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(54) **Elevator car guide rail rollers for engaging elevator guide rails**

(57) The invention relates to an elevator and a method for replacing guide rail guiding devices of an elevator. The elevator shaft of the elevator has guide rails on opposite sides of the elevator shaft. The guide rails are engaged with guide rail guiding devices mounted on both sides of the elevator car that limit the transverse movement of the elevator car between the guide rails. The

guide rail guiding devices comprise two coplanar wheels having a wheel portion and a flange portion. The wheel portions rollably engage both flanks of a guide rail web from both sides of the web. The flank portions on guide rail guiding devices on both sides of the elevator car serve to restrict the transverse movement of the elevator car in the direction between the guide rails.

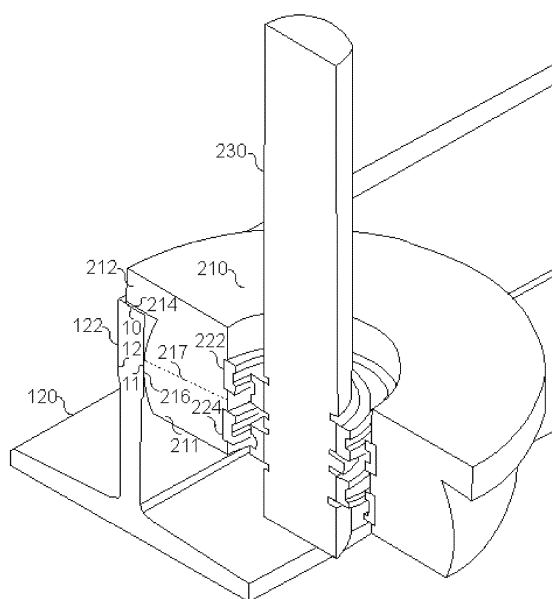


FIG. 2A

Description

BACKGROUND OF THE INVENTION

Field of the invention:

[0001] The invention relates to elevators, elevator guide rails elevator guide rollers for engaging elevator guide rails, and a method for replacing elevator car guide rail rollers.

Description of the Related Art:

[0002] Elevator shafts are equipped with guide rails that extend longitudinally along the elevator shaft. The guide rails are installed on opposite sides of the elevator shaft. The guide rails may not be installed to the sides of the elevator shaft where the elevator car and landing doors open. The purpose of the guide rails is to control the movement of the elevator car in horizontal directions when the elevator car is hoisted vertically in the elevator shaft. Elevator cars are equipped with guide rail rollers that engage the guide rails when the elevator car is driven along the elevator shaft. The guide rails are T-beams or T-bars having thereby a T-shaped profile, that is, cross section. The guide rails have a flange and a web. The web may also be referred to as a nose portion. The webs of the guide rails are arranged to face each other. The distance between the guide rails should remain constant throughout the height of the elevator shaft. In practice, there may be some variation. In the elevator shafts the flat surface of the flange is fixed to face a wall of the elevator shaft.

[0003] In prior art a guide rail web of a single guide rail is engaged by rollers from the three horizontal directions available on the guide rail web. The three guide rail web surfaces are engaged by three rollers. The axes of these rollers are perpendicular to the longitudinal axes of the guide rails. One of the three rollers engages a surface of the guide rail web that faces an equivalent guide rail web surface on the opposite side of the elevator shaft. Two of the three rollers engage opposite sides of a single guide rail web. These opposite sides of the guide rail web are adjacent to the flange.

[0004] A problem associated with the rollers that face the opposing surfaces of the two guide rail webs is that these rollers take a significant space from the elevator car in the direction perpendicular to the guide rails. It is not possible to solve the problem by simply reducing the wheel size of these rollers, because that would increase rolling resistance. If the rollers are mounted above or below the elevator car in a separate frame of the elevator car, the frame and the rollers take a significant vertical space from the elevator shaft. There may be limited vertical space available in the elevator shaft pit and headroom. The vertical space above the landing doors of the highest floor may already be limited due to elevator traction sheave and motor mounting. In prior art the problem

has been solved by replacing the rollers that face the opposing surfaces of the two guide rail webs with sliding pieces covered with a low-friction material such as plastic. The sliding pieces may be repeatedly lubricated. A problem with the lubrication is that the lubricant must be repeatedly added. Additionally, the use of a lubricant oil leads to accumulation of spilled lubricant in the elevator shaft, which must be cleaned periodically. A further problem is that lubricant oils may not be used in places such as hospitals where hygiene is a significant factor. Without lubrication the sliding pieces may cause noise. A further problem with the use of sliding pieces is the requirement for precise installation of the opposing guide rails to have a constant distance between the guide rail webs along the length of the elevator shaft.

[0005] Therefore, it would be beneficial to have a solution which solves the aforementioned problems.

SUMMARY OF THE INVENTION:

[0006] According to an aspect of the invention, the invention is an elevator, comprising: a first guide rail on a first side of an elevator shaft; a second guide rail on a second opposite side of the elevator shaft; and an elevator car comprising a first mount on a first side of the elevator car facing the first side of the elevator shaft and a second mount on a second side of the elevator car facing the second side of the elevator shaft, at least two first rollers being rollably mounted on the first mount through axes perpendicular to the first side of the elevator car, the at least two first rollers being mounted on separate sides of the first guide rail and rollably engaging opposite flanks of a web of the first guide rail, at least two second rollers being rollably mounted on the second mount through axes perpendicular to the second side of the elevator car, the at least two second rollers being mounted on different sides of the second guide rail and rollably engaging opposite flanks of a web of the second guide rail, wherein each of the at least two first rollers and the at least two second rollers comprise a wheel portion and a flange portion, the respective flange portions being arranged to face away from the respective first guide rail and the second guide rail, the flange portion having a diameter larger than the wheel portion in order to prevent a transverse or horizontal movement of the elevator car in the direction between the first guide rail and the second guide rail.

[0007] According to a further aspect of the invention, the invention is a method for replacing an elevator car guide rail guiding devices from an elevator comprising an elevator car and a first guide rail on a first side of an elevator shaft and a second guide rail on a second opposite side of the elevator shaft. The method comprises: removing elevator guide rail guiding devices from a first side of an elevator car facing the first side of the elevator shaft and a second side of the elevator car facing the second side of the elevator car, the guiding devices comprising sliding pieces arranged to slide along mutually

opposing surfaces of guide rail webs; removing lubricant supply devices associated with the elevator guide rail guiding devices; installing a first mount on a first side of the elevator car facing the first side of the elevator shaft, at least two first rollers being rollably mounted on the first mount through axes perpendicular to the first side of the elevator car, the at least two first rollers being mounted on separate sides of the first guide rail and rollably engaging opposite flanks of a web of the first guide rail; and installing a second mount on the second side of the elevator car facing the second side of the elevator shaft, at least two second rollers being rollably mounted on the second mount through axes perpendicular to the second side of the elevator car, the at least two second rollers being mounted on separate sides of the second guide rail and rollably engaging opposite flanks of a web of the second guide rail, wherein each of the at least two first rollers and the at least two second rollers comprise a wheel portion and a flange portion, the respective flange portions being arranged to face away from the respective first guide rail and the second guide rail, the flange portion having a diameter larger than the wheel portion in order to prevent a transverse movement of the elevator car between the first guide rail and the second guide rail.

