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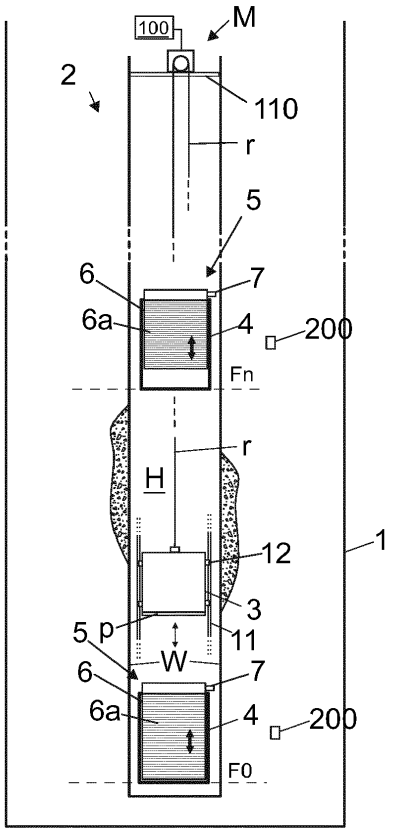
(54) METHOD AND CONSTRUCTION-TIME ELEVATOR ARRANGEMENT

(57) The invention relates to a method for transporting goods in a building (1) under construction, comprising providing an elevator arrangement (2;20) comprising a hoistway (H) inside the building (1) under construction, and vertically displaced landings (F0,Fn), and an elevator car (3), which is vertically movable inside the hoistway (H), the hoistway being provided with openings (4) between landings (F0,Fn) and the hoistway (H), one or more of the hoistway openings (4) being provided with a first door arrangement (5;25), wherein the first door arrangement (5;25) comprises a first sliding hoistway door (6;26) for openably closing the hoistway opening (4), the opening direction of which first hoistway door (6;26) is vertical; and thereafter transporting vertically goods between landings (F0,Fn) of the building (1) under construction with said elevator car (3); and thereafter constructing a second door arrangement (8) in place of one or more of the first door arrangements (5;25), wherein the second door arrangement (8) comprises a second sliding hoistway door (9) for openably closing the hoistway opening (4), the opening direction of which second sliding hoistway door (9) is horizontal; and thereafter transporting vertically passengers between landings (F0,Fn) of the building (1) with an elevator car (15) in the hoistway inside the building (1). The invention also relates to a construction-time elevator arrangement (2,20).

Fig. 1



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Description

FIELD OF THE INVENTION

[0001] The invention relates a method for transporting goods in a building under construction and a construction-time elevator arrangement.

BACKGROUND OF THE INVENTION

[0002] During construction of a building, people and goods need to move vertically for enabling construction work in the upper parts of the building under construction. For example, construction workers need to move to the floor where their construction site is located, as well as away from that floor. Likewise, goods, such as tools, equipment and construction material need to move to the floor where the construction site of the respective tools, equipment and construction material is located.

[0003] In prior art, transportation of goods during construction work of the building has been performed by lifting with a building crane and/or by temporary hoists and/or by a temporary elevator installed outside the building under construction. Typically, particularly heavy and/or large goods have been transported by a crane or by temporary hoists. In prior art, transportation of people has been performed by aid of a temporary elevator installed outside the building under construction or a construction-time elevator installed inside the building, such as a so-called jump elevator.

[0004] A drawback in use of said known solutions has been that they have not been sufficiently efficient in providing smooth flow of goods during construction time of a building, nor have they ensured sufficiently smooth transition to serving transportation needs of the final building.

BRIEF DESCRIPTION OF THE INVENTION

[0005] The object of the invention is to introduce a new method and elevator arrangement, which facilitate efficient flow of goods to be transported during construction-time of a building as well as smooth transition from construction phase operations to operations of the final building.

[0006] An object is particularly to introduce a solution by which one or more of the above defined problems of prior art and/or problems discussed or implied elsewhere in the description can be solved.

[0007] An object is moreover to introduce a solution by which a transportation arrangement is easy and quick to take into use (install) early in a building under construction, which is moreover robust, serves safely, reliably, and comfortably providing efficient goods transportation already during construction time of the building, while being simply convertible to forming an efficient part of a final transportation configuration of the building where requirements are different than during construction time.

[0008] An object is moreover to introduce a solution by which large goods transportation already during construction time of the building is made easy.

[0009] It is brought forward a new method for transporting goods in a building under construction, comprising

providing a construction-time elevator arrangement comprising a hoistway inside the building under construction, and vertically displaced landings, and an elevator car, which is vertically movable inside the hoistway, the hoistway being provided with openings between landings and the hoistway, one or more of the hoistway openings being provided with a first door arrangement, wherein the first door arrangement comprises a sliding hoistway door for openably closing the hoistway opening, the opening direction of which hoistway door is vertical; and thereafter transporting vertically goods between landings of the building under construction with said elevator car; and thereafter

constructing a second door arrangement in place of one or more of the first door arrangements, wherein the second door arrangement comprises a second sliding hoistway door for openably closing the hoistway opening, the opening direction of which second sliding hoistway door is horizontal; and thereafter

transporting vertically passengers between landings of the building with an elevator car vertically movable inside the hoistway, in particular the aforementioned hoistway which is inside the building, in particular while the building is still under construction or already finished. With this solution one or more of the above mentioned objects can be achieved. Permanent and temporary elevator parts are mixed and used together, and owing to specific configuration changes in a sequence, a well optimized overall method can be provided. Particularly, this provides that the configuration is swiftly adapted to serve needs of each prevailing stage of the construction process in an optimal manner such that safety and efficiency of flow of goods to be transported already during construction-time of a building are facilitated. This is achieved while facilitating simple and quick transition to serving needs of the final building, which may be different from those of the building during construction-time thereof. The opening direction of the hoistway door being vertical particularly facilitates installation and later modification of a transportation arrangement and construction time operation thereof for transporting goods, whereas the opening direction of the second sliding hoistway door being horizontal facilitates serving needs of the final building, e.g. due to allowing quick, safe and smooth way to open a passage via which a person fits to enter or exit an elevator car.

[0010] Preferable further details are introduced in the following, which further details can be combined with the method individually or in any combination.

[0011] In a preferred embodiment, said transporting vertically goods and/or said transporting vertically passengers comprises automatically operating, in particular

by an elevator control system, a machinery, to move the elevator car between vertically displaced landings, in particular in response to signals received from one or more interfaces, such as one or more user interfaces operable by a user.

[0012] In a preferred embodiment, the first hoistway door comprises one or more vertically slidable door members, such as one or more vertically slidable door panels or a flexible shutter.

[0013] In a preferred embodiment, the second sliding hoistway door comprises one or more horizontally slidable door members, such as one or more horizontally slidable door panels.

[0014] In a preferred embodiment, the elevator arrangement comprises in the hoistway at least one vertical guide rail line for guiding movement of the car. In said transporting, the car is moved along the at least one guide rail line. The car is preferably arranged to laterally lean on the guide rail line by guides such as roller guides or slide guides.

[0015] In a preferred embodiment, the method comprises, after said transporting vertically goods and before said transporting vertically passengers, constructing a second elevator car in place of the elevator car, and the transporting vertically passengers is performed with the second elevator car.

[0016] In a preferred embodiment, said constructing a second elevator car in place of the elevator car preferably comprises arranging the second elevator car to be vertically movable along said at least one guide rail line for guiding movement of the car. Thus, transformation of the elevator, which is a goods elevator, to form a passenger elevator in its place is performed utilizing components already present, which facilitates swiftness and economy of the transformation. This facilitates smooth transition to serving transportation needs of the final building. Preferably, one or more components comprised in the elevator car, such as one or more of a car frame, guide members, such as roller guides or slide guides, a transport platform, are utilized in the constructing the second passenger elevator car in place of the elevator car. In this case, preferably said constructing a second elevator car in place of the elevator car is performed such that one or more of a car frame, guide members, such as roller guides or slide guides, a transport platform form corresponding part(s) of the second elevator car. Thus, transformation to serving transportation needs of the final building is performed utilizing components of the construction-time elevator, which facilitates swiftness and economy of the transformation.

[0017] In a preferred embodiment, the first car does not comprise an openable door for allowing passage between a landing and the first car, and the second car comprises an openable door for allowing passage between a landing and the second car, preferably an automatic door.

[0018] In a preferred embodiment, each said first door arrangement comprises an actuator, preferably an electric motor, for actuating the first sliding hoistway door to open or close.

[0019] In a preferred embodiment, each said constructing a second door arrangement in place of a first door arrangement comprises removing the door and the actuator of the first door arrangement.

[0020] In a preferred embodiment, the door of each said second door arrangement is arranged to be actuated to open and/or close by an actuator, preferably an electric motor, mounted on the second car.

[0021] In a preferred embodiment, the door of each said second door arrangement is a sliding door mounted to be movable along one or more guide rails.

