the user agrees to take the stairs and/or considers the travel time resulting from the low-priority processing as being too long. In such a situation, the elevator is no longer needed, and the call can be cancelled to avoid an unnecessary trip. In one embodiment, the operating terminal may have a dedicated button for cancelling a call. It is contemplated that the elevator system may provide other features that allow a user to cancel a call, e. g., a voice recognition system that recognizes a spoken command, or an interface for communications with a dedicated software application (app) of a mobile phone that allows the user to enter a cancellation command using the mobile phone.

[0008] In one embodiment, which may be applicable in connection with one or more of the embodiments described herein, the trip information may require the user to confirm that the call is to be executed despite the delay

resulting from the low-priority processing. Such a call confirmation may be implemented like the call cancellation. The elevator system may be set up so that the call is canceled if the confirmation is not received with a predetermined period of time. Upon expiration of that period of time, it is assumed that the user is no longer interested in the trip.

[0009] The disclosed technology is not limited to a particular elevator control technology. An elevator system may be equipped with a destination call control system, in which a destination floor is entered, e. g., at a floor terminal or a mobile phone, while the user is outside the elevator car. Alternatively, an elevator system may be equipped with a conventional up/down call control, in which the travel direction is entered at a floor terminal and the destination floor is entered at a car terminal inside the elevator car. In practical terms, this means that, regardless of the implemented elevator control technology, the elevator system does not register an elevator call for a trip, for example, from a floor n to a floor n + 1 or n - 1, or n + 2 or n - 2.

[0010] According to the disclosed technology, however, short-distance elevator trips are possible for users that belong to a predetermined group, e. g., users with reduced mobility (e. g., a user in a wheelchair) and authorized persons and/or specified objects (e. g., building management personnel or autonomously moving objects, such as robots). Users that belong to such a predetermined group can present some kind of credential (e. g., a code, password, mechanical or electronic key, biometrics) when entering an elevator call. The credential indicates that a user belongs to a predetermined group. In one embodiment, the credential is transmitted to the elevator system when the user calls an elevator at an operating terminal or uses a mobile phone that executes a dedicated software application.

[0011] In one embodiment, the elevator system is configured to receive a credential associated with a user's elevator call for the elevator controller to verify the user belongs to the predetermined user group. The elevator controller is configured to execute the elevator call in response to verifying the user belongs to the predetermined user group; e. g., a wheelchair user is transported even in case of a short-distance trip. Further, the elevator controller is configured to generate trip information in response to determining the floor difference is less than three and the user is not part of the predetermined user group. The disclosed technology, therefore, takes into account the special needs of the elevator users.

[0012] In one embodiment, the operating terminal includes an acquisition unit configured to allow input of the credential by the user. The acquisition unit may include an optical reader to obtain an optical code, an RF unit for RFID, NFC or Bluetooth communication, a keypad and/or a receptacle for a mechanical or electromechanical key. In addition, or alternatively, the elevator system includes in one embodiment a radio communications interface to receive the credential transmitted by a mobile phone of the user. These options provide for flexibility in implementing the disclosed technology in a variety of differently equipped buildings.

[0013] In one embodiment, which may be applicable in connection with one or more of the embodiments described herein, the operating terminal includes an audio-enabled display configured to acknowledge the elevator call or to communicate the trip information to the user. An acknowledgment of the elevator call occurs, for example, in response to a call from a user in a wheelchair. In contrast, trip information is communicated to a user who does not belong to the predetermined user group. The audio-enabled display is configured to display and audible announce the acknowledgment and the trip information.

[0014] In one embodiment, which may be applicable in connection with one or more of the embodiments described herein, the displayed and audible announced trip information indicates the restricted elevator service and a trip alternative. The trip alternative includes, for example, a route including a stairwell of the building. It is contemplated that instead of using the audio-enabled display, the elevator system may be configured to communicate the acknowledgment and the trip information to a user's mobile phone. The trip information may include the above-mentioned query regarding call cancellation and/or the request for call confirmation.

[0015] Regardless of whether the operating terminal is a car terminal arranged at an interior wall of the elevator car or a floor terminal, in one embodiment, which may be applicable in connection with one or more of the embodiments described herein, the trip alternative is communicated to the user using the respective audio-enabled display.

[0016] In one embodiment, which may be applicable in connection with one or more of the embodiments described herein, the elevator controller is configured to control the function that provides for reducing the number of short-distance elevator trips according to a rule. The rule may be time dependent and/or traffic dependent.

