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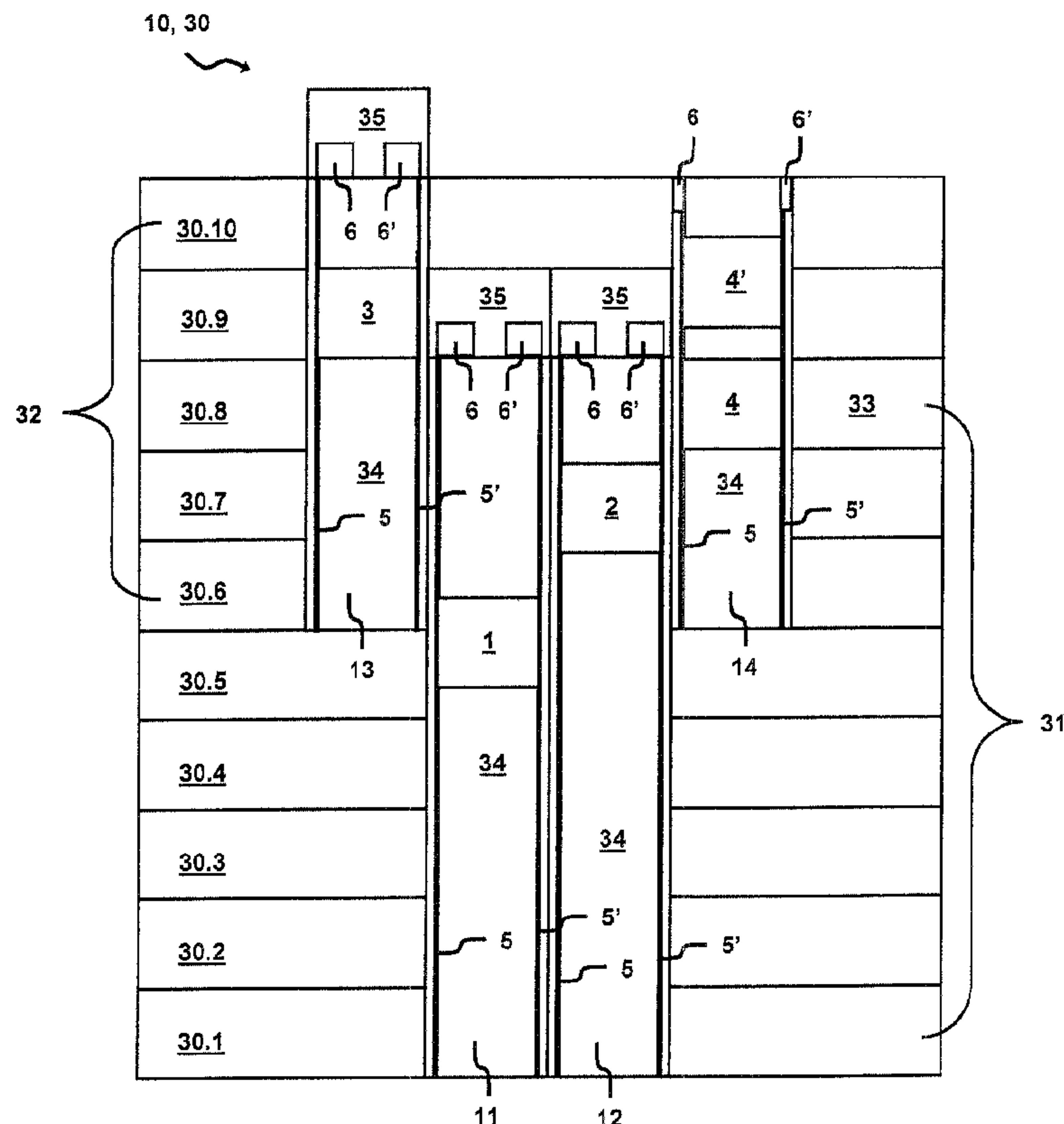
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(54) Titre : INSTALLATION DE LEVAGE POUR EXPLOITATION ZONALE DANS UN IMMEUBLE, METHODE D'EXPLOITATION ZONALE D'UNE TELLE INSTALLATION DE LEVAGE, ET METHODE DE MODERNISATION D'UNE INSTALLATION DE LEVAGE

(54) Title: LIFT INSTALLATION FOR ZONAL OPERATION IN A BUILDING, METHOD FOR ZONAL OPERATION OF SUCH A LIFT INSTALLATION AND METHOD FOR MODERNISATION OF A LIFT INSTALLATION



(57) Abrégé/Abstract:

The invention relates to a lift installation (10) for zonal operation in a building (30), to a method for zonal operation of such a lift installation and to a method for modernisation of an existing lift installation. The building is divided into several zones (31, 32). The



(57) **Abrégé(suite)/Abstract(continued):**

lift installation comprises several lifts (11, 12, 13, 14) for the transport of persons/goods in cages (1, 2, 2', 3, 4, 4'). A zone associated with each lift. At least one changeover storey (33) for the changing over of persons/goods between cages of different zones is arranged between the zones. At least one lift (12, 14) comprises at least two cages (2, 2', 4, 4') which are arranged one above the other and which are movable independently of one another at a pair of guide rails (5, 5').

IP 1470

14

Abstract

The invention relates to a lift installation (10) for zonal operation in a building (30), to a method for zonal operation of such a lift installation and to a method for modernisation of an existing lift installation. The building is divided into several zones (31, 32). The lift installation comprises several lifts (11, 12, 13, 14) for the transport of persons/goods in cages (1, 2, 2', 3, 4, 4'). A zone associated with each lift. At least one changeover storey (33) for the changing over of persons/goods between cages of different zones is arranged between the zones. At least one lift (12, 14) comprises at least two cages (2, 2', 4, 4') which are arranged one above the other and which are movable independently of one another at a pair of guide rails (5, 5').

(Fig. 1)

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Lift installation for zonal operation in a building, method for zonal operation of such a lift installation and method for modernisation of a lift installation

5 Field of the Invention

The invention relates to a lift installation for zonal operation in a building with several lifts for the transport of persons/goods in cages, wherein the building is divided into zones, a zone is allocated to each lift and at least one changeover storey for the changing over of persons/goods between cages of different zones is arranged between the zones. The invention also relates to a method for zonal operation of such lift installation and it relates to a method for modernisation of a lift installation.

15 Background of the Invention

A high transport requirement occurs today in large or high buildings. In order to satisfy this transport requirement, a building is frequently vertically divided into several zones or storey regions. At least one lift or group of lifts is provided in each zone. A changeover of persons/goods from a lift bringing up to a first zone to a lift taking away to a second zone takes place between the zones. The changeover storey is also termed sky lobby.

