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(71) Applicant: **AIP APS**
3400 Hillerød (DK)

(72) Inventors:
- **Pastor García, Marta**
  50198 LA MUELA (ES)
- **Martinez Cazamayor, Sergio**
  50198 LA MUELA (ES)

(74) Representative: **ZBM Patents - Zea, Barlocci & Markvardsen**
Plaza Catalunya, 1 2nd floor
08002 Barcelona (ES)

(54) **METHODS AND SYSTEMS FOR TRANSFERRING WEIGHT OF AN ELEVATOR CABIN**

(57) A method for transferring the weight of an elevator cabin from a traction wire to a guide wire in an elevator system is provided. The method comprises connecting a stopper to the elevator cabin, the stopper having a channel configured to pass the guide wire to run through it and clamping a wire clamp onto the guide wire in a vertical position below the stopper, the wire clamp being configured not to pass through the channel of the stopper. In addition, the method comprises lowering the elevator cabin and blocking the downwards movement of the stopper by the wire clamp, in such a way that the weight of the elevator cabin is partially or completely supported by the wire clamp. A kit for transferring the weight of an elevator cabin from a traction wire to a guide wire according to any of the examples herein described is also provided.

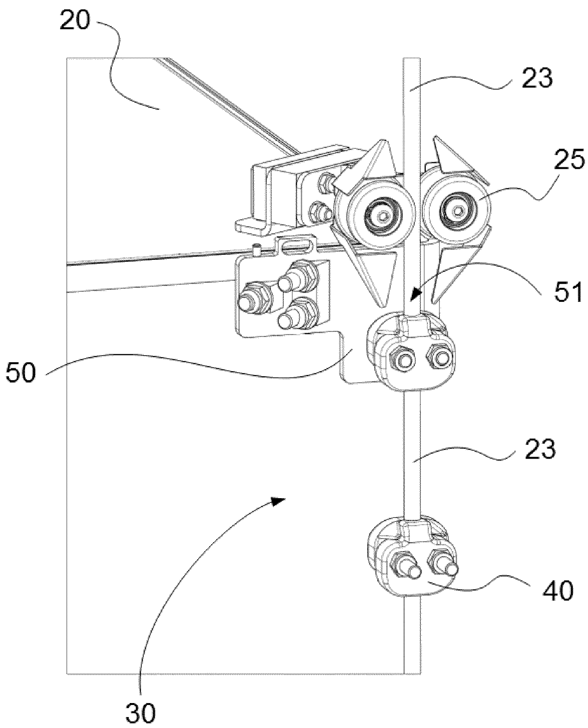

Figure 3

EP 3 498 652 A1

Description

[0001] The present disclosure relates to methods for transferring the weight of an elevator cabin from a traction wire to a guide wire in an elevator system. The present disclosure further relates to kits for transferring the weight of an elevator cabin from a traction wire to a guide wire.

BACKGROUND

[0002] Modern wind turbines are commonly used to supply electricity into the electrical grid. Wind turbines generally comprise a rotor mounted on top of a wind turbine tower, the rotor having a rotor hub and a plurality of blades. The rotor is set into rotation under the influence of the wind on the blades. The operation of the generator produces the electricity to be supplied into the electrical grid.

[0003] When maintenance works are required inside wind turbines, hoists are often used in the form of elevator-like structures where a lift platform or a cabin for the transportation of people and/or equipment is hoisted up and/or down within the wind turbine tower. Wind turbines are often provided with working platforms arranged at various heights along the height of the tower with the purpose of allowing workers to leave the cabin and inspect or repair equipment where intended. These sorts of elevator systems are also known in other applications, such as e.g. factories, construction sites, and all sorts of towers.

[0004] Elevator systems, in general, include an elevator cabin suspended within a hoistway or elevator path by wire ropes. The term wire rope is herein used to denote a relatively thick cable. But in the art, the terms cables and wire ropes are often used interchangeably. In some systems, e.g. for some electric elevators, a counterweight may be provided depending on e.g. the available space. Other systems normally do not comprise a counterweight.

[0005] The service elevators may incorporate some form of traction device mounted on or attached to the elevator. The traction device may comprise a housing including a traction mechanism, e.g. a motor driven traction sheave. The motor may typically be an electrical motor, although in principle other motors could be used. The traction device engages a traction wire for lifting and lowering the elevator cabin. The elevator cabins are therefore supported by the traction wire.

[0006] Elevators system may additionally comprise taut lines or cables, a rail, a ladder or any other rigid guiding element extending all the way from the top to the bottom of the elevator path. These elevator systems are sometimes referred as "ladder-guided" or "cable-guided". Such rigid structures provide stabilization to the elevator cabin and avoid horizontal displacement of the elevator cabin in long elevator paths, as for example in elevator systems of wind turbines.

[0007] Examples of known stabilization devices involve e.g. a pair of taut lines or cables running laterally from the elevator cabin and extending all the way from the top to the bottom of the elevator path, e.g. inside of the wind turbine tower. In these examples, the taut lines or guiding wires are under tension thus defining relatively rigid guiding means for the cabin. The elevator cabin may comprise some kind of guides that engage the guiding wires. In this way, the elevator cabin runs in a substantially controlled manner guided by the guide wires. Examples of guides of the elevator cabin comprise a pair of rollers having the axis horizontally arranged and wherein the guide wire runs between the rollers. These rollers are generally made from plastic or metal and are mainly configured to withstand horizontal rather vertical forces.

[0008] Service elevators may further incorporate an electromagnetic brake. In addition to this brake, a "secondary safety device" or "fall arrest device" can be mounted on or attached to the elevator cabin, directly or through supporting structures. Such a fall arrest device serves as a back-up for the main electromagnetic brake for example in case of failure of the service elevator or breakdown of the traction wire rope. The fall arrest device may typically incorporate some form of sensing mechanism to monitor the elevator's speed. The secondary safety device or the fall arrest device may automatically block the elevator and inhibit any further downward movement if the sensing mechanism detects an overspeed of the elevator cabin, i.e. when the elevator cabin might be falling. The speed detection mechanism in this sense acts as an overspeed detector.

[0009] Fall arrest devices, when fitted to an appropriate wire rope, can be of the type that comprises internal rollers and a clamping mechanism (e.g. involving clamping jaws) which closes onto the safety wire rope. A safety wire and a safety wire rope are herein used interchangeably. These devices may comprise a centrifugal overspeed detector.

[0010] Such an overspeed detector may be provided inside the housing of the fall arrest device and may comprise a driven roller coupled with movable parts that are forced outwardly as the roller rotates when it is driven by the safety wire rope passing along it. A pressure roller ensures the contact between the safety wire rope and the driven roller of the centrifugal overspeed detector. If the safety wire passes through the safety device too rapidly, the brake trips and the jaws clamp onto the wire, thus blocking the safety device on the wire rope by the frictional pressure exerted by the clamping jaws onto the wire.

[0011] Blocking the safety device has to be fast enough for adequately stopping the elevator cabin when an overspeed is detected. Therefore, the fall arrest device needs to be precisely calibrated.

[0012] Fall arrest devices are therefore periodically inspected to detect operation failures. Before using the elevator system, checking the correct functioning of the fall arrest device may be required or at least recommended.

A fall arrest device may be checked by performing an acceleration test. In an acceleration test, a fall of the elevator cabin is simulated and the fall arrest device is thus forced to act. The safety wire is forced to pass through the safety device sufficiently fast for activating the jaws. The safety wire is clamped by the jaws and the fall arrest device thus blocks the safety wire.

[0013] It is known to perform an acceleration test by disconnecting the fall arrest device from the elevator cabin, raising it and dropping it along the safety wire. If it works properly, the fall arrest is stopped when a sufficient relative speed between the fall arrest device and the safety wire is reached. However, performing this test requires disconnecting the fall arrest device from the elevator cabin and then connecting it again. As the fall arrest has to be securely connected to the elevator cabin, connecting and disconnecting operations may require a relatively long time. In addition, repeating these operations can cause assembly errors.

[0014] As these known methods require a relatively long time, some elevator users can be tempted to use the elevator system without previously performing an acceleration test. Therefore, the safety of the elevator users and of the whole elevator system may be compromised.

