

Method for installing an elevator system

The invention relates to a method for installing an elevator system according to the preamble of claim 1.

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The installation of an elevator system is complex and therefore involves considerable costs. In particular, the creation of an elevator shaft for an elevator system, e.g., when constructing a building, and the subsequent installation of components in the elevator shaft, is quite complex. Usually, the elevator shaft is first created completely, inside the building receiving the elevator system, and the elevator system with its components such as the elevator car, counterweight, drive machine, and guide rails is subsequently installed in the elevator shaft. It has already been proposed to create the elevator shaft from a plurality of prefabricated modules in which the necessary components, such as guide rail pieces, are already at least partially preassembled. In particular, prefabrication and preassembly do not take place on the construction site of the building that will house the elevator, but in a factory. This procedure requires less time. In addition, it has positive effects on the quality of the installation and on the working safety of the installation personnel. After the individual shaft modules have been assembled to form an elevator shaft, the individual guide rail pieces must, among other things, be assembled to form continuous guide rails, wherein individual guide rail pieces touch each other, particularly at their end faces, in order to enable one guide rail piece to be supported by the guide rail piece arranged directly underneath.

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EP 2559647 A1 describes a method for installing an elevator system in which a plurality of prefabricated shaft modules are provided. The shaft modules are placed on top of each other in such a way that the shaft spaces of the shaft modules are aligned vertically and form a vertically extending elevator shaft. In the resulting elevator shaft, an elevator car of the elevator system is arranged so that it can be moved vertically. After provision, the shaft modules each have a guide rail piece, which together, in the elevator shaft formed by the shaft modules, form a vertically extending guide rail for the elevator car. In this case, the individual guide rail pieces of the shaft modules protrude from the corresponding shaft module after the shaft modules have been provided as mentioned.

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In contrast, the object of the invention is in particular to propose a method for installing an elevator system which enables simple installation with the lowest possible risk of damage to components used during installation. According to the invention, this object is achieved by a method having the features of claim 1.

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The method according to the invention for installing an elevator system comprises at least the following method steps:

- providing a plurality of shaft modules, wherein the shaft modules are prefabricated and are intended to be placed on top of one another and wherein each shaft module encloses a shaft space, and
- placing said shaft modules on top of one another in such a way that the shaft spaces of the shaft modules are aligned vertically and form a vertically extending elevator shaft in which an elevator car of the elevator system can be arranged in a displaceable manner.

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In this case, the aforementioned plurality of shaft modules comprises a base module and a first intermediate module intended to be placed on top of the base module, and, optionally, further intermediate modules. In this case, the height of the intermediate modules corresponds in particular to a so-called floor height of the building accommodating the elevator system. This means that one intermediate module is provided for each floor of the building. The height of the base module may differ from the stated floor height.

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After provision, the shaft modules each have at least one guide rail piece. In the elevator shaft formed by the shaft modules, the guide rail pieces of the individual shaft modules form a vertically extending guide rail for the elevator car. After being placed on the base module, the guide rail piece of the first intermediate module is moved vertically downwards until it rests on the guide rail piece of the base module. According to the invention, an upper end of the guide rail piece of the base module is arranged at a downward distance from an upper edge of the base module.

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The mentioned distance between the upper end of the guide rail piece of the base module and the upper edge of the base module advantageously enables other parts to be placed on the base module after the base module has been provided and before the first intermediate module has been placed, i.e., before the start of installation of the elevator system on the building accommodating the elevator system, without there being a risk of damage to the

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guide rail piece of the base module. This makes handling of the base module and other components of the elevator system, such as intermediate modules, easier. The shaft modules can thus be easily stored temporarily, in particular stacked on top of each other, before the installation of the elevator system begins. The aforementioned lowering of the guide rail piece of the first intermediate module enables the individual guide rail pieces to be joined together to form a guide rail in a simple and therefore time- and cost-effective manner.

In the following, directional information such as above, below, and lateral or vertical and horizontal refers to the alignment of the respective component, in particular a shaft module or a guide rail piece, when assembled on top of one another. This alignment thus corresponds to the alignment of the respective component in an operating state of the elevator system. In this case, the operating state of the elevator system is understood to be the state after completion of the installation and commissioning of the elevator system. In the operating state, people and/or goods can thus be transported in the elevator car of the elevator system between floors of the building in which the elevator system is located.