It is disadvantageous that due to unequal transport capacities of the lifts of the different zones, queues can form in the changeover storey when there is a high incidence of transport. In addition, it is disadvantageous that the lift installations in high buildings demand a significant proportion of the building cross-section. Finally, the space available in the changeover storey is limited and cannot be increased without substantial constructional and financial outlay.

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Known solutions for preventing or limiting overfilling of the changeover storey are targeted either towards a reduction in the transport capacity of the lift bringing

up, which has a counterproductive effect with respect to main load times at transport peaks, or towards measures for increasing the transport capacity of the lift taking away, which in practice can be realized only to a limited extent. Thus, for example, an increase in the speed/acceleration of the cages or a shortening
5 of door opening times is employed. However, lifts are usually not overdimensioned with respect to motor power and current supply, so that an increase in speed/acceleration of the cages comes into consideration only to a very limited scope. Moreover, an increase in acceleration of the cages has a negative effect on travel sensation of persons, so that here, too, an increase in
10 transport capacity can be achieved only to a very limited extent. In addition, a shortening or optimization of the door opening times is already implemented as standard practice in many lifts. Thus, these measures do not lead to any actually noticeable increase in transport capacity.

15 Summary of the Invention

The object of the present invention thus consists in avoiding the above-mentioned disadvantages by creating a lift installation for zonal operation in a building which enables an increase in the transport capacity of the entire lift
20 installation without in that case reducing the transport capacity of a lift bringing to or a lift taking away. The object is also directed to a method for zonal operation of a lift installation. The object shall be realized by known and proven means of lift construction.

25 This object is fulfilled by the invention in accordance with the independent claims. The dependent claims show advantageous refinements of the invention.

The invention relates to a lift installation for zonal operation in a building and to a method for zonal operation of such lift installation. The building is divided into
30 several zones. The lift installation comprises several lifts for the transport of persons/goods in cages. A zone is associated with each lift. At least one changeover storey for the changing over of persons/goods between cages of

different zones is arranged between the zones. At least one lift comprises two cages which are arranged one above the other and which are movable independently of one another at a pair of guide rails.

- 5 According to the invention an increase in transport capacity of the lift installation is effected in that at least one lift has two cages movable independently of one another instead, as usual, of a single cage. The overall number of movable cages of the lift installation is thereby increased, while the demand of the lift installation on space in the building cross-section is kept the same. Due to the
10 increase in the number of movable cages in the building, the changeover storey can be moved to more frequently and queues are thus avoided or limited in targeted manner. In addition, existing lift installations can thus be modernised simply, quickly and favourably.
- 15 In another aspect, the present invention resides in a lift installation for zonal operation in a building divided into several zones, which lift installation comprises several lifts for the transport of persons/goods in cages, a zone is associated with each lift, and at least one changeover storey for the changing over of persons/goods between cages of different zones is arranged between the zones,
20 characterised in that at least one lift comprises at least two cages which are arranged one above the other and which are movable independently of one another at a pair of guide rails and the at least one changeover storey is served by at least two of the at least two independent cages.
- 25 In another aspect, the present invention resides in a method for zonal operation of a lift installation in a building divided into several zones, which lift installation comprises several lifts for the transport of persons/goods in cages, a zone is associated with each lift and at least one changeover storey for the changing over of persons/goods between cages of different zones is arranged between
30 the zones, characterised in that at least two cages, which are arranged one above the other, are movable independently of one another at a pair of guide

3a

rails and the at least one changeover storey is served by at least two of the at least two independent cages.

In another aspect, the present invention resides in a method of modernising a lift
5 installation in a building divided into several zones, which lift installation comprises several lifts for the transport of persons/goods in cages, a zone is associated with each lift and at least one changeover storey for the changing over of persons/goods between cages of different zones is arranged between the zones, characterised in that at least one lift with at least two cages, which are
10 arranged one above the other and which are movable independently of one another at a pair of guide rails, is installed and the at least one changeover storey is served by at least two of the at least two independent cages.

In another aspect, the present invention resides in an elevator installation for
15 zonal operation in a building divided into several zones, the elevator installation comprising: a plurality of elevators for transport of persons/goods in cages; a zone associated with each elevator; and at least one changeover storey arranged between the zones for changing over of persons/goods between cages of different zones, at least one of the elevators has at least two cages which are
20 arranged above one another and are movable independently of one another along a pair of guide rails, at least one changeover storey being served by at least two of the at least two independent cages.

In another aspect, the present invention resides in a method for zonal operation
25 of an elevator installation in a building divided into several zones, which elevator installation comprises several elevators for transport of persons/goods in cages, a zone associated with each elevator and at least one changeover storey arranged between the zones for changing over of persons/goods between cages of different zones, the method comprising the step of independently moving at
30 least two cages, which are arranged above one another, of an elevator along a pair of guide rails, at least one changeover storey being served by at least two of the at least two independent cages.

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In a further aspect, the present invention resides in a method for zonal operation of an elevator installation in a building divided into several zones, which elevator installation comprises several elevators for transport of persons/goods in cages, a zone associated with each elevator and at least one changeover storey arranged between the zones for changing over of persons/goods between cages of different zones, the method comprising the step of independently moving at least two cages, which are arranged above one another, of an elevator along a pair of guide rails, further including registering destination calls by persons/goods and determining a number of persons/goods changing over in the changeover storey from the destination calls at every instant of the zonal operation.

In yet another aspect, the present invention resides in a method of modernizing an elevator installation in a building divided into several zones, which elevator installation comprises several elevators for the transport of persons/goods in cages, a zone associated with each elevator and at least one changeover storey for changing over of persons/goods between cages of different zones is arranged between the zones, the method comprising the step of installing at least one elevator with at least two cages, which are arranged above one another and which are movable independently of one another, at a pair of guide rails, at least one changeover storey being served by at least two of the at least two independent cages.

Further aspects of the invention will become apparent upon reading the following detailed description of the drawings, which illustrate the invention and preferred embodiments of the invention.

Brief Description of the Drawings

The invention is explained in detail in the following on the basis of several forms of embodiment by way of example, wherein:

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- Fig. 1 shows a schematic illustration of a part of a first form of embodiment of a lift installation for zonal operation in a building with two cages, which are movable independently of one another at a pair of guide rails, of a lift departing,
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- Fig. 2 shows a schematic illustration of a part of a second form of embodiment of a lift installation for zonal operation in a building with two cages, which are movable independently of one another at a pair of guide rails, of a lift for both taking to and taking away and
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- Fig. 3 shows a schematic illustration of a part of a third form of embodiment of a lift installation for zonal operation in a building with a multi-cage of a lift taking to and two cages, which are movable independently of one another at a pair of guide rails, of a
- 15
- lift taking away.