[0008] According to a further aspect of the invention, the invention is an elevator. An elevator shaft of the elevator has guide rails on opposite sides of the elevator shaft. The guide rails are engaged with guide rail guiding devices mounted on both sides of the elevator car on same height with respect to elevator car. The guide rail guiding devices comprise two coplanar rollers having a wheel portion and a flange portion. The wheel portions rollably engage both flanks of a guide rail web from both sides of the web. The flank portions on guide rail guiding devices on both sides of the elevator car serve to restrict the transverse movement of the elevator car in the direction between the guide rails.

[0009] In one embodiment of the invention, the elevator car may also be referred to as elevator cage. The elevator car may be elevator cage.

[0010] In one embodiment of the invention, before the removal of elevator car guide rail guiding devices, the guide rails are removed from a length in the elevator shaft, which may permit removal and replacing of guide rail guiding devices. The elevator car is lowered or hoisted to the length in the elevator shaft to allow the replacing.

[0011] In one embodiment of the invention, the removal of the elevator car guide rail guiding devices is performed from the inside of the elevator car, for example, by removing a wall panel behind which a guide rail guiding device is located.

[0012] In one embodiment of the invention, the axes of the first mount comprise respective springs allowing a restricted movement of the at least two first rollers in a direction perpendicular to the first side of the elevator car and the axes of the second mount comprises respective springs allowing a restricted movement of the at least two second rollers in a direction perpendicular to the sec-

ond side of the elevator car.

[0013] In one embodiment of the invention, the first mount comprises at least one spring allowing a restricted movement of the at least two first rollers in a direction perpendicular to the first side of the elevator car and the second mount comprises at least one spring allowing a restricted movement of the at least two second rollers in a direction perpendicular to the second side of the elevator car.

[0014] In one embodiment of the invention, the wheel portion has a rounded profile rollably engaging a flank of the guide rail web.

[0015] In one embodiment of the invention, the wheel portion has a straight profile rollably engaging a flank of the guide rail web.

[0016] In one embodiment of the invention, the first mount and the second mount are arranged at same height with respect to the elevator car.

[0017] In one embodiment of the invention, the first mount and the second mount are arranged on the elevator car above a floor level of the elevator car floor and below a roof level of the elevator car.

[0018] In one embodiment of the invention, the first mount and the second mount are arranged on an upper portion of the elevator car.

[0019] In one embodiment of the invention, a third mount similar to the first mount is arranged on a lower portion of the elevator car on the first side of the elevator car and a fourth mount similar to the second mount is arranged on a lower portion of the elevator car on the second side of the elevator car.

[0020] In one embodiment of the invention, the first mount, the second mount, the third mount and the fourth mount are arranged on the elevator car above a floor level of the elevator car floor and below a roof level of the elevator car.

[0021] In one embodiment of the invention, the flange portion has a radius that exceeds the maximum radius of the wheel portion by a length that is equal to or larger than the width of guide rail web.

[0022] In one embodiment of the invention, the flange portion has a radius that exceeds the maximum radius of the wheel portion by a length that is equal to or larger than half of the width of guide rail web.

[0023] The embodiments of the invention described herein may be used in any combination with each other. Several or at least two of the embodiments may be combined together to form a further embodiment of the invention. A method and an elevator to which the invention is related may comprise at least one of the embodiments of the invention described hereinbefore.

[0024] It is to be understood that any of the above embodiments or modifications can be applied singly or in combination to the respective aspects to which they refer, unless they are explicitly stated as excluding alternatives.

[0025] The benefits of the invention are related to improved elevator riding comfort, reduced oil leakage to elevator shaft and increased elevator car interior space.

BRIEF DESCRIPTION OF THE DRAWINGS:

[0026] 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:

Fig. 1A illustrates an elevator car having guide rollers that engage two guide rails in one embodiment of the invention;

Fig. 1B illustrates two guide rollers mounted at different heights engaging a guide rail in one embodiment of the invention;

Fig. 2A illustrates a cross section of a guide roller engaging a guide rail in one embodiment of the invention, wherein the guide roller has a rounded surface engaging the web of the guide rail;

Fig. 2B illustrates a cross section of a guide roller engaging a guide rail in one embodiment of the invention, wherein the guide roller has a straight surface engaging the web of the guide rail;

Fig. 3A illustrates a cross section of a guide roller having a rounded surface engaging the web of a guide rail in one embodiment of the invention;

Fig. 3B illustrates a cross section of a guide roller having a straight surface engaging the web of a guide rail in one embodiment of the invention;

Fig. 4 is a flow chart illustrating a method for replacing an elevator car guide rail guiding devices from an elevator comprising an elevator car and a first guide rail on a first side of an elevator shaft and a second guide rail on a second opposite side of the elevator shaft in one embodiment of the invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS:

[0027] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0028] Figure 1A illustrates an elevator car having guide rollers that engage two guide rails in one embodiment of the invention.

[0029] In Figure 1 there is illustrated an elevator car 110 and a guide rail 120, 122. Elevator car 110 is driven vertically in an elevator shaft (not shown). Elevator car 110 is illustrated as viewed from a guide rail so that only the other guide rail 120, 122 behind elevator car 110 is shown so that elevator car 110 is illustrated as transparent. Elevator car 110 is illustrated as viewed from the side in an upper portion of Figure 1A, as indicated with label "SIDE".

[0030] Elevator car 110 is also illustrated in a lower portion of drawing labelled "FRONT" as rotated 90 degrees clockwise about a longitudinal axis at the center of the elevator shaft so that the guide rails are illustrated on both side of elevator car 110. This view of elevator

car 110 corresponds to a view of a person entering elevator car 110, for example. In Figure 1 there is illustrated a guide rail flange 120 and a guide rail web 122. Guide rail web 122 may be referred to as a guide rail nose 122.

The guide rail runs longitudinally a length in the elevator shaft. Guide rail flange 120 is secured to a wall or a supporting structure of the elevator shaft so that the surface of flange 120 that does not have the protruding web faces the wall of the elevator shaft or a supporting structure of the elevator shaft. There is also a similar guide rail on the opposing side of the elevator shaft. This second guide rail has also a flange 124 and a guide rail web 126.