The shaft modules and thus the guide rail pieces can, for example, be transported in an orientation different from that mentioned, from a factory in which they are manufactured to the construction site of the building accommodating the elevator system. At the beginning of the assembly of the provided shafts, the base module is arranged as the lowest shaft module, in particular on a foundation of said building. The first intermediate module is then placed as the lowest intermediate module on top of the base module to form the elevator shaft of the elevator system. Subsequently, further shaft modules in the form of further intermediate modules or a top module closing off the elevator shaft at the top can be placed on the uppermost intermediate module until the elevator shaft has reached the intended height. The arrangement of the base module and the subsequent placement of the first intermediate module and any further shaft modules is carried out in particular with a crane.

The shaft modules can be delimited by shaft walls, which can be made of concrete or wood, for example. However, it is also possible that the shaft modules be delimited by a supporting structure, particularly made of metal.

In particular, the elevator system can also have a counterweight which is connected to the elevator car by means of a support means - for example, a cable or a belt. During operation of the elevator system, the support means and thus the elevator car and the counterweight can be moved in the elevator shaft formed by the shaft modules by means of a drive machine of the elevator system. It is also possible that the elevator system does not have a counterweight. In this case, the elevator car is designed in particular as a self-propelled elevator car - for example, equipped with a friction wheel drive. In this case, the elevator system can also be designed as a so-called drum elevator.

After the provision described above and thus before the shaft modules are placed on top of each other, the shaft modules have at least one guide rail piece. The guide rail piece is thus arranged in the respective shaft module when the shaft modules are provided - in particular, fastened to a shaft wall of the shaft module. After the shaft modules have been placed on top of each other, the guide rail pieces of the individual shaft modules are connected to each other in such a way that, together, they form a continuous, vertically extending guide rail for the elevator car in the elevator shaft formed by the shaft modules. A guide rail piece has an elongated shape and usually a T-shaped profile.

The guide rail piece is fixed in particular with at least one, in particular at least two, so-called rail brackets or brackets to a shaft wall or a support delimiting the shaft module. The rail brackets are in particular designed in multiple parts, wherein a first bracket part is fixed, e.g., screwed, to the shaft wall or the support, and a second bracket part is connected to the guide rail piece by means of so-called rail clips. The guide rail piece is clamped in particular between the rail clips and the second bracket part. The first and the second bracket parts are screwed together, wherein the orientation of the two bracket parts relative to one another can be changed to align the guide rail piece. Different brackets can be used in this case. For example, so-called Z-brackets, L-brackets, or omega brackets can be used. An omega bracket is designed such that a travel path of the counterweight of the elevator system runs between an inner side of the omega bracket and the side wall on which the omega bracket is fixed.

The elevator car and, if present, the counterweight of the elevator system are each guided by two opposing guide rails during movement in the elevator shaft. This means that, when the shaft modules are provided, two or four guide rail pieces are arranged in each

shaft module. In addition to the guide rail pieces, other components of the elevator system can also be arranged in the shaft modules when the shaft modules are provided.

5 In the operating state of the elevator system, the guide rail piece of the base module rests in particular on a floor of the elevator shaft and thus in particular on a foundation of the building housing the elevator system. The guide rail piece mentioned can thus be supported directly or via another component of the elevator system, and thus indirectly on the floor of the elevator shaft. The guide rail piece of the base module is arranged in the base module in its final position, i.e., the position in the operating state of the elevator system,
10 when the base module is provided. However, it is also possible that the guide rail piece, after being placed on the foundation of the building, be moved vertically downwards until it rests on the shaft floor.

15 The upper end of the guide rail piece of the base module is arranged at a downward distance from an upper edge of the base module. The guide rail piece of the base module therefore does not protrude upwards out of the base module. In particular, the guide rail piece of the base module does not protrude downwards out of the base module. The distance mentioned can, for example, be 0.5 to 5 cm, in particular 1 cm.

20 The elevator shaft of the elevator system can be designed in such a way that a single elevator car can be moved vertically in the elevator shaft. However, it is also possible for the elevator shaft to be designed in such a way that more than one, e.g., two or three, elevator cars can be moved vertically next to each other and independently of each other. The elevator shaft can therefore be designed as a so-called single shaft or as a multi-shaft. In the
25 multi-shaft version, the shaft modules are in particular designed in such a way that they are only placed on top of each other to form the elevator shaft, i.e., no shaft modules are arranged next to each other. However, it is also conceivable that shaft modules be arranged both next to each other and on top of each other to form the elevator shaft.