Detailed Description of the Preferred Embodiments

Building: Figs. 1 to 3 show different forms of embodiment of a lift installation 10 for conveying persons/goods between storeys 30.1 to 30.10 of a building 30. The building 30 is divided into several zones 31, 32. Each zone comprises several storeys. For example, a first zone 31 comprises the storeys 30.1 to 30.8 and a second zone 32 comprises the storeys 30.6 to 30.10. With knowledge of the present invention it is free to the expert to realise other zonal divisions with

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more than two zones and more or less storeys per zone.

Shafts: The lift installation 10 comprises at least one lift 11, 12, 13, 14, but advantageously several lifts 11, 12, 13, 14, which lifts 11, 12, 13, 14 are advantageously installed in shafts 34 of the building 30. Numerous possibilities

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of variation of the installation of the lifts 11, 12, 13, 14 in the building 30 are freely available to the expert. Thus, the shafts 34 can extend only partly through

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the building 30 or a lift is installed without a shaft in an inner courtyard of the building 30 or outside the building 30.

Zones: The lifts 11, 12, 13, 14 transport persons/goods in the building 30. In
5 that case the lifts 11, 12, 13, 14 are allocated to the zones 31, 32. Lifts 11, 12 of
the first zone 31 are denoted as takers-to and lifts 13, 14 of the second zone 32
as takers-away. In the forms of embodiment according to Figs. 1 and 2 the
storey 30.8 is a changeover storey 33, 33', where a changing over of transported
persons/goods between takers-to and takers-away is carried out. The
10 embodiment according to Fig. 3 comprises two storeys 30.7,

IP 1470

4

30.8 as changeover storeys 33, 33'. The designations takers-to and takers-away is applicable as seen for a specific direction of the transport flow. In the following we consider takers-to and takers-away in the case of transport of persons/goods in upward direction in the building 30. These designations obviously reverse in the case of transport of persons/goods in upward direction in the building 30. Further details for zonal operation are described further below in detail. With knowledge of the present invention it is free to the expert to employ a greater or lesser number of lifts for the zonal operation of the building. In addition, the expert can provide several changeover storeys one above the other. Finally, the expert can provide several takers-to, which are connected in series, with changeover storeys.

Cages: Each of the lifts 11, 12, 13 comprises at least one cage 1, 2, 3, 4, 4', which cages 1, 2, 3, 4' are moved as single cages or multi-cages in vertical travel direction at a pair of guide rails 5, 5'. The cages 1, 2, 3, 4, 4' are usual and proven lift cages which are moved by way of guide shoes at guide rails 5, 5'.

Drives: The lift installation 10 has a drive 6, 6' per cage 1, 2, 3, 4, 4'. The drives are, for example, drive pulley drives with drive pulleys which connect the cages 1, 2, 3, 4, 4' by way of conveying means with counterweights. For reasons of clarity the conveying means and counterweights are not illustrated in the figures. Advantageously each cage 1, 2, 3, 4' is connected by way of at least one conveying means with a counterweight, which conveying means are driven by drive pulleys by friction couple. The conveying means can have any desired form, and it can also be of any desired materials. For example, the conveying means is a round cable, double cable or a belt. For example, the conveying means is at least partly of steel or aramide fibres. With knowledge of the present invention the expert can use all known and proven drives 6, 6'. For example, gearless drives can be used or drives with gears. In addition, drives 6, 6' with permanent magnets, synchronous motors or asynchronous motors can be used. The drives 6, 6' can be arranged in separate engine rooms 35 or directly in the shaft 34. Here, too, the expert with knowledge of the present invention has free selection of the arrangement of the drives. For example, the drives 6, 6' can, as illustrated in the form of embodiment according to Fig. 1, be arranged at the upper end of guide rails 5, 5' at substantially the same height in the shaft 34.

IP 1470

5

Destination call control: Advantageously the lift installation 10 transports persons/goods with a destination call control. In that case travel destinations are registered by way of destination call input apparatus. In the case of the destination call control there is carried out not a prior cage call, but a destination call from a location of the building 30. For reasons of clarity, no destination call input apparatus are illustrated in the figures. The destination call input apparatus can be panels, for example with a decade keyboard, and/or touch-screens fixedly installed on the storeys 30.1 to 30.10 at the entrances to the lift installation 10, but they can be mobile apparatus, such as mobile telephones, carried by the persons/goods. The destination call control obtains communication, by way of the destination call input apparatus, data about the location of the destination call input and the travel destination. These data can be used at any point in time of the zonal operation for optimisation of the transport capacity of the lift installation 10. Thus, the total number of lifts 11, 12, 13, 14 for transporting persons/goods can be ascertained from the data. In addition, the exact number of persons/goods changing over at the changeover storey 33, 33' is ascertained from the data. The destination call control controls all lifts 11, 12, 13, 14 in common and co-ordinated as a group. For that purpose the destination call control is connected by way of known and proven means with the drives 6, 6' and the cages 1, 2, 3, 4, 4'. Advantageously, the lifts 11, 12, 13, 14 are controlled in dependence on the number of persons/goods changing over in the changeover storey 33, 33', whereby an overfilling of the changeover storey 33, 33' is avoided or limited.

Advantageously the destination call control controls the lifts 11, 12, 13, 14 co-ordinated in such a manner that persons/goods are transported bunched. By bunched is understood a bunching in terms of time and location, i.e. persons/goods are transported at predetermined departure points in time by cages 1, 2, 3, 4, 4', which provide further transport in a further zone, and with consideration of the transport capacities of these cages 1, 2, 3, 4, 4', which provide further transport, to the changeover storey 33, 33'. Advantageously, the lift 11, 12, 13, 14 for taking away waits with opened doors for the persons/goods changing over. The destination call control also makes it possible to communicate to every person, who is changing over, the lift 11, 12, 13, 14 allocated to him or her as well as the cage 1, 2, 3, 4, 4' allocated to him or her, this also being able to be carried out before arrival at the changeover storey 33, 33'. With knowledge of the present invention the expert can, for example, employ indicating means which indicates to every person, who is changing over and who is located in front of entrances to the lifts 11, 12, 13, 14 and/or in a cage 1, 2, 3, 4, 4' taking to the changeover storey 33, 33' and/or located

IP 1470

6

in the changeover storey 33, 33' itself, the lift 11, 12, 13, 14 allocated to him or her as well as the cage 1, 2, 3, 4, 4' allocated to him or her. The indicating means can be arranged at different locations. They can be parts of panels arranged in stationary position in the cages 1, 2, 3, 4, 4' and/or in front of the entrances to the lifts 11, 12, 13, 14 and/or in the changeover storey 33, 33'. The display means can, however, also be parts of mobile apparatus, such as mobile telephones, carried by the persons. Such an indication can be, for example "Please take lift B and wait at the second cage".

