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(54) AN APPARATUS FOR OPERATING AN ELEVATOR CAR OF AN ELEVATOR SYSTEM AND A METHOD FOR OPERATING THE ELEVATOR CAR

(57) According to one aspect, there is provided an apparatus for operating an elevator car (102) of an elevator system, the elevator car (102) being driven by a belt (112). The apparatus comprises a wheel (120) configured to be connected to the belt (112) or to a diverting pulley (114) of the elevator system acting on the belt (112), and a mechanical interface (124) configured to provide a rotational motion to the wheel (120) to move the elevator car (102).

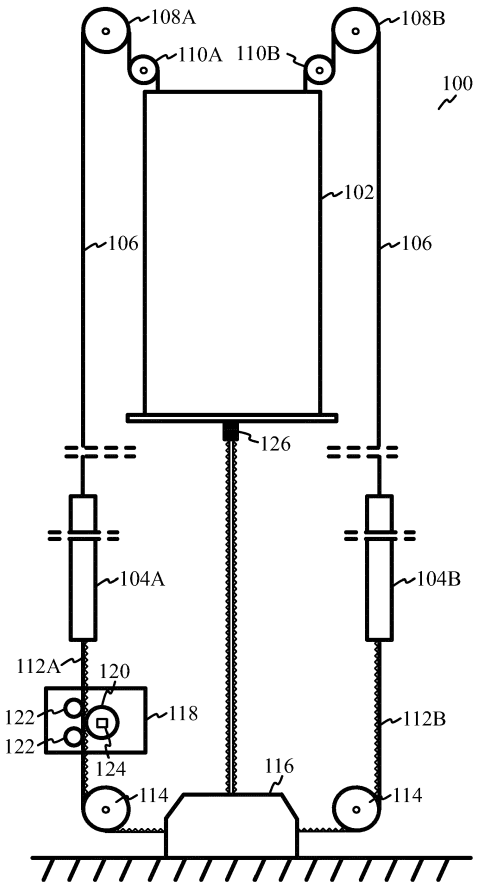

FIG. 1A

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Description

BACKGROUND

[0001] Elevators are usually balanced so that a counterweight is heavier than an elevator car relating to the counterweight. For example, in a rescue situation, hoisting machinery brakes are opened and the direction of the rescue depends on the current load of the elevator car. When the load is less than 50% of the rated load, the elevator car will move up when the hoisting machinery brakes are opened. When the load is more that 50% of the rated load, the elevator car will move down when the hoisting machinery brakes are opened.

[0002] It may occur that, in a rescue situation, it is possible to perform the rescue only in one direction. A further problem arises if the rescue direction is up and all floors in that direction are, for example, private or otherwise restricted premises.

SUMMARY

[0003] According to a first aspect of the invention, there is provided an apparatus for operating an elevator car of an elevator system, the elevator car being driven by a belt. The apparatus comprises a wheel configured to be connected to the belt or to a diverting pulley of the elevator system acting on the belt, and a mechanical interface configured to provide a rotational motion to the wheel to move the elevator car. The wheel may be connected against the rim surface of the diverting pulley, and the rim surface is engaged against the belt.

[0004] In one embodiment, the mechanical interface is configured to receive a cam for manually rotating the wheel to move the elevator car.

[0005] In one embodiment, the mechanical interface is configured to receive an electric tool for rotating the wheel to move the elevator car.

[0006] In one embodiment, alternatively or in addition, the apparatus comprises brake control means configured to control the release of the brakes of the elevator car before moving the elevator car with the mechanical interface.

[0007] In one embodiment, alternatively or in addition, the apparatus comprises at least one supporting roller configured to provide support for the wheel when the wheel is connected to the belt.

[0008] In one embodiment, alternatively or in addition, the apparatus comprises a gearing configured to adapt the movement applied via the mechanical interface.

[0009] In one embodiment, alternatively or in addition, the apparatus comprises rotation control means configured to prevent rotation of the wheel when a rotational motion is not applied with the mechanical interface.

[0010] In one embodiment, alternatively or in addition, the apparatus is a portable apparatus.

[0011] According to a second aspect, there is provided an elevator system comprising an apparatus of the first aspect.

[0012] In one embodiment, the elevator system comprises a separate hoisting machine for driving the elevator car.

[0013] According to a third aspect of the invention, there is provided a method for operating an elevator car of an elevator system, The method comprises connecting an apparatus according to the first aspect to a belt used to drive the elevator car or to a diverting pulley diverting the belt, releasing brakes of the elevator car, and using the mechanical interface to move the elevator car to a desired location.

[0014] In one embodiment, the method comprises connecting a cam to the mechanical interface, and moving the elevator car by manually operating the cam to provide a rotational motion to the wheel.

