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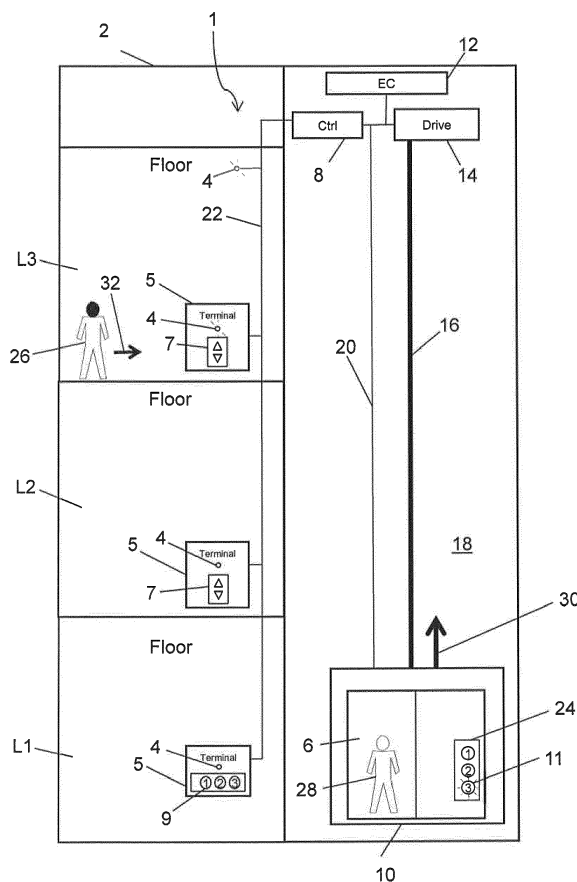
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(57) Accordingly, one aspect of such an improved technology involves a method of controlling an elevator installation (1) in a building (2). The elevator installation (1) includes a drive system (14), an elevator car (10) coupled to the drive system (14) and is movable between floors (L1, L2, L3) of the building (2) to transport a passenger (28) from a boarding floor to a destination floor, a floor terminal (5) on a floor (L1, L2, L3) served by the elevator car (10), and an elevator controller (12) communicatively coupled to the drive system (14) and each operating panel (5). The elevator controller (12) receives call input information indicating a destination floor to which the passenger (28) wishes to be transported, and controls the drive system (14) to move the elevator car (10) with the passenger (28) on board to the destination floor in response to the call input information. Further, the elevator controller (12) controls an indicator (4) at the destination floor to indicate approach of the elevator car (10) at the destination floor.



**Fig. 1**

## Description

**[0001]** The present disclosure of various embodiments generally relates to operating an elevator installation in a building. More particularly, the various embodiments described herein relate to an elevator installation and a method of operating the elevator installation.

**[0002]** Multi-story buildings are usually equipped with at least one elevator installation that provides for vertical transportation of passengers or objects. In a generally known elevator installation, a suspension medium - such as a rope or flat belt-type rope - interconnects a counterweight and an elevator car or cabin, and an electrical drive motor causes the suspension medium to move in order to thereby move the counterweight and the elevator car up and down along a shaft or hoistway. An elevator controller of the elevator installation controls and monitors the operation of the elevator installation, e.g., by processing elevator calls and allocating elevator cars to these calls. A passenger may enter a call, e.g., using a terminal (or operating panel) on a floor of the building (e.g., at an elevator landing), inside an elevator car, or both. If the elevator installation is equipped with a destination call control system, the passenger enters a desired destination floor at a floor terminal. Such a destination call identifies the boarding floor and the destination floor. If the elevator installation is equipped with a conventional control system, where a floor terminal with up/down buttons is installed on each floor, and a car terminal is installed inside each elevator car, the passenger initially presses an up or down button on a floor terminal to call an elevator car to the boarding floor, boards the elevator car assigned to serve that call, and then places a car call by pressing a destination button on a car terminal after boarding the elevator car.

**[0003]** Any entered call (hall call, car call, or destination call) is typically acknowledged to the passenger. For example, the elevator controller may illuminate the button in response to the passenger pressing the (up/down or destination) button on a floor terminal or a car terminal. Alternatively, or in addition, the elevator controller may inform the passenger about which elevator car is assigned to serve the call, for example, in a destination call control system by displaying the elevator car's number or letter on the floor terminal. In some installations, additional information is communicated to the passenger having entered a call. EP 1 621 505 A1, e.g., displays the arrival time of an elevator car at the floor where a passenger entered a call and is waiting for the car's arrival.