[0015] In addition, fall arrest devices and traction devices are generally arranged on top of the elevator system. Therefore, for performing maintenance operations or tests involving the fall arrest device or the traction device, operators or users may have to access the top of the elevator cabin, e.g. for connecting and disconnecting the fall arrest device to perform the acceleration test or for fixing the traction device. The elevator cabin is brought to the bottom platform and a scaffold or a ladder is required for the operators to reach the top of the cabin. However, working on a ladder or on a scaffold may involve working in unsafe conditions. In addition, some safety and health regulations do not allow operators to work on a ladder. In addition, mounting a scaffold to perform maintenance operations may be inefficient since it requires a relatively long time. Furthermore, components of the scaffold need to be transported to each wind turbine which may increase logistics costs, especially in offshore wind turbines.

[0016] The present disclosure provides examples of systems and methods that at least partially resolve some of the aforementioned disadvantages.

[0017] Service elevators and related safety devices such as fall arrest devices are not only used in wind turbine towers, but instead may be found in many different sites and structures.

SUMMARY

[0018] In a first aspect, a method for transferring the weight of an elevator cabin from a traction wire to a guide wire in an elevator system is provided. The elevator system comprises an elevator cabin, a traction system having a traction wire for lifting and lowering the elevator cabin and a guide wire extending along the elevator path, wherein the elevator cabin comprises one or more guides to couple with the guide wire. The method comprises connecting a stopper to the elevator cabin, the stopper having a channel configured to pass the guide wire to run through it, and clamping a wire clamp onto the guide wire in a vertical position below the stopper, the wire clamp being configured not to pass through the channel of the stopper. In addition, the method comprises lowering the elevator cabin and blocking the downwards movement of the stopper by the wire clamp, in such a way that the weight of the elevator cabin is partially or completely supported by the wire clamp.

[0019] In this aspect, the method allows to block and to hold the elevator cabin independently from the traction wire and/or the safety wire. The elevator cabin is stopped when the stopper reaches the wire clamp because the wire clamp cannot pass through the stopper of the cabin, the cabin is thus blocked. Therefore, the weight of the elevator is transferred to the guide wire through the stopper and the wire clamp. The stopper and the wire clamp are thus able to hold the weight of the elevator cabin.

[0020] The wire clamp may be mounted onto the guide wire at practically any position below the stopper of the elevator cabin, the elevator cabin may thus be blocked at a desired position. The elevator cabin may therefore be blocked in a position where an operator can safely access.

[0021] Elevator systems may comprise two guide wires laterally arranged in relation to the elevator cabin and therefore stoppers and wire clamps are mounted for each guide wire. In this way, the stabilization of the elevator cabin is enhanced.

[0022] As the elevator cabin can be suspended by the guide wire in an easy to access position and therefore it is no longer held by the traction wire or by the safety wire, traction systems and safety systems can be inspected or fixed while the elevator cabin is still suspended.

[0023] As a result, the traction system, i.e. the traction wire and the traction device that engages the traction wire for lifting and lowering the elevator cabin, or the safety system, i.e. the safety wire and the fall arrest device that clamps onto the safety wire when an overspeed is detected, can be inspected or repaired in a safe and ergonomic position. Consequently, lowering the elevator cabin to the bottom platform and then building a scaffold or using a ladder for accessing the traction device or the fall arrest device is not necessary. The elevator cabin may be blocked on a position that allows the operator access the top of the cabin from a platform arranged inside a tower. Therefore, the operators can perform maintenance operations, e.g. repairing or inspecting, on the traction systems and/or on the safety systems in a safe and efficient way.

[0024] According to this aspect, a method for performing maintenance operations in a traction system and/or a safety system of an elevator system is also provided. The elevator system comprises an elevator cabin, a traction system having a traction wire for lifting and lowering the elevator cabin, a guide wire extending along the elevator path, wherein the elevator cabin comprises one or more guides to couple with guide wire and a safety system having a fall arrest device for blocking the elevator cabin when an overspeed is detected. The method for performing maintenance operations in a traction system and/or in a safety system comprises positioning the elevator cabin in a position accessible from a platform arranged on a tower, transferring the weight of the elevator cabin from the traction wire to the guide wire according to any of the examples herein disclosed and performing maintenance operations in the traction system and/or in the safety system.

[0025] In a further aspect, the method for transferring the weight of an elevator cabin from a traction wire to a guide wire allows to stretch the guide wire in an elevator system. Guide wires may be generally tensioned by tensioning elements arranged under the bottom platform. One end of the guide wires are connected to these tensioning elements and the other end are connected to anchoring elements arranged on the top of the tower. By transferring the weight of the cabin from the traction wire to the guide wire, the weight of the elevator cabin stretches the guide wire. Therefore, as the guide wire is already initially stretched, the total tension provided by the tensioning elements to the guide wire can be higher. In addition, mounting these tensioning elements and connecting them to the guide wire may require less effort to the operators as a part of the tension necessary to provide enough stability, i.e. tension, to the guide wires is in fact provided by the weight of the elevator cabin.

[0026] According to this aspect, a method of tensioning a guide wire in an elevator system is provided. The elevator system according to this aspect comprises an elevator cabin, a traction system having a traction wire for lifting and lowering the elevator cabin, a guide wire extending along the elevator path, wherein the elevator cabin comprises one or more guides to couple with the guide wire and at least one tensioning element configured to be connected to the guide wire for tensioning the guide wire. The method of tensioning a guide wire comprises transferring the weight of the elevator cabin from the traction wire to the guide wire according to any of the examples herein disclosed and adjusting the tension provided by the at least one tensioning element to the guide wire.

[0027] In some examples, one end of the tensioning element is fixed to the structure, e.g. a wind turbine tower, below the bottom platform, while the other end is connected to the guide wire. Distance from one end to other one of the tensioning may be relatively adjusted by e.g. screwing the end connected to the guide wire towards the opposite end. In these examples, adjusting the tension provided by the at least one tensioning element to the guide wire comprises lengthening the guide wire, e. g. by screwing a nut or a stud so that the distance from the end connected to the guide wire to the fixed end of the tensioning element is reduced.

[0028] In some examples, the method of tensioning a guide wire may be carried out after the elevator system has been put into service, i.e. may be periodically performed to ensure the guide wire has the required tension to provide stabilization to the elevator cabin along its path.

[0029] Alternatively or additionally, the method of tensioning a guide wire may be carried out at the installation phase. In these examples, the method may comprise anchoring the guide wire(s) on the top of the structure, e.g. wind turbine tower, lowering the guide wire(s) and inserting them through the guides of the elevator cabin. In addition, the method of tensioning the guide wire(s) comprises transferring the weight of the elevator cabin from the traction wire to the guide wire(s) according to any of the examples herein described. The guide wire(s) may therefore be tensioned, e.g. lengthened, by the effect of the weight of the cabin. The guide wire(s) may then be connected to the tensioning element(s). Once connected to the tensioning elements, the tension provided by the tensioning element(s) is adjusted by e.g. lengthening the guide wire(s). As the guide wire has been previously tensioned, e.g. lengthened, adjusting the tension provided by the tensioning elements requires less effort. For example, the distance between the upper end and the lower end, i.e. fixed to the bottom part of the tower structure, of the tensioning element to be reduced is less than when the guide wire has not been previously stretched. Installation of the elevator system may thus be quicker. The tension of the guide wire may additionally be higher and consequently the stability of the elevator system might be increased.

[0030] In a further aspect, the method for transferring the weight of an elevator cabin from a traction wire to a guide wire may also be used for testing a fall arrest device. After stopping the going down movement by blocking the stopper by the wire clamp, the control of the elevator cabin may be still commanded to continue moving down. As the elevator cabin is blocked and the traction device, e.g. a motor, engages the traction wire, the tension on the traction wire is released. A slack on the traction wire may thus be created. Such a slack may be used for example to simulate a controlled fall down of the elevator cabin. By unclamping the wire clamp, the weight of the elevator cabin is thus not supported by the guide wire. As a result, and because the traction wire is not tensioned by the action of the traction device, the elevator cabin falls down. The fall arrest device generally comprises an overspeed detector and a blocking system for blocking the elevator cabin when an overspeed is detected by the overspeed detector. A dedicated safety wire may run through the fall arrest device. The blocking system may thus clamp the fall arrest device onto the safety wire when the overspeed is detected.