[0015] In one embodiment, the method comprises connecting an electrical tool to the mechanical interface, and moving the elevator car by using the electrical tool to provide a rotational motion to the wheel.

[0016] According to a fourth aspect of the invention, there is provided an apparatus for operating an elevator car of an elevator system, the elevator car being driven by a traction member. The apparatus comprises a wheel configured to be connected to the traction member or to a diverting pulley of the elevator system acting on the traction member, and a mechanical interface configured to provide a rotational motion to the wheel to move the elevator car.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The accompanying drawings, which are included to provide a further understanding of the invention and constitute a part of this specification, illustrate embodiments of the invention and together with the description help to explain the principles of the invention. In the drawings:

Figure 1A illustrates a simplified and diagrammatic view of an elevator arrangement comprising an apparatus for operating an elevator car in a service or an emergency situation according to one embodiment.

Figure 1B illustrates a simplified and diagrammatic view of an elevator arrangement comprising an apparatus for operating an elevator car in a service or an emergency situation according to another embodiment.

Figure 2 illustrates a location of an apparatus for operating an elevator car in a service or an emergency situation according to one embodiment.

Figure 3 illustrates a flow diagram of a method for operating an elevator car of an elevator system according to one embodiment.

DETAILED DESCRIPTION

[0018] Figure 1A presents a simplified and diagrammatic side view of one elevator arrangement. The elevator arrangement 100 comprises an elevator car 102 configured to move reciprocally in an elevator hoistway and at least one or more counterweights or compensating weights 104A, 104B, which are for their part connected to support the elevator car 102 by the aid of suspension members 106, such as belts or ropes, and also by the aid of e.g. diverting pulleys 108A, 108B in the top part of the elevator rails hoistway, of the e.g. mounted on bearings on guide rails of the elevator car 102. In addition, elevator arrangement 100 comprises a machine station 116 that is provided with at least one traction sheave or corresponding and with a hoisting motor, with a brake, with an encoder as well as with other components needed for a hoisting machine. Means enabling a weighing function may also be connected to the joint between the brake and the frame of the machine station 116.

[0019] The elevator arrangement 100 comprises also at least one or more traction members 112A, 112B, such as belts that are fully separate from the suspension members 106. The traction members 112A, 112B are configured to transmit the rotational movement of the traction sheave into linear movement of the elevator car 102 and of the compensating weights 104A, 104B. The two compensating weights 104A, 104B, or in some cases more than two compensating weights, are connected by the aid of their own traction member 112A, 112B provided with e.g. essentially spring tensioning or constant-force tensioning to most preferably one and the same hoisting machine in the machine station 116.

[0020] The elevator arrangement 100 according to Figure 1 comprises two compensating weights 104A, 104B, both of which are connected to the elevator car 102 by the aid of common suspension members 106. There can be one suspension member 106 or a number of them side by side. The suspension member 106 is fixed at its first end to the compensating weight 104B functioning as a counterweight, and passes over the diverting pulley 108B in the top part of the elevator hoistway or in the machine room and onwards above the elevator car 102 under diverting pulleys 110A, 110B disposed on the elevator car 102, and ascends upwards again and passes over the diverting pulley 108A in the top part of the elevator hoistway or in a machine room and descends downwards to a second compensating weight 104A functioning as a counterweight, to which compensating weight 104A the suspension member 106 is fixed at its second end. The diverting pulleys 108A, 108B are preferably disposed e.g. on the top ends of guide rails of the elevator car 102, and the guide rails take the forces produced by moving the elevator car e.g. via their guide rail brackets into the walls of the elevator hoist way or into other strong structures. There are, however, also other suitable location position points.

[0021] The machine station 116 with the hoisting machine, support structures and diverting pulleys 114 and with its traction sheave may be at some certain angle with respect to the mutual guide rail line of the guide rails of the elevator car 102. This angle can vary, depending on the respective elevator layout solution.

[0022] The elevator arrangement 100 comprises also an apparatus 118 for operating the elevator car 102 in a service or an emergency situation. The apparatus 118 is arranged into a location from which it is able to directly or indirectly operate the at least one traction member 112A, 112B. In the example disclosed in Figure 1, the apparatus 118 is configured to directly operate the traction member 112A. The apparatus 118 comprises a wheel 120 configured to be coupled with the traction member 112A, which is for example a belt. The apparatus 118 may also comprise at least one supporting roller 122 configured to provide support for the wheel 120 when the wheel 120 is connected to the traction member 112A. The at least one supporting roller 122 may press the traction member 112A against the wheel 120. This enables a firm coupling of the apparatus 118 to the traction member 112A. Further, in one embodiment traction member 112A is a cogged belt and the wheel 120 is a cogged belt wheel and the cogged belt acts directly on the cogged belt wheel. Further, although a belt is used as an example of a traction member, any other traction member to which a direct operational connection is possible, can be used.