30 In addition to the above-mentioned method steps of providing and stacking shaft modules, the method in particular has the further method steps of providing an elevator car and optionally a counterweight, and arranging the elevator car and optionally the counterweight in the elevator shaft such that the elevator car and optionally the counterweight can be displaced vertically in the elevator shaft.

According to the invention, before the mentioned downward displacement of the guide rail piece of the first intermediate module and thus after the provision of the first intermediate module, a lower end of the guide rail piece of the first intermediate module is arranged at a distance upwards from a lower edge of the first intermediate module, and an upper end of the guide rail piece of the first intermediate module is arranged at a distance downwards from an upper edge of the first intermediate module. The guide rail piece of the first intermediate module therefore protrudes neither upwards nor downwards from the first intermediate module. The distances mentioned can, for example, be 0.5 to 5 cm, in particular 1 cm. In this case, the distance to the upper edge and the distance to the lower edge can be the same or different. This means that the risk of the guide rail piece of the first intermediate module being damaged before or during placement on the base module is very low. In addition, the handling of the first intermediate module is made easier. The shaft modules can thus be easily stored temporarily, in particular stacked on top of each other, before the installation of the elevator system begins.

In an embodiment of the invention, when providing the first intermediate module, the guide rail piece of the first intermediate module is arranged in the first intermediate module such that it extends vertically. To ensure that the ends of the guide rail piece are each at a distance from the edge of the first intermediate module despite the vertical alignment, the length of the guide rail piece is less than the height of the first intermediate module. The vertical alignment of the guide rail piece advantageously means that, in order to form a continuous guide rail, the guide rail piece only has to be moved vertically downwards until it rests on the guide rail piece of the base module. This enables a particularly simple and thus cost-effective installation of the elevator system.

As an alternative to the mentioned vertical alignment of the guide rail piece of the first intermediate module, when providing the first intermediate module, the guide rail piece of the first intermediate module can be arranged in the first intermediate module in such a way that it pivots relative to the vertical and thus extends inclined relative to the vertical. The guide rail piece of the first intermediate module then has in particular a length which corresponds to a height of the first intermediate module.

In order to form a continuous guide rail, such a guide rail piece is in particular first pivoted so that it extends vertically, and then displaced vertically downwards until it rests on the guide rail piece of the base module. The mentioned arrangement of the guide rail

piece of the first intermediate module, pivoted relative to the vertical, advantageously enables the ends of the guide rail piece to be at a distance from the edges of the first intermediate module even when the length of the guide rail piece corresponds to the height of the first intermediate module. This advantageously means that, when more than one intermediate module is placed on top of another, the guide rail pieces do not have to be moved further and further vertically downwards, as the number of intermediate modules increases, to form a continuous guide rail.

In an embodiment of the invention, when providing the first intermediate module, a connecting tab for connecting the guide rail piece of the first intermediate module to an adjacent guide rail piece is fastened to one end of the guide rail piece of the first intermediate module in such a way that the connecting tab does not protrude beyond said end of the guide rail piece of the first intermediate module in a main extension direction of the guide rail piece of the first intermediate module. The main extension direction of the guide rail piece is understood to mean the length of the elongated guide rail piece, i.e., its vertical extension, in the operating state of the elevator system. The connecting tab has in particular an elongated, cuboid basic shape, with a plurality of through-holes or threaded holes. In order to ensure that the connecting tab does not protrude beyond said end of the guide rail piece, it is attached to said end of the guide rail piece in such a way that it does not extend outwards from said end relative to the guide rail piece, but inwards.

To form and secure a continuous guide rail, the guide rail pieces of adjacent shaft modules are firmly connected by means of a connecting tab. The connecting tab is in particular screwed to the two adjacent guide rail pieces. To make this possible, the connecting tab must extend beyond the ends of both guide rail pieces. The screws used to establish the connection between the guide rail piece and the connecting tab extend through the mentioned through-holes or threaded holes of the connecting tab, which are aligned with corresponding through-holes or threaded holes of the guide rail pieces. Such connecting tabs are available in different designs on the market.