[0031] During the falling down of the elevator cabin, the fall arrest device detects an overspeed and blocks the elevator cabin by clamping onto the safety wire. This falling down may be used for testing a proper functioning of the fall arrest.

[0032] According to this aspect, a method for testing a fall arrest device using a method for transferring the weight of the elevator cabin from the traction wire to the guide wire according to any of the examples herein described is provided. The method for testing a fall arrest device may be performed in an elevator system comprising an elevator cabin, a traction system having a traction wire for lifting and lowering the elevator cabin, a guide wire extending along the elevator path wherein the elevator cabin comprises one or more guides to couple with the guide wire and a safety system having a fall arrest device for blocking the elevator cabin when an overspeed is detected. The method for testing a fall arrest device comprises positioning the elevator cabin above a bottom platform, transferring the weight of the elevator cabin from the traction wire to the guide wire according to any of the examples herein described. The method further comprises commanding the elevator cabin to lower, so that the tension on the guide wire is released and unclamping the wire clamp and the elevator cabin is allow to fall down for activating the fall arrest device.

[0033] Positioning the elevator cabin only some centimeters above the bottom platform, e.g. 5 - 15 cm, may be enough to create an overspeed able to be detected by the fall arrest device and not too far away from the bottom platform that could create an excessive acceleration causing a crash if the fall arrest device is not working properly.

[0034] Such a method allows testing a fall arrest device of an elevator system, e.g. a drop test, in a quick and safe way. Compared to other methods for testing a fall arrest device, this method reproduces in a controlled manner the conditions of a real drop of an elevator cabin. Therefore, the result of the test is more realistic.

[0035] In addition, testing the fall arrest device may be carried out in a very short time and consequently the performance of operations involving the use of the elevator cabin inside a tower structure may be improved. Therefore, the costs of these operations can be reduced, e.g. maintenance or inspection operations. In addition, in those cases where the elevator system is mounted in a wind turbine tower, not only the cost of maintenance or inspection operations may be reduced, but the availability of the wind turbine may also be improved. Consequently, the energy generated by a wind turbine, and by extension a wind farm, may be increased.

[0036] In yet a further aspect, the present disclosure provides a kit for transferring the weight of an elevator cabin from a traction wire to a guide wire according to any of the examples herein described. The kit comprises a stopper configured to be connected to an elevator cabin, wherein the stopper has a channel configured to pass a guide wire to run through it and a wire clamp configured to clamp a guide wire and not to pass through the channel of the stopper. The kit may be used in several wind turbines of a wind farm. Therefore, a single kit may be used in a wind farm, rather than a kit for each wind turbine, so that the installation cost can be reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0037] Non-limiting examples of the present disclosure will be described in the following, with reference to the appended drawings, in which:

Figure 1 shows an elevator system arranged on a wind turbine:

Figure 2 shows a part of an elevator system comprising an example of an elevator cabin;

Figure 3 shows an example of a kit for transferring the weight of an elevator cabin from a traction wire to a guide wire before blocking the stopper by the wire clamp;

Figure 4 shows the example of the kit of Figure 3 when the stopper is blocked by the wire clamp;

Figure 5 represents a partial view of an operator performing maintenance operations comprising transferring the weight of the elevator cabin from the traction wire to the guide wire according to any of the examples herein described;

Figure 6 shows a wire clamp according to one example;

Figures 7A - 7B show a cross-section of another example of a wire clamp in an open and in a blocked position;

Figure 8 shows a stopper according to one example;

DETAILED DESCRIPTION OF EXAMPLES

[0038] In these figures the same reference signs have been used to designate matching elements.

[0039] Figure 1 shows a wind turbine 1 having a wind turbine tower 2. The wind turbine tower 2 comprises a bottom platform 3, a top platform 5 and several intermediate platforms 4. The wind turbine 1 comprises an elevator system 10 having an elevator cabin 20 for transporting people and/or equipment along the wind turbine 1 defining an elevator path 11. The elevator cabin 20 is displaceable along the elevator path 11, e.g. from the bottom platform 3 to the top platform 5. The elevator system 10 comprises a traction system with traction wire (not shown) for lifting and lowering the elevator cabin 20 and a pair of guide wires 23 along the elevator path 11 for guiding the vertical movement of the elevator cabin 20 and providing stability.

[0040] Figure 2 shows a partial view of an example of an elevator system 10 comprising an elevator cabin 20. The elevator system 10 comprises a traction wire 21 which engages a traction device (not shown) for lifting and lowering the elevator cabin 20 and a safety wire 22 in which a fall arrest device (not shown) may be clamped if an overspeed of the elevator cabin 20. The elevator cabin 20 comprises wire guides 25 coupled with the guide wires 23 so that the elevator cabin 20 may be moved along the elevator path guided by the vertical guide wires 23. In this example, the elevator cabin 20 comprises four wire guides substantially arranged on the top and the bottom portion of the lateral sides of the elevator cabin.

[0041] Figure 3 shows an example of a kit 30 for transferring the weight of an elevator cabin 20 from a traction wire (not shown) to a guide wire 23 before blocking the stopper 50 by the wire clamp 40. The stopper 50 comprises a channel 51 that allows the guide wire 23 to run through it. The wire clamp 40 is clamped onto the guide wire 23 and cannot pass through the channel 51 of the stopper 50.

[0042] The stopper 50 of figure 3 is connected to the elevator cabin in a position below the wire guides, e.g. rollers, 25 of the elevator cabin 20 and above the wire clamp 40. The elevator cabin may be lifted without the interference of the wire clamp and lowered until the wire clamp 40. In this example, the stopper is bolted to the elevator cabin, in particular, to a top corner of the elevator cabin.

[0043] Figure 4 shows the example of the kit 30 of figure 3 when the stopper 50 is blocked by the wire clamp 40. The elevator cabin of figure 3 has been lowered until the stopper 50 connected to the elevator cabin has reached the position of the wire clamp 40. As the wire clamp 40 cannot pass through the channel 51 of the stopper 50, the stopper is blocked and therefore the elevator cabin 20 is stopped. Consequently, the weight of the elevator cabin 20 is supported by the wire clamp 40. The weight of the elevator cabin has been therefore transferred from the traction wire to the guide wire 23.

[0044] Depending on which position the wire clamp 40 is mounted onto the guide wire 23, the vertical position wherein the elevator cabin is stopped varies. Therefore, the wire clamp may be mounted in a position that allows the elevator cabin being blocked in a position where for example an operator can easily access or an operator can repair a traction device or a fall arrest device arranged on top of the elevator cabin.

[0045] Figure 5 shows an example of transferring the weight of the elevator cabin 20 from a traction wire to a guide wire 23 for performing maintenance operations in a traction device 26 and/or in a fall arrest device 27. The elevator system of figure 5 comprises an elevator cabin 20, a traction system having a traction device 26 and a traction wire (not shown in figure 5) and a safety system having a fall arrest device 27 that clamps onto a safety wire when an overspeed is detected for blocking the elevator cabin. In this example, the fall arrest device 27 and the traction device 26, e.g. a motor, are mounted on top of the elevator cabin. The traction device and/or the fall arrest device may be mounted inside the elevator cabin or externally attached to the elevator cabin structure.

[0046] In Figure 5, the elevator cabin is held by the guide wire in a position that an operator can access the traction device 26 and the fall arrest device 27. As the cabin is only supported by the guide wires 23, elements of the traction system or of the safety system may be repaired o inspected.

[0047] In this example, the elevator cabin 20 is blocked in a position in which an operator can perform maintenance operations in the traction device 26 and the fall arrest device 27 from a platform, e.g. from an intermediate platform 4. The platform may comprise a platform fence 6 to protect people from falling through the elevator path. Such a fence also helps the operators to prevent falling fixing tools or equipment when operators are performing maintenance operations. As result, there is no need to use scaffolds or ladders for reaching the traction device or the fall arrest device.

[0048] Similarly, wire clamps and/or stoppers may be mounted by an operator from a platform.