Statistical unit: The destination call control recognises how many persons/goods have to change over in the changeover storey 33, 33' and advantageously comprises a statistical unit. The statistical unit obtains from the destination call control even at the first destination call input of each person or item of goods changing over a statement of the approximate arrival time at the changeover storey 33, 33'. As soon as the exact disembarkation time of the person/goods making the changeover in the changeover storey 33, 33' is known, this is communicated to the statistical unit together with the approximate boarding time in a cage 1, 2, 3, 4, 4' providing further transport. As soon as the exact arrival time of the cage 1, 2, 3, 4, 4' providing further transport is known, the destination call control reports this exact boarding time to the statistical unit. The statistical unit can thus record a future-oriented occupancy statistic for the changeover storey 33, 33', which is constantly refined by reports about the exact arrival and departure times per person/goods. In addition, an occupancy trend is detected by the statistical unit in that the positive or negative increase in the number of persons/goods in the changeover storey 33, 33' is ascertained per time interval. The statistic about the occupancy trend supplements the statement about the passenger number in the changeover storey 33, 33' in order to thus draw correct conclusions about the development of future occupancy of the occupancy storey 33, 33'.

In the statistical units, two parameters "maximum number of passengers in the changeover storey; switch on increased transport capacity" and "maximum number of passengers/goods in changeover storey; switch off increased transport capacity" are used. These two parameters are provided with threshold values individually per building 30 and changeover storey 33, 33' since they are dependent on the respective architectonic solution of the lift foyers and on the possible non-uniformity of the transport capacities between cages 1, 2, 3, 4, 4' taking to and taking away. If the occupancy statistic recorded by the statistical unit has reached a threshold value for the parameter "maximum number

IP 1470

7

of passengers in the changeover storey; switch on the increased transport capacity" and the instantaneous occupancy trend indicates a correspondingly positive increase, automatic destination call control parameters of the cages 1, 2, 3, 4, 4' taking away are so adapted by means of the destination call control that the maximum transport capacity of the cages 1, 2, 3, 4, 4' taking away is activated. This is also termed peak traffic mode of the lift installation 10. The transport capacity of the cages 1, 2, 3, 4, 4' taking to is maintained and the building 30 is filled in optimum manner, but not overfilled. For example, cages 1, 2, 3, 4, 4' taking away are preferably sent to the changeover storey 33, 33' and/or the arrival time of the cages 1, 2, 3, 4, 4' taking away is adapted to the heavily filled cages 1, 2, 3, 4, 4' taking to.

If a threshold value for the parameter "maximum number of passengers/goods in the changeover storey; switch off increased transport capacity" is reached and the occupancy trend points downwardly, the lift installation 10 is again operated in normal traffic mode in which passenger comfort is optimal with sufficient transport capacity.

First form of embodiment: In the first form of embodiment of a lift installation according to Fig. 1, lifts 11, 12 each with a cage 1, 2, which is movable at a pair of guide rails 5, 5', as taker to the changeover storey 33 in the first zone 31 and a lift 13 with a cage 33, which is movable at a pair of guide rails 5, 5', as well as a lift 14 with two cages 4, 4' movable independently of one another at a pair of guide rails 5, 5' serve as taker away of the changeover storey 33 in the second zone 32. The lifts 11, 12 which take to transport persons/goods in the first zone 31 between the storeys 30.1 to 30.8 and the lifts 13, 14 which take away transport persons/goods in the second zone 32 between the storeys 30.6 to 30.10. The middle storeys 30.6 to 30.8 can thus be served by all lifts 11, 12, 13, 14. Often, however, the takers-to directly serve the changeover storey 33 in shuttle service and do not serve any storeys 30.6, 30.7 near this directly served changeover storey 33. Advantageously, the lift 14 which takes away transports persons/goods in one and the same zone 32 by two cages 4, 4' movable independently of one another at a pair of guide rails 5, 5', wherein the lower cage 4 serves a lower region of the zone 32, i.e. the middle storeys 30.6 to 30.8, and the upper cage 4' serves an upper region of the second zone 32, i.e. the upper storeys 30.8 to 30.10. The lower cage 4 always remains below the upper cage 4'.

IP 1470

8

Persons/goods with a travel destination in the lower region of the second zone 32 are transported in cages 1, 2 of the lifts 11, 12, which take to, of the first zone 31 to the changeover storey 33 and thereupon are further transported in the lower cage 4 of the lift 14, which takes away, with two cages 4, 4', which are movable independently of one another, in the lower region of the second zone 32. The lower region of the second zone 32 comprises the storeys 30.6 to 30.8. The upper region of the second zone 32 comprises the storeys 30.8 to 30.10. In analogous manner, persons/goods with a travel destination in the upper region of the second zone 32 are transported in cages 1, 2 of the lifts 11, 12, which take to, to the changeover storey 33 and thereupon further transported in the upper cage 4 of the lift 14, which takes away, with two cages 4, 4', which are movable independently of one another, in the upper region of the second zone 32. Conversely, persons/goods with a travel destination in the first zone 31 are transported in cages 4, 4' of the lift 14, which takes to, with two cages 4, 4', which are movable independently of one another, of the second zone 32 to the changeover storey 33 and thereupon further transported in cages 1, 2 of the lifts 11, 12, which take away, in the first zone 31.

Second form of embodiment: In the second form of embodiment of a lift installation according to Fig. 2 two cages 2, 2', which are movable independently of one another at a pair of guide rails 5, 5', belong to a lift 12 which, by a lower cage 2, serves as taker-to of the changeover storey 33 in the first zone and, by an upper lift 2', as taker-away of the changeover storey 33 in the second zone 32. Advantageously, persons/goods are transported in the first zone 31 by the lower cage 2 movable at the pair of guide rails 5, 5' and persons/goods are transported in the second zone 32 by the upper cage 2' movable independently of the lower cage 2 at the same pair of guide rails 5, 5'. In addition, a lift 11 with a cage 1 movable at a pair of guide rails 5, 5' serves as taker-to of the changeover storey 33 in the first zone 31 and two lifts 13, 14 each with a respective cage 3, 4 movable at a pair of guide rails 5, 5' serve as taker-away of the changeover storey 33 in the second zone 32.

Persons/goods with a destination storey in a second zone 32 are transported by a lower cage 2 of the lift 12 with two cages 2, 2', which are movable independently of one another, in a first zone 31 to the changeover storey 33 and thereupon further transported in an upper cage 2' of the same lift 12 in the second zone 32. Conversely, persons/goods with a travel destination in a first zone 31 are transported by an upper cage 2' of the lift cage 12 with two cages 2, 2', which are movable independently of one another in a second zone 32

IP 1470

9

to the changeover storey 33 and thereupon further transported in a lower cage 2 of the same lift 12 in the first zone 31.

Third form of embodiment: In the third form of embodiment of a lift installation according to Fig. 3 a lift 12 with a multi-cage 2 serves as taker-to to two changeover storeys 33, 33' in the first zone 31 and a lift 14 with two cages 4, 4', which are movable independently of one another at a pair of guide rails 5, 5', serves as taker-away of the changeover storeys 33, 33' in the second zone 32. In addition, a lift 11 with a cage 1 movable at a pair of guide rails 5, 5' serves as taker-to of the changeover storeys 33, 33' in the first zone 31 and a lift 13 with a cage 33 movable at a pair of guide rails 5, 5' serves as taker-away of the changeover storeys 33, 33' in the second zone 32.