[0022] In a preferred embodiment, the door of each said second door arrangement comprises plurality of sliding door panels.

[0023] In a preferred embodiment, each said first door arrangement is mounted on the building in proximity of the hoistway opening which it can openable close, separately of the car i.e. not traveling with the car.

[0024] In a preferred embodiment, said second door arrangement does not comprise an actuator for actuating the hoistway door to move between open and closed position.

[0025] In a preferred embodiment, the first sliding hoistway door is a roller shutter door.

[0026] In a preferred embodiment, the first sliding hoistway door comprises a slidable door member which is a flexible shutter. Preferably, the flexible shutter is arranged to be inreeled for opening the door and outreeled for closing the door.

[0027] In a preferred embodiment, the flexible shutter comprises pivotally linked rigid sections.

[0028] In a preferred embodiment, the flexible shutter comprises a plurality of pivotally linked rigid sections in a vertically lined up array when the door is in closed state, which sections are movable vertically by rolling into a roll for opening passage through the hoistway opening. Preferably, the roll is positioned beside the upper edge of the hoistway opening

[0029] In a preferred embodiment, the first sliding hoistway door is positioned inside the hoistway or on the landing side. When the first sliding hoistway door is positioned inside the hoistway, an advantage is that the constructor can finish the landing side structures before constructing a second door arrangement in place of one or more of the first door arrangements. When the first sliding hoistway door is positioned on the landing side, an advantage is that a large space is left on the hoistway side for the first car to move. Additionally, in this case, it is advantageous that the first sliding hoistway door can take support from the edges of the opening so that it is very robust and endures well bumps without risks. More space is also left of the hoistway side so that it is unlikely to deform to be on path of the first car.

[0030] In a preferred embodiment, the actuator of first door arrangement, which preferably an electric motor, is connected to a shaft around which the slidable door mem-

ber can be inreeled by rotating the shaft with the actuator.

[0031] In a preferred embodiment, the first sliding hoistway door is a guillotine door. Then, preferably the first sliding hoistway door comprises one or more vertically slidable door panels. More preferably, the first sliding hoistway door comprises two vertically slidable door panels on top of each other, the door being openable by moving them away from each other such that a gap is opened vertically between them and closable by moving them towards each other such that the gap is closed. Then, preferably the actuator of the first door arrangement, which is preferably an electric motor, is connected with transmission to each of said door panels.

[0032] In a preferred embodiment, the first door arrangement comprises a door frame installed in the hoistway opening. Preferably, the door frame comprises a first frame member mounted on the building and a second frame member mounted on the first frame member, the door panels being mounted on the second frame member.

[0033] In a preferred embodiment, the second car comprises an automatic door.

[0034] In a preferred embodiment, the second car comprises a door and an actuator, preferably an electric motor, mounted on the second car for actuating the door of the second car to open or close. The door of the second car is in particular an openable door for allowing passage between a landing and the second car.

[0035] In a preferred embodiment, the door of the second car is a sliding door mounted to be movable along one or more guide rails.

[0036] In a preferred embodiment, the door of the second car comprises plurality of sliding door panels.

[0037] In a preferred embodiment, the door of each said second door arrangement is arranged to be actuated to open or close by an actuator, preferably an electric motor, mounted on the second car.

[0038] In a preferred embodiment, an actuator mounted on the second car is connected to the door of the second car with transmission for transmitting force between the actuator and the door the transmission preferably comprising a belt.

[0039] In a preferred embodiment, the second elevator car comprises a coupling mechanism for coupling the door of the second car with the door of the second door arrangement. Particularly, thereby the door of the second car and the door of the second door arrangement are arranged to be actuatable simultaneously by the actuator mounted on the second car, in particular when the second car is in such position that the door thereof and the door of the second door arrangement are level with each other.

[0040] In a preferred embodiment, the second door arrangement comprises at least one counterpart for the coupling mechanism of the second car which at least one counterpart is connected to the door of the second door arrangement. The at least one counterpart is preferably mounted on a door hanger of a door panel, but it can alternatively be differently positioned.

[0041] In a preferred embodiment, the coupling mechanism comprises at least one coupling member for coupling with the at least one counterpart of the second door arrangement.

[0042] In a preferred embodiment, the coupling mechanism is arranged to transmit force from the actuator mounted on the second car via the at least one counterpart to the second sliding hoistway door for opening and/or closing it.

[0043] In a preferred embodiment, the construction-time elevator arrangement comprises a machinery for moving an elevator car and an elevator control system for automatically operating the machinery.

[0044] It is also brought forward a new construction-time elevator arrangement comprising a hoistway inside a building under construction, and vertically displaced landings, and an elevator car, which is vertically movable inside the hoistway, the hoistway being provided with openings between landings and the hoistway, one or more of the hoistway openings being provided with a first door arrangement, wherein the first door arrangement comprises a sliding hoistway door for openably closing the hoistway opening, the opening direction of which hoistway door is vertical. With this solution one or more of the above mentioned objects can be achieved. Particularly, this provides that the configuration is swiftly adaptable to serve needs changing in different stages of the construction process in an optimal manner such that safety and efficiency of flow of goods to be transported already during construction-time of a building are facilitated. This is achieved while facilitating simple and quick transition to serving needs of the final building, which may be different from those of the building during construction-time thereof. The opening direction of the hoistway door being vertical particularly facilitates installation and later modification of a transportation arrangement and construction time operation thereof for transporting goods

[0045] Preferable further details of the arrangement have been introduced earlier above as well as in the following, which further details can be combined with the arrangement individually or in any combination.

[0046] In a preferred embodiment, the construction-time elevator arrangement is configured, in particular by an elevator control system thereof, to automatically operate a machinery, to move the elevator car between vertically displaced landings, in particular in response to signals received from one or more interfaces, such as one or more user interfaces operable by a user, for example.

[0047] In a preferred embodiment, the first car does not comprise an openable door for allowing passage between a landing and the first car.

[0048] In a preferred embodiment, the first car comprises at least a platform on which a load can be placed to rest.

[0049] In a preferred embodiment, the elevator arrangement comprises in the hoistway at least one vertical

guide rail line for guiding movement of the car. The car is movable along the guide rail line. The car is preferably arranged to laterally lean on the guide rail line by guides, such as roller guides or slide guides.

[0050] In a preferred embodiment, each said first door arrangement comprises an actuator, preferably an electric motor, for actuating the hoistway door to open or close.

[0051] In a preferred embodiment, the first sliding hoistway door is a roller shutter door or a guillotine door. The operating mechanisms of vertically openable doors, such as a so called guillotine door or a roller shutter door in particular, are simple, robust and able to produce a wide open passageway quickly. A roller shutter door and a guillotine door are each also simply removable to be used in a different construction site in a different building, for example.

[0052] In a preferred embodiment, the building under construction is preferably such that it has not reached its final height yet, the upper parts thereof still being missing. Hereby, preferably during the method, the building under construction is constructed to be higher.

[0053] In a preferred embodiment, said hoistway is a space inside the building under construction wherein an elevator car can move vertically.

[0054] In a preferred embodiment, said hoistway is delimited by one or more inner walls of the building, said walls preferably being concrete walls.

BRIEF DESCRIPTION OF THE DRAWINGS

[0055] In the following, the present invention will be described in more detail by way of example and with reference to the attached drawings, in which

Figure 1 illustrates a construction-time elevator arrangement according to a first embodiment at a phase of a method according to a first embodiment.

Figure 2 illustrates preferred details of the elevator arrangement of Figure 1 as modified at a subsequent phase of the method according to the first embodiment.

Figure 3 illustrates a construction-time elevator arrangement according to a second embodiment at a phase of a method according to a second embodiment.

Figure 4 illustrates preferred details of the elevator arrangement of Figure 3 as modified at a subsequent phase of the method according to the second embodiment.

Figure 5 illustrates preferred details of the first door arrangement of Figure 1 according to a first kind as viewed from the hoistway side.

Figure 6 illustrates preferred details of the first door arrangement of Figure 1 according to a second kind as viewed from the landing side.

Figure 7 illustrates preferred details of the first door arrangement of Figure 3 as viewed from the landing side in closed state.

Figure 8 illustrates preferred details of the first door arrangement of Figure 3 as viewed from the hoistway side in open state.

Figures 9 and 10 illustrate preferred details of parts of the first door arrangement of

Figures 7 and 8.

Figures 11 and 12 illustrate preferred details of the elevator arrangement illustrated in Figures 2 and 4.

The foregoing aspects, features and advantages of the invention will be apparent from the drawings and the detailed description related thereto.