[0023] When the wheel 118 is rotated, the wheel 118 acts directly on the traction member 112A and the elevator car 102 is caused to move. The apparatus 118 comprises also a mechanical interface 124 configured to provide a rotational motion to the wheel 120 to move the elevator car 102. The mechanical interface 124 a rotational motion may receive a cam, which when operated manually by a user, causes rotation of the wheel 102. The user is thus able to manually move the elevator car 102 to a desired position in the elevator hoistway either in up or down direction.

[0024] In one embodiment, the apparatus 118 may be permanently installed into the hoistway, and in a normal operation of the elevator car 102, the apparatus 118 may be turned to an idle position when it is not in use. When a maintenance or a rescue situation occurs, a user operating the elevator car 102 turns the apparatus 118 to a use position and positions the traction member 112A between the supporting rollers 122 and the wheel 120. The apparatus may be used in maintenance operations if, for example, the hoisting machine of the elevator is broken or otherwise out-of-service. A hinge or any other means for turning the apparatus 118 to its use position may be arranged into the hoistway. The coupling between the hoistway and the apparatus 118 is arranged such that the apparatus 118 is locked into a fixed position when it is to be used. When the apparatus 118 is locked into the fixed position, it is possible to use the apparatus 118 to move the elevator car 102 to a desired position in the hoistway.

[0025] In one embodiment, the apparatus 118 is a port-

able apparatus and the user operating the elevator car 102 brings the apparatus 118 with him. The hoistway may comprise a support member or other means fixedly attaching the portable apparatus 118 to the hoistway. When a maintenance or a rescue situation occurs, a user operating the elevator car 102 arranges the portable apparatus 118 to a use position and positions the traction member 112A between the supporting rollers 122 and the wheel 120. The coupling between the hoistway and the portable apparatus 118 may be arranged such that the portable apparatus 118 is locked into a fixed position when it is to be used. When the apparatus 118 is locked into the fixed position, it is possible to use the portable apparatus 118 to move the elevator car 102 to a desired position in the hoistway.

[0026] Instead of the cam to manually rotate the wheel 120, the mechanical interface 124 may be configured to receive a tool for rotating the wheel to move the elevator car. The tool may be an electrical or a battery operated rotation tool, for example, a power drill.

[0027] The apparatus 118 may also comprise brake control means configured to control the release of the brakes of the elevator car before moving the elevator car 102 with the means 124 for providing a rotational motion to the wheel 120. In one embodiment, the apparatus 118 comprises a mechanical switch, which when operated by the user, releases the brakes of the elevator car 102. In another embodiment, the brake control means are automated so that when the user starts to manually or using electric means to provide a rotational motion to the wheel to move the elevator car 102, the brake control means causes an automatic release of the brakes of the elevator car 102. In both embodiments, there may be a mechanical or an electrical connection from the apparatus 118 to a control entity in the elevator system that controls the brakes of the elevator car 102.

[0028] In some embodiments the brakes are car brakes mounted on the car and engage, for example, against the guide rails of the elevator car. In some embodiments the brakes are machinery brakes of the hoisting machine, disposed in the machine station 116.

[0029] The apparatus 118 may comprise a gearing configured to adapt the movement applied via the mechanical interface 124. The gearing enables the user to manually by hand without excessive force or using electrical means to move the elevator car 102 to a desired position in the hoistway. The gearing also enables the user to move the elevator car 102 to both up and down directions. Because of the gearing rotation velocity of an electric tool may be increased, and the size of an electric motor of the electric tool may be decreased.

[0030] The apparatus 118 may also comprise rotation control means configured to prevent rotation of the wheel 120 when a rotational motion is not applied with the mechanical interface 124. This can be implemented, for example, using a gearing which prevents the rotation of the wheel 120 when the user is not manually rotating the cam by hand or using an electric tool for rotating the wheel 120. Once the user again starts rotating the wheel 120, the gearing allows the rotational motion of the wheel 120.

[0031] Figure 1B presents a simplified and diagrammatic side view of another elevator arrangement. The embodiment illustrated in Figure 1B is similar with the embodiment illustrated in Figure 1A with the exception that an apparatus 132 for operating the elevator car 102 in a service or an emergency situation is connected to the diverting pulley 114 of the elevator system 100. As already disclosed in the embodiment of Figure 1A, the apparatus 132 comprises a wheel 134 configured to be coupled with the diverting pulley 114. When the wheel 134 is rotated, the wheel 134 acts directly on the diverting pulley 114 and the elevator car 102 is caused to move. The apparatus 132 comprises also a mechanical interface 136 configured to provide a rotational motion to the wheel 134 to move the elevator car 102. The mechanical interface 136 may be configured to receive a cam, which when operated by a user, causes rotation of the wheel 134. The user is thus able to manually move the elevator car 102 to a desired position in the elevator hoistway either in up or down direction. Instead of the cam to manually rotate the wheel 134, the mechanical interface 136 be configured to receive a tool for rotating the wheel 134 to move the elevator car. The tool may be an electrical or a battery operated rotation tool, for example, a power drill.