**[0004]** Even though these technologies acknowledge calls and provide information to a passenger, in certain buildings and elevator installations, however, it may be beneficial to provide additional assistance or information. There is, therefore, a need for an improved technology that provides additional assistance and information.

**[0005]** Accordingly, one aspect of such an improved technology involves a method of controlling an elevator

installation in a building. The elevator installation includes a drive system, an elevator car coupled to the drive system and is movable between floors of the building to transport a passenger from a boarding floor to a destination floor, a floor terminal on a floor served by the elevator car, and an elevator controller communicatively coupled to the drive system and each operating panel. The elevator controller receives call input information indicating a destination floor to which the passenger wishes to be transported, and controls the drive system to move the elevator car (e.g., with the passenger on board) to the destination floor in response to the call input information. Further, the elevator controller controls an indicator at the destination floor to indicate approach of the elevator car at the destination floor.

**[0006]** Another aspect of the alternative technology involves an elevator installation having a drive system, an elevator car coupled to the drive system and movable between floors of a building to transport a passenger from a boarding floor to a destination floor, floor terminals, wherein a floor terminal is provided on each floor served by the elevator car, and an elevator controller communicatively coupled to the drive system and each floor terminal. In response to receiving call input information indicating a destination floor to which the passenger wishes to be transported, the elevator controller controls the drive system to move the elevator car (e.g., with the passenger on board) to the destination floor. Further, the elevator controller controls an indicator at the destination floor to indicate approach of the elevator car at the destination floor.

**[0007]** The technology described herein provides assistance and information to a person/passenger that has not called an elevator car, but may want to travel with the elevator. For instance, if the passenger is on a floor to which an elevator car is currently travelling, the technology informs the passenger that an elevator car is approaching the passenger's floor. The passenger's floor corresponds to a destination floor of the elevator car's current trip. There is, therefore, no need for the passenger to call an elevator car to the floor. Also, if the passenger is still some distance away from the elevator landing on that floor, or involved in a conversation, and sees the indication for an approaching elevator car, the passenger has the option to hurry up and get to the elevator landing to board that elevator car. That reduces the waiting time for the passenger. In contrast, if the passenger does not board this elevator car, the passenger has to place a call and wait for the elevator car to arrive.

**[0008]** The technology allows flexibility regarding the origin of the call input information. In one embodiment, receiving the call input information includes receiving a car call entered via a car terminal inside the elevator car. In another embodiment, receiving the call input information includes receiving a destination call entered via one of the floor terminal, wherein the destination call indicates a boarding floor and a destination floor.

**[0009]** In one embodiment, the elevator controller con-

trols the indicator at the destination floor to disable indication of the approach of the elevator car after the elevator car's arrival at the destination floor. Alternatively, the elevator controller may control the indicator at the destination floor to disable indication of the approach of the elevator car a set time after the elevator car's arrival at the destination floor, for example, a few seconds or until the elevator doors begin to close. In that case, an activated indicator may not only indicate that an elevator car is approaching, but also that it is available for boarding.

**[0010]** Flexibility exists also with respect to the kind of indicator. The indicator may include a light source, a sound source, a display, or a combination of such components. Once activated by the elevator controller, the indicator generates at least one of an optical signal, a display, and an acoustic signal. An acoustic signal may be particularly beneficial for passengers with limited eyesight, whereas an optical signal or display may be particularly beneficial for passengers with limited hearing capabilities.

**[0011]** The technology is adaptable to particular circumstances of a building, e.g., the size of elevator halls, lobbies, and hallways. As such, the indicator is in one embodiment comprised in a floor terminal. There, the indicator may be arranged separate from any up/down buttons, or destination buttons. Alternatively, the up/down buttons or destination buttons may be configured to implement the function of the indicator, e.g., by providing buttons that can be illuminated. In yet another alternative, the indicator may be a stand-alone device that can be arranged away from any floor terminal, e.g., in a hallway or lobby.

