

Lift installation for transporting lift users in a building area

The invention relates to a method of operating a lift installation for transporting lift users in a building area. Moreover, the invention relates to a lift installation for carrying out the above method.

A lift installation with a recognition device is known from EP 0 699 617 B1, in which a lift user carries an information transmitter which is interrogated by recognition devices mounted at the entrance to the lifts. The data stored on the information transmitter are passed on to the lift control in order to control the lift in correspondence with the stored data.

A control device for transporting persons/goods with the help of user profiles is described in EP 1 295 838 A1. Individual transport preferences of the persons/goods are stored in the user profiles of the control unit. A recognition device which recognises an identification code of a person or item of goods is provided. A user profile of the person or item of goods to be transported is provided for each recognised identification code. The lift installation is controlled in drive by a control device. This drive control is based in parts on the user profile and comprises multiple lift-specific details such as the boarding storey and destination storey of the person or item of goods to be transported. However, it is not possible to establish whether the person or item of goods to be transported is actually transported in accordance with the user profile.

The users of the lift installation are not only persons, but also goods and are termed lift users in the following.

In building areas having a plurality of lifts an allocation of the lifts to individual lift users is frequently undertaken by way of a destination call control. The lift users then no longer have to activate a cage call. It is known to arrange an access check at the entrance of building areas of that kind in order to grant access to such lift users which can identify themselves and in order to deny access to other lift users which cannot identify themselves. However, building areas frequently have public and private regions or regions internal to companies so that at the entrance of the building area there are let in not only lift users which have access to the private regions in the building area, but also lift users which have access only to the public regions. The control and checking of the access

authorisations in the building areas is thus not simple to realise.

The continued stay or also the movement of the lift users in the respective building area can now be monitored only with a high level of cost. Thus, for example, it is possible that a non-authorised lift user at the same time enters a lift cage, which travels to a private region, and thus gains access to the private regions. Securing of these private regions for cases of that kind was previously possible only by expensive monitoring or by further access checks in the private regions. Such safeguards require a trained, often armed, security service as well as special and substantial devices. All this is intimidating and regarded as unpleasant.

It is accordingly the lift user of the invention to indicate, in a building area which has regions with different access authorisations, a lift installation and a method by which the stay of lift users in the building area can be monitored and checked without substantial cost in order to enable an effective drive control of the lift installation or intervention of a security service.

A method of operating a lift installation according to patent claim 1 and a lift installation according to patent claim 10 are proposed for fulfilling this lift user.

Advantageous embodiments can be inferred from the subclaims.

An lift user to be transported in the building area can for starting transport by the lift installation trigger either a destination call or a combination of a lift call with a cage call. An elevator call is a call in which only the boarding location is communicated to a lift control. The lift control allocates a lift cage to the corresponding lift user. After boarding of the cage the lift user triggers a cage call in the cage. The cage call is communicated to the lift control and the cage thereupon transports the lift user from the boarding location to the appropriate storey corresponding with the destination storey of the cage call. A destination call is a call in which not only the boarding location, but also the destination location are transmitted to a lift control. The lift control allocates to the corresponding lift user a lift cage which transports this lift user from the boarding location to the appropriate storey corresponding with the destination location of the destination call and this without a further cage call being triggered by the lift user.

The core of the invention is detection of the position of the lift users in the building area. If a destination call or lift call is triggered by a detected lift user and if this destination call or lift call is served by an associated lift cage the position of a detected lift user, which has boarded a lift cage, is compared with the position of that lift user which has triggered the destination call or lift call. If the lift user has triggered a lift call, it triggers a cage call in the cage. Moreover, the invention is based on granting to the lift users access authorisations to building regions. Thus, it is checked in the lift cage whether the detected lift user has an access authorisation for a destination storey corresponding with the destination call or cage call.