DETAILED DESCRIPTION

[0056] Figure 1 illustrates a construction-time elevator arrangement 2 according to a first embodiment at a phase of a method according to a first embodiment. The method for transporting goods in a building 1 under construction comprises providing an elevator arrangement 2 as illustrated, which elevator arrangement 2 comprises a hoistway H formed inside the building 1 under construction, and vertically displaced landings F0,Fn, and an elevator car 3 (also referred to as the first elevator car 3), which is vertically movable inside the hoistway H, the hoistway H being provided with plurality of openings 4 between a landing F0,Fn and the hoistway H, each forming a passage between a landing F0,Fn and the hoistway H, one or more of the hoistway openings 4 being provided with a first door arrangement 5. After this, the method comprises transporting vertically goods between landings F0,Fn of the building 1 under construction with said elevator car 3 in the hoistway H inside the building 1 under construction. In Figures 1 and 2, the front wall of the hoistway H has been left transparent so as to better show the components that are located in the hoistway. The front wall of the hoistway H, which front wall comprises the openings 4, is preferably closed concrete wall apart from the openings 4.

[0057] Said transporting vertically goods preferably comprises automatically operating, in particular by an elevator control system 100, a machinery M, to move the elevator car 3 between vertically displaced landings, in particular in response to signals received from one or more interfaces 200, such as one or more user interfaces operable by a user. For this purpose, the construction-time elevator arrangement 2 is configured, in particular

by an elevator control system 100 thereof, to automatically operate a machinery M, to move the elevator car 3 between vertically displaced landings in response to signals received from one or more interfaces 200, such as one or more user interfaces operable by a user. The interface 200 can be a user interface operable by a user such as a panel for instance, mounted stationary at a landing or a portable communication device, such as a mobile phone or a tablet, or alternatively an automatic detecting interface for automatically detecting identification or destination of a load to be transported and for automatically sending a signal to the elevator control system 100. In the latter case, the interface can comprise a detector for detecting a code provided on a load to be transported, or a detector for detecting a code sent by a load to be transported, for example.

[0058] Each said first door arrangement 5 comprises a first sliding hoistway door 6 (also referred to as hoistway door 6) for openably closing the hoistway opening 4, the opening direction of which hoistway door 6 is vertical. The hoistway door 6 the opening direction of which is vertical can be simply installed, e..g. by working from a landing, while also being able to openably cover a very great portion of a hoistway opening width thereby allowing transportation of large objects often needed during construction time. Due to being of temporary kind, it can be made robust so that it endures bumps during construction time, as well as fire resistant, without prioritizing many properties that are typically desired from a permanent door, such as aesthetic look or noise caused by operation thereof. The door 6 is also simple to remove, which allows easy replacement with a final door, which is optimized for passenger transport and kept safe from construction time wear until the completion of the building is at hand. The removed door is then usable in a different construction site in a different building, for example.

[0059] After said transporting, the method comprises constructing a second door arrangement 8 in place of one or more of the first door arrangements 5. This is advantageous to be performed for example after a period of transporting, at a suitable moment such as at a late stage of the construction process of the building or after completion of the building.

[0060] Figure 2 illustrates the elevator arrangement of Figure 1 after said constructing. The second door arrangement 8 comprises a second sliding hoistway door 9 (also referred to as the door 9) for openably closing the hoistway opening 4, the opening direction of which second sliding hoistway door 9 is horizontal. This kind of opening direction allows quick, safe and smooth way to open a passage via which a person fits to enter or exit an elevator car 15. The second sliding hoistway door 9 preferably comprises one or more, preferably at least two as illustrated in Figure 2, horizontally slidable door members 9a,9b, in particular door panels 9a,9b. After this, the method comprises transporting vertically passengers between landings with an elevator car 15 vertically movable inside the hoistway H, in particular the aforementioned hoistway H, which is inside the building 1, in particular while the building 1 is still under construction or already finished.

[0061] Said transporting vertically passengers preferably comprises automatically operating, in particular by an elevator control system 100, a machinery M, to move an elevator car 15 between vertically displaced landings in response to signals received from one or more interfaces 200, such as one or more user interfaces operable by a user. The control system 100 and/or the machinery M can be the same as earlier used in the transporting vertically goods, but the control system 100 and/or the machinery M can be also be modified or replaced with a new one before said transporting vertically passengers, which may be advantageous for the purpose of fulfilling requirements of the final building.

[0062] The first car 3 is preferably optimized for efficient goods transport. For this purpose, in the illustrated embodiment, the first car 3 does not comprise an openable door for allowing passage, in particular horizontal in direction, between a landing F0,Fn and the first car 3. Hereby, quick loading and unloading of goods is enabled once the vertically opening hoistway door 6,26 is opened, Preferably, the first car 3 comprises at least a platform p on which a load can be placed to rest. Hereby, it is quick to load and/or unload e.g. by a forklift.

[0063] For facilitating efficient and fluent movement of the first car 3, in the preferred embodiment the elevator arrangement 2 comprises in the hoistway H at least one, preferably two as illustrated, vertical guide rail line 11 for guiding movement of the car 3 along which the car 3 is moved/movable. The car 3 is arranged to laterally lean on the guide rail line 11 by guides 12 such as roller guides or slide guides.

[0064] The method preferably moreover comprises after said transporting vertically goods and before said transporting vertically passengers, constructing a second elevator car 15 in place of the first elevator car 3, and the transporting vertically passengers is performed with the second elevator car 15. The second car 15 is preferably optimized for safe, comfortable and efficient passenger transport, so that it can be used permanently in the final building. For this purpose, the second car 15 preferably comprises a door 16 and an actuator 17, preferably an electric motor 17, mounted on the second car 15 for actuating the door 16 to open or close. The door 16 is an openable door for allowing passage between a landing F0,Fn and the second car 15. The door 16 is preferably an automatic door, in which case preferably the actuator 17 is automatically operated by an elevator control system 100 or a sub-control system thereof mounted on the second car 15.

[0065] In the preferred embodiment of Figure 1, the hoistway door 6 of each said first door arrangement 5 comprises a vertically slidable door member 6a, in particular a flexible shutter 6a, whereby the hoistway door 6 is a roller shutter.

[0066] In the preferred embodiment of Figure 1, each

said first door arrangement 5 comprises an actuator 7, which is preferably an electric motor 7, for actuating the hoistway door 6 to open or close.

[0067] In the preferred embodiment of Figure 1, each said first door arrangement 5 is mounted on the building 1 in proximity of the hoistway opening 4 which it can openable close, separately from the car 3 i.e. not traveling with the car.

[0068] Figure 3 illustrates a construction-time elevator arrangement 20 according to a second embodiment at a phase of a method according to a second embodiment. The method for transporting goods in a building 1 under construction comprises providing an elevator arrangement 20 as illustrated, which elevator arrangement 20 comprises a hoistway H formed inside the building 1 under construction, and vertically displaced landings F0,Fn, and an elevator car 3 (also referred to as the first elevator car), which is vertically movable inside the hoistway H, the hoistway H being provided with plurality of openings 4 between a landing F0,Fn and the hoistway H, each forming a passage between a landing F0,Fn and the hoistway H, one or more of the hoistway openings 4 being provided with a first door arrangement 25. After this, the method comprises transporting vertically goods between landings F0,Fn of the building 1 under construction with said elevator car 3 in the hoistway inside the building 1 under construction. In Figures 3 and 4, the front wall of the hoistway H has been left transparent so as to better show the components that are located in the hoistway. The front wall of the hoistway H is preferably closed concrete wall part from the openings 4.

[0069] Said transporting vertically goods preferably comprises automatically operating, in particular by an elevator control system 100, a machinery M, to move the elevator car 3 between vertically displaced landings, in particular in response to signals received from one or more interfaces 200, such as one or more user interfaces operable by a user. For this purpose, the construction-time elevator arrangement 20 is configured, in particular by an elevator control system 100 thereof to automatically operate a machinery M, to move the elevator car 3 between vertically displaced landings in response to signals received from one or more interfaces 200, such as one or more user interfaces operable by a user. The interface 200 can be a user interface operable by a user such as a panel for instance, mounted stationary at a landing or a portable communication device, such as a mobile phone or a tablet, or alternatively an automatic detecting interface for automatically detecting identification or destination of a load to be transported and for automatically sending a signal to the elevator control system 100. In the latter case, the interface can comprise a detector for detecting a code provided on a load to be transported, or a detector for detecting a code sent by a load to be transported, for example.

[0070] Each said first door arrangement 25 comprises a sliding hoistway door 26 for openably closing the hoistway opening 4, the opening direction of which hoistway door 26 is vertical. The hoistway door 6 the opening direction of which is vertical can be simply installed, e..g. by working from a landing, while also being able to openably cover a very great portion of a hoistway opening width thereby allowing transportation of large objects often needed during construction time. Due to being of temporary kind, it can be made robust so that it endures bumps during construction time, as well as fire resistant without prioritizing many properties that are typically desired from a permanent door, such as aesthetic look or noise caused by operation thereof. The door 26 is also simple to remove, which allows easy replacement with a final door, which is optimized for passenger transport and kept safe from construction time wear until the completion of the building is at hand. The removed door 26 is then usable in a different construction site in a different building, for example.