[0049] Figure 6 shows an example of a wire clamp 40 configured to be clamped onto a guide wire 23. The wire clamp 40 may comprise a first clamp part 41 and a second clamp part 42 configured to be connected to the first clamp part 41. The second clamp part 42 of this example is displaceable relative to first clamp part 41 in such a way that the wire clamp 40 can clamp a guide wire 23 between the clamp parts.

[0050] According to this aspect, clamping a wire clamp 40 onto the guide wire 23 may comprise arranging the guide wire 23 between the clamp parts and connecting the second clamp part 42 to the first clamp part 41. The clamp parts may be connected by fasteners 23, e.g. a couple of bolts secured by a couple of nuts. The pressure exerted by the clamp parts against the guide wire 23 may be controlled, i.e. the clamping pressure. In these examples, clamping the wire comprises connecting the second clamp part to the first clamp part and unclamping comprises disconnecting the clamp parts.

[0051] Alternatively, other systems for releasably connecting the first and the second clamp parts may be used.

[0052] In some examples, the wire clamp may be made from steel. Alternatively, other suitable material able to withstand the weight of the elevator and to transfer it to the guide wire may be used.

[0053] Figures 7A - 7B show a cross-section of another example of a wire clamp 40 in an open and in a blocked position. The wire clamp 40 comprises a first clamp part 41 and a second clamp part 42, wherein the second clamp part is displaceable relative to the first clamp part 41.The wire guide of this example may clamp a guide wire 23 between the clamp parts. In these examples, the wire clamp 40 comprises a lever 44 for relatively displacing the second clamp part with respect to first clamp part. The lever 44 is pivotable from an open position as shown in Figure 7A to a blocked position as illustrated in Figure 7B. The wire guide 23 is unclamped, i.e. the wire guide may run through the wire clamp, when the lever is in the open position and it is clamped when the lever is in the blocked position. The second clamp part 42 is moved by the action of the lever 44, pushing the guide wire against the first clamp part and therefore the guide wire is clamped.

[0054] The lever may be moved from an open position to a blocked position by pushing it. The pressure exerted by the lever to the second clamp part and consequently to the guide wire may be released by pulling the lever.

[0055] The wire clamp may therefore be clamped and unclamped very fast. Releasing the pressure exerted onto the guide wire very fast, i.e. unclamping the guide wire, may be used for creating a sudden fall of the elevator cabin as in any of the methods for testing a fall arrest device herein described. The guide wire may be quickly unclamped and therefore the wire clamp may be relatively displaced along the guide wire after unclamping all guide wires, the elevator cabin is allowed to suddenly fall down. Falling down the elevator cabin may activate the fall arrest device.

[0056] Alternatively, instead of a lever exerting pressure on the second clamp part a spring may be used for acting on the blocking element.

[0057] Figure 8 shows a stopper according to one example. The stopper 50 comprises a channel 51 configured to pass the guide wire 23 to run through it. The stopper may additionally comprise a support 52 for connecting the stopper 50 to the elevator cabin 20 and a closing member 53 releasably connected to the support 52. The channel 51 may be substantially arranged between the support 52 and the closing member 53. In these examples, the channel 51 is defined by the support 52 and the closing member 53. The channel 51 may therefore be enclosed by the support 52 and the closing member 53.

[0058] The closing member 53 may be connected to the support 52. Connecting the stopper 50 to the elevator cabin 20 may comprise fastening the support 52 to the elevator cabin 20, arranging the guide wire 23 on the channel 51 and connecting the closing member 53 to the support 52.

[0059] The closing member 53 may be fastened to the support 52. In some examples a pair of studs fixed to the support, e.g. welded on the support, may be inserted in suitable holes of the closing member and then a pair of nuts may be screwed on the studs. In other examples, bolts may be inserted through holes on the support and on the closing member and then secured by nuts. Other suitable joining methods may alternatively be used as for example a U-bolt and a saddle secured by nuts. By connecting the closing member to the support, the guide wire is kept in the through hole. Furthermore, blocking the stopper by the guide wire is enhanced as the contacting area is increased.

[0060] In some examples, the support 52 may comprise a first side 70 and a second side 80 defining a substantially right angle for engaging a corner of the elevator cabin 20. The stopper 50 may therefore be connected to a corner of the elevator cabin 20. In the example of the figure 8, the stopper is being connected to a top corner of the elevator cabin.

[0061] The elevator cabin may comprise through holes for fastening the support of the stopper. Such through holes may be arranged on different vertical sides. Such holes may be drilled before carrying out the method of transferring a weight, e.g. during the installation phase of the elevator system or during the manufacturing of the elevator cabin. Otherwise, drilling holes on the elevator cabin for inserting fasteners may be carried out as a part of connecting a stopper to the elevator cabin of a method for transferring the weight of an elevator cabin from a traction wire to a guide wire according to any of the examples herein disclosed.

[0062] The support 52 may comprise through holes fitting with the holes of the elevator cabin. In this way, the first side 70 may comprise at least one through hole 71 and the second side 80 may also comprise at least one through hole 81. A fastener may be inserted from the at least on through hole 71 of the first side 70 through the holes of the elevator to the at least one through hole 81 of the second side 80. The stopper may thus be connected to the elevator cabin by inserting a fastener from the first side 70 to the second side 80 of the support of the stopper. According to this aspect, the stopper may be attached to the elevator cabin from outside and therefore there is no need to enter into the elevator cabin for connecting the stopper to the elevator cabin.

[0063] In some examples, a fastener connecting the first side 70 to the second side 80 through the elevator cabin 20, and the first and second sides may define a right triangle.

[0064] In some examples, the stopper may comprise a pair of wedges arranged on the first 70 and on the second sides 80. A first wedge 72 may be arranged on the first side 70 and a second wedge 82 on the second side 70. The first wedge 72 may comprise the at least one through hole 71 of the first side 70 and the second wedge 82 may comprise the at least one through hole 81 of the second side 80. Each of the wedges may comprise a surface 73 that is substantially perpendicular to the projection of the through holes arranged on the first and the second wedges. According to this aspect, when a fastener is inserted into such through holes, these surfaces are substantially perpendicular to the fastener. Therefore, nuts or bolt heads of fasteners may rest on these surfaces. In this way, fasteners through the first side to the second side, e.g. bolts or studs, may work substantially axial. Such surfaces 73 define an angle with the sides. The angle defined by the surface 73 of a first wedge 72 with the first side 70 and by the surface 73 of a second wedge 82 with the second side 80 may be complementary.

[0065] In some examples, each of the first and the second sides may comprise several wedges, e.g. two or three. Wedges may comprise several through holes. In the example of the figure 8, the first side 70 comprises two first wedges 72, wherein one of the first wedges has one through-hole 71 and the other first wedge has two through-holes 71. Additionally, the second side 80 may comprise two second wedges 82, one of them having only one through-hole 81 and the other one two through-holes 81.

[0066] Although only a number of examples have been disclosed herein, other alternatives, modifications, uses and/or equivalents thereof are possible. Furthermore, all possible combinations of the described examples are also covered. Thus, the scope of the present disclosure should not be limited by particular examples, but should be determined only by a fair reading of the claims that follow.

Claims

1. A method for transferring the weight of an elevator cabin from a traction wire to a guide wire in an elevator system, wherein the elevator system comprises:

an elevator cabin;
a traction system having a traction wire for lifting and lowering the elevator cabin;
a guide wire extending along the elevator path;
and wherein the elevator cabin comprises one or more guides to couple with the guide wire
wherein the method comprises:

connecting a stopper to the elevator cabin, the stopper having a channel configured to pass the guide wire to run through it;
clamping a wire clamp onto the guide wire in a vertical position below the stopper, the wire clamp being configured not to pass through the channel of the stopper;
lowering the elevator cabin;
blocking the downwards movement of the stopper by the wire clamp, in such a way that the weight of the elevator cabin is partially or completely supported by the wire clamp.

2. A method according to claim 1, wherein the wire clamp comprises:

a first and a second clamp parts; and

wherein clamping a wire clamp onto the guide wire comprises:

arranging the guide wire between the clamp parts; and
connecting the second to the first clamp part.