[0032] Further, the wheel 134 may be connected against the rim surface of the diverting pulley 114, and the rim surface is engaged against the belt 112A.

[0033] In one embodiment, the apparatus 132 may be permanently installed into the hoistway, and in a normal operation of the elevator car 102, the apparatus 132 is turned to an idle position when it is not in use. When a maintenance or a rescue situation occurs, a user operating the elevator car 102 turns the apparatus 132 to a use position and positions the apparatus 132 to contact the diverting pulley 114. A hinge or any other means for turning the apparatus 132 to its use position may be arranged into the hoistway. The coupling between the hoistway and the apparatus 132 is arranged such that the apparatus 132 is locked into a fixed position when it is to be used. When the apparatus 132 is locked into the fixed position, it is possible to use the apparatus 132 to move the elevator car 102 to a desired position in the hoistway.

[0034] In one embodiment, the apparatus 132 is a portable apparatus and the user operating the elevator car 102 brings the apparatus 132 with him. The hoistway may comprise a support member or other means for fixedly attaching the portable apparatus 132 to the hoistway. When a maintenance or a rescue situation occurs, a user operating the elevator car 102 puts the portable apparatus 132 to a use position and positions the wheel 134 to contact to the diverting pulley 114. The coupling between the hoistway and the portable apparatus 132 is arranged such that the portable apparatus 132 is locked into a fixed position when it is to be used. When the ap-

paratus 132 is locked into the fixed position, it is possible to use the portable apparatus 132 to move the elevator car 102 to a desired position in the hoistway.

[0035] The apparatus 132 may also comprise brake control means configured to control the release of the brakes of the elevator car before moving the elevator car 102 with the means 136 for providing a rotational motion to the wheel 134. In one embodiment, the apparatus 134 comprises a mechanical switch, which when operated by the user, releases the brakes of the elevator car 102. In another embodiment, the brake control means are automated so that when the user starts to manually or using electric means to provide a rotational motion to the wheel to move the elevator car 102, the brake control means causes an automatic release of the brakes of the elevator car 102. In both embodiments, there may be a mechanical or an electrical connection from the apparatus 132 to a control entity in the elevator system that controls the brakes of the elevator car 102.

[0036] The apparatus 132 may comprise a gearing configured to adapt the movement applied via the mechanical interface 136. The gearing enables the user to manually by hand without excessive force or using electrical means to move the elevator car 102 to a desired position in the hoistway.

[0037] The apparatus 132 may also comprise rotation control means configured to prevent rotation of the wheel 134 when a rotational motion is not applied with the mechanical interface 136. This can be implemented, for example, using a gearing which prevents the rotation of the wheel 134 when the user is not manually rotating the arm or cam by hand or using an electric tool for rotating the wheel 134. Once the user again starts rotating the wheel 134, the gearing allows the rotational motion of the wheel 134.

[0038] Although Figures 1A and 1B illustrate that the elevator arrangement comprises two compensation weights, in another embodiment, it is possible to implement an elevator arrangement using only one compensating weight.

[0039] Figure 2 illustrates an elevator arrangement in which an apparatus 206 for operating the elevator car in a service or an emergency situation is integrated into a machinery bed plate 200.

[0040] The elevator arrangement comprises also at least one or more traction members 204, such as belts. The traction member 204 is configured to transmit the rotational movement of a traction sheave 202 into linear movement of an elevator car and compensating weights. The apparatus 206 comprises a wheel 208 configured to be coupled with the traction member 204. The apparatus 206 may also comprise at least one supporting roller 212 configured to provide support for the wheel 208 when the wheel 208 is connected to the traction member 204.

[0041] When the wheel 208 is rotated, the wheel 208 acts directly on the traction member 204 and the elevator car is caused to move. The apparatus 206 comprises also a mechanical interface 210 configured to provide a rotational motion to the wheel 208 to move the elevator car. The mechanical interface 210 may be configured to receive a cam, which when operated by a user, causes rotation of the wheel 208. The user is thus able to manually move the elevator car to a desired position in the elevator hoistway either in up or down direction.

[0042] The apparatus 206 may also comprise brake control means configured to control the release of the brakes of the elevator car before moving the elevator car with the means 210 for providing a rotational motion to the wheel 208. In one embodiment, the apparatus 208 comprises a mechanical switch, which when operated by the user, releases the brakes of the elevator car. In another embodiment, the brake control means are automated so that when the user starts to manually or using electric means to provide a rotational motion to the wheel 208 to move the elevator car, the brake control means causes an automatic release of the brakes of the elevator car. In both embodiments, there may be a mechanical or an electrical connection from the apparatus 206 to a control entity in the elevator system that controls the brakes of the elevator car.