[0071] After said transporting, the method comprises constructing a second door arrangement 8 in place of one or more of the first door arrangements 25. This is advantageous to be performed for example after a period of transporting, at a suitable moment such as at a late stage of the construction process of the building or after completion of the building.

[0072] Figure 4 illustrates the elevator arrangement of Figure 3 after said constructing. The second door arrangement 8 comprises a second sliding hoistway door 9 for openably closing the hoistway opening 4, the opening direction of which second sliding hoistway door 9 is horizontal. This kind of opening direction allows quick, safe and smooth way to open a passage via which a person fits to enter or exit an elevator car 15. The second sliding hoistway door 9 preferably comprises one or more, preferably at least two as illustrated in Figure 2, horizontally slidable door panels 9a,9b. After this, the method comprises transporting vertically passengers between landings with an elevator car 15 in the hoistway inside the building 1, in particular while the building 1 is still under construction or already finished.

[0073] Said transporting vertically passengers preferably comprises automatically operating, in particular by an elevator control system 100, a machinery M, to move an elevator car 15 between vertically displaced landings in response to signals received from one or more interfaces 200, such as one or more user interfaces operable by a user. The control system 100 and/or the machinery M can be the same as earlier used in the transporting vertically goods, but the control system 100 and/or the machinery M can be also be modified or replaced with a new one before said transporting vertically passengers, which may be advantageous for the purpose of fulfilling requirements of the final building.

[0074] The first car 3 is preferably optimized for efficient goods transport. For this purpose, in the illustrated embodiment, the first car 3 does not comprise an openable door for allowing passage, in particular horizontal in direction, between a landing F0,Fn and the first car 3. Hereby, quick loading and unloading of goods is enabled

once the vertically opening hoistway door 6,26 is opened, Preferably, the first car 3 comprises at least a platform p on which a load can be placed to rest. Hereby, it is quick to load and/or unload, e.g. by a forklift.

[0075] For facilitating efficient and fluent movement of the first car 3, in the preferred embodiment the elevator arrangement 20 comprises in the hoistway H at least one, preferably two as illustrated, vertical guide rail line 11 for guiding movement of the car 3 along which the car 3 is moved/movable. The car 3 is arranged to laterally lean on the guide rail line 11 by guides 12 such as roller guides or slide guides.

[0076] The method preferably moreover comprises after said transporting vertically goods and before said transporting vertically passengers, constructing a second elevator car 15 in place of the first elevator car 3, and the transporting vertically passengers is performed with the second elevator car 15. The second car 15 is preferably optimized for safe, comfortable and efficient passenger transport, so that it can be used permanently in the final building. For this purpose, the second car 15 preferably comprises a door 16 and an actuator 17, preferably an electric motor 17, mounted on the second car 15 for actuating the door 16 to open or close. The door 16 is an openable door for allowing passage between a landing F0,Fn and the second car 15. The door 16 is preferably an automatic door, in which case preferably the actuator 17 is automatically operated by an elevator control system 100 or a sub-control system thereof mounted on the second car 15.

[0077] In the preferred embodiment of Figure 3, the hoistway door 26 of each said first door arrangement 25 comprises a vertically slidable door member 26a,26b, in particular two of them, wherein each said vertically slidable door member 26a,26b is a door panel, in particular a door panel rigid such that it does not deform in opening and closing movement.

[0078] In the preferred embodiment of Figure 3, each said first door arrangement 26 comprises an actuator 27, which is preferably an electric motor 27, for actuating the hoistway door 26 to open or close.

[0079] In the preferred embodiment of Figure 3, each said first door arrangement 25 is mounted on the building 1 in proximity of the hoistway opening 4 which it can openable close, separately from the car 3, whereby it does not travel with the car 3.

[0080] In the preferred embodiments of Figures 2 and 4, the second car 15 is optimized for safe, comfortable and efficient passenger transport, so that it can be used permanently in the final building. For this purpose, the second car 15 comprises a door 16 and an actuator 17, preferably an electric motor 17, mounted on the second car 15 for actuating the door 16 of the second elevator car 15 to open or close. The door 16 is in particular an openable door for allowing passage between a landing F0,Fn and the second car 15. The door 16 is preferably an automatic door, in which case preferably the actuator 17 is automatically operated by an elevator control system 100 or a sub-control system thereof mounted on the second car 15.

[0081] In the preferred embodiments of Figures 2 and 4, the hoistway door 9 of each said second door arrangement 8 is arranged to be actuated to open or close by an actuator 17, preferably an electric motor 17, mounted on the second car 15. Thus, the second door arrangement 8 does not comprise an actuator for actuating the hoistway door 9 thereof to open or close. Figures 11 and 12 illustrate further preferred details of the door 16 of the second elevator car 15 and the door 9 of the second door arrangement 8 and preferred details related to actuation of them.

[0082] In the preferred embodiments, said constructing a second elevator car 15 in place of the first elevator car 3 comprises arranging the second elevator car 15 to be vertically movable along at least one guide rail line 11 of the first elevator car 3, as it is illustrated in Figures 2 and 4. Thus, transformation of a goods elevator to form a passenger elevator in its place is performed utilizing components already present, which facilitates swiftness and economy of the transformation. This facilitates smooth transition to serving transportation needs of the final building. Preferably, one or more components comprised in the first elevator car 3, such as one or more of a car frame, guide members, such as roller guides or slide guides, a transport platform, are utilized in the constructing the second passenger elevator car in place of the elevator car. In this case, preferably said constructing a second elevator car 15 in place of the first elevator car 3 is performed such that one or more of a car frame, guide members, such as roller guides or slide guides, a transport platform form corresponding part(s) of the second elevator car 15. Thus, transformation to serving transportation needs of the final building is performed utilizing components of the construction-time elevator, which facilitates swiftness and economy of the transformation. Even though preferable, use of components comprised in the first elevator car in the constructing of the second elevator car is however not necessary, since alternatively, an entirely new second elevator car can be constructed in place of the first elevator car 3.

[0083] Figure 5 illustrates preferred details of the first door arrangement 5 of Figure 1 as viewed from the landing side. The hoistway door 6 is a roller shutter door. The hoistway door 6 comprises a vertically slidable door member 6a which is a flexible shutter 6a, whereby the hoistway door 6 is a roller shutter. The flexible shutter 6a is arranged to be inreeled for opening the door 6 and outreeled for closing the door 6. In the illustrated embodiment, the flexible shutter 6a comprises pivotally linked rigid sections, whereby the door is in this sense a sectional door. The door 6 is configured such that the flexible shutter 6a comprises a plurality of pivotally linked rigid sections in a vertically lined up array when the door is in closed state, which rigid sections are movable vertically by rolling into a roll for opening passage through the opening. The roll is positioned beside the upper edge of

the hoistway opening 4. In the illustrated embodiment, the door is positioned on the landing side, i.e. outside the hoistway H. This makes it easy to remove to be replaced by a second door arrangement in context of a later conversion of the construction time arrangement into final arrangement. In the illustrated embodiment, the first door arrangement 5 comprises an actuator 7, which is preferably an electric motor 7, for actuating the hoistway door 6 to open or close. The actuator 7, preferably an electric motor 7, is connected to a shaft 30 around which the slidable door member 6a can be inreeled by rotating the shaft with the actuator 7. The first door arrangement 5 moreover comprises a door frame 18 installed in the hoistway opening 4. Figure 5 illustrates the door 6 in a slightly open state so as to make different parts of the first door arrangement 5. Figure 6 illustrates preferred details of the first door arrangement of Figure 1 according to a second kind as viewed from the hoistway side. In this embodiment, the first door arrangement 5 is otherwise similar to the one showed in Figure 5, but the hoistway door 6 is positioned inside the hoistway H, which may be practical when space savings are desired on the landing side.

[0084] Figures 7-10 illustrate preferred details of the first door arrangement 25 of Figure 3. The presented hoistway door 26 is a so called guillotine door comprising two vertically slidable door panels 26a,26b. The hoistway two vertically slidable door panels 26a,26b are planar and disposed on top of each other parallel to each other, the door being openable by moving door panels 26a,26b away from each other such that a gap is opened vertically between them and closable by moving them towards each other such that the gap is closed.

[0085] In the illustrated embodiment, the first door arrangement 25 comprises an actuator 27, which is preferably an electric motor 7, for actuating the hoistway door 26 to open or close. The actuator 27, preferably an electric motor 27, is connected with transmission 31 to each of said door panels. In the preferred embodiment, the transmission 31 comprises a flexible transmission member preferably in the form of a belt, the door panels 26a,26b being coupled with the flexible transmission member to hang from portions of the transmission member which portions are on opposite sides of a drive wheel 27a such that they move in opposite directions when the flexible transmission member is moved by the actuator 27.