Fastening a connecting tab to one end of the guide rail piece advantageously provides the connecting tab for the necessary connection, after the shaft modules have been placed on top of one another, of the guide rail pieces at the location where the connecting tab is needed. This means that the connecting tab does not have to be provided separately, which would cause additional effort and therefore costs.

In particular, the connecting tab is attached to the end of the guide rail piece in such a way that, in order to connect the guide rail piece to an adjacent guide rail piece, it is first removed from said end of the guide rail piece and then connected to the two guide rail
5 pieces. In the case of the described cuboid basic shape of the connecting tab with through-holes or threaded holes, this means that the connecting tab is fastened, in particular screwed, "upside down" using the through-holes or threaded holes at the end of the guide rail piece of the first intermediate module, which are intended for connection to an adjacent guide rail piece in the operating state of the elevator system.

10 Alternatively, the connecting tab is attached to the end of the guide rail piece in such a way that it is pivoted relative to said end of the guide rail piece in order to connect the guide rail piece to an adjacent guide rail piece, and is then connected to said adjacent guide rail piece. In the case of the described cuboid basic shape of the connecting tab with
15 through-holes or threaded holes, this means that the connecting tab is fastened, in particular screwed, to the end of the guide rail piece of the first intermediate module only using one of at least two through-holes or threaded holes arranged next to one another. To connect the guide rail piece of the first intermediate module to an adjacent guide rail piece, in particular the fastening of the connecting tab, in particular the screw connection to the
20 guide rail piece of the first intermediate module, is loosened, and then the connecting tab is pivoted around the loosened connection into the position required for the connection to the adjacent guide rail piece. Finally, the connecting tab is connected, in particular screwed, to the two adjacent guide rail pieces using all the through-holes or threaded holes. When providing the first intermediate module, the connecting tab can also be at-
25 tached to the guide rail piece of the first intermediate module with an additional connection, which is released before the connecting tab is pivoted as described.

In an embodiment of the invention, a plurality of intermediate modules are provided and placed on top of one another, wherein the intermediate modules are in particular designed
30 identically. In this case, the first intermediate module is placed on the base module as described above. A second intermediate module is placed on top of the first intermediate module. This is repeated, up to an uppermost intermediate module. After being placed on the shaft module below, the guide rail pieces of the individual intermediate modules are each moved vertically downwards until they rest on the guide rail piece of the shaft mod-
35 ule below. In this case, the lowering mentioned takes place in particular first at the guide

rail piece of the first intermediate module, and then at the guide rail piece of the second intermediate module, up to the guide rail piece of the uppermost intermediate module.

5 In an embodiment of the invention, an additional guide rail piece is placed on top of the guide rail piece of an uppermost intermediate module. This is advantageous in particular when providing and stacking a plurality of intermediate modules with guide rail pieces that have a length shorter than the height of the intermediate modules. With each such intermediate module that is added, the corresponding guide rail piece must be moved further downwards until it can support itself on the guide rail piece below. The additional
10 guide rail piece serves to compensate for the mentioned displacement, i.e., to also provide a sufficiently long guide rail piece - in this case, a two-part guide rail piece - in the uppermost intermediate element. The additional guide rail piece is placed on top of the guide rail piece of the uppermost intermediate module, in particular after the guide rail piece of the uppermost intermediate module has been moved vertically downwards.

15 For example, if 20 intermediate modules are placed on top of each other, and the respective guide rail pieces are 2 cm shorter than the height of the intermediate modules, then the guide rail piece of the uppermost intermediate module must be moved downwards by 40 cm. The additional guide rail piece then advantageously has a length of 40 cm.

20 In an embodiment of the invention, a top module is provided as a further shaft module, which is placed on top of the uppermost intermediate module. This closes off the elevator shaft towards the top. After provision, the top module also has a guide rail piece which, after being placed on the uppermost intermediate module, is moved vertically downwards to
25 form the guide rail for the elevator car. In particular, the guide rail piece of the top module is moved vertically downwards until it rests on the guide rail piece of the uppermost intermediate module or, if an additional guide rail piece is provided, on the additional guide rail piece from above. When providing the top module, in particular a drive and other components of the elevator system are arranged in the top module. The top module can be de-
30 signed, for example, like a top module described in WO 2022/233803 A1.

In particular, a lower end of the guide rail piece of the top module is at a vertical distance upwards from the lower edge of the top module.