[0031] To an upper portion of elevator car 110, below a roof of elevator car 110 or a highest point of elevator car 110, there is fixed a roller mount 130 to which is mounted a roller axis 141 and a roller axis 151 protruding perpendicularly from roller mount 130 in a direction away from elevator car 110. To a lower portion of elevator car 110, above a floor of elevator car 110 or a lowest point of elevator car 110, there is fixed a roller mount 132 to which is mounted a roller axis 161 and a roller axis 171 protruding perpendicularly from roller mount 132 in a direction away from elevator car 110. Roller mounts 130 and 132 are illustrated in Figure 1A as transparent even though roller mount 130 and 132 may be, for example, a metal plate or metal framework and thus not transparent. Roller mounts 130 and 132 may have a surface facing a wall of elevator car 110 that is parallel to a plane formed by the wall of elevator car 110. Roller axes 141, 151, 161 and 171 are perpendicular to a plane formed by the side of elevator car 110 to which mounts 130 and 132 are fixed. Roller mounts 130 and 132 may be parallel to the plane formed by the side of elevator car 110. Roller axis 141 is mounted below roller axis 151 as well as roller axis 161 is mounted below roller axis 171. Roller axis 141 and roller axis 151 are mounted on mount 130 to be on different sides of guide rail web 122 when elevator car 110 is suspended in the elevator shaft and elevator car 110 is viewed from the side of guide rail web 126, that is, from the other side of elevator car in relation to guide rail web 122. Similarly, roller axis 161 and roller axis 171 are mounted on mount 132 to be on different sides of guide rail web 122 when elevator car 110 is suspended in the elevator shaft and elevator car 110 is viewed from the side of guide rail web 126. Roller axis 151 is mounted on mount 130 above roller axis 141. Similarly, roller axis 171 is mounted on mount 132 above roller axis 161. To roller axes 141, 151, 161 and 171 are rotatably mounted rollers 140, 150, 160 and 170, respectively. On the other side of elevator car 110 in relation to rollers 140, 150, 160 and 170 there are similar respective rollers 140L, 150L, 160L and 170L rotatably mounted via respective axes to upper and lower mounts similar to roller mounts 130 and 132, respectively. Roller 140 has a surface 144 which rollably engages a surface of guide rail web 122 adjacent to guide rail flange 120.

[0032] Roller 140 also has roller flange 142 which is coaxial with roller 140. The diameter of flange 142 is larg-

er than the diameter of the rest of roller 140. Flange 142 has a surface that engages a surface of guide rail web 122 which faces guide rail web 126 on the other side of elevator shaft, assuming for illustrative purposes that elevator car 110 is in position in the elevator shaft. Roller 150 has a surface 154 which rollably engages a surface of guide rail web 122 adjacent to guide rail flange 120. Surface 154 rollably engages a surface of guide rail web 122 opposite to the surface of guide rail web 122 that surface 144 of roller 142 rollably engages. Roller 150 also has roller flange 152 which is coaxial with roller 150. The diameter of flange 152 is larger than the diameter of the rest of roller 150. Flange 152 has a surface that engages a surface of guide rail web 122 which faces guide rail web 126 on the other side of elevator shaft, assuming for illustrative purposes that elevator car 110 is in position in the elevator shaft. The radii of flanges 142 and 152 may exceed the largest radii of rest of rollers 140 and 150 by at least 25% of the width of guide rail web 122. Axis 151 is rotatably mounted above axis 141 so that respective flanges 152 and 142 do not come in contact with each other.

[0033] Similarly, rollers 160 and 170 have flanges respectively similar to flanges 142 and 152. Similarly, rollers 150L, 140L, 170L and 160L have similar flanges as respective opposite side rollers 150, 140, 170 and 160.

[0034] The purpose of flanges 142 and 152 is to prevent a transverse movement of elevator car 110 toward guide rail flange 120. Similar flanges in rollers 140L and 150L together with flanges 142 and 152 minimize a transverse movement of elevator car 110 between guide rail web 122 and guide rail web 126. Flanges 142 and 152 engage the surface of guide rail web 122 which faces guide rail web 126 so that flanges 142 and 152 rotate about respective axes 141 and 151. Therefore, the surfaces of flanges 142 and 152 are in motion with respect to the surface of guide rail web 122 engaged. Therefore, the friction is reduced compared to a fixed sliding piece or member arranged to restrict transverse movement of elevator car 110.

[0035] Line 190 illustrated in Figure 1A illustrates that illustration of elevator car 110 labelled "SIDE" must be rotated 90 degrees clockwise about the vertical axis to arrive at the illustration of elevator car 110 labelled "FRONT". The number of rollers and mounts may vary in different embodiments of the invention. There may be a different number of rollers arranged on a mount. Similarly, the position of mounts 130 and 132 may vary.

[0036] In one embodiment of the invention, the mutual vertical positions of rollers 140 and 150 on mount 130 may be switched so that roller 140 is rotatably mounted on mount 130 above roller 150. Similarly, the mutual vertical positions of rollers 160 and 170 on mount 132 may be switched so that roller 160 is rotatably mounted on mount 130 above roller 170. The same concerns also rollers on the other side of elevator car 110.

[0037] Figure 1B illustrates guide roller 140 and 150 according to Figure 1A mounted at different heights with

respect to elevator car 110. Guide rollers 140 and 150 engage a guide rail. Roller mount 130 to which roller axes 141 and 151 are mounted is not shown in Figure 1B, but it may be seen as transparent for the purposes of illustration. The circumference of a wheel portion of roller 140 rollably engaging a surface of guide rail web 122 adjacent to guide rail flange 120 is illustrated with dashed line 144. Similarly, the circumference of a portion of roller 150 rollably engaging a surface of guide rail web 122 adjacent to guide rail flange 120 is illustrated with dashed line 154. In Figure 1B flange 142 has a radius that exceeds the maximum radius of the rest of roller 140 by a length L that is equal or larger than the width W of guide rail web 122. Roller 150 may be similar to roller 140 in Figure 2B with this respect.

[0038] The embodiments of the invention described hereinbefore in association with the summary of the invention and Figures 1A and 1B may be used in any combination with each other. At least two of the embodiments may be combined together to form a further embodiment of the invention.

[0039] Figure 2A illustrates a cross section of a guide roller engaging a guide rail in one embodiment of the invention, wherein the guide roller has a rounded surface engaging the web of the guide rail.