3. A method according to claim 1, wherein the wire clamp comprises:

a first and a second clamp parts; and
a lever for displacing the second clamp part with respect to the first clamp part; wherein
the lever is pivotable from an open position to a blocked position; and
the clamping a wire clamp comprises moving the lever from an open to a blocked position.

4. A method according to any of claims 1 - 3, wherein the stopper comprises:

a support and a closing member;
wherein,
the channel is substantially arranged between the support and the closing member; and
connecting the stopper to the elevator cabin comprises:

fastening the support to the elevator cabin;
arranging the guide wire on the channel; and
connecting the closing member to the support.

5. A method for performing maintenance operations in a traction system and/or in a safety system of an elevator system, wherein the elevator system comprises:

an elevator cabin;
a traction system having a traction wire for lifting and lowering the elevator cabin;
a guide wire extending along the elevator path;
wherein the elevator cabin comprises one or more guides to couple with the guide wire; and
a safety system having a fall arrest device for blocking the elevator cabin when an overspeed is detected;

wherein the method comprises:

positioning the elevator cabin in a position accessible from a platform arranged on a tower;
transferring the weight of the elevator cabin from the traction wire to the guide wire according to any of claims 1 - 4;
performing maintenance operations in the traction system and/or in the safety system.

6. A method of tensioning a guide wire in an elevator system, wherein the elevator system comprises:

an elevator cabin;
a traction system having a traction wire for lifting and lowering the elevator cabin;
a guide wire extending along the elevator path;
wherein the elevator cabin comprises one or more guides to couple with the guide wire; and

at least one tensioning element configured to be connected to the guide wire for tensioning the guide wire;

wherein the method comprises:

transferring the weight of the elevator cabin from the traction wire to the guide wire according to any of claims 1 - 4; and
adjusting the tension provided by the at least one tensioning element to the guide wire.

7. A method for testing a fall arrest device of an elevator system, wherein the elevator system comprises:

an elevator cabin;
a traction system having a traction wire for lifting and lowering the elevator cabin;
a guide wire extending along the elevator path ;
wherein the elevator cabin comprises one or more guides to couple with the guide wire; and
a safety system having a fall arrest device for blocking the elevator cabin when an overspeed is detected;

wherein the method comprises:

positioning the elevator cabin above a bottom platform;
transferring the weight of the elevator cabin from the traction wire to the guide wire according to any of claims 1 - 4;
commanding the elevator cabin to lower, so that the tension on the guide wire is released.
unclamping the wire clamp, so that the elevator cabin is allow to fall down for activating the fall arrest device.

8. A method for testing a fall arrest device of an elevator system according to claim 7, wherein the wire clamp comprises:

a first and a second clamp parts; and
a lever for displacing the second clamp part with respect to the first clamp part; wherein
the lever is pivotable from an open position to a blocked position; and
wherein clamping the wire clamp comprises moving the lever from an open to a blocked position; and
unclamping the wire clamp comprises moving the lever of the wire clamp from the blocked to the open position, so that the elevator cabin is allow to fall down for activating the fall arrest device.

9. A kit for transferring the weight of an elevator cabin from a traction wire to a guide wire according to any of the claims 1 - 4, the kit comprising:

a stopper configured to be connected to an elevator cabin, wherein the stopper comprises a channel configured to pass a guide wire to run through it;
a wire clamp configured to clamp a guide wire and not to pass through the channel of the stopper.

10. A kit according to claim 9, wherein the wire clamp comprises:

a first and a second clamp parts;
wherein the second clamp part is displaceable relative to the first clamp part for clamping a guide wire between the clamp parts.

11. A kit according to claim 10, wherein the wire clamp further comprises a lever for displacing the second clamp part with respect to the first clamp part, wherein the lever is pivotable from an open position to a blocked position such that the wire clamp is configured to clamp a guide wire when the lever is in the blocked position and to pass the guide wire to run through the wire clamp when the lever is in the open position.

12. A kit according to any of claims 9 - 11, wherein the stopper comprises:

a support for connecting the stopper to the elevator cabin;
a closing member releasably connected to the support; and

wherein the channel is substantially arranged between the support and the closing member.

13. A kit according to claim 12, wherein the support comprises a first and a second side defining a substantially right angle for engaging a corner of the elevator cabin.

14. A kit according to claim 13, wherein each of the sides comprise at least one through hole for inserting a fastener from the first side to the second side to connect the stopper to the elevator cabin.

15. A kit according to claim 14, wherein the stopper comprises a pair of wedges having first wedge arranged on the first side and a second wedge arranged on the second side, wherein the pair of wedges comprises the at least one through hole of each side; and wherein the pair of wedges comprises a surface configured to be substantially perpendicular to the fastener to be inserted into the at least one through hole.