In an advantageous embodiment of the invention it is possible to check whether all lift users which are transported in a lift cage have also triggered a destination call or lift call. If an lift user does not have an appropriate access authorisation for the destination storey a security measure can be triggered and if it is established that there is located in the lift cage an lift user which has not triggered a destination call or lift call a security measure is similarly triggered.

In particular, it is advantageous if the lift user triggering a destination call or lift call has to identify itself. This can take place, for example, by way of an input keyboard into which a code is input. Alternatively, this can be undertaken in wire-free manner by way of a chipcard. The identification is also possible through input of a password by way of an input terminal. In addition to identification, an authentication is also possible. This counter-check or authentication increases the security in the building area. For example, the authentication is carried out by biometric recognition systems of a face, an iris, a fingerprint, the speech, etc. It is particularly advantageous if the lift user triggering a destination call or lift call not only identifies itself, but is also authenticated. If need be, the identification and the authentication can take place in one step.

It is particularly advantageous in a further embodiment of the invention if the number of lift users, which have triggered a destination call or lift call and have been detected in their position, is determined and compared with the number of lift users, which have boarded a lift cage. It can thus be checked whether a difference exists between the numbers. If the number of lift users, which have triggered a destination call or lift call or were detected, should differ from the number of lift users, which have boarded a lift cage, an increased security risk exists.

It is particularly advantageous if in the case of non-agreement of the position of the lift user, which has boarded the lift cage, with the position of the lift user, which has triggered a destination call or lift call and is served by the lift, a security measure is undertaken. This security measure can, for example, follow up monitoring of the floors concerned by installed security cameras. Another possibility is personal checking of the floors concerned by security forces.

Further possibilities consist in influencing the lift control and in a given case no longer travelling to regions in the building area having a high security grade. Thus, non-authorised lift users are effectively prevented from accessing these high-security regions.

In the case of detection of the position of lift users, there can be detection not only of the position in space, but also a position in time of an lift user in a building area. The position in space can in that case be triggered at different levels. Thus, in the simplest case it can contain information about the plane on which an lift user is located. However, it is equally possible to divide a plane into several sectors and to additionally add to the plane information also sector information. The position in time of an lift user can be detected alternatively or also in combination with the position in space. It can thus be established, for example, when an lift user has entered a building area at a point in time and, if after a fixedly preset period in time has not actuated a destination call or lift call, this lift user possibly remains without authorisation somewhere in another building region. Moreover, it is thus possible to assign increased monitoring to lift users, to which access to the building sections is granted only in a specific time window, at times in which they normally do not have access to the building area.

The lift users can be persons or goods. The goods are preferably transported by persons. Through monitoring a transported item of goods it can be ensured that the corresponding goods can be transported only into the building planes intended for that purpose.

The lift user is also fulfilled by a lift installation comprising several lift cages. Moreover, a position detection device is arranged at the building entrance and/or in the building area and/or in lift cages. The lift installation comprises input terminals for input of a destination call. Moreover, a lift control for controlling the individual lift cages is provided. A main control unit is connected not only with a detection unit, but also with an identification unit,

an access authorisation unit, input terminals for lift calls and the lift cages.

The invention is explained in more detail in the following by way of examples of embodiment which are illustrated in schematic manner in the drawings, in which:

Figure 1 shows a schematic illustration of a lift installation according to the present invention; and

Figure 2 shows a flow chart for a method according to the present invention.

The lift installation according to the invention is located in a building area. The building area is either a building with several planes such as an office building, a hospital, a shopping centre, etc., or it is a complex consisting of several such buildings, such as a factory site, a sports installation, etc. The lift installation comprises several lifts with one or more lift cages A1 to A6 per lift shaft. The lift shaft runs through several planes 30, 40 of the building area. Accesses to the lift shaft are located in the different planes of the building area. In Figure 1 the accesses to the lift cages A1 to A3 are arranged in the second plane 30 and the accesses to the lift cages A4 to A6 are arranged in the first plane 40. The individual planes are also connected together, for example, by way of moving walkways 41 and staircases.