[0040] In Figure 2A there is illustrated a guide rail comprising a flange 120 and a web 122 or a nose 122. Guide rail web 122 has a surface 10 that faces the guide rail web on the other side of the elevator shaft, when the guide rails are installed in an elevator shaft. The guide rail has a flank 11 or a side 11 adjacent to flange 120. There is also another flank 12 or surface 12 adjacent to flange 120. The guide rails are assumed to be installed to the wall or other supporting structure of the elevator shaft so that the surfaces of flanges such as flange 120 not having a web such as web 122 face the elevator shaft wall or the supporting structure in the elevator shaft. In Figure 2A there is illustrated a roller 210. Roller is rotatably mounted to a shaft or axis 230, for example, using bearings 222 and 224 which may comprise ball bearings (not shown). Roller 210 has a flange portion 212 and a wheel portion 211. The flange portion 212 may be referred to as flange 212 and the wheel portion may be referred to as wheel 211 in short. In a cross section of wheel 211 along axis 230, wheel 211 has a rounded profile. The rounded profile acts as a contact surface 216 which rollably engages side 11 of guide rail web 122. The profile of wheel 211 may have the form of a segment of a circle, where the origin of the circle is outside the segment. Thus, diameter of wheel 211 is largest at a centerline 217 of wheel 211. Centerline 217 may be seen to be transverse to the axis 230. The diameter of wheel 211 reduces when moving axially along axis 230 toward the side of wheel 211 adjacent to flange 212. Similarly, the diameter of wheel 211 reduces when moving axially along axis 230 toward the side of wheel 211 facing flange 120 of the guide rail.

[0041] Figure 2B illustrates a cross section of a guide

roller engaging a guide rail web in one embodiment of the invention, wherein the guide roller has a straight surface engaging the web of the guide rail.

[0042] In Figure 2B there is illustrated the guide rail of Figure 2A comprising flange 120 and web 122 or nose 122. Guide rail web 122 has surface 10 to face the guide rail web on the other side of the elevator shaft, when the guide rails are installed in an elevator shaft. The guide rail has a surface 11 adjacent to flange 120. There is also another surface 12 adjacent to flange 120. The guide rails are assumed to be installed to the wall or other supporting structure of the elevator shaft so that the surfaces of flanges such as flange 120 not having a web such as web 122 face the elevator shaft wall or the supporting structure in the elevator shaft. In Figure 2A there is illustrated a roller 250. Roller is rotatably mounted to a shaft or axis 230, for example, using bearings 222 and 224 which may comprise ball bearings (not shown). The bearings may be similar to bearings in Figure 2A. Roller 250 has a flange portion 252 and a wheel portion 251. The flange portion 252 may be referred to as flange 252 and the wheel portion may be referred to as wheel 251 in short. In a cross section of wheel 251 along axis 230, wheel 251 has a straight profile 254 in contrast to Figure 2A. Straight profile 254 acts as a contact surface 254 which rollably engages flank 11 of guide rail web 122.

[0043] Figure 3A illustrates a cross section of a guide roller having a rounded surface engaging the web of a guide rail in one embodiment of the invention.

[0044] In Figure 3A there is illustrated a two-dimensional cross section of guide roller having a rounded surface according to Figure 2A.

[0045] Figure 3B illustrates a cross section of a guide roller having a straight surface engaging the web of a guide rail in one embodiment of the invention.

[0046] In Figure 3A there is illustrated a two-dimensional cross section of guide roller having a straight surface according to Figure 2B.

[0047] In Figures 3A and 3B there is illustrated at least one spring 232 incorporated to axis 230 which allows movement of either roller 210 or roller 250 along direction of axis 230 between an expanded position and a compressed position. Spring 232 may be, for example, a cup spring. The at least one spring 232 allows some degree of imperfection in the installation of guide rails in elevator shaft so that a distance between surface 214 of flange 212, or between surface 254 of flange 252, and a corresponding surface of a similar flange on the other side of elevator car 110 does not have to exactly match the distance between mutually opposite guide rail web surfaces on two respective sides of the elevator shaft. If the distances between the mutually opposing web surfaces in the elevator shaft exceed the distance between surfaces 214 or surfaces 254 on opposite sides of elevator car 110 at some lengths, this would allow a transverse movement of elevator car 110 between guide rails at these lengths. However, with the introduction of the least one spring 232 in each respective roller axis in elevator car

110, the transverse movement of elevator car 110 may be inhibited if the distances between surfaces 214, or surfaces 254, on opposite sides of elevator car 110 exceed or equal to the distances between mutually opposing web surfaces in the elevator shaft.

[0048] Figure 4 is a flow chart illustrating a method for replacing an elevator car guide rail guiding devices from an elevator comprising an elevator car and a first guide rail on a first side of an elevator shaft and a second guide rail on a second opposite side of the elevator shaft in one embodiment of the invention.

[0049] At step 400 elevator guide rail guiding devices are removed from a first side of an elevator car facing the first side of the elevator shaft and from a second side of the elevator car facing the second side of the elevator shaft, the guiding devices comprising sliding pieces arranged to slide along mutually opposing surfaces of guide rail webs.

[0050] At step 402 lubricant supply devices supplying lubricant for the sliding pieces of the elevator guide rail guiding devices are removed.

[0051] At step 404 a first mount is installed on a first side of the elevator car facing the first side of the elevator shaft, at least two first rollers being rollably mounted on the first mount through axes perpendicular to the first side of the elevator car, the at least two first rollers being mounted on separate sides of the first guide rail and rollably engaging opposite flanks of a web of the first guide rail.

[0052] At step 406 a second mount is installed on the second side of the elevator car facing the second side of the elevator shaft, at least two second rollers being rollably mounted on the second mount through axes perpendicular to the second side of the elevator car, the at least two second rollers being mounted on separate sides of the second guide rail and rollably engaging opposite flanks of a web of the second guide rail, wherein each of the at least two first rollers and the at least two second rollers comprise a wheel portion and a flange portion, the respective flange portions being arranged to face away from the respective first guide rail and the second guide rail, the flange portion having a diameter larger than the wheel portion in order to prevent a transverse movement of the elevator car between the first guide rail and the second guide rail.

[0053] Thereupon, the method is finished. The method steps may be performed in the order of the numbering of the steps.

[0054] The embodiments of the invention described hereinbefore in association with Figures 1A, 1B, 2A, 2B, 3A, 3B and 4 or the summary of the invention may be used in any combination with each other. Several of the embodiments may be combined together to form a further embodiment of the invention.

[0055] All or a portion of the exemplary embodiments can be implemented by the preparation of one or more application-specific integrated circuits or by interconnecting an appropriate network of conventional component

circuits, as will be appreciated by those skilled in the electrical art(s).

[0056] While the present inventions have been described in connection with a number of exemplary embodiments, and implementations, the present inventions are not so limited, but rather cover various modifications, and equivalent arrangements, which fall within the purview of prospective claims.

[0057] The embodiments of the invention described hereinbefore in association with the figures presented and the summary of the invention may be used in any combination with each other. At least two of the embodiments may be combined together to form a further embodiment of the invention.

[0058] It is obvious to a person skilled in the art that with the advancement of technology, the basic idea of the invention may be implemented in various ways. The invention and its embodiments are thus not limited to the examples described above; instead they may vary within the scope of the claims.