[0017] In the following, various aspects of the improved technology are explained in more detail by means of exemplary embodiments in connection with the figures. All figures are merely schematic illustrations of methods and terminals or their components according to exemplary embodiments of the improved technology. In particular, distances and size relations are not reproduced to scale in the figures. In the figures, identical elements have identical reference signs. In the drawings:

Fig. 1 shows a schematic illustration of an exemplary elevator system in a building having several floors;

Fig. 2 shows a schematic illustration of exemplary operating terminal having a user interface displaying content according to a first example;

Fig. 3 shows a schematic illustration of exemplary operating terminal having a user interface display-

ing content according to a second example; and

Fig. 4 shows an example of an embodiment of a method of operating the elevator system of Fig. 1.

[0018] Fig. 1 shows a schematic illustration of an exemplary embodiment of an elevator system 1 in a building; the building can be any type of multilevel building (e. g., residential building, hotel, office building, sports station, etc.). Further, the elevator system 1 may be installed in a ship. In the following, components, and functions of the elevator system 1 are explained with reference to Fig. 1 and as far as they may be helpful for an understanding of the technology described herein. The building shown in Fig. 1 has a plurality of floors L1, L2, L3 and at least one internal or external stairwell 2 (also referred to as stairs 2) that interconnects the floors L1, L2, L3. The elevator system 1 serves these floors L1, L2, L3, i. e., the elevator system 1, under control of an elevator controller (EC) 12, transports a user 8 in an elevator car 6 from a boarding floor to a destination floor which the user 8 may enter at an operating terminal 4. In the exemplary embodiment shown, the elevator car 6 is movable along a travel path in the building; the travel path extends along a vertical elevator shaft 10, without being limited to such a travel path. Embodiments of the technology disclosed herein are described with reference to the exemplary elevator system 1 shown in **Fig. 1.**

[0019] In the situation shown in **Fig. 1,** the technology described herein may be advantageously used to operate the elevator system 1 in a more energy efficient way. Summarized briefly and by way of example, the elevator system 1 according to one exemplary embodiment restricts short-distance elevator trips to those users that belong to a predetermined user group. That restriction leads to a reduced the number of short-distance elevator trips because users that do not belong to the predetermined user group are instructed to use the stairs to get, e. g., to a neighboring floor L1, L2, L3. Reducing the number of short-distance elevator trips contributes to operating the elevator system 1 more energy efficiently. For that purpose, and in response to an elevator call for a trip from a boarding floor to a destination floor, the elevator controller 12 determines a floor difference between the boarding floor and the destination floor. If the floor difference is less than three, in particular one, the elevator controller 12 restricts servicing the elevator call to at least one predetermined user group, as specified and stored in the elevator system 1, for example, so that only users with reduced mobility, building management personnel or robots can use the elevator system 1 for such short-distance elevator trips.

[0020] The elevator system 1 shown in **Fig. 1** includes further a drive machine (M) 14, a counterweight 18, a signal transmission system 20 (also referred to as hanging cable), a suspension means 16 (one or more steel ropes or flat belts) and a plurality of deflection pulleys 24. The suspension means 16 has two ends, each end being attached to a fixed point 22 in the elevator shaft 10. Between the fixed points 22, the suspension means 16 partially wraps around the deflection pulley 24 on the counterweight 18, a traction sheave of the drive machine 14 and the deflection pulleys 24 on the elevator car 6. The elevator system 1 shown is thus a traction elevator, wherein further details, such as, for example, guide rails for the elevator car 6 and guide rails for the counterweight 18 are not shown in **Fig. 1.** The elevator controller 12 is connected to the drive machine 14 and controls it to move the elevator car 6 in the shaft 10. The function of a traction elevator, the components of which and the tasks of an elevator control 12 are generally known to the person skilled in the art. The person skilled in the art will recognize that the technology described here is not limited to use in a traction elevator. The person skilled in the art will also recognize that the elevator system 1 can comprise a plurality of elevator cars 6 or multi-deck cars in one or more elevator shafts 10 or can comprise one or more groups of elevators controlled by a group controller.