Advantageously, the multi-cage 2 transports persons/goods by a first cage 2" and by a second cage 2"". The storey 30.7 forms a lower changeover storey 33 and is served by the first cage 2". The storey 30.8 forms an upper changeover storey 33' and is served by the second cage 2"". With knowledge of the present invention it is obviously entirely possible to serve the two changeover storeys 33, 33' successively by the first cage 2" and by the second cage 2"". In addition, the expert can employ more than one lift with a multi-cage and the expert can also use a triple cage or a quadruple cage. Finally, the expert can also provide only one changeover storey per multi-cage or more than two changeover storeys per multi-cage.

Persons/goods with a travel destination in a lower region of a second zone 32 are transported in the first cage 2" of the multi-cage 2 of the first zone 31 to the lower changeover storey 33 and thereupon further transported in the lower cage 4 of the lift 14 with two cages 4, 4', which are movable independently of one another, in the lower region of the second zone 32. In analogous manner, persons/goods with a travel destination in the upper region of the second zone 32 are transported in the second cage 2"" of the multi-cage 2 of the first zone 31 to the upper changeover storey 33' and thereupon further transported in the upper cage 4' of the lift 14 with two cages 4, 4', which are movable independently of one another, in the upper region of the second zone 32. The lower region of the second zone 32 comprises the storeys 30.6 to 30.8. The upper region of the second zone 32 comprises the storeys 30.8 to 30.10. Conversely, persons/goods with a travel destination in the first zone 31 are transported in two cages 4, 4', which are movable

IP 1470

10

independently of one another, of a lift 14 of the second zone 32 to the changeover storeys 33, 33' and thereupon are further transported in the multi-cage 2 in the first zone 31.

5 With knowledge of the present invention it is free to the expert to realise combinations of the illustrated forms of embodiment. For reasons of time and space, these are not explained here in more detail.

Modernisation: With the zonal operation according to the invention the transport capacity of an existing lift installation can be increased by installation of a lift 12, 14 with at least two
10 cages 2, 2', 4, 4' movable independently of one another at a pair of guide rails 5, 5'. For this purpose an existing lift simply has to be replaced by a single cage. For example, the two drives 6, 6', as illustrated in the forms of embodiment according to Figs. 1 and 3, are arranged at the upper end of the guide rails 5, 5' at substantially the same height in the shaft 34. It is obviously also possible to arrange two drives 6, 6', as illustrated in the form
15 of embodiment according to Fig. 2, in the engine room 35.

Claims

1. Lift installation for zonal operation in a building divided into several zones, which lift installation comprises several lifts for the transport of persons/goods in cages, a zone is associated with each lift, and at least one changeover storey for the changing over of persons/goods between cages of different zones is arranged between the zones, characterised in that at least one lift comprises at least two cages which are arranged one above the other and which are movable independently of one another at a pair of guide rails and the at least one changeover storey is served by at least two of the at least two independent cages.
2. Lift installation according to claim 1, characterised in that lifts of a first zone transport persons/goods to the changeover storey each time by a cage movable at a pair of guide rails and that a lift of a second zone transports persons/goods to the changeover storey by two cages movable independently of one another at a pair of guide rails.
3. Lift installation according to claim 1 or 2, characterised in that a lower cage movable at a pair of guide rails transports persons/goods in the lower region of a zone and that an upper cage movable independently of the lower cage at the same pair of guide rails transports persons/goods in an upper region of this zone.
4. Lift installation according to claim 1, characterised in that the lift transports persons/goods in a first zone by a lower cage movable at a pair of guide rails and that the lift transports persons/goods in a second zone by an upper cage movable independently of the lower cage at the same pair of guide rails.
5. Lift installation according to claim 2, characterised in that at least one lift of a first zone transports persons/goods to the changeover storey by a multi-cage movable at a pair of guide rails.

6. Method for zonal operation of a lift installation in a building divided into several zones, which lift installation comprises several lifts for the transport of persons/goods in cages, a zone is associated with each lift and at least one changeover storey for the changing over of persons/goods between cages of different zones is arranged between the zones, characterised in that at least two cages, which are arranged one above the other, are movable independently of one another at a pair of guide rails and the at least one changeover storey is served by at least two of the at least two independent cages.

7. Method according to claim 6, characterised in that destination calls are registered by persons/goods and that the number of persons/goods changing over in the changeover storey is determined from these destination calls at every instant of the zonal operation.

8. Method according to claim 6 or 7, characterised in that in the case of exceeding a threshold value of the number of persons/goods changing over in the changeover storey, the lift installation is operated in a peak traffic mode and in the case of falling below a threshold value of the number of persons/goods changing over in the changeover storey, the lift installation is operated in a normal traffic mode.

9. Method according to one of claims 6 to 8, characterised in that persons/goods changing over are transported to the changeover storey at predetermined departure points in time by cages providing further transport in a further zone.

10. Method according to claim 9, characterised in that persons/goods with a travel destination in a lower region of a second zone are transported in cages of a first zone to the changeover storey and thereupon are further transported in a lower cage of the lift by two cages, which are movable independently of one another, in the lower region of the second zone and that persons/goods with a

travel destination in an upper region of a second zone are transported in cages of a first zone to the changeover storey and thereupon further transported in an upper cage of the lift by two cages, which are movable independently of one another, in the upper region of the second zone and that persons/goods with a travel destination in a first zone are transported in two cages, which are movable independently of one another, of a lift of a second zone to the changeover storey and thereupon are further transported in cages in the first zone.

11. Method according to claim 9, characterised in that persons/goods with a travel destination in a second zone are transported by a lower cage of the lift with two cages, which are movable independently of one another, in a first zone to the changeover storey and thereupon are further transported in an upper cage of the same lift in the second zone and that persons/goods with a travel destination in a first zone are transported by an upper cage of the lift with two cages, which are movable independently of one another, in a second zone to the changeover storey and thereupon further transported in a lower cage of the same lift in the first zone.

12. Method according to claim 9, characterised in that persons/goods with a travel destination in a lower region of a second zone are transported in a first cage of a multi-cage of a first zone to the changeover storey and thereupon are further transported in a lower cage of the lift with two cages, which are movable independently of one another, in the lower region of the second zone and that persons/goods with a travel destination in an upper region of a second zone are transported in a second cage of a multicage of a first zone to the changeover storey and thereupon are further transported in an upper cage of the lift with two cages, which are movable independently of one another, in the upper region of a second zone and that persons/goods with a travel destination in a first zone are transported in two cages, which are movable independently of one another, of a lift in a second zone to the changeover storey and thereupon are further transported in a multi-cage in the first zone.