[0086] The first door arrangement 25 moreover comprises a door frame 28 installed in the hoistway opening 4. Figures 7 and 8 illustrate the frame 28 in use and Figures 9 and 10 preferred details of parts thereof.

[0087] The door frame 28 preferably comprises a first frame member 28a illustrated individually in Figure 9, which is mounted on the building as illustrated in Figures 7 and 8, and a second frame member 28b mounted on the first frame member 28a as illustrated in Figures 7 and 8, the door panels 26a,26b being mounted on the second frame member 28b.

[0088] In the preferred embodiment, the first frame member 28a comprises plurality of mounting protrusions 28a3 and the second frame member 28b comprises plurality of slots 28b1 for receiving mounting protrusions 28a3 of the first frame member 28a. Hereby, the second frame member 28b is easy to mount on the first frame member 28a after the latter has been already mounted in its place.

[0089] In the preferred embodiment, the first frame member 28a comprises a border part 28a2 bordering an opening 28a4, and a cover plate 28a1 mounted on the border part 28a2, which cover plate covers lower portion of the opening 28a4 of the border portion 28a2. By covering the lower portion of the opening, the cover plate can be used to adjust height of the passage so that the lower of the door panels 26a,26b, when in open closed state, may be above the level of the landing. This is advantageous when the floor between the landing in question and the landing below it is thin such that the lower door panel.

[0090] Figures 11 and 12 illustrate preferred details of the elevator arrangement illustrated in Figures 2 and 4. Figure 11 illustrate the car 15 as seen from direction of a landing openings 4 and Figure 12 illustrates the second door arrangement 8 as seen from direction of the second car 15, i.e. from the hoistway side. These Figures illustrate the doors 9 and 16 without their frame structures for the sake of clarity.

[0091] As illustrated in Figure 11, the second car 15 comprises a door 16 and an actuator 17, which is an electric motor 17, mounted on the second car 15 for actuating the door 16 of the second elevator car 15 to open and close. The 16 door is a sliding door comprising plurality of sliding door panels 16a, 16b mounted to be movable along one or more guide rails 16d, 16c for guiding the door panels 16a, 16b. Said one or more guide rails 16d, 16c preferably include a lower guide rail 16c and/or an upper guide rail 16d. Also the door 9 of each said second door arrangement 8 is arranged to be actuated to open and close by said actuator 17 mounted on the second car 15.

[0092] As illustrated in Figure 12, the door 9 of each said second door arrangement 8 is a sliding door comprising plurality of sliding door panels 9a, 9b mounted to be movable along one or more guide rails 9d, 9c for guiding the door panels 9a, 9b. Said one or more guide rails 9d, 9c preferably include a lower guide rail 9c and/or an upper guide rail 9d.

[0093] The actuator 17 is connected to the door panels 16a, 16b of the door 16 with transmission 41 for transmitting force between the actuator 17 and the door panels 16a, 16b of the door 16. In the preferred embodiment of Figure 11, the transmission 41 comprises a flexible transmission member preferably in the form of a belt, the door panels 16a,16b being coupled with the flexible transmission member 41a in particular with portions of the transmission member 41a which portions are on opposite sides of a drive wheel 17a of the actuator 17 such that

they move in opposite directions when the flexible transmission member 41a is moved by the rotating the drive wheel 17a of the actuator 17.

[0094] The second elevator car 15 comprises a coupling mechanism 40 for coupling the door 16 of the second car 15 with the door 9 of the second door arrangement 8 whereby the door 16 of the second car and the door 9 of the second door arrangement 8 are arranged to be actuatable simultaneously by the actuator 17 mounted on the second car 15, in particular when the second car 15 is in such position that the door 16 thereof and the door 9 of the second door arrangement 8 are level with each other. The coupling mechanism 40 is preferably mounted on a door hanger h1 of a door panel 16a as illustrated, but it can alternatively be different. For example, it can alternatively be mounted on a door panel 16a directly or on any component fixed on the door panel 16a.

[0095] The second door arrangement 8 comprises at least one counterpart 42 for the coupling mechanism 40 of the second car 15 which at least one counterpart 42 is connected to the door 9 of the second door arrangement 8. The at least one counterpart 42 is preferably mounted on a door hanger h2 of a door panel 9a as illustrated, but it can alternatively be differently positioned. For example, it can alternatively be mounted on a door panel 9a directly, or on any component fixed on the door panel 9a.

[0096] The coupling mechanism 40 comprises at least one coupling member 40a, 40b for coupling with the at least one counterpart 42 of the second door arrangement 8. The coupling mechanism 40 is arranged to transmit force from the actuator 17 via the at least one counterpart 42 to the door 16 for opening and/or closing it. The coupling mechanism 40 can more specifically be such that it comprises two coupling members 40a, 40b in the form of horizontally spaced apart vertically elongated vanes, which are suitable for receiving said at least one counterpart 42 between them from above or from below direction. The vanes travel with the second car 15 such that when it arrives at a landing, they ascend or descend (depending on car movement direction) to be on opposite lateral sides of the counterpart 42. Thereby the at least one counterpart 42 is arranged to be positioned (as illustrated in Figure 11 with broken line) between the vanes when the second car 15 is parked at a landing and the door 16 of the second car 15 and the door 9 of the second door arrangement 8 are level with each other. Each said at least one counterpart 42 can be in the form of a roller, for instance. When contacted by a vane, one or more of the at least one counterpart 42 can be arranged to open a landing door lock as well (not showed).

[0097] The second door arrangement 8 is more specifically such that it comprises a synchronizing mechanism for 43 for synchronizing movement of the door panels 9a,9b of the door 9. The synchronizing mechanism 43 comprises a flexible transmission member 43a preferably in the form of a belt, the door panels 9a,9b being coupled with the flexible transmission member 43a in particular with portions of the transmission member 43a which portions are on opposite sides of a diverting wheel 44 of the synchronizing mechanism 43 such that the second door panel 9b moves in opposite horizontal direction than the first door panel 9a is moved, in particular pushed by force exerted on the counterpart 42 by the coupling mechanism 40.

[0098] The construction-time elevator arrangement 2,20 as described anywhere above can be, although this is not necessary, a so called jump-lift arrangement and the method for elevator use during construction of a building can concern a jump-lift arrangement. In this case, the arrangement is provided such that the traveling zone of the first elevator car can be increased to reach higher in the hoistway. In this case, the method preferably comprises at a suitable moment between said transporting vertically goods and said constructing a second door arrangement removing the car 3 from transport use, and thereafter increasing the traveling zone of the car 3 to reach higher and thereafter taking the car 3 back to transport use. The jumping ability can be implemented by utilizing technology of known "jump-lifts", for example. Then it is preferable to utilize in the method a movable support structure for supporting the car 3, which support structure 110 is mounted in the hoistway H such that it can be dismounted and lifted to a higher position in the hoistway H and mounted there stationary. The support structure 110 can support the car by supporting a suspension roping r via the machinery M of the elevator, as illustrated in Figure 1 or 3, for example. Additional length of roping r is preferably stored in a rope supply storage (not showed), such as one or more rope reels, wherefrom it can be supplied via a releasable rope clamp (not showed). There are also other kind of elevators the traveling height of which can be extended, where one or more of the above described features of a "jump lift" may be unnecessary due to different type of solution.

[0099] Generally, in the method, the machinery M of the elevator as illustrated in Figure 1 and 3 can be left in place to serve also in the final building. However, in some cases it may be preferable to replace it at the end of the construction phase of the building 1 with a second machinery. In this way, the machinery M used during construction-time may for instance be optimized for construction-time use.

[0100] In Figures 11-12 a simplistic version of a coupling is illustrated. It is possible to arrange the coupling alternatively with different means, such as by any known coupling arrangement, for instance.

[0101] In the preferred embodiment of Figure 3, the second sliding hoistway door 6 comprises two vertically slidable door panels 26a,26b, however, the second sliding hoistway door could alternatively have only one vertically slidable door panel, such as one being arranged to open with upwards directed movement and close with downwards directed movement.

[0102] It is to be understood that the above description

and the accompanying Figures are only intended to teach the best way known to the inventors to make and use the invention. It will be apparent to a person skilled in the art that the inventive concept can be implemented in various ways. The above-described embodiments of the invention may thus be modified or varied, without departing from the invention, as appreciated by those skilled in the art in light of the above teachings. It is therefore to be understood that the invention and its embodiments are not limited to the examples described above but may vary within the scope of the claims.