[0043] The apparatus 206 may comprise a gearing configured to adapt the movement applied via the mechanical interface 210 a rotational motion to the wheel 208. The gearing enables the user to manually by hand without excessive force or using electrical means to move the elevator car to a desired position in the hoistway.

[0044] The apparatus 206 may also comprise rotation control means configured to prevent rotation of the wheel 208 when a rotational motion is not applied with the mechanical interface 210. This can be implemented, for example, using a gearing which prevents the rotation of the wheel 208 when the user is not manually rotating the arm or cam by hand or using an electric tool for rotating the wheel 208. Once the user again starts rotating the wheel 208, the gearing allows the rotational motion of the wheel 208.

[0045] In another embodiment of Figure 2, the apparatus 206 is removably attachable to the machine bed plate 200. The machine bed plate 200 and/or the apparatus 206 may comprise locking means for locking, for example, a bolt, a latch etc., the apparatus 206 in place. When the apparatus 206 is a portable apparatus and the user operating the elevator car brings the apparatus 206 with him, the user operating the elevator car puts the portable apparatus 206 to a use position and positions the traction member 204 between the supporting rollers 212 and the wheel 208. The coupling between the machinery bed plate 200 and the portable apparatus 206 is such that the portable apparatus 206 is locked into a fixed position when it is to be used. When the apparatus 206 is locked into the fixed position, it is possible to use the portable apparatus 118 to move the elevator car to a desired position in the hoistway. Figure 3 is a flow diagram illustrating a method for operating an elevator car of an elevator system. In 300 a service or rescue person connects an apparatus comprising a wheel configured

to be connected to a belt or to a diverting pulley of the elevator system acting on the belt and a mechanical interface configured to provide a rotational motion to the wheel to move the elevator car to the belt or to the diverting pulley. The apparatus itself may be a portable apparatus or an apparatus that is already present in a hoistway comprising the elevator car. The apparatus may be turned away in an idle position, and the service or rescue person positions the apparatus to a use position where the wheel of the apparatus connects to the belt or to the diverting pulley acting on the belt.

[0046] In 302 brakes of the elevator car are released. The service or rescue person may release the brakes manually using a brake release property of the elevator system. In another embodiment, the apparatus may have a connection interface to the elevator system and a separate switch via which the brakes may be released. Yet in another embodiment, the apparatus may have a connection interface to the elevator system and the apparatus controls the brakes to be released automatically when the service or rescue person starts to operate the mechanical interface.

[0047] In 304 the service or rescue person uses the mechanical interface to move the elevator car to a desired location up or down direction. A cam connected to the mechanical interface may be used to move the elevator car. Alternatively, an electric tool, for example, a power drill may be connected to the mechanical interface to move the elevator car. The apparatus may comprise a gearing that enables the service or rescue person to manually by hand to move the elevator car. The apparatus may also comprise rotation control means to prevent rotation of the wheel when a rotational motion is not applied via the mechanical interface.

[0048] One or more of the above examples and embodiments enable with the disclosed apparatus a movement of an elevator car both to up and down direction not depending of the loading condition of the elevator car. Further, one or more of the above examples and embodiments enable a solution where the elevator car may be manually or using electric means moved to a desired location in a hoistway.

[0049] While there have been shown and described and pointed out fundamental novel features as applied to preferred embodiments thereof, it will be understood that various omissions and substitutions and changes in the form and details of the devices and methods described may be made by those skilled in the art without departing from the spirit of the disclosure. For example, it is expressly intended that all combinations of those elements and/or method steps which perform substantially the same function in substantially the same way to achieve the same results are within the scope of the disclosure. Moreover, it should be recognized that structures and/or elements and/or method steps shown and/or described in connection with any disclosed form or embodiments may be incorporated in any other disclosed or described or suggested form or embodiment as a general matter of design choice. Furthermore, in the claims means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents, but also equivalent structures.

[0050] The applicant hereby discloses in isolation each individual feature described herein and any combination of two or more such features, to the extent that such features or combinations are capable of being carried out based on the present specification as a whole, in the light of the common general knowledge of a person skilled in the art, irrespective of whether such features or combinations of features solve any problems disclosed herein, and without limitation to the scope of the claims. The applicant indicates that the disclosed aspects/embodiments may consist of any such individual feature or combination of features. In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the disclosure.

Claims

1. An apparatus for operating an elevator car of an elevator system, the elevator car being driven by a belt, the apparatus comprising:

   a wheel configured to be connected to the belt or to a diverting pulley of the elevator system acting on the belt; and
   a mechanical interface configured to provide a rotational motion to the wheel to move the elevator car.