**[0012]** The novel features and method steps characteristic of the technology are set out in the claims below. The various embodiments of the technology, however, as well as other features and advantages thereof, are best understood by reference to the detailed description, which follows, when read in conjunction with the accompanying drawings, wherein:

Fig. 1 shows a schematic illustration of an exemplary elevator installation in a building;

Fig. 2 is a flow diagram of one embodiment of a method of operating the elevator installation of Fig. 1

**[0013]** Fig. 1 is a schematic illustration of an exemplary elevator installation 1 in a building 2, in particular a multi-story building. The building 2 may be an apartment building, an office building, a commercial/shopping center, a hotel, a sports arena, an airport terminal, a ship, or any other structure suitable for a person to reside or stay for a longer period of time. The exemplary building 2 shown in Fig. 1 is used herein to describe various embodiments of the technology. The illustrated part of the building 2 has several floors L1, L2, L3, each one providing access to an elevator car 10. That is, a passenger 26, 28 can board the elevator car 10 on one of these floors L1, L2,

L3 (sometimes referred to as a boarding floor), and, after having been transported to another one of these floors L1, L2, L3 (sometimes referred to as a destination floor), exit the elevator car 10 at the destination floor.

**[0014]** In the illustration of Fig. 1, for reasons of brevity, the elevator installation 1 is equipped to operate according to a conventional up/down control system, a destination call control system, or a combination thereof. It is contemplated, however, that in one embodiment the elevator installation 1 is equipped to operate according to a conventional up/down control system, or a destination call control system, but not both control schemes. It is further contemplated that the technology described herein is not limited to one of these control schemes. In Fig. 1, for example, the floors L2, L3 are provided with floor terminals 5 (which may be referred to as landing operating panels (LOP)) having up/down buttons 7 to call the elevator car 10, and the floor L1 is provided with a floor terminal 5 having destination buttons 9 to enter a destination floor L2, L3. For instance, in response to a passenger 26 on floor L3 entering a call using the floor terminal 5 on that floor L3, the elevator car 10 arrives and the passenger 26 boards the elevator car 10. Once inside the elevator car 10, the passenger 26 uses a car terminal 24 (which may be referred to as car operating panel (COP)) to enter a desired destination floor L1, L2. A passenger on floor L1, however, enters the desired destination floor L2, L3 before boarding the elevator car 10. Once inside the elevator car 10, no further action is required by the passenger. Hence, in a destination call control system, any car terminal 24 may not provide for entering a destination floor; it may, however, have floor indicators 11 to indicate the (destination) floor L1, L2, L3. A call entered via the up/down buttons 7 is referred to as hall call, and a call entered via the car terminal 24 is referred to as a car call, whereas a call entered via the destination buttons 9 is referred to as a destination call.

**[0015]** Fig. 1 shows additional components of the elevator installation 1 to the extent believed to be helpful for a complete understanding of the technology described herein. An elevator controller 12 is coupled to a drive system 14, which is configured to move the elevator car 10 by means of one or more suspension members 16 up and down a shaft 18. The elevator controller 12 is further coupled to a control unit 8, which processes calls received from the floor terminals 5, the car terminal 24, or both. The call processing depends on the control scheme (up/down control or destination call control) used, and includes, for example, determining the floor L1, L2, L3 where the elevator car 10 is needed, determining the destination floor L1, L2, L3, allocating the call to the elevator car 10, and acknowledging the call. Based on that call processing, the elevator controller 12 controls the drive system 14 to move the elevator car 10 to the boarding floor L1, L2, L3, and then to the destination floor L1, L2, L3. Depending on a particular embodiment, the functionality of the control unit 8 may be implemented within the elevator controller 12 so that a separate control unit

8 may not be provided.

**[0016]** A communications line 22 couples the elevator controller 12 to the floor terminals 5, wherein the communications line 22 allows the elevator controller 12 to communicate with each one of the floor terminals 5. The communications line 22 is in one embodiment a wired communications bus. Communications over such a communications bus may follow a LON or the BACnet protocol. Any other known technology for communications over a wired network may be used. Alternatively, although Fig. 1 shows only one communications line 22, a separate point-to-point communications line may connect each floor terminal 5 to the elevator controller 12. In another embodiment, the communications line 22 may be implemented through a wireless communications network. In such an embodiment, each floor terminal 5 is provided with, or coupled to an RF transceiver, and the elevator controller 12 is likewise provided with, or coupled to an RF transceiver. For these communications, any suitable RF technology may be used, e.g., WiFi technology.