[0021] In **Fig. 1,** an operating terminal 4 is arranged on each floor L1, L2, L3 and is coupled to the elevator controller 12 by means of a communication connection 26. The communication connection 26 may be implemented with wires (e. g., by individual lines or a communication bus) and/or without wires (e. g., using known RF technologies such as Wi-Fi/WLAN or ZigBee networks). Each of these operating terminals 4 can have, for example, a terminal identifier (also referred to as a terminal ID) by which an operating terminal 4 is identifiable and addressable; in one embodiment, for example, the operating terminal 4 sends a call along with its terminal ID to the elevator controller 12 which acknowledges the call to the operating terminal 4 identified by the terminal ID. In connection with a destination call control system, information about an elevator car 6 allocated to serve the call can also be sent.

[0022] As shown in **Fig. 1,** a further operating terminal 4 is arranged in the elevator car 6 and connected to the elevator controller 12 by means of the signal transmission system 20. The floor-side operating terminal 4 may be referred to as floor terminal and the car-side operating terminal may be referred to as car terminal. For illustration purposes, the operating terminals 4 are shown with the same symbol. The person skilled in the art will recognize that the configurations of the operating terminals 4 depend on the control technology (up/down (directional) call control technology or destination call control technology) applied in the elevator system 1. For example, when the destination call control technology is used, a floor terminal allows a user 8 to enter a destination floor, while the car terminal may allow the user 8, e. g., to signal an emergency and/or to affect the closing of the elevator doors. When the up/down directional call control technology is used, a floor terminal is configured for inputting a desired direction of travel, i. e., it has a button for the upward direction and a button for the downward direction, while the car terminal has buttons for inputting destination floors. Embodiments of the technology described herein

are in the following described as being applicable to the destination call control technology and the up/down call control technology.

[0023] The operating terminal 4 can be arranged at a desired location on a floor L1, L2, L3, e. g., on a building wall or freestanding at a desired location. The location can be, e. g., an anteroom in front of one or more elevator (floor) doors or an entrance to an elevator lobby. While the location is relatively freely selectable, there are specifications (e. g. according to a standard (e. g., EN81-70) or applicable laws and regulations) in terms of in which height range the operating terminal 4 or a user interface of the operating terminal 4 is to be arranged. This is to ensure that the operating terminal 4 is located at a height at which the operating terminal 4 or the user interface can be reached by potential users and displayed information can be perceived, in particular by users with reduced mobility.

[0024] **Fig. 2** and **Fig. 3** each show a schematic illustration of an exemplary operating terminal 4 having a user interface 30 displaying content according to a first and second example, respectively. The operating terminal 4 includes an audio-enabled display 28, e. g., configured as a touch-sensitive screen system. The audio-enabled display 28 is configured to generate the graphical user interface 30 for display on a touch-sensitive screen surface. In **Fig. 2** and **Fig. 3,** the audio-enabled display 28 with its graphical user interface 30 is shown above a representation for an acquisition device 38. The operating mode and principal structure of an audio-enabled display having a touch screen are generally known to the person skilled in the art; the person skilled in the art knows, for example, from the programming and use of smartphones or other electronic terminals having graphical user interfaces, how text, symbols, pictograms, input and output fields, etc. are generated on a touch screen and displayed on the user interface, and how to react when a user touches a certain area of the touch screen for selecting content represented by a symbol, pictogram or field (e. g., for entering a selection or command).

[0025] The audio-enabled display 28 is configured to cause the graphical user interface 30 to display a predetermined content. Corresponding to the building and elevator situation shown in **Fig. 1,** the graphical user interface 30 according to the embodiment shown in **Fig. 2** contains a keypad for entering an elevator call. The keypad includes fields arranged, e. g., in form of a (M x N) matrix (e.g., M = 5 rows, N = 4 columns, with a total of 20 fields). The skilled person recognizes that the arrangement of the fields is not limited to a matrix. Each field displays a number assigned to one the 20 floors of the building. In the illustrated embodiment, the user 8 is on floor eight (indicated through a numbered key "8" shown in dashed lines) and entered an elevator call to floor nine (indicated through a numbered key "9" shown in solid lines). It is contemplated that an entered elevator call may be accompanied by an audible tone or announcement.

[0026] The graphical user interface 30 according to the embodiment shown in **Fig. 3** contains trip information 32 including a trip alternative. The trip information 32 may indicate, for example, that the elevator call cannot be registered (e. g., using text and/or pictograms), and may explain that short-distance elevator trips are disabled to reduce energy consumption of the elevator system 1. In the illustrated embodiment, the displayed trip alternative includes a symbol for stairs and an arrow that points upwards from floor eight to floor nine. In another embodiment, additional information may be displayed, e. g., a route to the closest stairwell 2 and/or other guidance information depending on particularities of the building. In one embodiment, the graphical user interface 30 displays a button 33 that allows the user 8 to cancel or confirm a call.