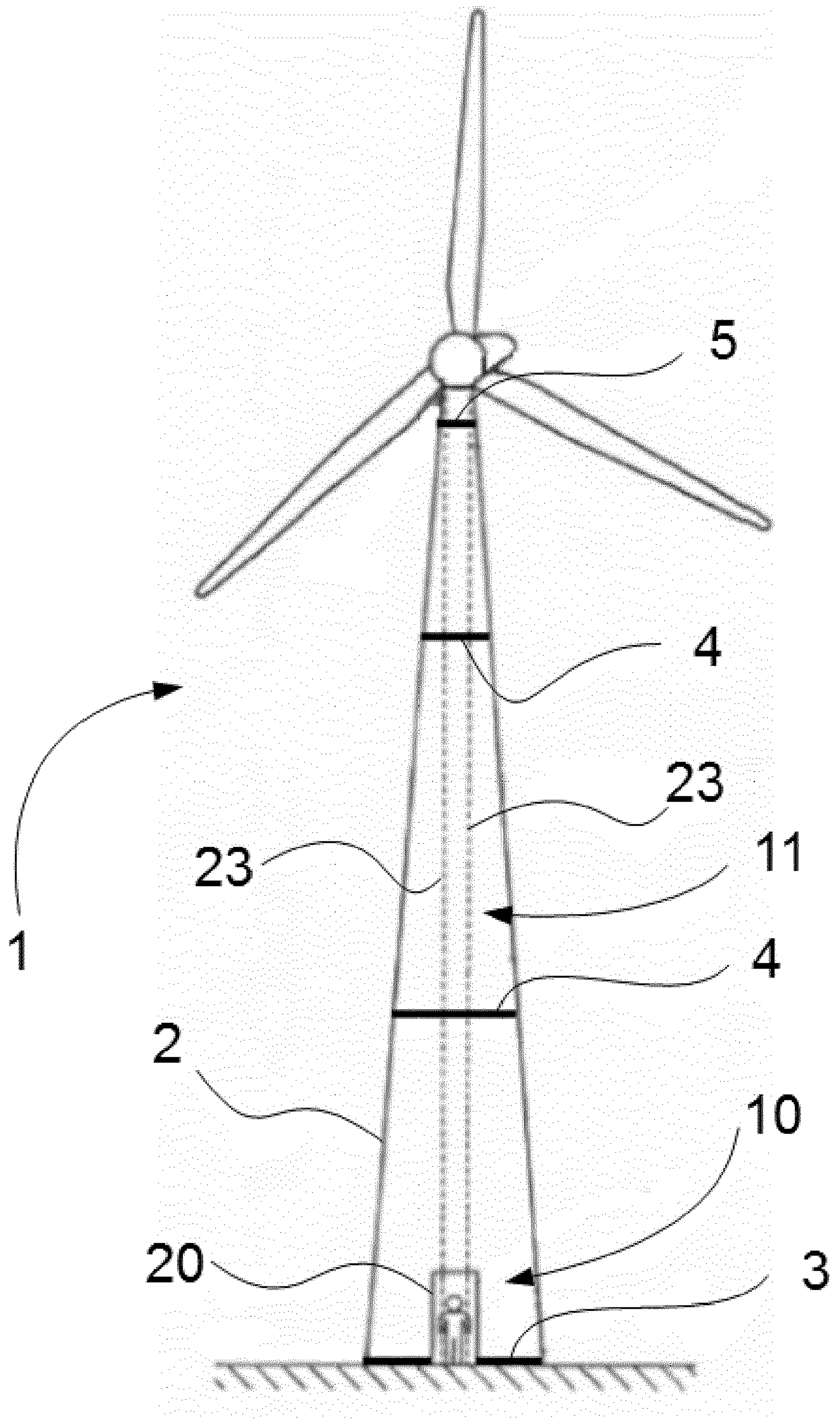

Figure 1

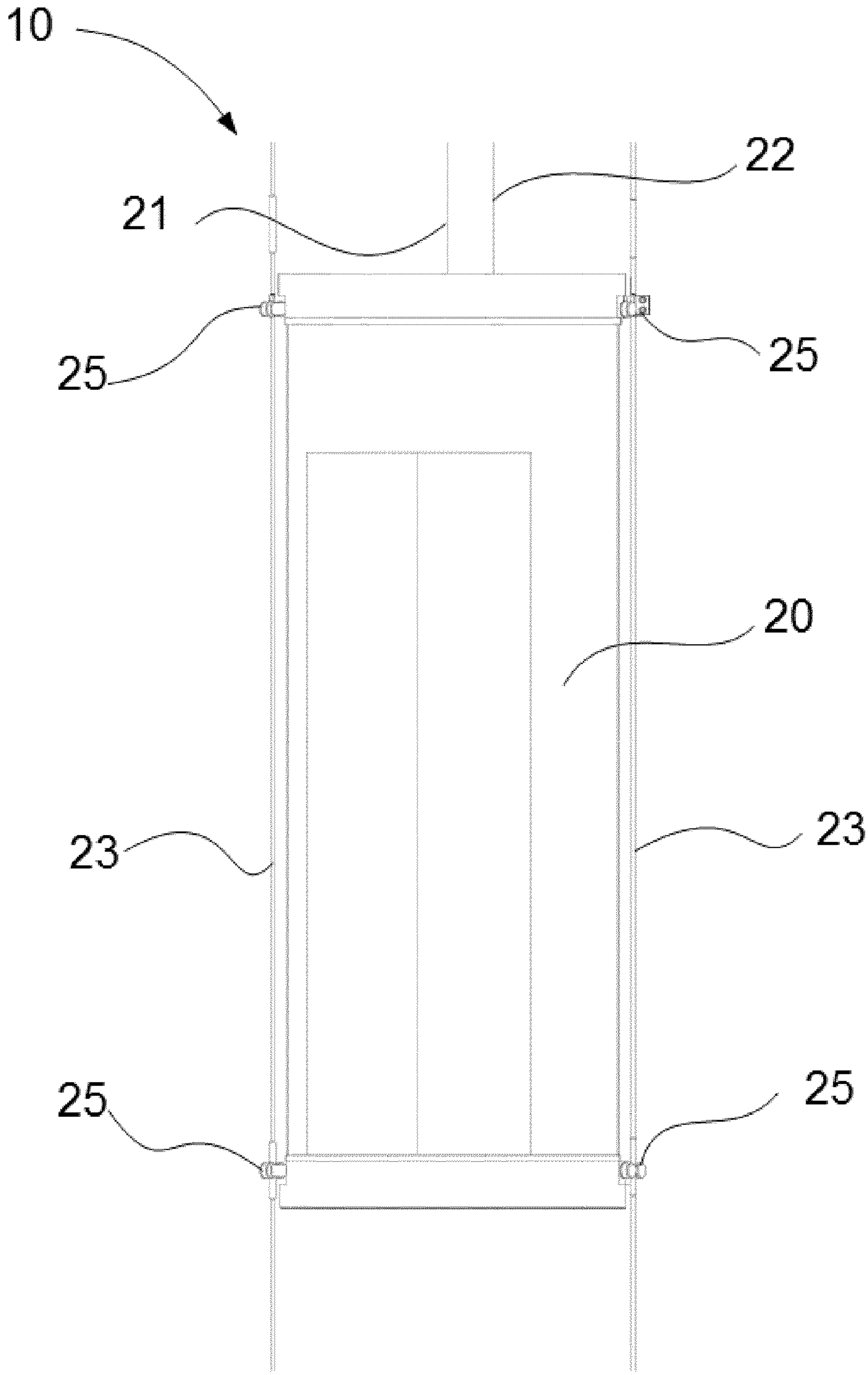

Figure 2

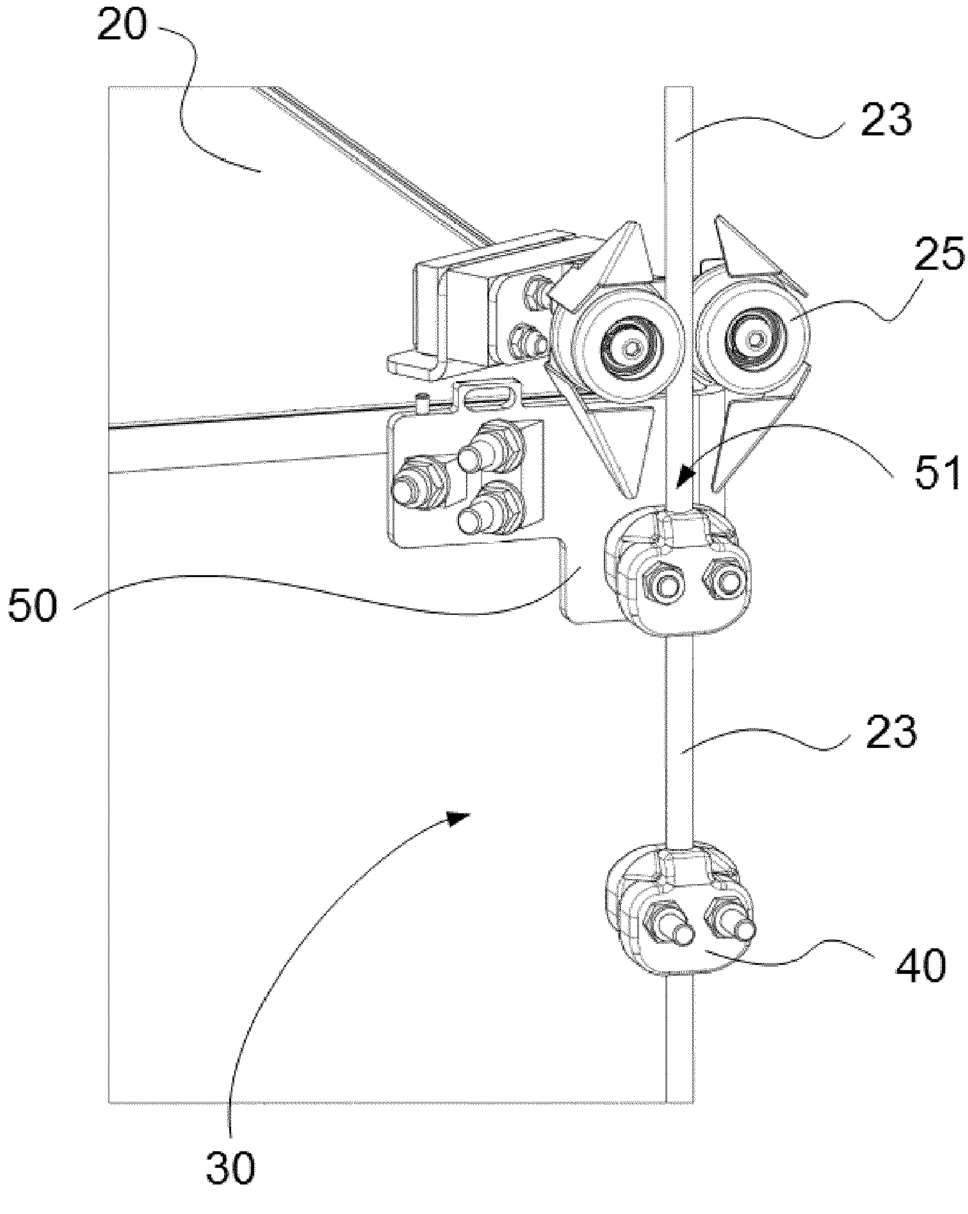

Figure 3

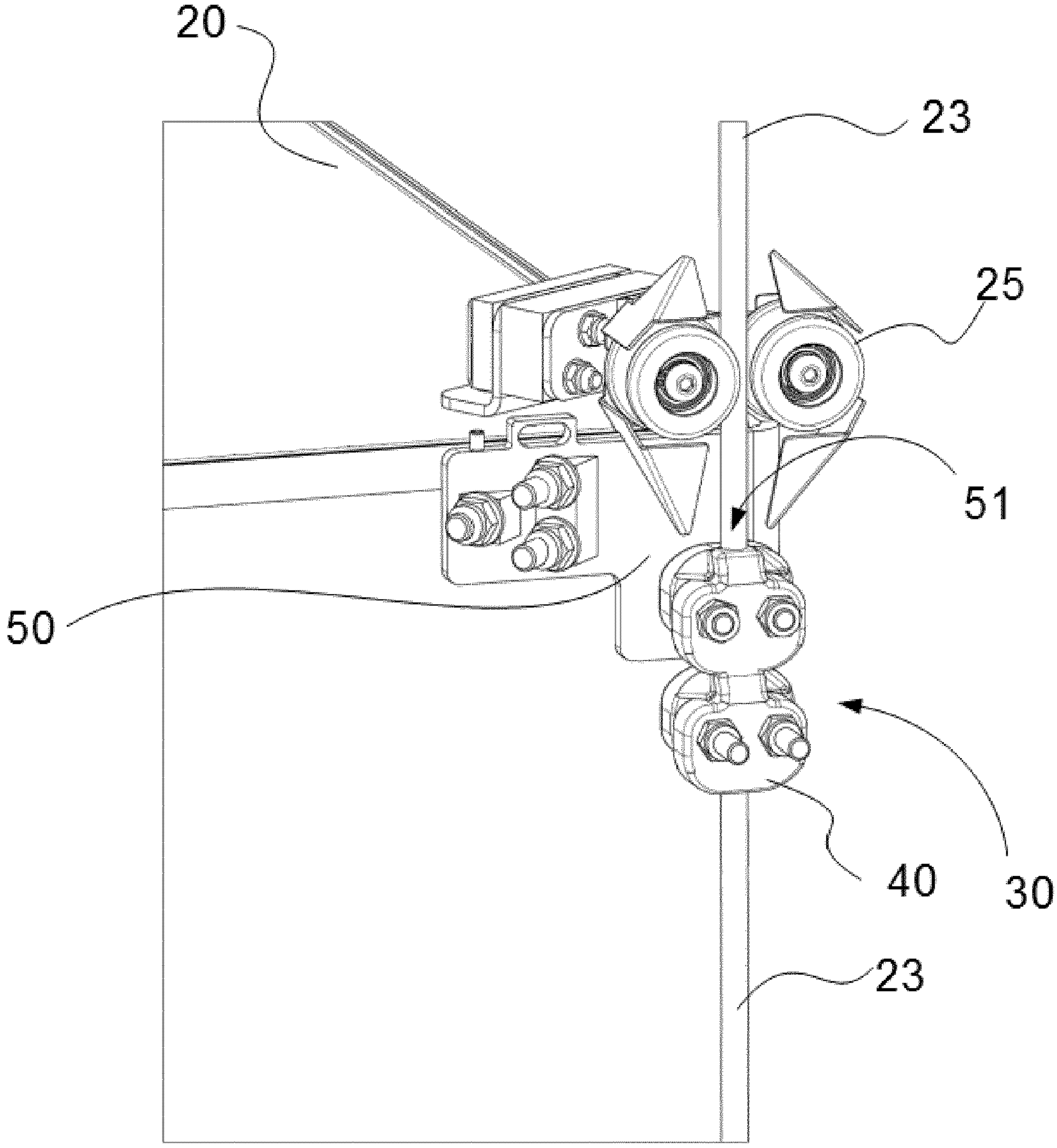

Figure 4

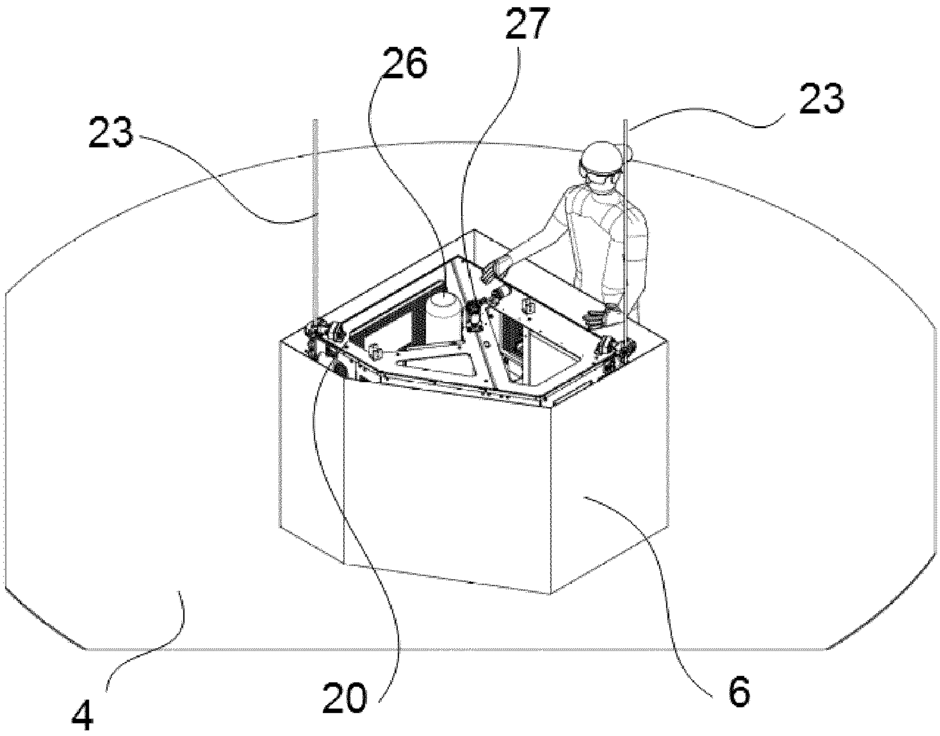

Figure 5

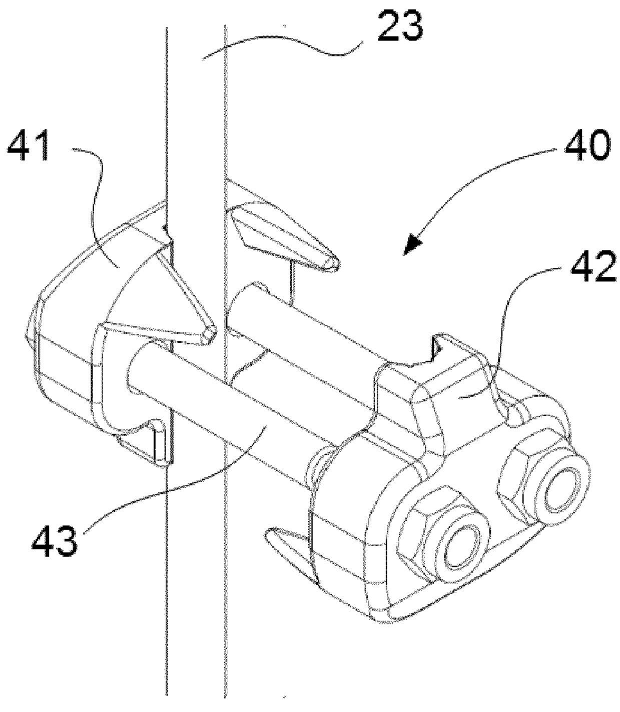

Figure 6

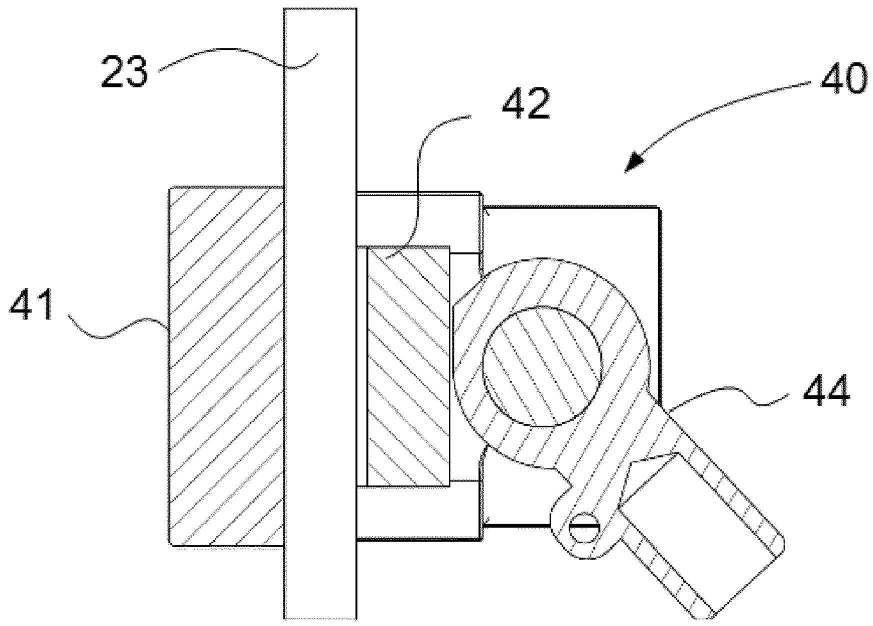

Figure 7A

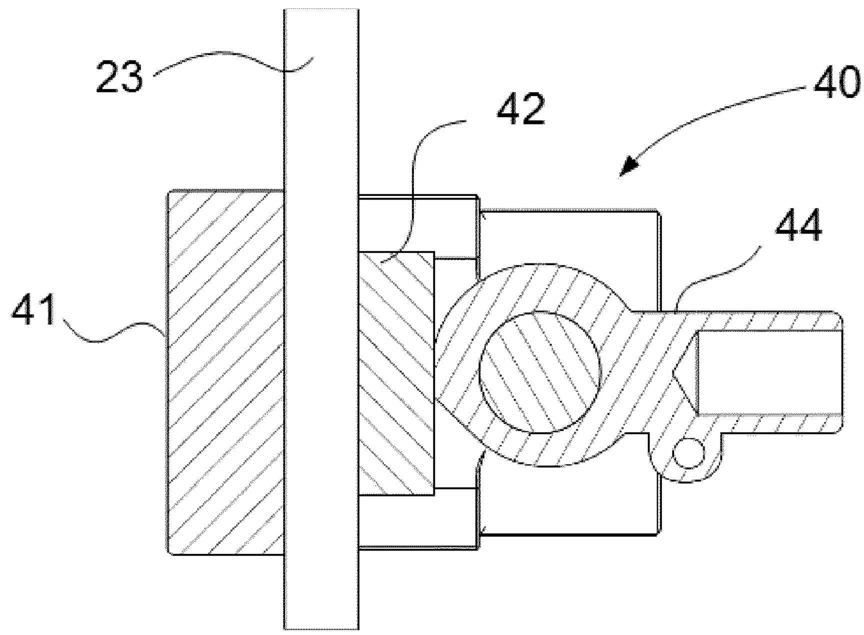

Figure 7B

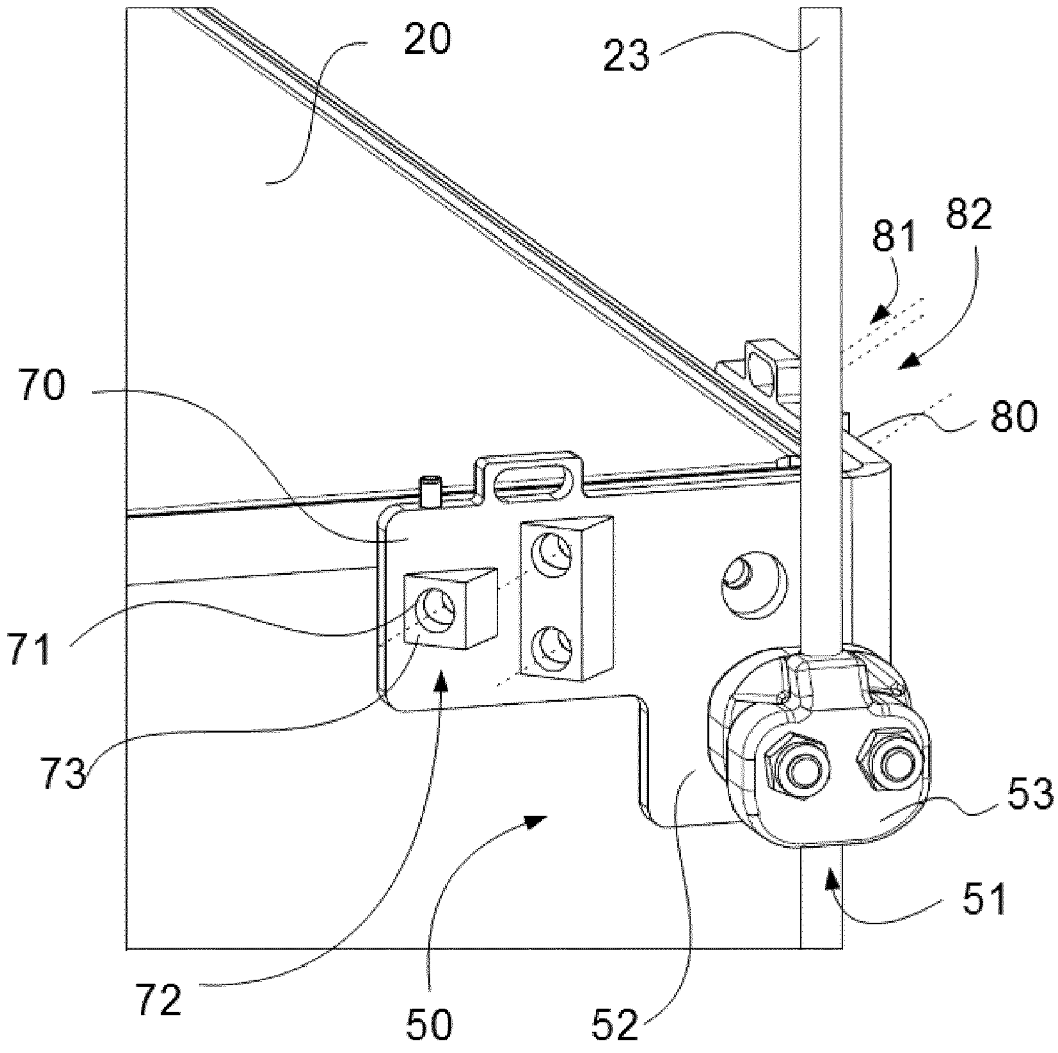

Figure 8

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EUROPEAN SEARCH REPORT

Application Number
EP 17 38 2857