2. The apparatus of claim 1, wherein the belt is a cogged belt and the wheel is a cogged belt pulley.

3. The apparatus of claim 2, wherein the mechanical interface is configured to receive a cam for manually rotating the wheel to move the elevator car.

4. The apparatus of claim 2, wherein the mechanical interface is configured to receive an electric tool for rotating the wheel to move the elevator car.

5. The apparatus of any of claims 1 - 4, comprising brake control means configured to control the release of the brakes of the elevator car before moving the elevator car with the mechanical interface.

6. The apparatus of any of claims 1 - 5, comprising at least one supporting roller configured to provide support for the wheel when the wheel is connected to the belt.

7. The apparatus of any of claims 1 - 6, comprising a gearing configured to adapt the movement applied

via the mechanical interface.

8. The apparatus of any of claims 1 - 7, comprising rotation control means configured to prevent rotation of the wheel when a rotational motion is not applied with the mechanical interface.

9. The apparatus of any of claims 1 - 8, wherein the apparatus is a portable apparatus.

10. An elevator system comprising an apparatus according to any of claims 1 - 9.

11. The elevator system of claim 10, comprising a separate hoisting machine for driving the elevator car.

12. A method for operating an elevator car of an elevator system, the method comprising:

connecting an apparatus according to any of claims 1 - 9 to a belt used to drive the elevator car or to a diverting pulley diverting the belt;
releasing brakes of the elevator car; and
using the mechanical interface to move the elevator car to a desired location.

13. The method according to claim 12, comprising:

connecting a cam to the mechanical interface; and
moving the elevator car by manually operating the cam to provide a rotational motion to the wheel.

14. The method according to claim 12, comprising:

connecting an electrical tool to the mechanical interface; and
moving the elevator car by using the electrical tool to provide a rotational motion to the wheel.

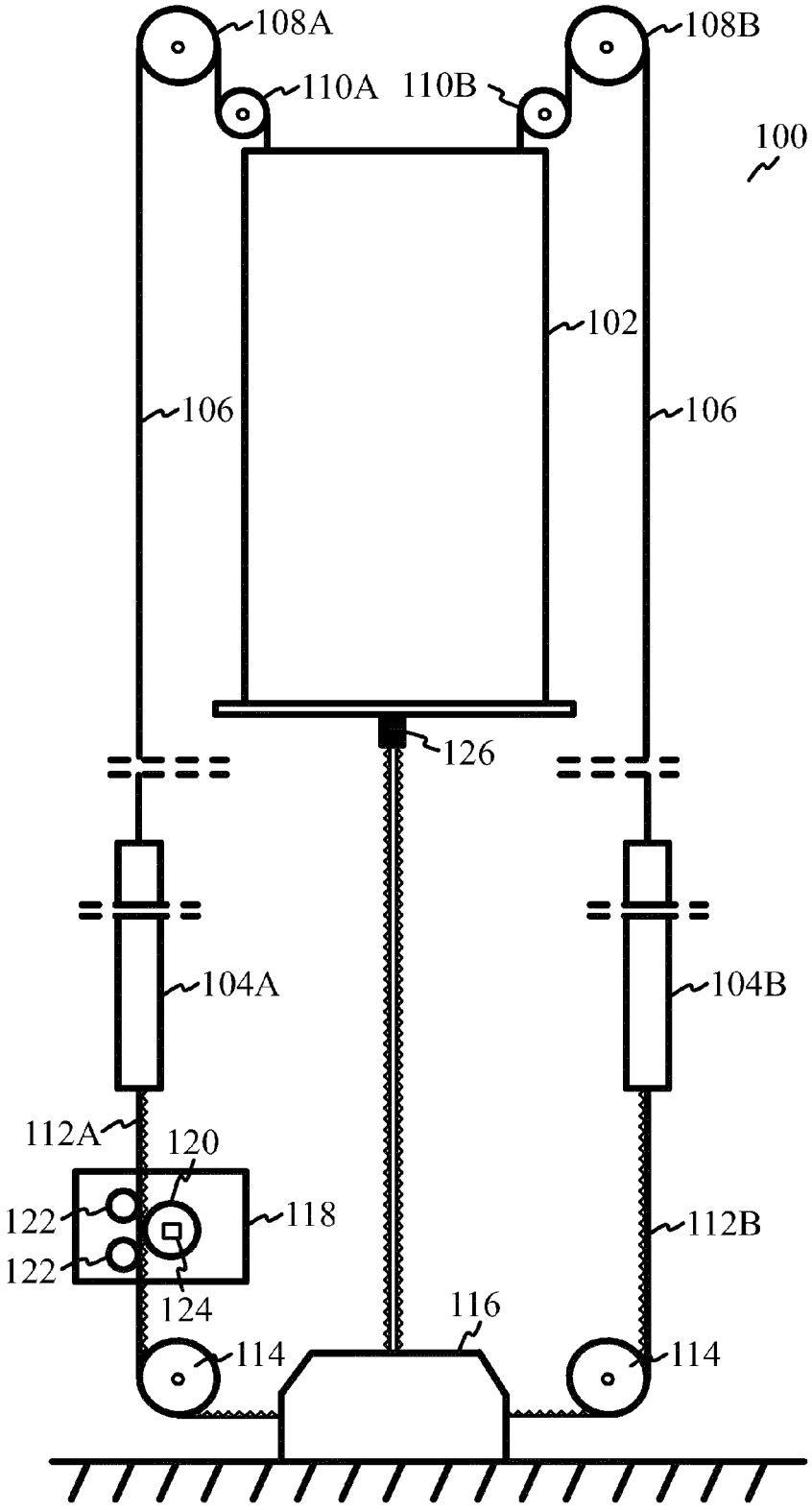
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FIG. 1A