**[0017]** A communications line 20 couples the elevator controller 12 to the elevator car 10, wherein the communications line 20 allows the elevator controller 12 to communicate with components of the elevator car 10. The communications line 20 allows, e.g., communications between the elevator controller 12 and the car terminal 24.

**[0018]** Fig. 1 further shows an indicator 4 on each floor L1, L2, L3. The indicator 4 may include a light source (e.g., based on LED technology), a sound source (e.g., including a loudspeaker or a buzzer), a display (e.g., an LCD display to display text, one or more symbols, and/or one or more pictograms), or a combination of such components. In the illustrated embodiment, the indicator 4 is comprised in the floor terminal 5. As such, the floor terminal 5, under control of the elevator controller 12, can activate the indicator 4, e.g., to emit light or sound, or to display text, one or more symbols or one or more pictograms, or any combination thereof. As described herein, the indicator 4 on a floor L1, L2, L3 is activated to indicate approach of the elevator car 10 on that floor L1, L2, L3. In the illustrated situation of Fig. 1, the indicator 4 on floor L3 has been activated, as illustrated through light rays emanating from a circular area, while the indicators 4 on floors L1, L2 are inactive, as illustrated through a circular area.

**[0019]** In another embodiment, a separate indicator 4, as shown in Fig. 1, is not provided. Instead, the floor terminals 5 may be configured to have the up/down buttons 7 or the destination buttons 9 take over the function of indicating approach of the elevator car 10, and as such act as indicators. For example, on floors L2, L3 the floor terminal 5 may activate the up button, the down button, or both buttons of the up/down buttons 7. Once activated, a button lights up. Similarly, the terminal 5 on floor L1 may activate a destination button 9.

**[0020]** In yet another embodiment, the function of indicating approach of the elevator car 10 may be provided

on at least one floor L1, L2, L3 by a stand-alone indicator 4 mounted away from the terminal 5. Fig. 1 shows such a stand-alone indicator 4 on floor L3. For example, such a stand-alone indicator 4 may be positioned in a floor hallway so that persons that are farther away from a floor terminal 5 have an unobstructed view of the indicator 4. Other locations may be at or next to doors and/or stairwells. Such a person, noting that the indicator 4 has been activated and planning to use the elevator, may hurry up to get to the elevator landing knowing that the elevator car 10 will be arriving shortly. As in the other embodiments of the indicator 4, the stand-alone indicator 4 is under control of the elevator controller 12, and may be connected to the elevator controller 12 or the floor terminal 4 by means of a wired or wireless link. In one embodiment, the stand-alone indicator 4 may be provided in addition to the indicator 4 arranged in the floor terminal 5, e.g. in larger lobbies or halls.

**[0021]** With the understanding of the general structure of the elevator installation 1 and certain features of its components described with reference to Fig. 1, a description of how one embodiment of the elevator installation 1 operates follows with reference to Fig. 2. Fig. 2 shows a flow diagram of one embodiment of a method of operating the elevator installation 1. It is contemplated that in another illustration of the flow diagram some of the shown steps may be merged into a single step, or split into several separate steps. The flow diagram starts at a step S1 and ends at a step S5.

**[0022]** In a step S2, the elevator controller 12 receives call input information, wherein the call input information indicates the destination floor L1, L2, L3 to which a passenger 28 wants to be transported. In the embodiment of Fig. 1, the elevator controller 12 receives the call input information from the control unit 8. Depending on the control scheme used in the elevator installation 1, the control unit 8 generates the call input information based on a destination call entered at a floor terminal 5, or a car call entered at the car terminal 24. In the situation illustrated in Fig. 1, the elevator car 10 stopped at floor L1, either in response to a destination call or a hall call, and the passenger 28 boarded the elevator car 10 on floor L1. At the car terminal 24, the destination indicator 11 is activated to show floor L3 as the destination floor (symbolized as an illuminated functional key), again in response to a destination call or a hall call.

**[0023]** Proceeding to a step S3, following receipt of the call input information the elevator controller 12 controls the drive system 14 to move the elevator car 10 with the passenger 28 on board to the destination floor. An arrow 30 illustrates the (upward) movement of the elevator car 10. The various acts involved with controlling the drive system 14 to move the elevator car 10 from one floor L1, L2, L3 to another floor L1, L2, L3 are known to a person skilled in the art. For example, the elevator controller 12 checks a safety circuit to ensure that it is safe to depart from the boarding floor, and causes the drive system 14 to accelerate and decelerate the elevator car 10.