It is also possible that the top module that closes off the elevator shaft at the top does not have a guide rail piece, such that the top module forms a kind of machine room.

If an additional guide rail piece is provided, this is arranged in the top module, especially when the top module is provided. The additional guide rail piece therefore advantageously does not have to be transported and provided separately, but is transported and provided in the top module. Arranging the additional guide rail piece in the top module also has the advantage that the top module is placed on the uppermost intermediate module, and thus the additional guide rail piece is provided where it is needed.

Further advantages, features, and details of the invention can be found in the following description of exemplary embodiments and with reference to the drawings, in which like or functionally like elements are provided with identical reference signs. The drawings are merely schematic and are not to scale.

In the figures:

Fig. 1 shows an elevator system having an elevator car in an elevator shaft composed of three shaft modules,

Fig. 2 shows a snapshot when a top module is placed on an as yet unfinished elevator shaft of an elevator system,

Fig. 3 shows an elevator shaft composed of five shaft modules before lowering guide rail pieces,

Fig. 4 shows the elevator shaft from Fig. 3 after lowering the guide rail pieces,

Fig. 5 shows ends of adjacent guide rail pieces with a connecting tab arranged at one end of a guide rail piece before lowering the upper guide rail piece,

Fig. 6 shows the ends from Fig. 5 after lowering the upper guide rail piece and connecting the adjacent guide rail pieces with the connecting tab,

Fig. 7 shows ends of adjacent guide rail pieces with an alternative arrangement, compared to Fig. 5, of the connecting tab,

Fig. 8 shows an elevator shaft composed of five shaft modules before lowering guide rail pieces, with an alternative arrangement, compared to Fig. 3, of the guide rail pieces in the shaft modules, and

Fig. 9 shows the elevator shaft from Fig. 8 after lowering the guide rail pieces.

According to Fig. 1, an elevator system 10 has an elevator shaft 12 for a three-story building, which in the present exemplary embodiment is composed of three shaft modules in the form of a base module 14, a first intermediate module 16, and a top module 18. The elevator shaft 12 can comprise further intermediate modules 16, depending upon the number of floors. Said shaft modules 14, 16, 18 are pre-produced in a factory and provided with elevator components. Subsequently, they are brought to the construction site and put on top of one another. The described pre-production, provision of elevator components, and transport of the shaft modules 14, 16, 18 can be referred to as a provision of the shaft modules 14, 16, 18.

Each shaft module 14, 16, and 18 encloses a shaft space 15. The shaft modules 14, 16, 18 are placed on top of one another in such a way that the shaft spaces 15 of the shaft modules 14, 16, 18 are aligned vertically and form the vertically extending elevator shaft 12 in which an elevator car 22 of the elevator system 10 is arranged in a displaceable manner.

Fig. 2 shows how the top module 18 is placed on the first intermediate module 16 from above by means of a crane 20. The first intermediate module 16 was previously placed in the same way onto the base module 14. The base module 14 stands on a foundation (not shown) of the elevator shaft 12. The base module 14 and the first intermediate module 16 form an elevator shaft which is open at the top and has not yet been completed, and which is closed off at the top by placing the top module 18 on it.

Moreover, the elevator system 10 of Fig. 1 has a car 22 which can be moved vertically in the elevator shaft 12 along guide rails (see 66 in Fig. 4) which are not shown in Fig. 1.

For this purpose, the elevator system 10 has a support means 24, the first end 26 of which is fixed in the top module 18. It then extends downwards and around the elevator car 22 and is guided via a drive machine 28, arranged in the top module 18, opposite the first end 26 of the support means 24. From there, it runs through a suspension of a counterweight 30 to its second end 32, which is fixed in the region of the drive machine 28. The drive machine 28 can move the support means 24 and thus the elevator car 22 in the elevator shaft 12. The elevator car 22 is connected to an elevator controller 36, arranged in the top module 18, via a traveling cable 34. The traveling cable 34 enables a power supply and a communication with the elevator car 22.

The individual shaft modules can be delimited by shaft walls, which can be made of concrete or wood, for example. However, it is also possible that the shaft modules be delimited by a supporting structure, especially made of metal. The elevator shaft can also have more than one intermediate module, wherein the individual intermediate modules in particular are constructed identically.