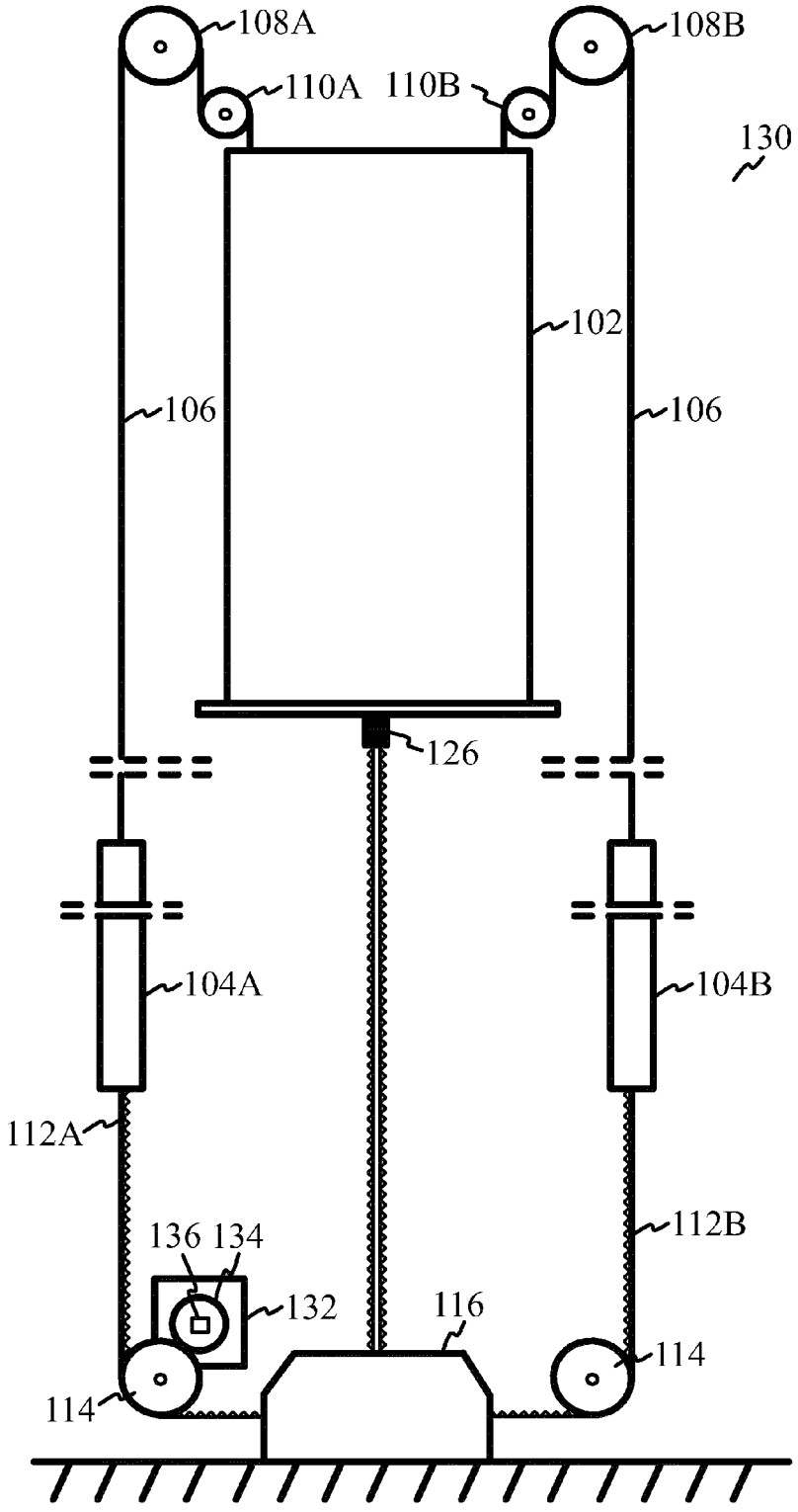
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FIG. 1B