[0027] With the understanding of the above-described principal system components of the elevator system 1 and its functionalities, a description of an exemplary method of operating the elevator system 1 is provided below with reference to **Fig. 4.** The exemplary description is provided with reference to the exemplary elevator system 1 shown in **Fig. 1.** The elevator system 1 is in operation (i. e., not in standby mode). The method described with reference to **Fig. 4** starts in a step **S1** and ends in a step **S9.** The person skilled in the art will recognize that the division into the steps shown is exemplary, and that one or more of these steps can be divided into one or more sub-steps, or that several of the steps can be combined into one step.

[0028] The illustrated method considers a situation in which a user 8 is present at one of the operating terminals 4, either on one of the floors L1, L2, L3 or inside the elevator car 6, and enters an elevator call at the operating terminal 4. If the operating terminal 4 is in an inactive or standby mode (e. g., the audio-enabled display 28 is not illuminated), detecting the presence of the user 8 causes the operating terminal 4 to change from the standby mode to an active mode (e. g., the audio-enabled display 28 is then illuminated).

[0029] Referring to a step **S2,** the elevator system 1 receives the elevator call entered by the user 8. As mentioned above, if the elevator system 1 is equipped with a destination call control system, the elevator call entered at the operating terminal 4 located on a floor L1, L2, L3 (boarding floor) indicates the destination floor to which the user 8 wants to be transported. If the elevator system 1 is equipped with an up/down call control system, the elevator call that indicates the destination floor is entered at the operating terminal 4 inside the elevator car 6. The elevator call, either entered outside or inside the elevator car 6, is for an elevator trip from a boarding floor to a destination floor. The boarding floor results from the floor on which the operating terminal 4 is located; such location information is stored in the elevator system 1.

[0030] In a step **S3,** a floor difference between the boarding floor and the destination floor is determined by the elevator controller 12. In **Fig. 3,** for example, the de-

termined elevator trip from the 8th floor to the 9th floor results in a floor difference of one.

[0031] In a step **S4,** it is determined if the floor difference is less than three. If this is the case, i. e., the elevator trip is a short-distance trip, the method proceeds along the Yes-branch to a step **S5.** If the floor difference is three or more, the methods proceed along the No-branch to a step **S6.** In the step **S6,** the elevator call is executed (served) by the elevator system 1, as known in the art.

[0032] In the step **S5,** it is determined if the user 8 that entered the elevator call belongs to predetermined user group, and elevator service is to be restricted to that user group because the elevator call is for a short-distance trip. As mentioned above, at least one predetermined user group may be specified. A predetermined user group may include, e. g., users with reduced mobility (e. g., users in wheelchairs or with impaired vision) and authorized persons and/or dedicated objects (e. g., building management personnel or autonomously moving objects, such as robots). A user belonging to such user group may present a credential at the time of entering the elevator call. The elevator system 1 is configured to receive the credential associated with a user's elevator call so that the elevator controller 12 can verify the user 8 belongs to the predetermined user group. For example, the user 8 may have to present the credential at the acquisition unit 38, or via a dedicated app running on the user's mobile phone.

[0033] If it is verified in the step **S5** that the user 8 who entered the elevator call belongs to a predetermined user group, the method proceeds along the Yes-branch to the step S6 and executes the elevator call. Even though the user's elevator call is for a short-distance elevator trip, the elevator call is registered and served, for example, because the user 8 may depend on the elevator service (e. g., a wheelchair user) or may require the elevator service for performing work within the building (e. g., for transporting heavy loads or frequent floor changes).

[0034] If it is determined in the step **S5** that the user 8 who entered the elevator call does not belong to the predetermined user group, elevator service is restricted. The elevator system 1 does not register or enable the elevator call because the user 8 does not belong to the predetermined user group. As an alternative response, the elevator system 1 may execute the elevator call with a low priority which may lead to a longer waiting time or travel time for the user 8, in particular during times of increased elevator traffic in the building. In one embodiment, the elevator system 1 does not serve elevator calls for elevator trips, for example, from a floor n to a floor n + 1 or n - 1. In another embodiment, elevator trips from a floor n to a floor n + 2 or n - 2 may not be served.