Claims

1. Method for transporting goods in a building (1) under construction, comprising

   providing an elevator arrangement (2;20) comprising a hoistway (H) inside the building (1) under construction, and vertically displaced landings (F0,Fn), and an elevator car (3), which is vertically movable inside the hoistway (H), the hoistway (H) being provided with hoistway openings (4) between landings (F0,Fn) and the hoistway (H), one or more of the hoistway openings (4) being provided with a first door arrangement (5;25), wherein the first door arrangement (5;25) comprises a first sliding hoistway door (6;26) for openably closing the hoistway opening (4), the opening direction of which first hoistway door (6;26) is vertical; and thereafter
   transporting vertically goods between landings (F0,Fn) of the building (1) under construction with said elevator car (3); and thereafter
   constructing a second door arrangement (8) in place of one or more of the first door arrangements (5;25), wherein the second door arrangement (8) comprises a second sliding hoistway door (9) for openably closing the hoistway opening (4), the opening direction of which second sliding hoistway door (9) is horizontal; and thereafter
   transporting vertically passengers between landings (F0,Fn) of the building (1) with an elevator car (15) vertically movable inside the hoistway (H).

2. A method according to claim 1, wherein said transporting vertically goods and/or said transporting vertically passengers comprises automatically operating, in particular by an elevator control system (100), a machinery (M), to move the elevator car (3,15) between vertically displaced landings (F0,Fn), in particular in response to signals received from one or more interfaces (200), such as one or more user interfaces operable by a user.

3. A method according to any of the preceding claims, wherein the first sliding hoistway door (6;26) comprises one or more vertically slidable door members (6a;26a,26b), such as one or more vertically slidable door panels (26a,26b) or a flexible shutter (6a).

4. A method according to any of the preceding claims, wherein the second sliding hoistway door (9) comprises one or more horizontally slidable door members (9a,9b), such as one or more horizontally slidable door panels (9a,9b).

5. A method according to any of the preceding claims, wherein the elevator arrangement (2;20) comprises in the hoistway (H) at least one vertical guide rail line (11) for guiding movement of the car (3).

6. A method according to any of the preceding claims, wherein the method comprises, after said transporting vertically goods and before said transporting vertically passengers, constructing a second elevator car (15) in place of the elevator car (3), and the transporting vertically passengers is performed with the second elevator car (15).

7. A method according to any of the preceding claims 5-6, wherein said constructing a second elevator car (15) in place of the elevator car (3) comprises arranging the second elevator car (15) to be vertically movable along said at least one guide rail line (11) for guiding movement of the car (3).

8. A method according to any of the preceding claims, wherein the car (3) does not comprise an openable door for allowing passage between a landing (F0,Fn) and the first car (3), and the second car (15) comprises an openable door (16) for allowing passage between a landing (F0,Fn) and the second car (15), which openable door (16) is preferably an automatic door (16).

9. A method according to any of the preceding claims, wherein each said first door arrangement (6;26) comprises an actuator (7;27), preferably an electric motor (7;27), for actuating the hoistway door (6;26) to open or close.

10. A method according to any of the preceding claims, wherein each said constructing a second door arrangement (8) in place of a first door arrangement (5;25) comprises removing the door (6;26) and the actuator (7;27) of the first door arrangement (5;25).

11. A method according to any of the preceding claims, wherein the first sliding hoistway door (6;26) is a roller shutter door (6) or a guillotine door (26).

12. A method according to any of the preceding claims,

wherein the second car (15) comprises a door (16) and an actuator (17), preferably an electric motor (17), mounted on the second car (15) for actuating the door (16) to open or close.

13. A method according to any of the preceding claims, wherein the door (9) of each said second door arrangement (8) is arranged to be actuated to open and/or close by an actuator (17), preferably an electric motor (17), mounted on the second car (15).

14. A method according to any of the preceding claims, wherein the second elevator car (15) comprises a coupling mechanism (40) for coupling the door (16) of the second car (15) with the door (9) of the second door arrangement (8), whereby in particular the door (16) of the second car (15) and the door (9) of the second door arrangement (8) are arranged to be actuatable simultaneously by the actuator (17) mounted on the second car (15), in particular when the second car (15) is in such position that the door (16) thereof and the door (9) of the second door arrangement (8) are level with each other.

15. A construction-time elevator arrangement (2;20) comprising a hoistway (H) inside a building (1) under construction, and vertically displaced landings (F0,Fn), and an elevator car (3), which is vertically movable inside the hoistway (H), the hoistway (H) being provided with hoistway openings (4) between landings (F0,Fn) and the hoistway (H), one or more of the hoistway openings (4) being provided with a first door arrangement (5;25), wherein the first door arrangement (5;25) comprises a sliding hoistway door (6;26) for openably closing the hoistway opening (4), the opening direction of which hoistway door (6;26) is vertical.

16. A construction-time elevator arrangement (2;20) according to the preceding claim, wherein the construction-time elevator arrangement (2;20) is configured, in particular by an elevator control system (100) thereof, to automatically operate a machinery (M), to move the elevator car (3) between vertically displaced landings (F0,Fn), in particular in response to signals received from one or more interfaces (200), such as one or more user interfaces operable by a user, for example.

Fig. 1

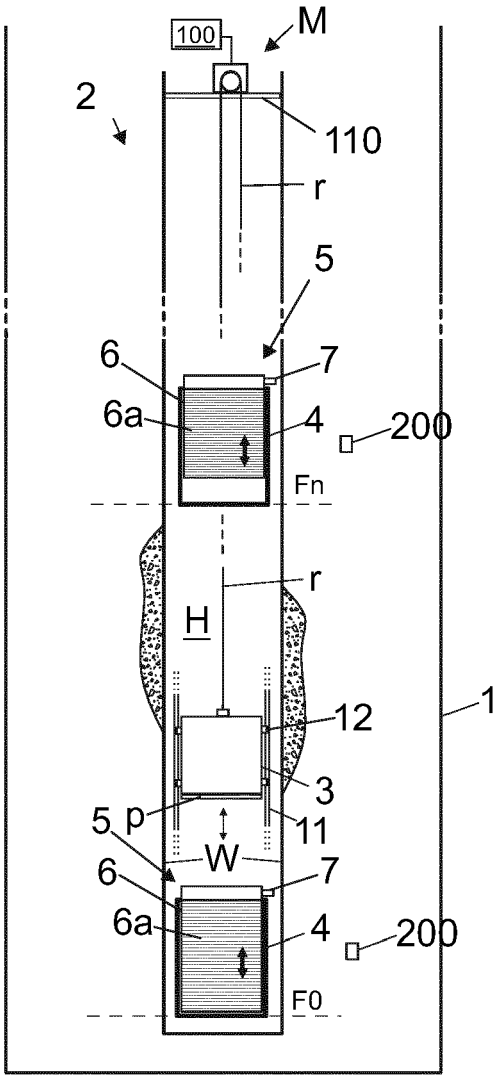
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Fig. 2

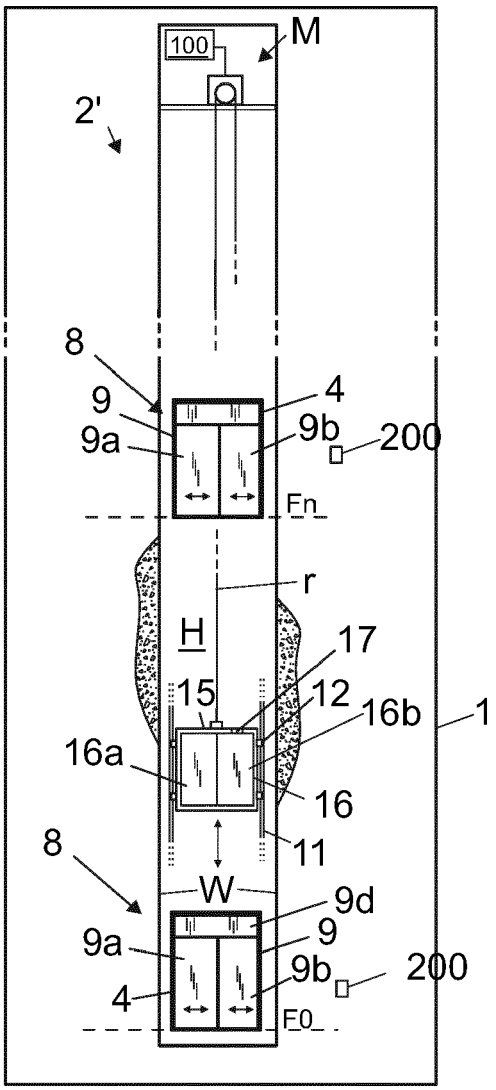
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Fig. 3