13. Method according to one of claims 6 to 12, characterised in that there is indicated to each person, who is changing over and who is at least one of located before entrances to the lifts, in a cage en route to the changeover storey and in the changeover storey, the lift allocated to the person as well as the cage allocated to the person.

14. Method of modernising a lift installation in a building divided into several zones, which lift installation comprises several lifts for the transport of persons/goods in cages, a zone is associated with each lift and at least one changeover storey for the changing over of persons/goods between cages of different zones is arranged between the zones, characterised in that at least one lift with at least two cages, which are arranged one above the other and which are movable independently of one another at a pair of guide rails, is installed and the at least one changeover storey is served by at least two of the at least two independent cages.

15. An elevator installation for zonal operation in a building divided into several zones, the elevator installation comprising: a plurality of elevators for transport of persons/goods in cages; a zone associated with each elevator; and at least one changeover storey arranged between the zones for changing over of persons/goods between cages of different zones, at least one of the elevators has at least two cages which are arranged above one another and are movable independently of one another along a pair of guide rails, at least one changeover storey being served by at least two of the at least two independent cages.

16. The elevator installation according to claim 15, wherein the elevators of a first zone are operative to transport persons/goods to the changeover storey each time by a cage movable along a pair of guide rails, and the elevator of a second zone is operative to transport persons/goods to the changeover storey by two cages movable independently of one another along a pair of guide rails.

17. The elevator installation according to claim 15, wherein a lower one of the at least two cages movable along a pair of guide rails is operative to transport persons/goods in a lower region of a zone and an upper one of the at least two cages movable independently of the lower cage along the same pair of guide rails is operative to transport persons/goods in an upper region of the zone.

18. The elevator installation according to claim 16, wherein the at least two cages in the second zone include a lower cage operative to transport persons/goods in a lower region of the second zone and an upper cage operative to transport persons/goods in an upper region of the second zone.

19. The elevator installation according to claim 15, wherein one of the elevators is operative to transport persons/goods in a first zone by a lower cage movable along a pair of guide rails and the one elevator transports persons/goods in a second zone by an upper cage movable independently of the lower cage along the same pair of guide rails.

20. The elevator installation according to claim 16, wherein at least one elevator of a first zone is operatively constructed to transport persons/goods to the changeover storey by a multi-cage movable along a pair of guide rails.

21. A method for zonal operation of an elevator installation in a building divided into several zones, which elevator installation comprises several elevators for transport of persons/goods in cages, a zone associated with each elevator and at least one changeover storey arranged between the zones for changing over of persons/goods between cages of different zones, the method comprising the step of independently moving at least two cages, which are arranged above one another, of an elevator along a pair of guide rails, at least one changeover storey being served by at least two of the at least two independent cages.

22. A method for zonal operation of an elevator installation in a building divided into several zones, which elevator installation comprises several elevators for transport of persons/goods in cages, a zone associated with each elevator and at least one changeover storey arranged between the zones for changing over of persons/goods between cages of different zones, the method comprising the step of independently moving at least two cages, which are arranged above one another, of an elevator along a pair of guide rails, further including registering destination calls by persons/goods and determining a number of persons/goods changing over in the changeover storey from the destination calls at every instant of the zonal operation.

23. The method according to claim 22, further including operating the elevator installation in a peak traffic mode when a threshold value of the number of persons/goods changing over in the changeover storey is exceeded.

24. The method according to claim 22, further including operating the elevator installation in a normal traffic mode when a threshold value of the number of persons/goods changing over in the changeover storey is fallen below.

25. The method according to claim 21, including transporting persons/goods changing over to the changeover storey at predetermined departure points in time by cages providing further transport in a further zone.

26. The method according to claim 25, wherein persons/goods with a travel destination in a lower region of a second zone are transported in cages of a first zone to the changeover storey and thereupon are further transported in a lower cage of the elevator by two cages, which are movable independently of one another, in the lower region of the second zone.

27. The method according to claim 25, wherein persons/goods with a travel destination in an upper region of a second zone are transported in cages of a first zone to the changeover storey and thereupon further transported in an

upper cage of the elevator by two cages which are movable independently of one another in the upper region of the second zone.

28. The method according to claim 25, wherein persons/goods with a travel destination in a first zone are transported in two cages which are movable independently of one another of an elevator of a second zone to the changeover storey and thereupon are further transported in cages in the first zone.

29. The method according to claim 26, wherein persons/goods with a travel destination in an upper region of a second zone are transported in cages of a first zone to the changeover storey and thereupon further transported in an upper cage of the elevator by two cages which are movable independently of one another in the upper region of the second zone.

30. The method according to claim 26, wherein persons/goods with a travel destination in a first zone are transported in two cages which are movable independently of one another of an elevator of a second zone to the changeover storey and thereupon are further transported in cages in the first zone.

31. The method according to claim 27, wherein persons/goods with a travel destination in a first zone are transported in two cages which are movable independently of one another of an elevator of a second zone to the changeover storey and thereupon are further transported in cages in the first zone.

32. The method according to claim 26, wherein persons/goods with a travel destination in an upper region of a second zone are transported in cages of a first zone to the changeover storey and thereupon further transported in an upper cage of the elevator by two cages which are movable independently of one another in the upper region of the second zone and wherein persons/goods with a travel destination in a first zone are transported in two cages which are movable independently of one another of an elevator of a second zone to the

changeover storey and thereupon are further transported in cages in the first zone.

33. The method according to claim 25, wherein persons/goods with a travel destination in a second zone are transported by a lower cage of the elevator with two cages, which are movable independently of one another, in a first zone to the changeover storey and thereupon are further transported in an upper cage of the same elevator in the second zone.

34. The method according to claim 25, wherein persons/goods with a travel destination in the first zone are transported by an upper cage of the elevator with two cages which are movable independently of one another in a second zone to the changeover storey and thereupon further transported in a lower cage of the same elevator in the first zone.

35. The method according to claim 33, wherein persons/goods with a travel destination in the first zone are transported by an upper cage of the elevator with two cages which are movable independently of one another in a second zone to the changeover storey and thereupon further transported in a lower cage of the same elevator in the first zone.

36. The method according to claim 25, wherein persons/goods with a travel destination in a lower region of a second zone are transported in a first cage of a multi-cage of a first zone to the changeover storey and thereupon are further transported in a lower cage of the elevator with two cages, which are movable independently of one another, in the lower region of the second zone.

37. The method according to claim 25, wherein persons/goods with a travel destination in an upper region of a second zone are transported in a second cage of a multi-cage of a first zone to the changeover storey and thereupon are further transported in an upper cage of the elevator with two cages which are movable independently of one another in the upper region of a second zone.