[0035] Proceeding to a step **S8,** trip information 32 is generated. The trip information may be displayed on the audio-enabled display 28 and include a trip alternative, for example, as shown in **Fig. 3.** The user 8 may then proceed according to the trip alternative to reach the destination floor.

[0036] In one embodiment, the trip information 32 may query the user 8 whether the call is to be canceled, e. g., because the user 8 agrees to take the stairs 2 and/or considers the waiting or travel time resulting from the low-priority processing as being too long. In such a situation, the elevator is no longer needed, and the call can be cancelled to avoid an unnecessary trip. In one embodiment, the user 8 may press or touch the button 33 to cancel the elevator call. It is contemplated that the elevator system 1 may provide other features that allow the user 8 to cancel the elevator call, e. g., a voice recognition system that recognizes a spoken command, or an interface for communications with the app of the user's mobile phone that allows entering a cancellation command.

[0037] In one embodiment, the trip information 32 may require the user 8 to confirm that the elevator call is to be executed despite the delay resulting from the low-priority processing. Such a call confirmation may be implemented like the call cancellation, i. e., by means of the button 33. It is contemplated that the button 33 may be labeled depending on the situation (call cancellation or call confirmation). The elevator system 1 may be set up so that the elevator call is canceled if the confirmation is not received with a predetermined period of time (e. g., a few seconds). Upon expiration of that period of time, it is assumed that the user 8 is no longer interested in the elevator trip.

[0038] After performing the steps **S6** or **S8,** the method ends in the **S9.**

[0039] Depending on the building and/or the elevator system 1, the operating terminal 4 may include the acquisition device 38 to receive a credential of the user 8. The acquisition device 38 can be provided in the building, for example, if users first have to identify themself as authorized before the operating terminal 4 can be enabled for the call input or a call is registered. The credentials can, for example, be in the form of a physical key, a manually input password (e.g., a PIN code), a biometric feature (e.g., fingerprint, iris pattern, speech/voice characteristics) or an access code captured from a magnetic card, chip card or RFID card or from an electronic terminal (NFC-, Bluetooth- or cellular network-based). Users 8 present the credentials when they want to input the elevator calls. The acquisition device 38 is configured in accordance with the credentials provided in the elevator system 1. This means that the recognition device 38 has, for example, a key cylinder, a terminal for capturing a biometric feature, a terminal for capturing an optical code, a reader for a magnetic stripe card or a chip card, a keypad or a touch-sensitive screen for manually inputting a password, or a transmitting and receiving terminal for radio signals. The skilled person recognizes that the operating terminal 4 may be configured for more than one of these alternatives.

[0040] The credentials captured by the recognition device 38 are forwarded to the elevator controller 12, which carries out or initiates the authorization check, for exam-

ple, by checking whether the credential captured is assigned to an authorized user 8 in a database. The check can be carried out, for example, by an access control function of the elevator system 1 or of an (separate) access control system. If the user 8 is authorized to access, the elevator operating terminal 6 can be enabled, or an entered elevator call can be registered by the elevator controller 12.

[0041] In the embodiment shown in **Fig. 2,** the acquisition device 38 is configured for transmitting and receiving radio signals (TX/RX). The recognition device 38 can include an RFID reader or a radio module which communicates with a portable communication terminal (e.g., mobile radio/mobile phone, smartphone, tablet PC) of a user 8. As an alternative, a reader for an optical code presented by the user 8 (for example a barcode, QR code or color code) can be provided.

[0042] The communication network 26 connects the elevator operating terminals 4 to the elevator controller 12 and thus makes communication possible between the elevator controller 12 and the elevator operating terminals 4. For this communication, the elevator operating terminals 4 and the elevator controller 12 can be directly or indirectly connected to the communication network 26. The communication network 26 can comprise a communication bus system, individual data lines, a wireless communications system or a combination thereof. Depending on the implementation of the communication network 26, individual addresses and/or identifiers can be allocated to the elevator controller 12 and each elevator operating terminal 4, such that, for example, the elevator controller 12 can send a message to a desired elevator operating terminal 4 in a targeted manner. Communication can take place in accordance with a protocol for wired or wireless communication, for example the Ethernet protocol. As mentioned, in one embodiment the elevator operating terminals 4 are supplied with electrical energy via the communication network 26 (PoE).