Claims

1. An elevator, comprising:

a first guide rail on a first side of an elevator shaft;
a second guide rail on a second opposite side of the elevator shaft; and
an elevator car comprising a first mount on a first side of the elevator car facing the first side of the elevator shaft and a second mount on a second side of the elevator car facing the second side of the elevator shaft, at least two first rollers being rollably mounted on the first mount through axes perpendicular to the first side of the elevator car, the at least two first rollers being mounted on separate sides of the first guide rail and rollably engaging opposite flanks of a web of the first guide rail, at least two second rollers being rollably mounted on the second mount through axes perpendicular to the second side of the elevator car, the at least two second rollers being mounted on different sides of the second guide rail and rollably engaging opposite flanks of a web of the second guide rail, wherein each of the at least two first rollers and the at least two second rollers comprise a wheel portion and a flange portion, the respective flange portions being arranged to face away from the respective first guide rail and the second guide rail, the flange portion having a diameter larger than the wheel portion in order to prevent a transverse movement of the elevator car in the direction between the first guide rail and the second guide rail.

2. The elevator according to claim 1, wherein the axes

of the first mount comprise respective springs allowing a restricted movement of the at least two first rollers in a direction perpendicular to the first side of the elevator car and the axes of the second mount comprises respective springs allowing a restricted movement of the at least two second rollers in a direction perpendicular to the second side of the elevator car.

3. The elevator according to claim 1, wherein the first mount comprises at least one spring allowing a restricted movement of the at least two first rollers in a direction perpendicular to the first side of the elevator car and the second mount comprises at least one spring allowing a restricted movement of the at least two second rollers in a direction perpendicular to the second side of the elevator car.

4. The elevator according to any of the claims 1 - 3, wherein the wheel portion has a rounded profile rollably engaging a flank of the guide rail web.

5. The elevator according to any of the claims 1 - 3, wherein the wheel portion has a straight profile rollably engaging a flank of the guide rail web.

6. The elevator according to any of the claims 1 - 5, wherein the first mount and the second mount are arranged at same height with respect to the elevator car.

7. The elevator according to claim any of the claims 1 - 6, wherein the first mount and the second mount are arranged on the elevator car above a floor level of the elevator car and below a roof level of the elevator car.

8. The elevator according to claim 7, wherein a third mount similar to the first mount is arranged on a lower portion of the elevator car on the first side of the elevator car and a fourth mount similar to the second mount is arranged on a lower portion of the elevator car on the second side of the elevator car.

9. The elevator according to claim 7, wherein the first mount, the second mount, the third mount and the fourth mount are arranged on the elevator car above a floor level of the elevator car and below a roof level of the elevator car.

10. The elevator according to any of the claims 1 - 9, wherein the first mount and the second mount are arranged on an upper portion of the elevator car.

11. The elevator according to any of the claims 1 - 10, wherein the flange portion has a radius that exceeds the maximum radius of the wheel portion by a length that is equal to or larger than the width of guide rail

web.

12. The elevator according to any of the claims 1 - 10, wherein the flange portion has a radius that exceeds the maximum radius of the wheel portion by a length that is equal to or larger than half of the width of guide rail web. 5
13. A method for replacing an elevator car guide rail guiding devices from an elevator comprising an elevator car and a first guide rail on a first side of an elevator shaft and a second guide rail on a second opposite side of the elevator shaft, the method comprising: 10
- removing elevator guide rail guiding devices from a first side of an elevator car facing the first side of the elevator shaft and a second side of the elevator car facing the second side of the elevator car, the guiding devices comprising sliding pieces arranged to slide along mutually opposing surfaces of guide rail webs; 15 20
- removing lubricant supply devices supplying lubricant for the sliding pieces of the elevator guide rail guiding devices;
- installing a first mount on a first side of the elevator car facing the first side of the elevator shaft, at least two first rollers being rollably mounted on the first mount through axes perpendicular to the first side of the elevator car, the at least two first rollers being mounted on separate sides of the first guide rail and rollably engaging opposite flanks of a web of the first guide rail; and 25 30
- installing a second mount on the second side of the elevator car facing the second side of the elevator shaft, at least two second rollers being rollably mounted on the second mount through axes perpendicular to the second side of the elevator car, the at least two second rollers being mounted on separate sides of the second guide rail and rollably engaging opposite flanks of a web of the second guide rail, wherein each of the at least two first rollers and the at least two second rollers comprise a wheel portion and a flange portion, the respective flange portions being arranged to face away from the respective first guide rail and the second guide rail, the flange portion having a diameter larger than the wheel portion in order to prevent a transverse movement of the elevator car between the first guide rail and the second guide rail. 35 40 45 50

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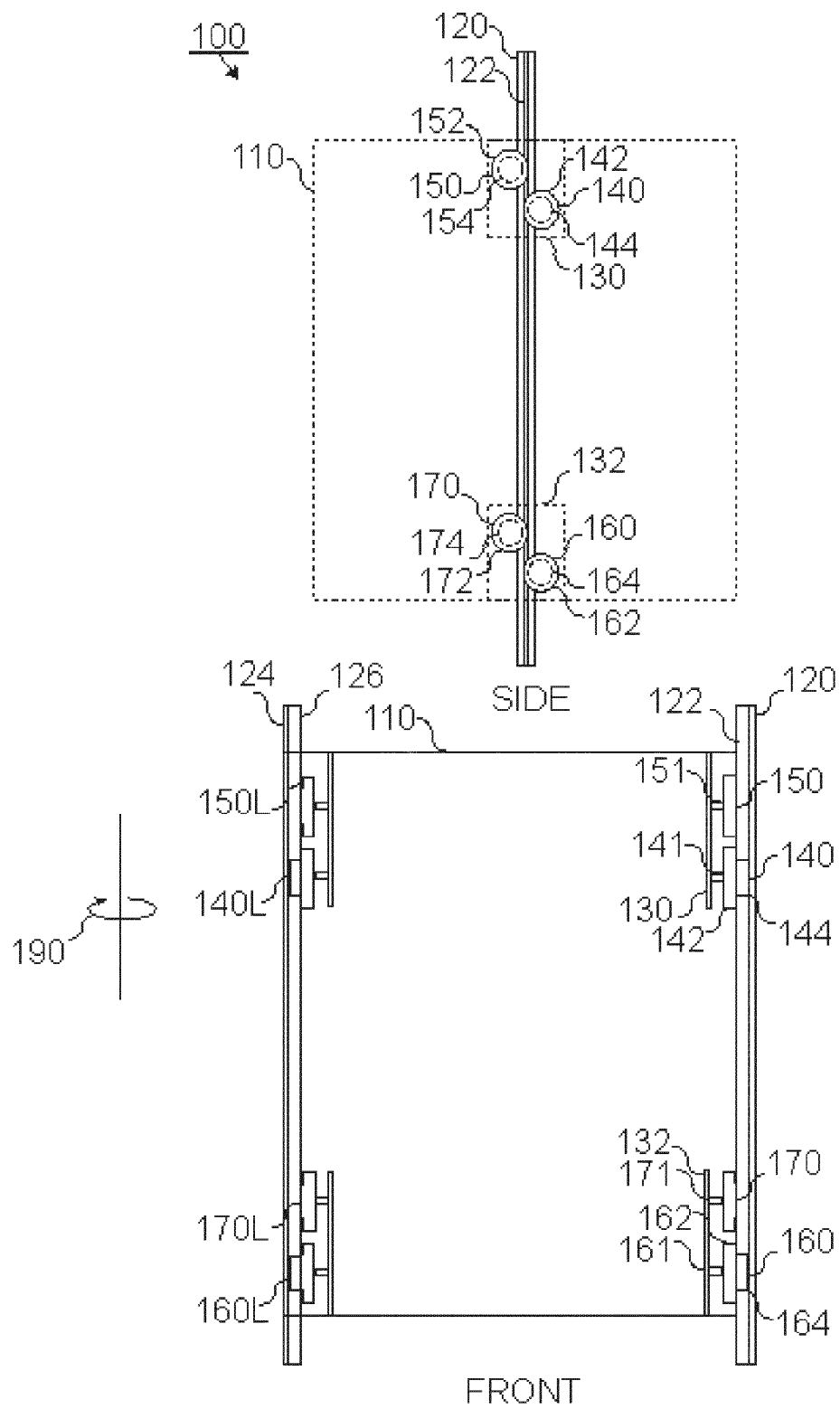