**[0024]** Proceeding to a step S4, the elevator controller 12 controls an indicator 4 at the destination floor to indicate approach of the elevator car 10 at the destination floor. The elevator controller 12 may activate the indicator 4 as soon as the passenger 28 entered the destination floor, or at any time prior to arrival of the elevator car 10 at the destination floor. It is contemplated that the earlier the indicator 4 is activated the more time the passenger 26 on the destination floor has to reach the elevator landing. In Fig. 1, an arrow 32 indicates the passenger's movement towards the elevator landing.

**[0025]** Once activated, the indicator 4 emits or generates at least one of an optical signal, a display, and an acoustic signal. The acoustic signal may be an audible sound, its volume being adjusted to be suitable for the environment. The optical signal may stem from an activated light source, the emitted light may be continuous (i.e., constant intensity) or pulsed according to a set or varying frequency. For example, the frequency may increase the closer the approaching elevator car 10 is.

**[0026]** In the elevator installation 1 of Fig. 1 various situations may exist within the building 2. For example, during periods of low passenger traffic the elevator installation 1 may be in an idle or stand-by mode. If, during such periods, the passenger 26 on floor L3 walks towards the elevator landing and the indicator 4 is not activated, this means that the elevator car 10 is not approaching floor L3. Of course, the passenger 26 can then place, e.g., a hall call at the floor terminal 5, which acknowledges entry of the hall call, e.g., the pressed button of the up/down buttons 7 lights up.

**[0027]** At other times, when the elevator installation 1 is in an active mode, the elevator car 10 may already be moving, e.g., from floor L1 to floor L3 in response to the call the passenger 28 entered, as shown in Fig. 1. The elevator controller 12 activates the indicator 4 on the destination floor, as described above with reference to Fig. 2. If several passengers boarded the elevator car 10 and placed calls to different destination floors, the elevator car 10 sequentially travels to these destination floors. Accordingly, the elevator controller 12 activates in one embodiment the indicators 4 in accordance with the travel sequence. Alternatively, the elevator controller 12 may activate the indicators 4 on those destination floors where the elevator car 10 will stop at essentially the same time.

**[0028]** In one embodiment, the elevator controller 12 controls the indicator 4 at the destination floor to disable indication of the approach of the elevator car 10 after the elevator car's arrival at the destination floor. Alternatively, the elevator controller 12 may control the indicator 4 at the destination floor to disable indication of the approach of the elevator car 10 a set time after the elevator car's arrival at the destination floor, for example, a few seconds or until the elevator doors begin to close. In that case, an activated indicator 4 may not only indicate that an elevator car 10 is approaching, but also that it is available for boarding.

**[0029]** Various embodiments of the technology are de-

scribed herein using terms like "buttons" or "pressing a button." The technology, however, is not limited to mechanical or electro-mechanical buttons or keys that physically move when pressed. Rather, the skilled person will understand that the function of a button can be implemented without a physically moving button, e.g., using a capacitive sensor, or a touch screen.

**[0030]** Further, some elevator installations 1 may require the passengers 26, 28 to be authorized to use the elevator, or to travel to certain floors L1, L2, L3. For that reason, the passengers 26, 28 may need an information carrier, for example, shaped as a credit card or an employee badge to use the elevator installation 1. The information carrier may be used to place a destination call, or to unlock a floor terminal 5 or car terminal 24 before entry of a call is possible. Depending on a particular technology, the information carrier may contain a memory chip with contact pads visible on an exterior surface of the information carrier, an RFID transponder coupled to a memory chip embedded in the information carrier, a magnetic strip, or an optical code applied to an exterior surface of the information carrier, such as a QR code, a barcode, or other machine-readable code. The function of such an information carrier may also be implemented on a mobile electronic device. In some embodiments, the mobile electronic device may display a QR code, a barcode, or a color pattern code (e.g., described in WO2015049186A1). The floor terminals 5 and the car terminal 24 are equipped to communicate with such an information carrier, e.g., they may have a reader (e.g., as part of the terminal's user interface) that is compatible with the technology used by the information carrier (e.g., a camera or scanner to read an optical code, or an RFID reader to communicate with an RFID transponder).