[0043] In one embodiment, the signal transmission system 20 comprises an electric cable provided, e. g., in a traction elevator for transmitting electrical energy and electrical signals and extending between the elevator car 6 and a fixed point to which the elevator controller 12 is coupled. For this purpose, the electrical cable has electrical power and signal lines. For example, the electrical cable supplies electrical energy to the elevator car 6 and transmits signals (e.g., load, status, and/or car call information) to and from the elevator car 6. The electrical cable is also known as a (flat) traveling cable and is therefore referred to as such below. Terminals that couple the traveling cable to the elevator controller 12 and its power/voltage supply and to the elevator car 6 and its electrical and electronic components are known. The person skilled in the art will recognize that the car terminal 2 is electrically coupled to the traveling cable.

[0044] As described above, restricting short-distance elevator trips to those users that belong to a predetermined user group, leads to a reduced the number of short-distance elevator trips and, consequently, to a lower energy consumption of the elevator system 1. Depending on a particular building and its use(s), it may not be desired or necessary that the function that provides for reducing the number of short-distance elevator trips is always enabled. For that reason, one or more rules may be defined to specify when (e. g., day(s), or time(s) of a day) and/or under what condition (e. g., traffic situation in the building) the function is, e. g., enabled.

Claims

1. Elevator system (1), comprising:

   an elevator controller (12);
   elevator operating terminals (4) communicatively coupled to the elevator controller (12); and
   an elevator car (6) movable under control of the elevator controller (12) between a plurality of floors (L1, L2, L3) of a building in response to an elevator call for a trip from a boarding floor to a destination floor,
   wherein the elevator controller (12) is configured to determine a floor difference between the boarding floor and the destination floor, and to restrict servicing the elevator call to at least one predetermined user group in response to the floor difference being less than three, wherein the elevator system (1) is configured to store a specification of the at least one predetermined user group.

2. Elevator system (1) according to claim 1, wherein restricting servicing the elevator call to the at least one predetermined user group includes disabling the trip, or executing the elevator call with a low priority, in response to the user (8) not being part of the at least one predetermined user group.

3. Elevator system (1) according to claim 1 or 2, wherein the at least one predetermined user group includes users (8) with reduced mobility, authorized personnel and/or autonomously moving objects, and wherein the elevator system (1) is configured to receive a credential associated with a user's elevator call for the elevator controller (12) to verify the user (8) belongs to the at least one predetermined user group, wherein the elevator controller (12) is configured to execute the elevator call in response to verifying the user (8) belongs to the at least one predetermined user group and to generate trip information (32) in response to determining the floor difference is less than three and the user (8) is not part of the at least one predetermined user group.

4. Elevator system (1) according to claim 3, wherein the operating terminal (4) includes an acquisition unit

(38) configured to acquire the credential from the user (8), or wherein the elevator system (1) is configured to receive the credential transmitted by a mobile phone of the user (8).

5. Elevator system (1) according to claim 3 or 4, wherein the operating terminal (4) includes an audio-enabled display (28) configured to acknowledge the elevator call or to communicate the trip information (32) to the user (8).

6. Elevator system (1) according to claim 3, 4 or 5, wherein the operating terminal (4) is arranged on a floor (LI, L2, L3) and configured to allow entry of the destination floor, wherein the trip information (32) indicates the restricted elevator service and a trip alternative, and/or wherein the trip information (32) indicates a call cancellation query or a call confirmation request.

7. Elevator system (1) according to claim 3, 4 or 5, wherein the operating terminal (4) is arranged at an interior wall of the elevator car (6) and configured to allow entry of the destination floor, wherein the trip information (32) indicates the restricted elevator service and a trip alternative, and/or wherein the trip information (32) indicates a call cancellation query or a call confirmation request.

8. Elevator system (1) according to claim 6 or 7, wherein the trip alternative includes a route including a stairwell (2) of the building.

9. Elevator system (1) according to one of the preceding claims, wherein the floor difference is one.

10. Method of operating an elevator system (1) comprising an elevator controller (12), elevator operating terminals (4) communicatively coupled to the elevator controller (12) and elevator car (6) movable under control of the elevator controller (12) between a plurality of floors (LI, L2, L3) of a building in response to an elevator call, wherein the method comprises:

receiving an elevator call for a trip from a boarding floor to a destination floor;
determining, by the elevator controller (12), a floor difference between the boarding floor and the destination floor; and
restricting servicing the elevator call to at least one predetermined user group in response to the floor difference being less than three, wherein the elevator system (1) is configured to store a specification of the at least one predetermined user group.