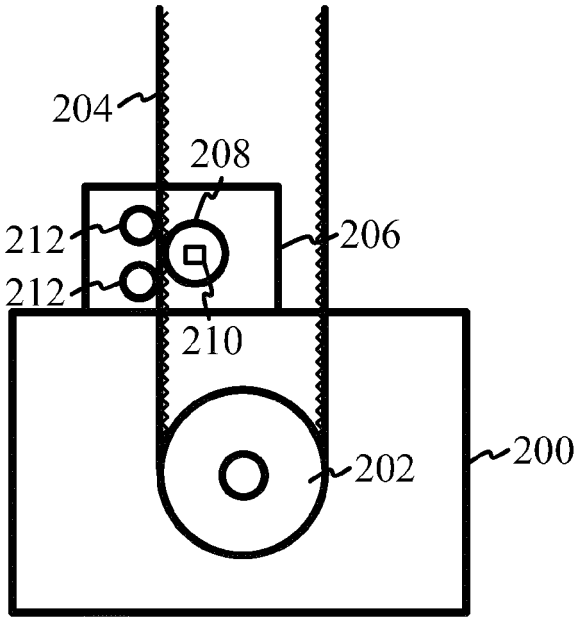
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FIG. 2

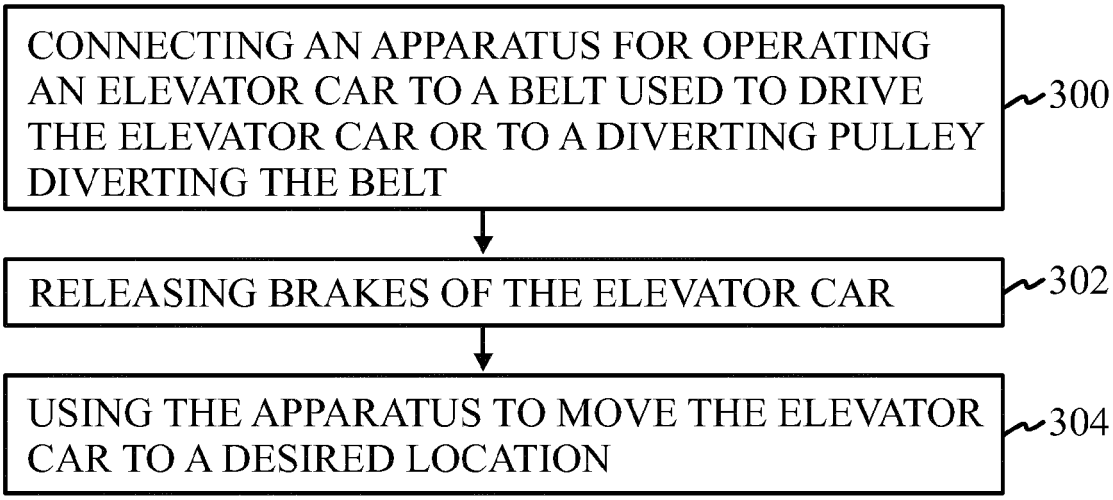
CONNECTING AN APPARATUS FOR OPERATING AN ELEVATOR CAR TO A BELT USED TO DRIVE THE ELEVATOR CAR OR TO A DIVERTING PULLEY DIVERTING THE BELT
300
RELEASING BRAKES OF THE ELEVATOR CAR
302
USING THE APPARATUS TO MOVE THE ELEVATOR CAR TO A DESIRED LOCATION
304

FIG. 3

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 15 19 1692

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	JP 2012 121699 A (MEIDENSHA ELECTRIC MFG CO LTD) 28 June 2012 (2012-06-28) * paragraph [0018]; figures 2,3 *	1-7,10	INV. B66B5/02
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Y	US 2013/056305 A1 (SANCHEZ JOSE LUIS BLANCO [ES] ET AL) 7 March 2013 (2013-03-07) * abstract; figures 1-7 *	1-8,10	
A	CA 2 342 457 A1 (INVENTIO AG [CH]) 30 September 2001 (2001-09-30) * abstract; figures 1-2 *	1-14	
A	EP 2 457 862 A2 (CHEN YUNG-HSIN [TW]) 30 May 2012 (2012-05-30) * abstract; figures 1-6 *	1-14	
			TECHNICAL FIELDS SEARCHED (IPC) B66B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 May 2016	Lenoir, Xavier

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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L : document cited for other reasons

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 19 1692

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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03-05-2016

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