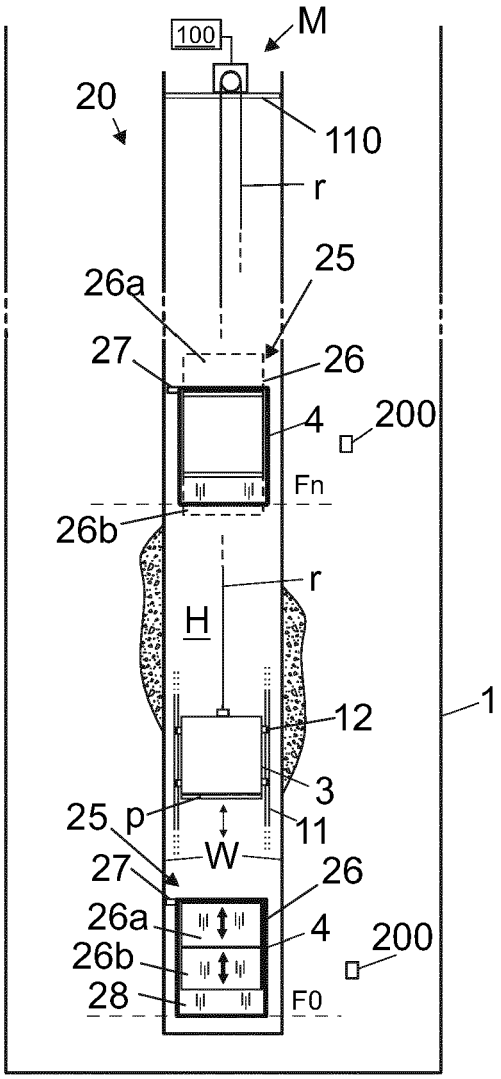
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Fig. 4

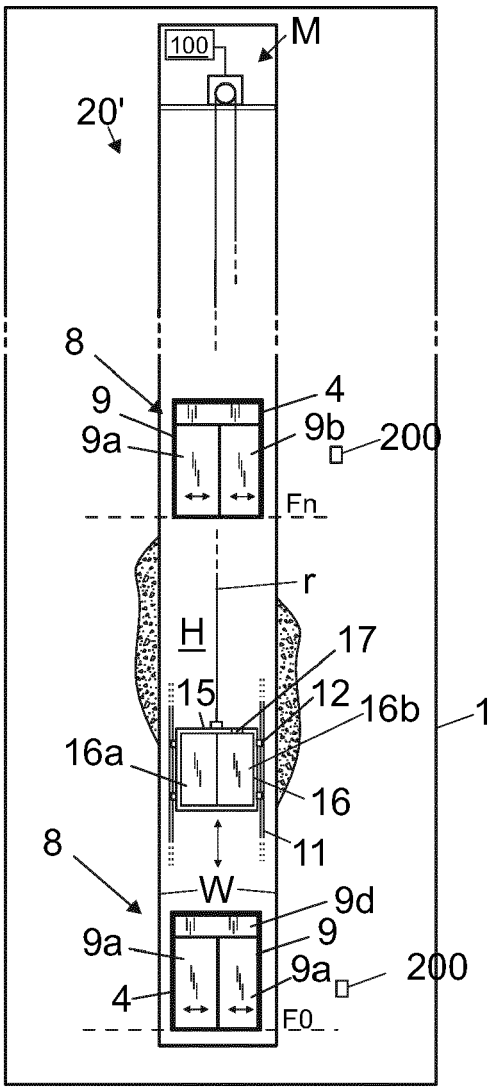
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Fig. 5