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	JP 2001 171933 A (HITACHI BUILDING SYS CO LTD) 26 June 2001 (2001-06-26) * figures 1-4 * & DATABASE WPI Week 200151 Thomson Scientific, London, GB; AN 2001-471592 & JP 2001 171933 A (HITACHI BUILDING SYSTEM SERVICE KK) 26 June 2001 (2001-06-26) * abstract * -----	1-15	INV. B66B19/02 B66B5/00
A	US 2004/222046 A1 (GUT HUBERT [CH]) 11 November 2004 (2004-11-11) * abstract * * paragraph [0011] - paragraph [0031] * * figures 1-6 * -----	1-15	
A	GB 185 678 A (MICHAEL COULSON) 14 September 1922 (1922-09-14) * the whole document * -----	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

B66B
F03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 June 2018	Dijoux, Adrien

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EP 17 38 2857

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18-06-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2001171933 A	26-06-2001	NONE	
US 2004222046 A1	11-11-2004	AT 390378 T	15-04-2008
		AU 2004201959 A1	25-11-2004
		CA 2466406 A1	07-11-2004
		CN 1550442 A	01-12-2004
		EP 1475342 A1	10-11-2004
		ES 2303919 T3	01-09-2008
		HK 1071120 A1	31-10-2008
		JP 4673574 B2	20-04-2011
		JP 2004352503 A	16-12-2004
		NO 20041861 A	08-11-2004
		PT 1475342 E	23-06-2008
		US 2004222046 A1	11-11-2004
GB 185678 A	14-09-1922	NONE	

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