## Claims

1. A method of controlling an elevator installation (1) in a building (2), wherein the elevator installation (1) includes a drive system (14), an elevator car (10) coupled to the drive system (14) and movable between floors (L1, L2, L3) of the building (2) to transport a passenger (28) from a boarding floor to a destination floor, a floor terminal (5) on a floor (L1, L2, L3) served by the elevator car (10), and an elevator controller (12) communicatively coupled to the drive system (14) and each floor terminal (5), comprising:

receiving, by the elevator controller (12), call input information indicating a destination floor to which the passenger (28) wishes to be transported;

controlling, by the elevator controller (12), the drive system (14) to move the elevator car (10) to the destination floor in response to the call input information; and

controlling, by the elevator controller (12), an in-

- indicator (4) at the destination floor to indicate approach of the elevator car (10) at the destination floor.
2. The method of Claim 1, wherein receiving the call input information includes receiving a car call entered via a car terminal (24) inside the elevator car (10).
  3. The method of Claim 1, wherein receiving the call input information includes receiving a destination call entered via one of the floor terminal (5), wherein the destination call indicates a boarding floor and a destination floor.
  4. The method of any preceding claim, further comprising controlling, by the elevator controller (12), the indicator (4) at the destination floor to disable indication of the approach of the elevator car (10) after the elevator car's arrival.
  5. The method of any preceding claim, wherein controlling the indicator (4) at the destination floor includes activating the indicator (4), wherein the indicator (4) emits at least one of an optical and acoustic signal.
  6. The method of any preceding claim, wherein controlling the indicator (4) at the destination floor includes controlling the floor terminal (5) on the destination floor, wherein the indicator (4) is comprised in the floor terminal (5) on the destination floor.
  7. An elevator installation (1) comprising:
    - a drive system (14);
    - an elevator car (10) coupled to the drive system (14) and movable between floors (L1, L2, L3) of a building (2) to transport a passenger (28) from a boarding floor to a destination floor;
    - floor terminals (5), wherein a floor terminal (5) is provided on each floor (L1, L2, L3) served by the elevator car (10); and
    - an elevator controller (12) communicatively coupled to the drive system (14) and each floor terminal (5), wherein the elevator controller (12), in response to receiving call input information indicating a destination floor to which the passenger (28) wishes to be transported, controls the drive system (14) to move the elevator car (10) to the destination floor, and wherein the elevator controller (12) controls an indicator (4) at the destination floor to indicate approach of the elevator car (10) at the destination floor.
  8. The system of Claim 7, wherein the floor terminals (5) include up/down buttons (7) to enter floor calls.
  9. The system of Claim 7, further comprising a car terminal (24) arranged inside the elevator car (10) to enter a car call.
  10. The system of Claim 7, wherein the floor terminals (5) include destination buttons (9) to enter destination calls.
  11. The system of one of Claims 7 - 10, wherein each floor terminal (5) includes an indicator (4).
  12. The system of any one of Claims 7 - 11, wherein each floor (L1, L2, L3) is provided with an indicator (4), wherein on at least one floor (L1, L2, L3) the indicator (4) is arranged at a distance from the floor terminal (5) on that floor (L1, L2, L3).