The elevator shaft 12 according to Fig. 3 is composed of a base module 14, a first intermediate module 16, two further intermediate modules 17, and a top module 18, i.e., a total of five shaft modules. When providing the shaft modules 14, 16, 17, 18, a guide rail piece 40 has been arranged in each shaft module 14, 16, 17, 18. The guide rail pieces 40 have in particular been screwed to a wall of the respective shaft module by means of rail brackets (not shown). The following describes the procedure for only one guide rail piece per shaft module. In each case, two guide rail pieces for guiding the elevator car 22 and two guide rail pieces for guiding the counterweight 30 are arranged in the shaft modules. In this case, the procedure for all the guide rail pieces is analogous to the procedure described below for one guide rail piece.

The guide rail piece 40 of the base module 14 has been arranged in the base module 14 such that a lower end 42 of the guide rail piece 40 of the base module 14 is flush with a lower edge 44 of the base module 14. This allows the guide rail piece 40 of the base module 14 to rest on the floor of the elevator shaft 12. It is also possible for at least one sheet and/or at least one block to be attached below to the lower end of the guide rail piece of the base module, which are flush with the lower edge of the base module.

An upper end 46 of the guide rail piece 40 of the base module 14 is arranged at a downward distance from an upper edge 48 of the base module 14. The guide rail piece 40 of the base module 14 thus ends below the upper edge 48 of the base module 14. At the upper end 46 of the guide rail piece 40 of the base module 14, a connecting tab 50 is arranged, which will be discussed in connection with Fig. 5 to 7. The connecting tab 50 is fastened to the guide rail piece 40 of the base module 14 in such a way that it does not protrude beyond the upper end 46 of the guide rail piece 40 of the base module 14 in a main extension direction of the guide rail piece, and thus here in the vertical direction.

The guide rail piece 40 of the first intermediate module 16 placed on the base module 14 is arranged above the guide rail piece 40 of the base module 14. The guide rail piece 40 of

the first intermediate module 16 has been arranged in the intermediate module 16 such that a lower end 52 of the guide rail piece 40 of the first intermediate module 16 is arranged at an upward distance from a lower edge 52 of the intermediate module 16. The guide rail piece 40 of the first intermediate module 16 thus ends above the lower edge 52 of the first intermediate module 16. An upper end 56 of the guide rail piece 40 of the first intermediate module 16 is arranged at a downward distance from an upper edge 58 of the first intermediate module 16. The guide rail piece 40 of the first intermediate module 16 thus ends below the upper edge 58 of the first intermediate module 16. At the upper end 54 of the guide rail piece 40 of the first intermediate module 16, a connecting tab 50 is arranged analogously to the arrangement at the upper end 46 of the guide rail piece 40 of the base module 14.

The two further intermediate modules 17 arranged above the first intermediate module 16 are constructed identically to the first intermediate module 16.

In the top module 18, a guide rail piece 40 is also arranged, the lower end 60 of which is arranged at a distance upwards from a lower edge 62 of the top module 18. The drive motor 28 is supported from above on the guide rail piece 40 of the top module 18. In the top module 18, an additional guide rail piece 64 with a connecting tab 50 is also arranged laterally offset from the guide rail piece 40 of the top module 18.

In the example described in Fig. 3, the base module 14 for forming a shaft pit is higher than the intermediate modules 16, 17. However, it is also possible that the base module according to Fig. 3 be replaced by a combination of a low base module and a first intermediate module.

Starting from the state of the guide rail pieces 40 shown in Fig. 3, for further installation, the guide rail piece 40 of the first intermediate module 16 is first displaced vertically downwards until it rests on the guide rail piece 40 of the base module 14, i.e., until the lower end 52 of the guide rail piece 40 of the first intermediate module 16 and the upper end 46 of the guide rail piece 40 of the base module 14 touch. Subsequently, the lower end 52 of the guide rail piece 40 of the first intermediate module 16 and the upper end 46 of the guide rail piece 40 of the base module 14 are connected by means of the connecting tab 50 arranged on the guide rail piece 40 of the base module 16.