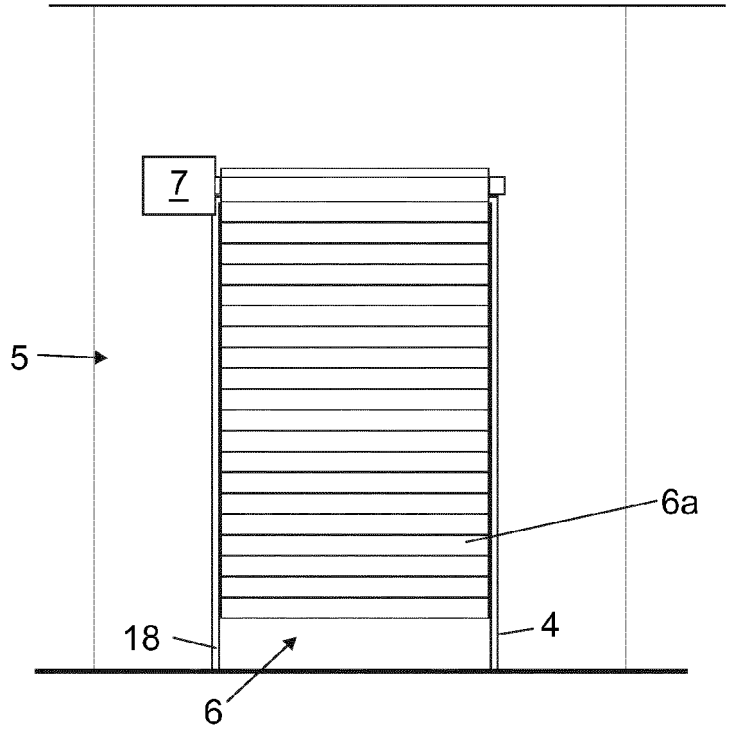


Fig. 6

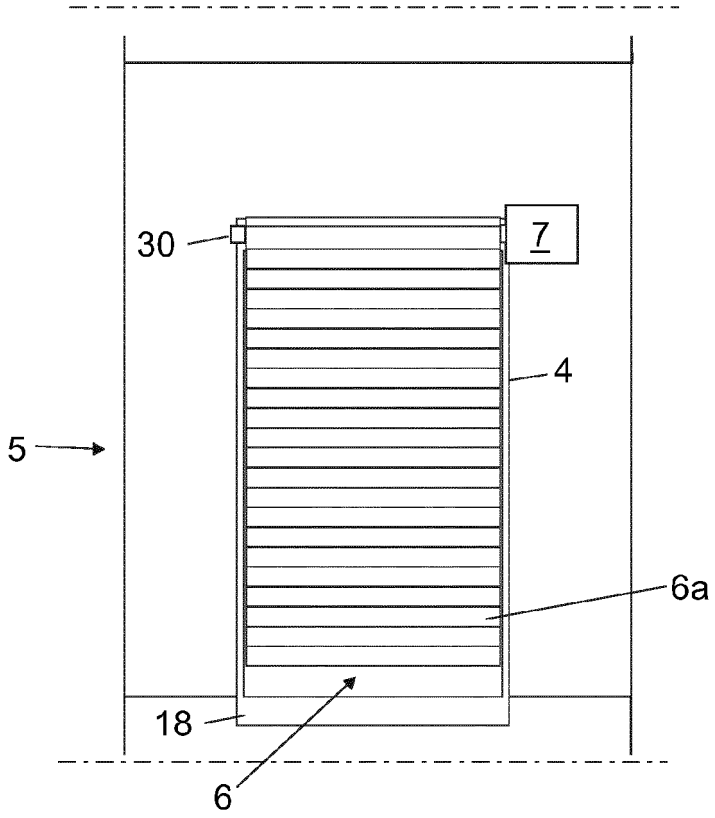


Fig. 7

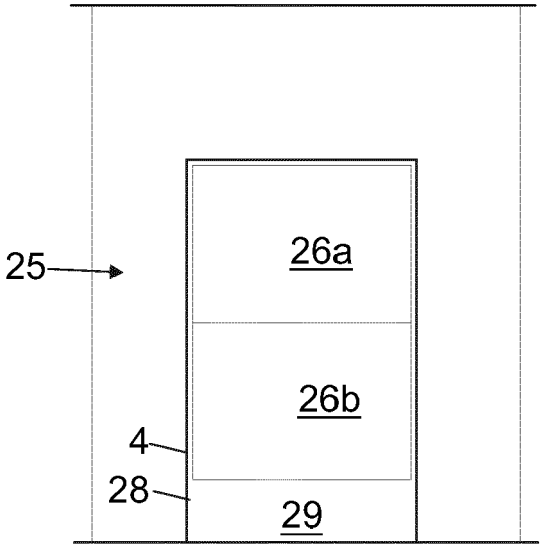


Fig. 8

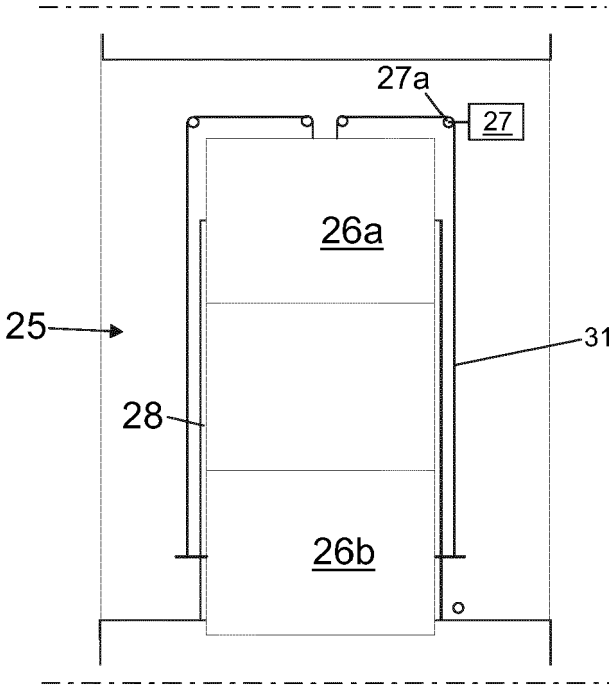
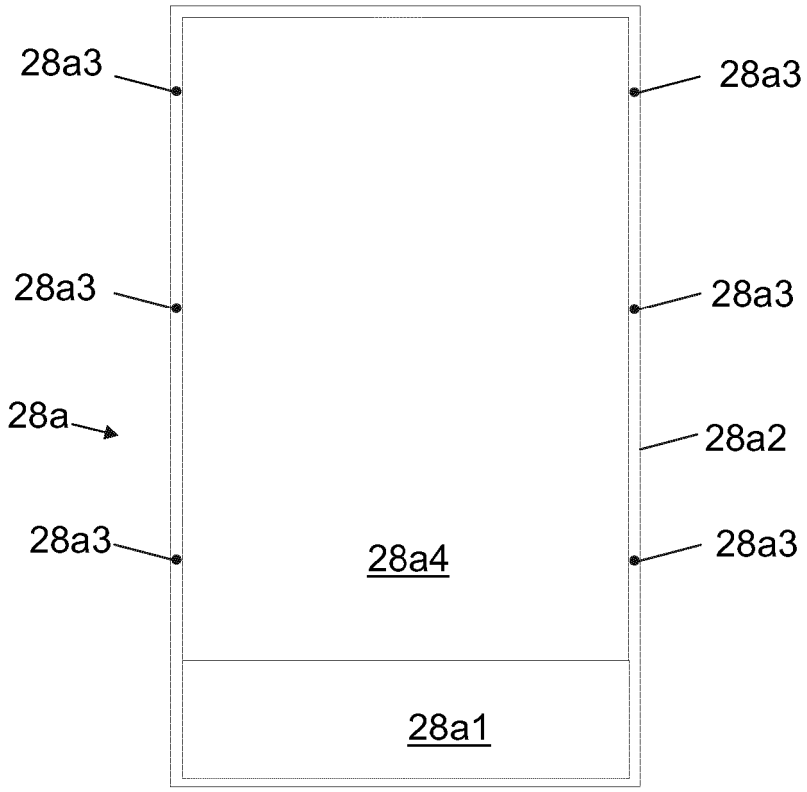


Fig. 9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28a1

Fig. 10

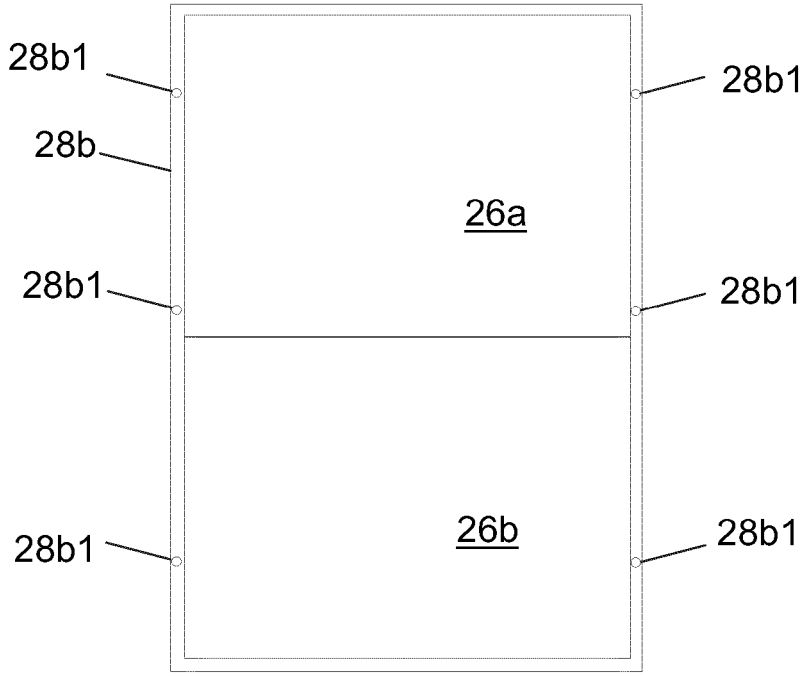
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Fig. 11

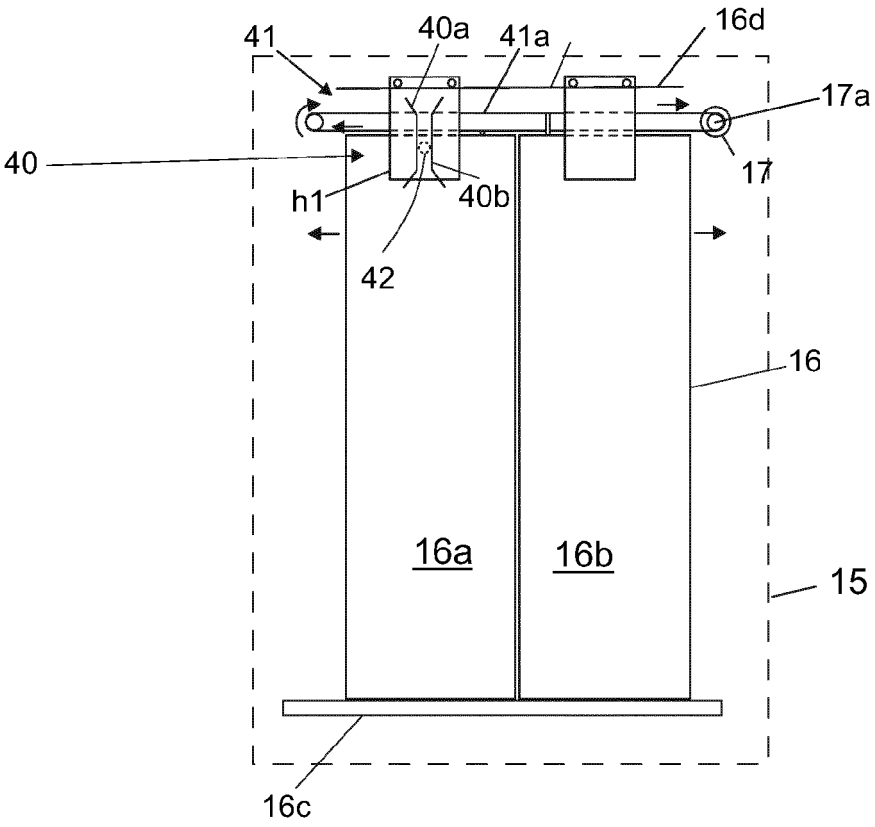
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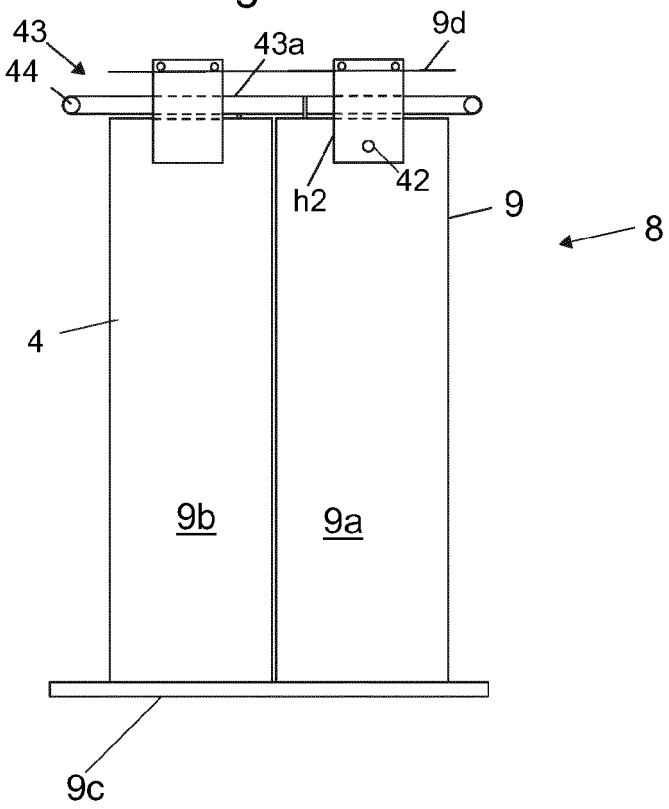
Fig. 12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Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 19 20 9137

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	JP H08 2857 A (TAISEI CORP; MITSUBISHI HEAVY IND LTD) 9 January 1996 (1996-01-09) * paragraphs [0001], [0014] - [0017]; figures 1-3 * -----	15,16 1-14	INV. B66B19/00
X Y	JP H10 8731 A (HITACHI BUILDING SYST CO LTD) 13 January 1998 (1998-01-13) * abstract; figures 1-14 * -----	15 1-14	

TECHNICAL FIELDS SEARCHED (IPC)

B66B
E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 May 2020	Janssens, Gerd

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 20 9137

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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07-05-2020

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