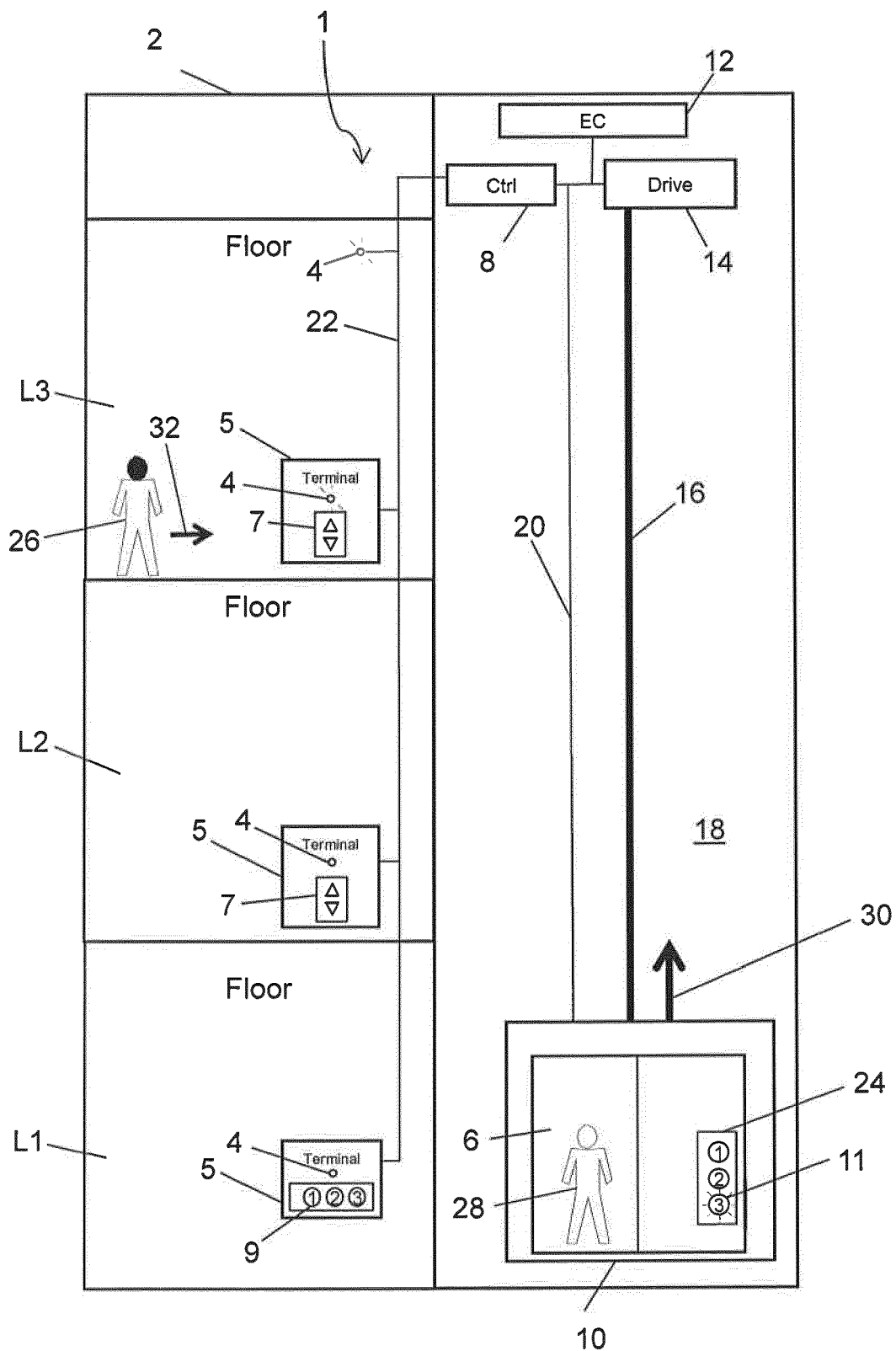
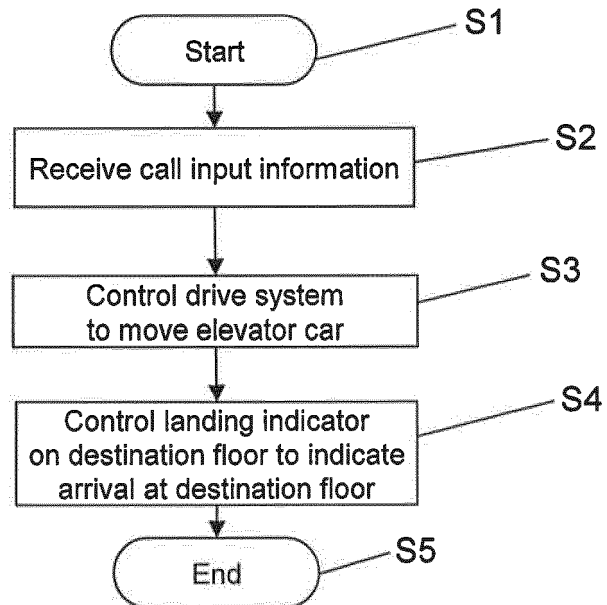


Fig. 1



**Fig. 2**



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Application Number  
EP 16 17 3026

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                  |                                                      |                                         |
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| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                  |                                                      |                                         |

EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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