The described lowering and connecting is repeated with the guide rail pieces 40 of the other intermediate modules 17. Then, the additional guide rail piece 64 is detached from the top module 18 and arranged above the guide rail piece 40 of the uppermost intermediate module 17 and connected to it. The length of the additional guide rail piece 64 is selected such that the gap between the guide rail piece 40 of the uppermost intermediate module 17 and the guide rail piece 40 of the top module 18 is almost closed. After arranging the additional guide rail piece 64, the guide rail piece 40 of the top module 18 is lowered until it is supported on the additional guide rail piece 64 from above. Finally, the guide rail piece 40 of the top module 16 and the additional guide rail piece 64 are connected to the connecting tab 50 previously arranged in the top module 16. The resulting state is shown in Fig. 4. In this state, the guide rail pieces 40 of the shaft modules 14, 16, 17, and 18 together with the additional guide rail piece 64 form a vertically extending guide rail 66 for the elevator car 22.

According to Fig. 5, a connecting tab 50 has a total of eight first through-holes 68. The connecting tab could also have threaded holes instead of through-holes. When providing a shaft module with a guide rail piece 40, a connecting tab 50 is attached to the upper end of a guide rail piece 40 such that the connecting tab 50 does not protrude upwards beyond the guide rail piece 40. The guide rail pieces 40 each have four second through-holes 70 at their ends. The first and second through-holes 68, 70 are arranged such that the connecting tab 50 can be arranged on the guide rail piece 40 such that the first and second through-holes 68, 70 are aligned, and screws 72 can be inserted through the through-holes 68, 70. In Fig. 5, the connecting tab 50 is fastened with two screws 72 to the, in Fig. 5, lower guide rail piece 40.

After lowering the guide rail pieces 40 as described in connection with Fig. 3 and 4, the two screws 72 are loosened, and the connecting tab 50 is thus released from the lower guide rail piece 40. The connecting tab 50 is then pushed upwards along the lower and upper guide rail pieces 40 until the four upper through-holes 68 of the connecting tab 50 are aligned with the four through-holes 70 of the upper guide rail piece 40, and the four lower through-holes 68 of the connecting tab 50 are aligned with the four through-holes 70 of the lower guide rail piece 40. Subsequently, screws 72 are inserted through all through-holes 68 and 70, and the connecting tab 50 is screwed to the guide rail pieces 40. This state is shown in Fig. 6.

Fig. 7 shows a different arrangement, compared to Fig. 5, of a connecting tab 50 on a guide rail piece 40 when providing a shaft module. The connecting tab 50 is connected to the lower guide rail piece 40 with only one screw 72. In this case, the one screw 72 is selected and arranged such that it is already arranged at the position where it will also be arranged after connection to the upper guide rail piece 40. After lowering the upper guide rail piece 40, this one screw 72 only needs to be loosened, and the connecting tab 50 needs to be pivoted about this one screw 72 into the position shown in Fig. 6. The connecting tab 50 can then be screwed to the two guide rail pieces 40 as described above.

The elevator shaft 12 shown in Fig. 8 differs from the elevator shaft in Fig. 8 mainly in the arrangement of the guide rail pieces 40 in the intermediate modules 16, 17, which is why only the differences between these two elevator shafts will be discussed. The guide rail pieces 40 of the intermediate modules 16, 17 do not extend in the vertical direction as in Fig. 3, but are arranged pivoted relative to the vertical. A length of the guide rail pieces 40 of the intermediate modules 16, 17 corresponds to a height of the intermediate modules 16, 17. The guide rail pieces 40 of the intermediate modules 16, 17 are pivoted so far relative to the vertical that their ends are arranged above and below at a distance from the edges of the respective intermediate module.

Due to the mentioned length of the guide rail pieces 40 of the intermediate modules 16, 17, no additional guide rail piece is necessary, in contrast to Fig. 3. The guide rail piece 40 of the top module 18 can be moved downwards until it rests on the guide rail piece 40 of the uppermost intermediate module 17. This state is shown in Fig. 9.

Finally, it should be noted that terms such as “having,” “comprising,” etc., do not preclude other elements or steps, and terms such as “a” or “an” do not preclude a plurality. Furthermore, it should be noted that features or steps which have been described with reference to one of the above exemplary embodiments may, in the scope of protection of the accompanying claims, also be used in combination with other features or steps of other exemplary embodiments described above. Reference signs in the claims should not be considered limiting.