FIG. 1A

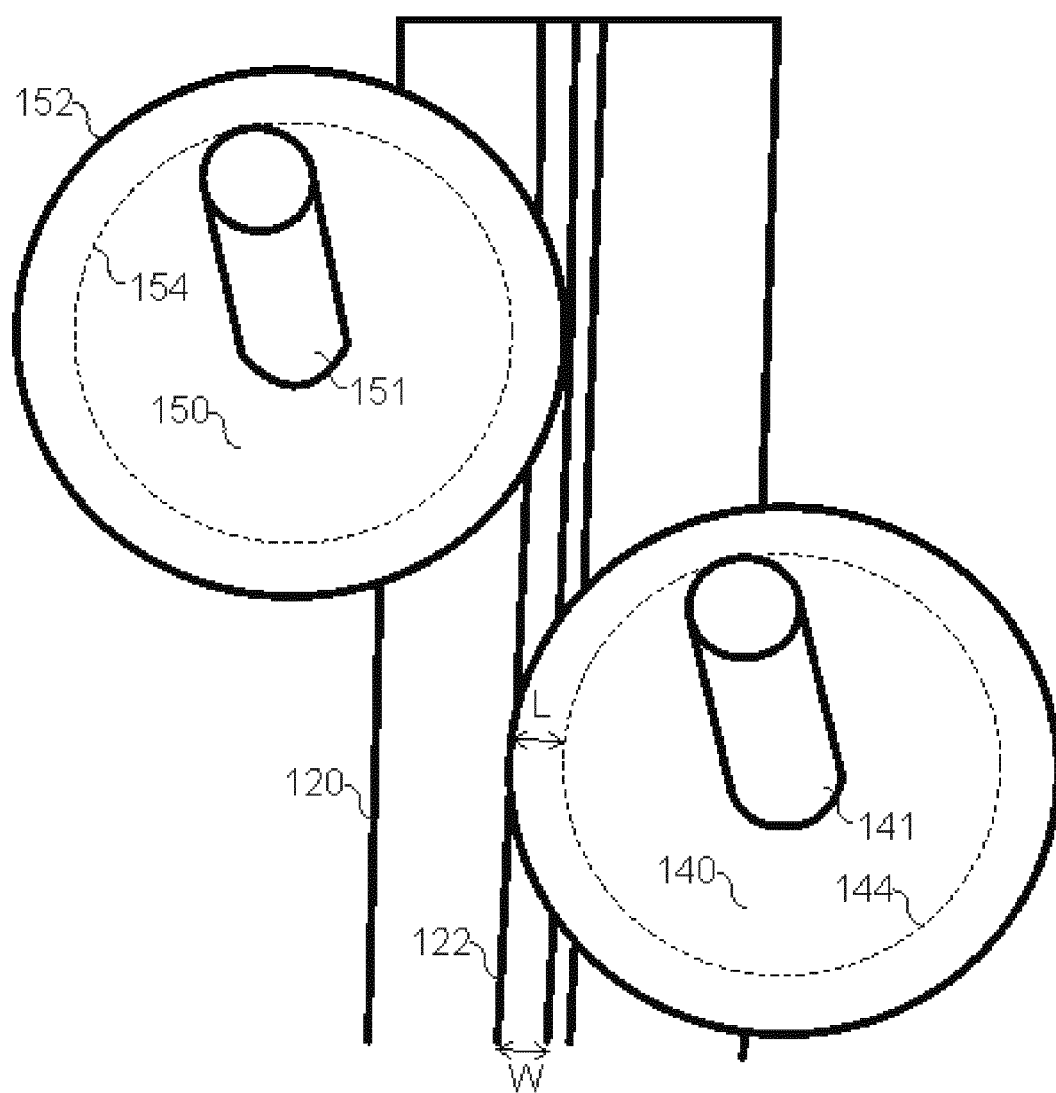


FIG. 1B

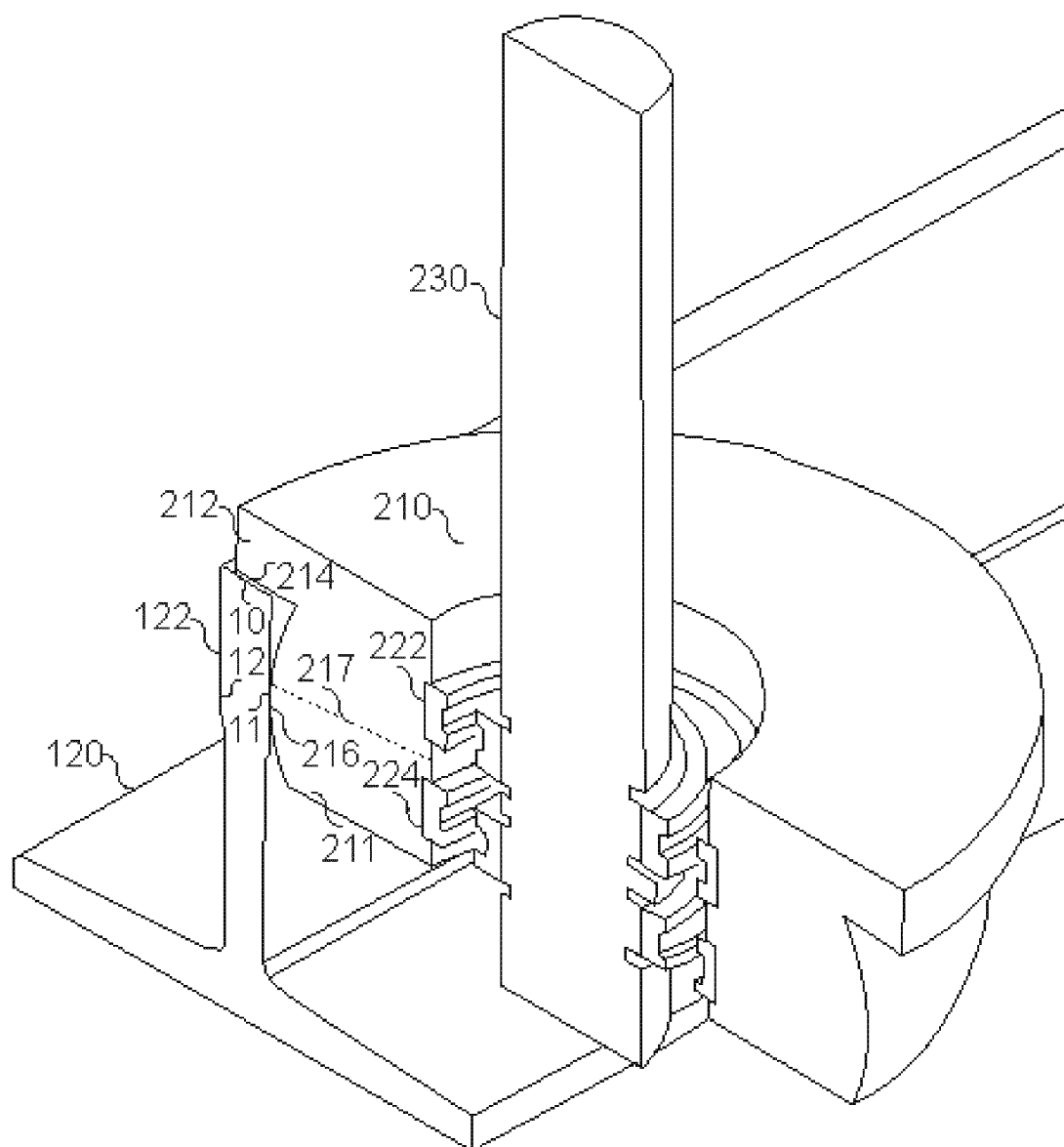


FIG. 2A