38. The method according to claim 25, wherein persons/goods with a travel destination in a first zone are transported in two cages which are movable independently of one another of an elevator in a second zone to the changeover storey and thereupon are further transported in a multi-cage in the first zone.

39. The method according to claim 36, wherein persons/goods with a travel destination in an upper region of a second zone are transported in a second cage of a multi-cage of a first zone to the changeover storey and thereupon are further transported in an upper cage of the elevator with two cages which are movable independently of one another in the upper region of a second zone.

40. The method according to claim 36, wherein persons/goods with a travel destination in a first zone are transported in two cages which are movable independently of one another of an elevator in a second zone to the changeover storey and thereupon are further transported in a multi-cage in the first zone.

41. The method according to claim 37, wherein persons/goods with a travel destination in a first zone are transported in two cages which are movable independently of one another of an elevator in a second zone to the changeover storey and thereupon are further transported in a multi-cage in the first zone.

42. The method according to claim 36, wherein persons/goods with a travel destination in an upper region of a second zone are transported in a second cage of a multi-cage of a first zone to the changeover storey and thereupon are further transported in an upper cage of the elevator with two cages which are movable independently of one another in the upper region of a second zone and wherein persons/goods with a travel destination in a first zone are transported in two cages which are movable independently of one another of an elevator in a second zone to the changeover storey and thereupon are further transported in a multi-cage in the first zone.

43. The method according to claim 21, further including indicating to each person, who is changing over and who is at least one of located before entrances to the elevators, in a cage en route to the changeover storey and in the changeover storey, the elevator allocated to the person as well as the cage allocated to the person.

44. A method of modernizing an elevator installation in a building divided into several zones, which elevator installation comprises several elevators for the transport of persons/goods in cages, a zone associated with each elevator and at least one changeover storey for changing over of persons/goods between cages of different zones is arranged between the zones, the method comprising the step of installing at least one elevator with at least two cages, which are arranged above one another and which are movable independently of one another, at a pair of guide rails, at least one changeover storey being served by at least two of the at least two independent cages.