Claims

1. Method for installing an elevator system (10), having the following method steps:

– providing a plurality of shaft modules (14, 16, 17, 18), wherein the shaft modules (14, 16, 17, 18) are prefabricated and are intended to be placed on top of one another and wherein each shaft module (14, 16, 17, 18) encloses a shaft space (15), and

– placing said shaft modules (14, 16, 17, 18) on top of one another in such a way that the shaft spaces (15) of the shaft modules (14, 16, 17, 18) are aligned vertically and form a vertically extending elevator shaft (12) in which an elevator car (22) of the elevator system (10) can be arranged in a displaceable manner,

wherein

– said plurality of shaft modules (14, 16, 17, 18) comprises a base module (14) and a first intermediate module (16) intended to be placed on the base module (14), and

– the shaft modules (14, 16, 17, 18) each have at least one guide rail piece (40) after provision, which guide rail pieces (40) together form a vertically extending guide rail (66) for the elevator car (22) in the elevator shaft (12) formed by the shaft modules (14, 16, 17, 18),

– the guide rail piece (40) of the first intermediate module (16) is displaced vertically downwards after being placed on the base module (14) until it rests on the guide rail piece (40) of the base module (14),

characterized in that

an upper end (46) of the guide rail piece (40) of the base module (14) is arranged at a downward distance from an upper edge (48) of the base module (14) and prior to the said downward displacement of the guide rail piece (40) of the first intermediate module (16),

– a lower end (52) of the guide rail piece (40) of the first intermediate module (16) is arranged at an upward distance from a lower edge (54) of the first intermediate module (16), and

– an upper end (56) of the guide rail piece (40) of the first intermediate module (16) is arranged at a downward distance from an upper edge (58) of the first intermediate module (16).

2. Method according to claim 1,

characterized in that,

when providing the first intermediate module (16), the guide rail piece (40) of the first intermediate module (16) is arranged in the first intermediate module (16) such that it extends vertically.

5 3. Method according to claim 1,

characterized in that,

when providing the first intermediate module (16), the guide rail piece (40) of the first intermediate module (16) is arranged in the first intermediate module (16) such that it extends pivoted relative to the vertical.

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4. Method according to claim 3,

characterized in that

the guide rail piece (40) of the first intermediate module (16) has a length which corresponds to a height of the first intermediate module (16).

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5. Method according to any of claims 1 to 4,

characterized in that,

when providing the first intermediate module (16), a connecting tab (50) for connecting the guide rail piece (40) of the first intermediate module (16) to an adjacent guide rail piece (40) is fastened to one end (56) of the guide rail piece (40) of the first intermediate module (16) in such a way that it does not protrude beyond said end (56) of the guide rail piece (40) of the first intermediate module (16) in a main extension direction of the guide rail piece (40) of the first intermediate module (16).

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25 6. Method according to claim 5,

characterized in that

the connecting tab (50) is fastened to the end (56) of the guide rail piece (40) of the first intermediate module (16) in such a way that, in order to connect the guide rail piece (40) of the first intermediate module (16) to an adjacent guide rail piece (40), it is first removed from said end (56) of the guide rail piece (40) of the first intermediate module (16) and then connected to the two guide rail pieces (40).

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7. Method according to claim 5,

characterized in that

the connecting tab (50) is fastened to the end (56) of the guide rail piece (40) of the first intermediate module (16) in such a way that, in order to connect the guide rail piece (40) of the first intermediate module (16) to an adjacent guide rail piece (40), it is pivoted relative to said end (56) of the guide rail piece (40) of the first intermediate module (16) and is then connected to said adjacent guide rail piece (40).

8. Method according to any of claims 1 to 7,

characterized in that

a plurality of intermediate modules (16, 17) are provided and placed on top of one another.

9. Method according to claim 8,

characterized in that

all intermediate modules (16, 17) are identical.

10. Method according to any of claims 1 to 9,

characterized in that

an additional guide rail piece (64) is placed on top of the guide rail piece (40) of an uppermost intermediate module (17).

11. Method according to any of claims 1 to 10,

characterized in that

a top module (18) is provided as a further shaft module, which is placed on top of the uppermost intermediate module (17), whereby the elevator shaft (12) is closed off at the top, wherein the top module (18) after provision has a guide rail piece (40) which, after being placed on the uppermost intermediate module (17), is displaced vertically downwards to form the guide rail (66) for the elevator car.

12. Method according to claims 10 and 11,

characterized in that,

when providing the top module (18), the additional guide rail piece (64) is arranged in the top module (18).