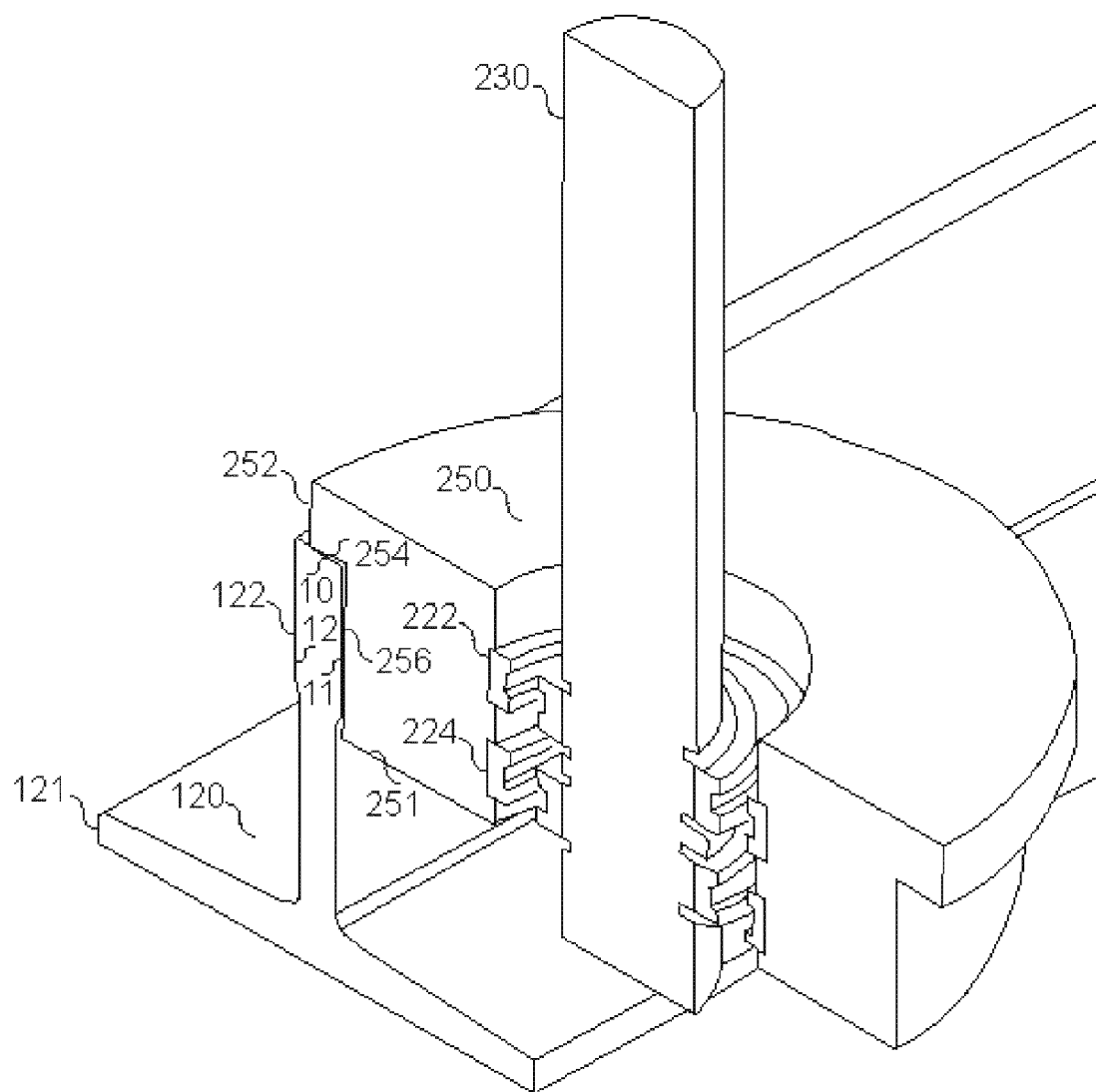
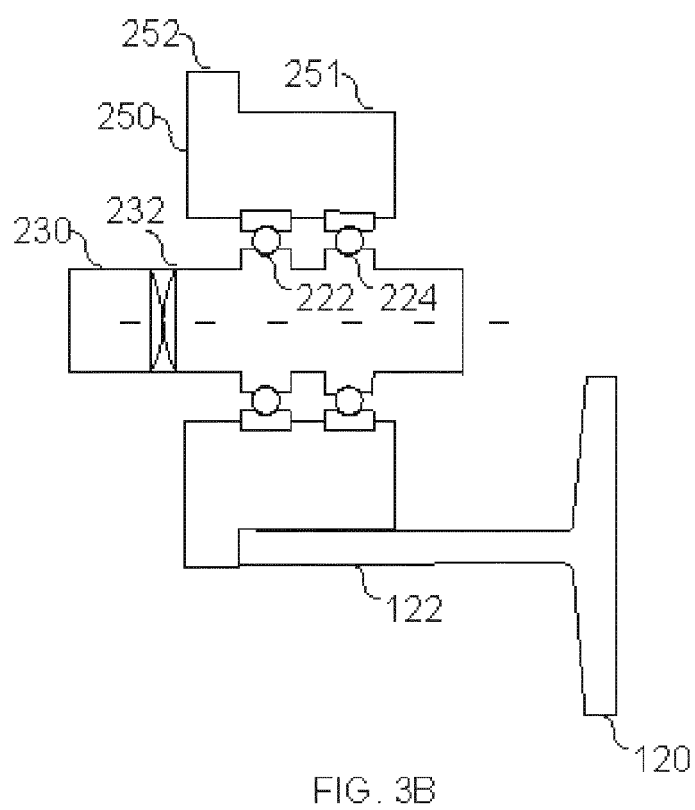
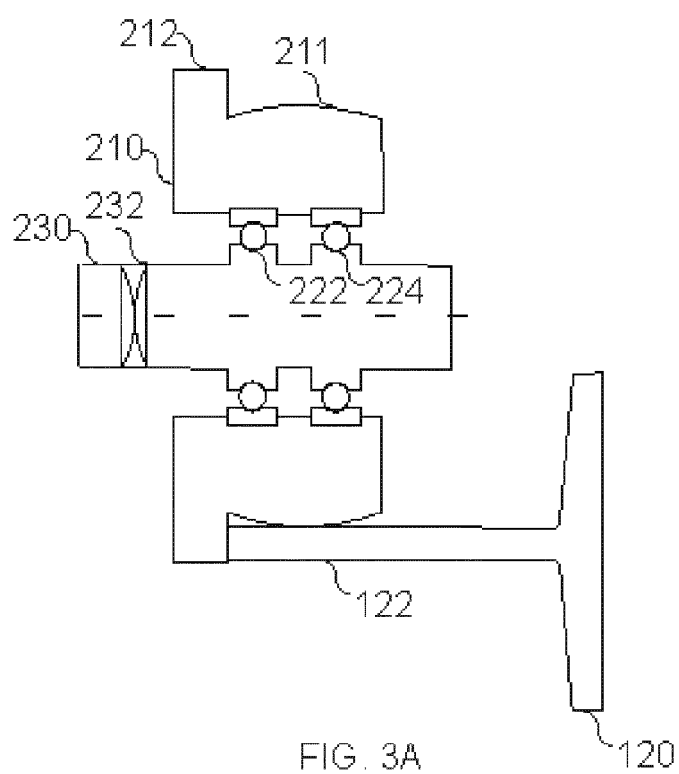