At least one input terminal 49, 50 for the input of lift calls is provided in each plane 30, 40. These input terminals 39, 50 contain, for example, an input keyboard and a display for indicating an allocated lift cage serving the destination call or lift call. The input terminals are advantageously arranged near the accesses to the lifts. The input terminals 49, 50 are connected by way of electronic data lines with a main control unit 31 of the lift installation. The lift calls are thus communicated to the main control unit 31.

Moreover, a position detection device is arranged in the building area and in the simplest case is realised by a camera 42 in an entry region of the building area. In the normal case the position detection device consists of a number of such cameras, which are mounted everywhere in the building area. Advantageously, all routes accessible to lift users in the building area are detected by cameras. In that case each camera has a specific detection range. Adjacent cameras are so arranged that their detection range overlaps at least in regions. An lift user which moves from a first detection range to an adjacent second

detection range is thus initially detected only by the first camera, as soon as it crosses through an overlap region it is detected by both cameras and thereafter is detected only by the second camera. Advantageously, the cameras are connected with an evaluating unit and a storage medium. The detected lift user positions are evaluated by the evaluating unit and fixed on the storage medium as spatial and time position data. It is possible through evaluation of the camera signals to continuously check where an lift user is just located in the building area. Conventional digital liquid-crystal display (LCD) cameras are suitable for the lift user detection, but also movement sensors such as infrared (IR) detectors or radar sensors and ultrasound sensors can be used. The evaluating unit can be a standard computer unit with a program for recognition of camera signals in the form of digital images. Such a recognition program allows, for example, distinction of different lift users on a camera image. Distinction criteria are the colour, size and shape of lift users or also the differences, which can be established by image comparison, between images of different cameras or between images which were recorded at different points in time. Thus, the number of lift users per camera image can be determined. In addition, such a recognition program allows determination of the movement direction and speed of lift users on camera images. Several such recognition programs are commercially available.

An identification unit comprises, for example, an input terminal 45 with a numeric keyboard or a card reader 44. An alternative embodiment comprises a wireless chipcard reader 43 which can, for example, interrogate codes, which are stored on radio-frequency identification (RFID) chips and which are carried by the lift users. An lift user is identified by way of these codes which are exchanged in that manner and which are either input or read by the card or the RFID chip. After an identification by means of the identification unit access to the building area is granted via opening doors or released turnstiles 46. In the case of an identification or after an lift user access to the building area has been achieved, an access authorisation is allocated to the lift user by means of the access authorisation unit.

Moreover, the lift installation comprises a main control unit 31 with which all components of the lift installation are connected. The main control unit can also be realised by co-operation of several distributed control units. The main control unit 31 is coupled with a security unit 32 which has several monitors 33, loudspeaker units 34 and camera systems 35. The camera and loudspeaker system 34, 35 can be distributed over the planes 30 and 40 or further planes in the building area.

In addition, a detail view of a lift cage A1-A6 is schematically illustrated in Figure 1. The lift cage 36 is coupled with the main control unit 31. An input terminal 39 with a numeric keyboard and an indicating display is similarly disposed in the lift cage 36. An RFID chip reader 38 represents an alternative. The lift cage 36 is controlled by a lift control 37, wherein the lift control 37 similarly receives its commands from the main control unit 31. The main control unit 31 conducts to each lift a user profile with all necessary data for operation of the lift. Thus, a user profile comprises constantly updated details about the number of lift calls which are associated with the lift cage 36. With respect to each lift call the user profile registers the boarding and destination planes and also the point in time at which the destination call or lift call was triggered. In addition, the user profile indicates the sequence in which the lift cages 36 are moved to the destinations. It is therefore particularly advantageous if also the position data and the access authorisation of each lift user are communicated to the main control unit 31 and filed in the user profile. The main control unit 31 can thus assign, to each destination call or lift call actuated at an input terminal 49, 50, exactly one lift user position current in terms of time and an access authorisation of the lift user. For this purpose the position detection device and the main control unit 31 are connected together by way of an electronic data line, for example a bus system or a network.