I / III

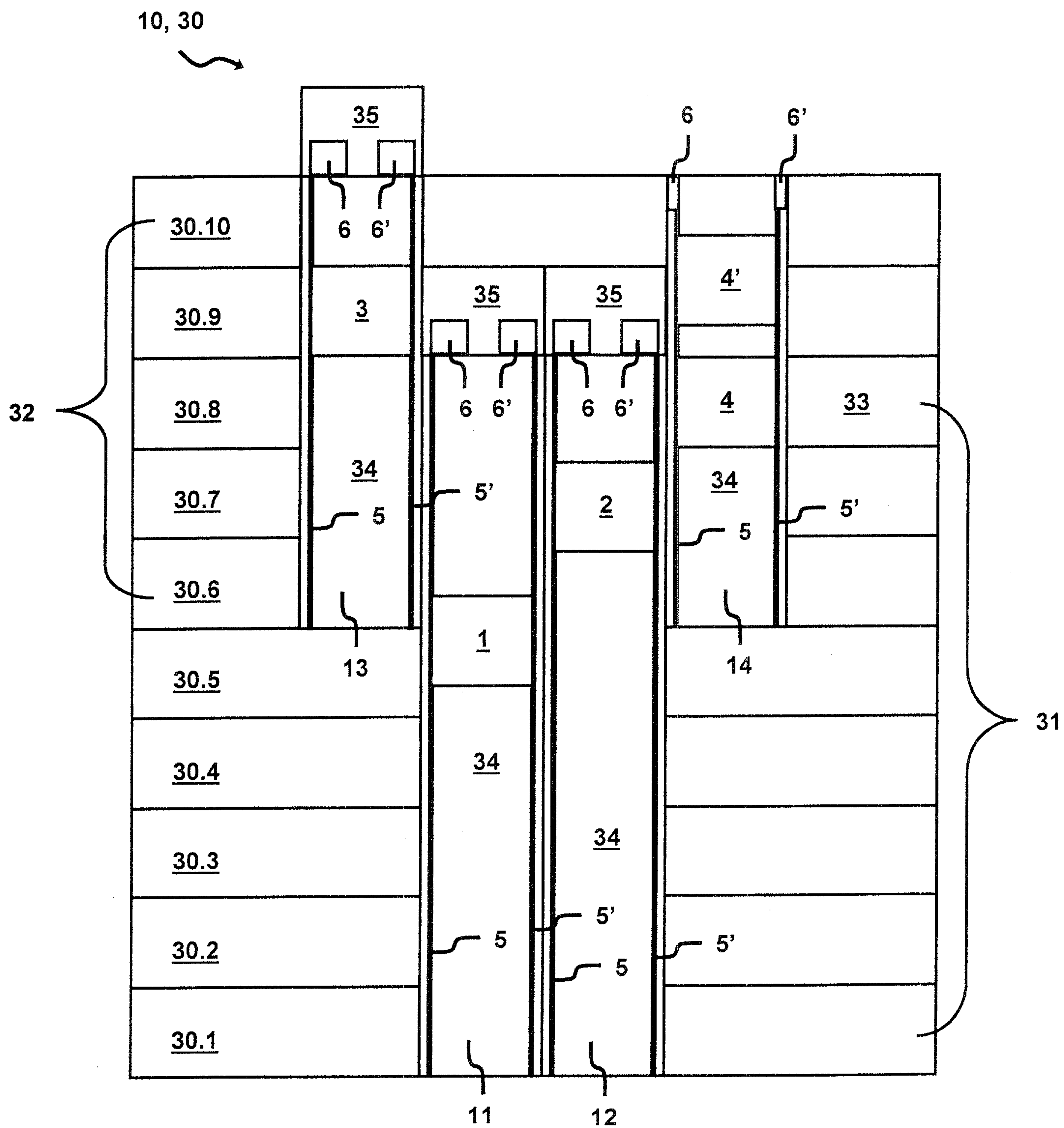


Fig. 1

II / III

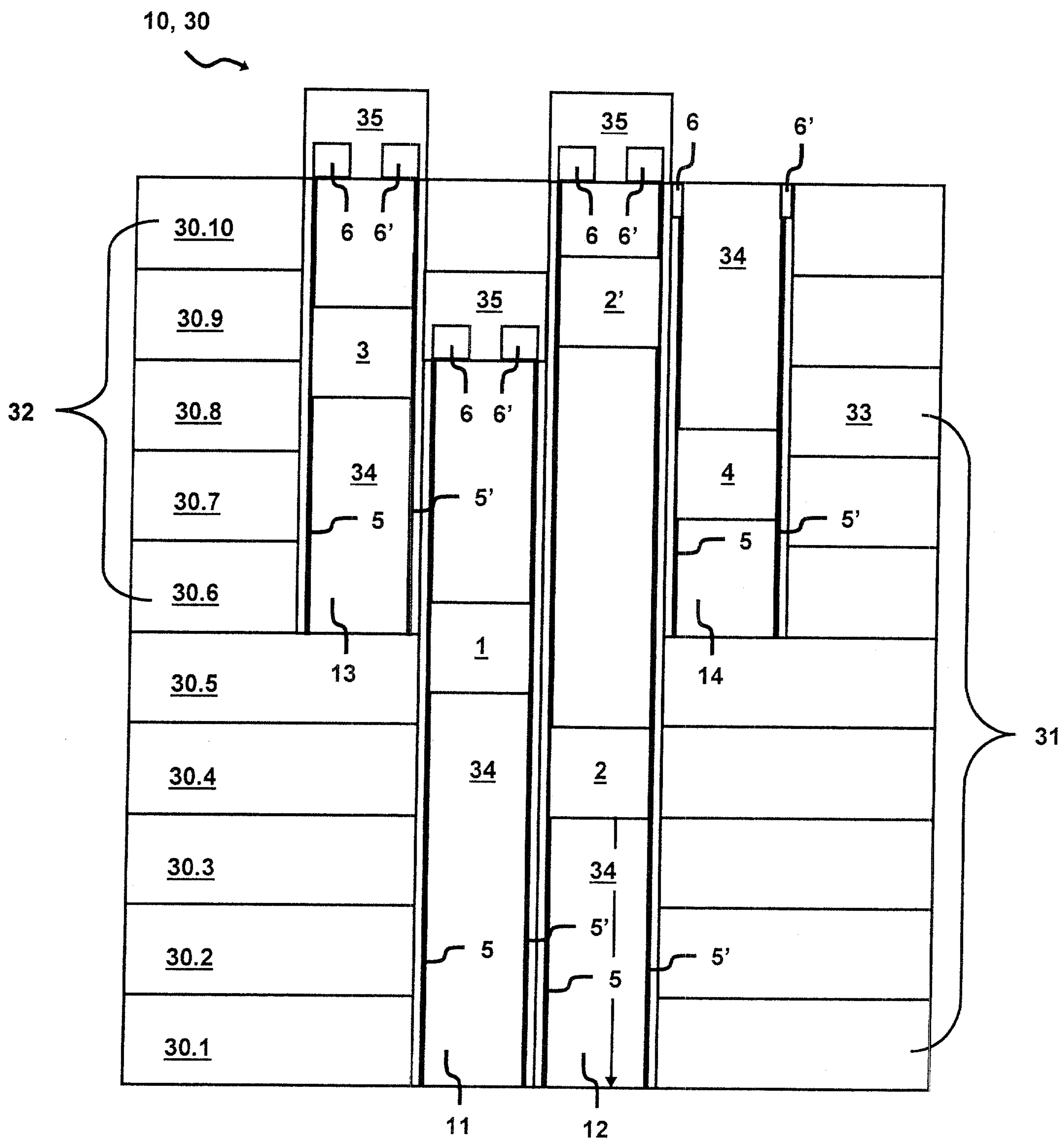


Fig. 2

III / III

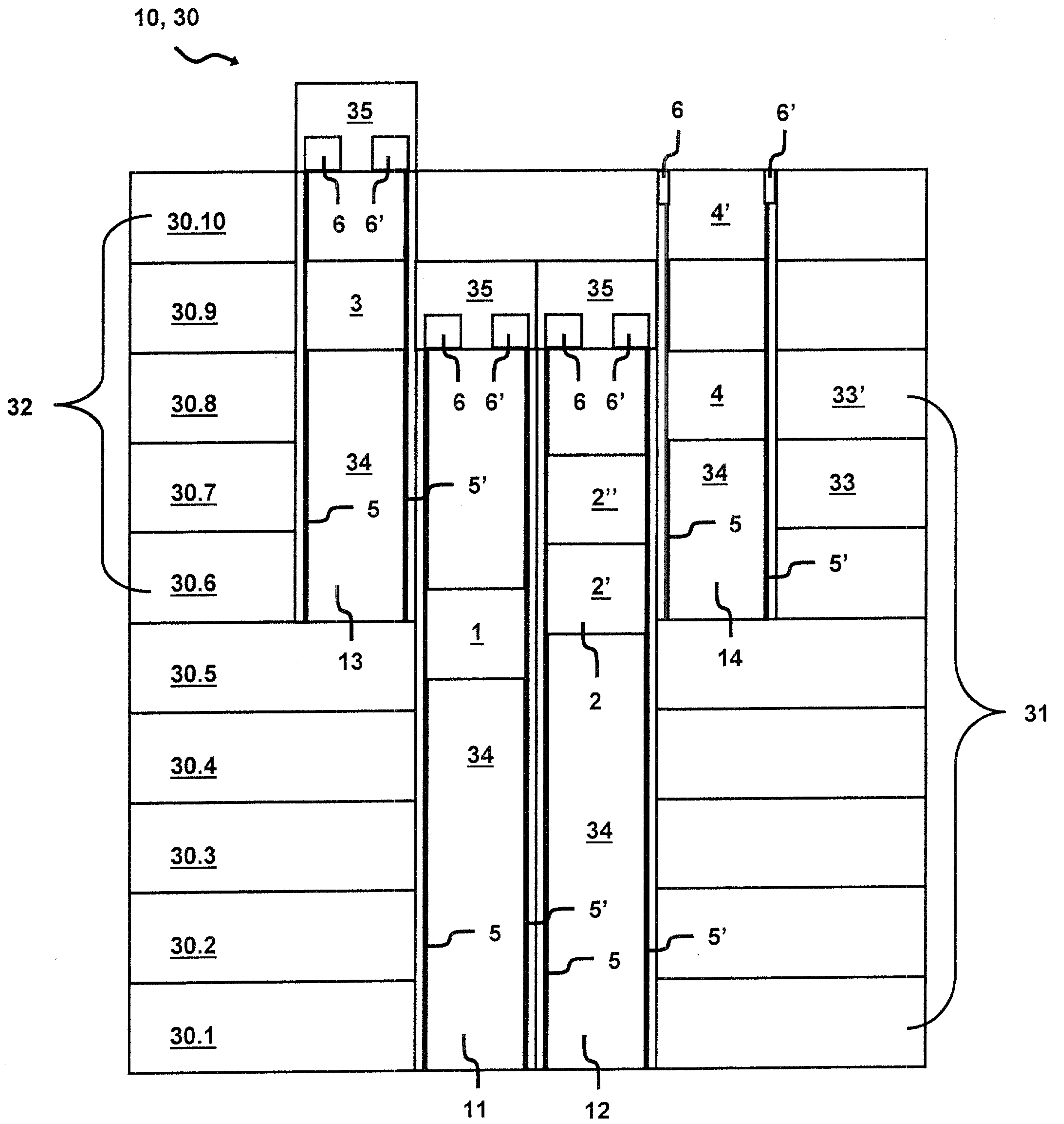


Fig. 3

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32