11. Method according to claim 10, wherein restricting servicing the elevator call to the at least one predetermined user group includes disabling the trip, or executing the elevator call with a low priority, in response to the user (8) not being part of the at least one predetermined user group.

12. Method according to claim 10 or 11, wherein the at least one predetermined user group includes users (8) with reduced mobility, authorized personnel and/or autonomously moving objects, the method further comprising:

receiving, by the elevator system (1), a credential associated with a user's elevator call;
verifying, by the elevator controller (12), that the user (8) belongs to the at least one predetermined user group;
execute the elevator call in response to verifying the user (8) belongs to the at least one predetermined user group; and
generating trip information (32) in response to determining the floor difference is less than three and the user (8) is not part of the at least one predetermined user group.

13. Method according to claim 12, further comprising acknowledging the elevator call or communicating the trip information to the user (8).

14. Method according to one of claims 12 to 13, further comprising generating a trip alternative and communicating the trip alternative to the user (8), wherein the trip alternative includes a route including a stairwell (2) of the building, and/or wherein the trip information (32) indicates a call cancellation query or a call confirmation request.

15. Method according to one of claims 10 - 15, wherein the floor difference is one.

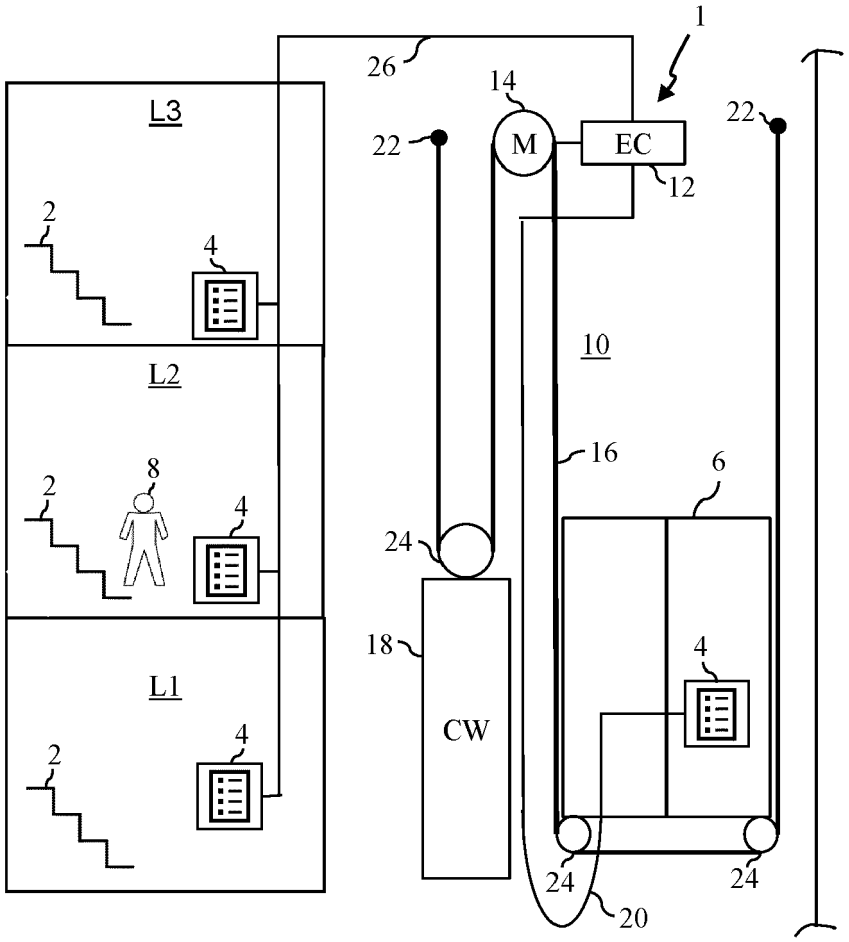

Fig. 1

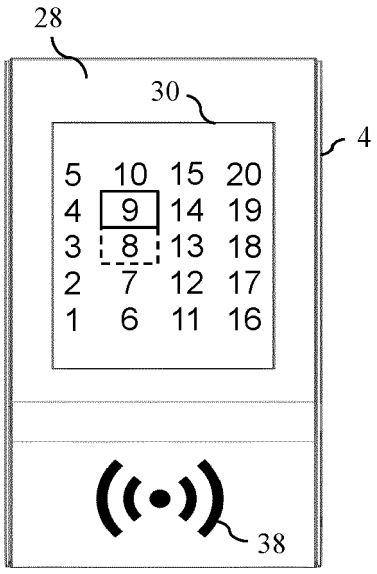

Fig. 2

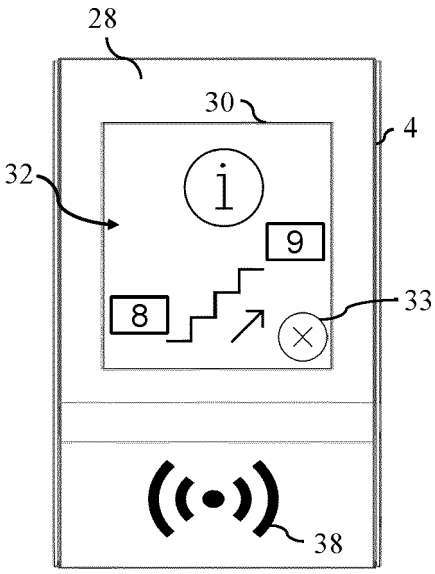

Fig. 3

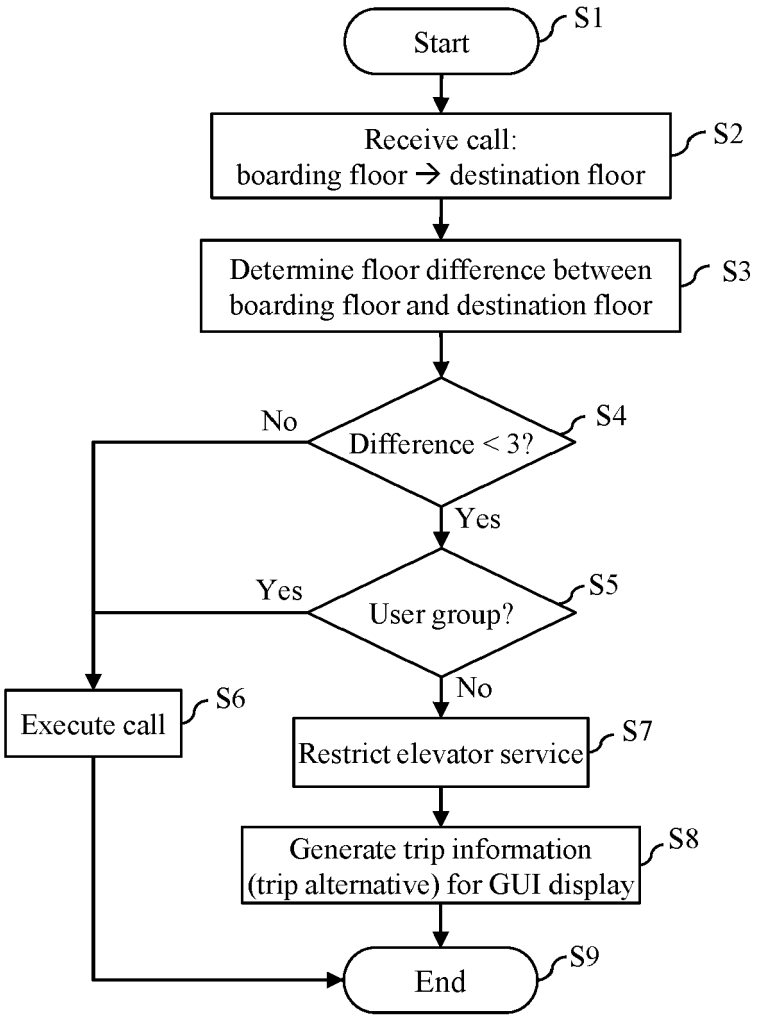
Start
S1
Receive call:
boarding floor → destination floor
S2
Determine floor difference between
boarding floor and destination floor
S3
Difference < 3?
S4
No
Yes
User group?
S5
Yes
No
Execute call
S6
Restrict elevator service
S7
Generate trip information
(trip alternative) for GUI display
S8
End
S9

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 22 20 4412

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			B66B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 March 2023	Oosterom, Marcel

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29-03-2023

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