A method according to the invention is explained in the following according to Figure 2. After an lift user in the form of a person or an item of goods to be transported has entered the building area or was brought into the building area S10, the position of the lift user is detected in step S11. After the position was detected, for example by way of the camera 42, S11 the lift user is identified or authenticated S12. This identification or authentication takes place, for example, by way of an input terminal 45, a chipcard reader 44 or a wireless RFID chip interface 43. For authentication of the lift user, for example, a biometric recognition system detects from the lift user a face, an iris, a fingerprint, speech, etc. In step S13 it is checked whether the lift user has been correctly identified or authenticated and whether its position was detected. If the lift user was not identified or authenticated or its position was not detected, a safety measure S21 is initiated. This safety measure S21 can comprise, for example, the entry doors or turnstiles 46 or other kinds of barriers being blocked or remaining blocked in order to prevent forcible incursion of an unauthorised lift user. After the lift user has been correctly identified or authenticated and its position detected it is granted an access authorisation in step S14. In the simplest

case this can be opening of a door or release of a turnstile 46.

After the lift user has correctly entered the building area, it can move, for example, from a first plane 40 by way of an escalator 41 to another plane, for example a second plane 30. In that case the current position of the lift user is constantly ascertained by the position detection device. Depending on the plane 30, 40 in which the lift user is disposed, in step S15 a destination call or lift call can be input at an input terminal 49, 50 in the corresponding plane. This destination call or lift call is input, for example, by way of a numeric keyboard and transmitted to the main control unit 31. The main control unit 31 then allocates to the lift user in step S16 a lift cage which is disposed on the corresponding plane and is represented by, for example, the input terminal 49 or 50 in a display.

In step S17 the detected lift user enters the lift cage allocated thereto.

If the lift user has triggered not a destination call, but a lift call, the lift user in step S18 triggers a cage call in the lift cage.

Advantageously, in step S19 the number or position of the detected lift users in the lift cage is checked. This advantageously takes place by the recognition program of the position detection device. If the number of lift users disposed in the lift cage does not, for example, agree with the number of lift users allocated to this lift cage a security measure S21 can be triggered. Alternatively or additionally, a security measure can be triggered in step S19 when the position of the lift user in the lift cage does not agree with the position of that lift user which has activated the destination call or lift call. In the case of a security measure, a security department is informed in that, for example, the monitors 33 in the security department are directly switched over to the planes concerned and a detectable report is issued in the safety department.

In step S20 it is checked whether all detected lift users transported in the lift cage also have an access authorisation for the destination location. If an lift user does not have such an access authorisation, a security measure S21 can again be triggered. Alternatively or additionally to the security measure S21 it is possible to so influence the lift control 37 by way of the main control unit 31 that the lift cage 36 does not travel to the planes with high-security relevance. Another possibility is to block the lift cage so that lift users located in this lift cage cannot disembark. A further possibility is to convey the lift cage directly back

again to the public region and allow the lift users to disembark. Another possibility is to move the lift cage to a security stop where a check can be carried out by security personnel.

In step S22 lift users detected and checked in that manner are transported by the lift cage 36 to the destination locations.

An increase in security in building areas is possible with the present invention. In particular, it is possible to prevent unauthorised movement of lift users from public regions to private regions. Through the possibility of influencing the lift cages security measures can be taken effectively and at good time and thus access of non-authorised lift users to high-security regions prevented.

Moreover it is possible to selectively influence the lift control 37 by way of the main control unit 31 so that there is taken into consideration exactly that control data which corresponds with the lift users located in the cage. Thus, for example, it is possible to enable an improved lift operation if not all lift users, which are assigned to the lift, have entered the lift in that, for example, there is movement to only precisely those destinations which correspond with the lift users actually transported.

Patent Claims

1. Method of operating a lift installation for transporting lift users in a building area, the method comprising the steps:
 - detection of positions of lift users in the building area by means of a position detection device;
 - said position detection device being a camera (42) which detects camera signals in the form of digital signals;
 - evaluation of detected positions of lift users by means of an evaluating unit,
 - fixing of detected positions of lift users as spatial and time position data by means of a storage medium;
 - distinction of different lift users on a camera image by means of distinction criteria;
 - checking of a position of a detected lift user;
 - checking of an authentication of a lift user;
 - if a lift user has been correctly authenticated and its position has been detected, grant of an access authorisation to the building area by an access authorisation unit;
 - communication of the position data and the access authorisation of each lift user to a main control unit (31) of the elevator installation; and
 - filling the position data and the access authorisation of each lift user in a user profile.
2. Method according to claim 1, characterised in that distinction criteria include at least one of the color of lift users, the size and shape of lift users, differences which can be established by image comparison between images of different cameras, and differences which can be established by image comparison between images which were recorded at different points in time.
3. Method according to one of claims 1 or 2, characterised in that all routes accessible to lift users are detected by cameras (42); each has a specific detection range; adjacent cameras are so arranged that their detection range overlaps at least in regions; a lift user which moves from a first detection range to an adjacent second detection range is thus initially detected only by the first camera (42), as soon as it crosses through an overlap region it is detected by both cameras (42) and thereafter is detected only by the second camera (42).

4. Method according to one of claims 1 to 3, characterised in that a number of lift user per camera image is determined, or that a movement direction and speed of lift users is determined on camera images.
5. Method according to one of claims 1 to 4, characterised in that a lift user is identified by means of an identification unit (43, 44, 45).
6. Method according to claim 5, wherein the identification unit (43, 44, 45) includes at least one of an input terminal (45), an input terminal (45) with a numeric keyboard, a card reader (44), and a wireless chipcard reader (43) which interrogates codes which are stored on radio-frequency identification chips which are carried by the lift users.
7. Method according to one of claims 5 or 6, characterised in that a biometric recognition system authenticates a lift user.
8. Method according to claim 7, wherein the biometric recognition system authenticates a lift user by detection of a face from the lift user, an iris from the lift user, a fingerprint from the lift user, or a speech from the lift user.
9. Method according to one of claims 7 or 8, characterised in that if the lift user has been correctly identified or authenticated and its position has been detected, the access authorisation unit grants an access authorisation to the building area by opening a door or release of a turnstile (46).
10. Method according to one of claims 5, 6, 7, 8 or 9, characterized in that if the lift user was not identified or authenticated or its position was not detected, a safety measure is initiated.
11. Method according to claim 10, wherein the safety measure is initiated by blocking entry doors or turnstiles (46) or other kinds of barriers.
12. Method according to claim 9, characterised in that after a lift user has correctly entered the building area, a current position of the lift user is constantly ascertained

by the position detection device.

13. Method according to one of claims 1 to 12, characterised in that an input terminal (49, 50) is provided in a plane (30, 40) for the input of a destination call or a lift call by the lift user, and that said destination call or said lift call is communicated to a main control unit (31).
14. Method according to claim 13, characterised in that the detected lift user enters the lift cage (36) allocated thereto.
15. Method according to claim 14, characterised in that the number or position of the detected lift users in the lift cage (36) is checked, wherein if the number of lift users disposed in the lift cage (36) does not agree with the number of lift users allocated to this lift cage (36), a security measure is triggered, and wherein if the position of a lift user in the lift cage (36) does not agree with the position of that lift user which has activated the destination call or lift call, a security measure is triggered.
16. Method according to one of claims 14 or 15, characterised in that the main control unit (31) conducts a user profile for a lift, said user profile comprises constantly updated details about the number of lift calls which are associated with the lift cage (36).