FIG. 2B



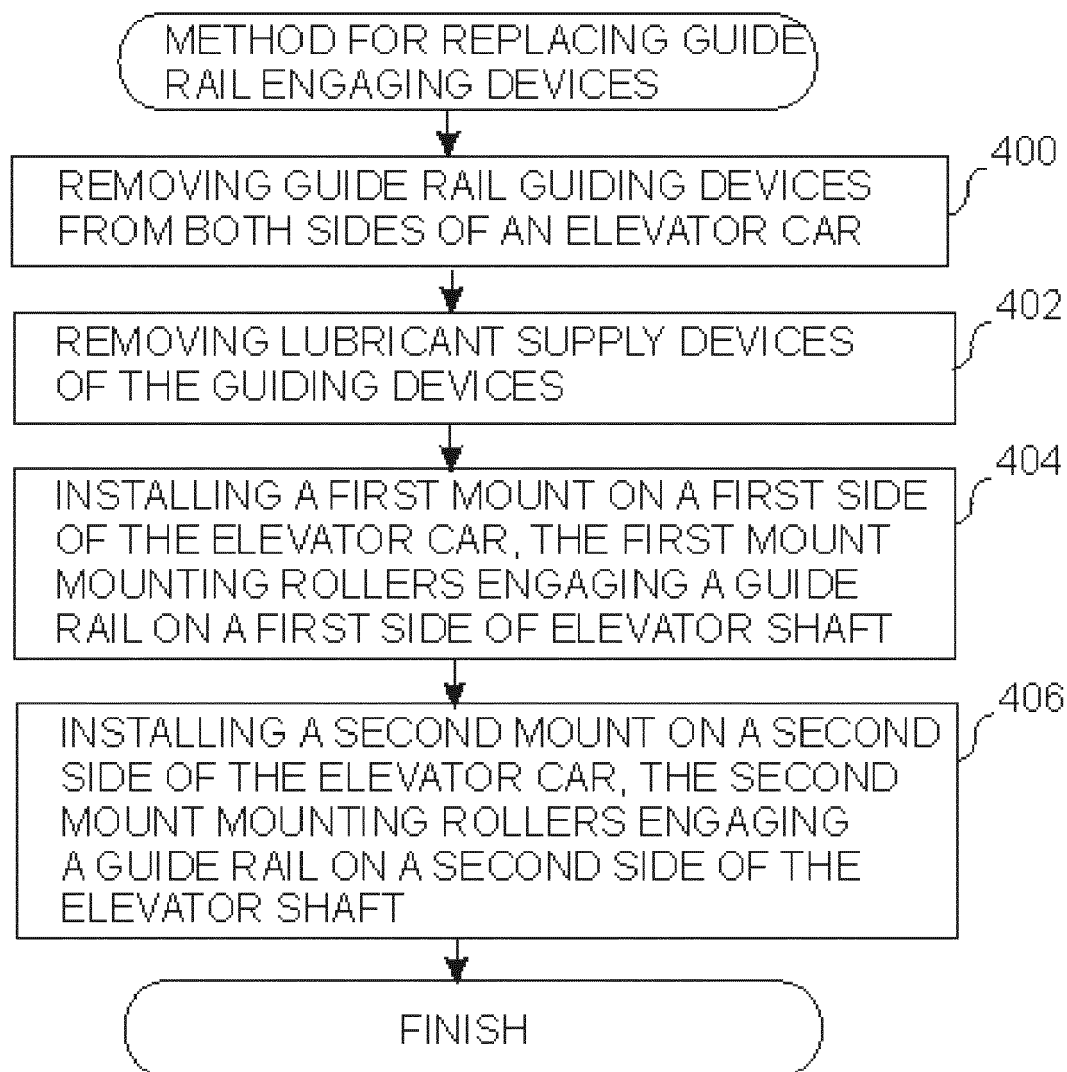


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 14 15 4851

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* abstract *	6-10	
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	* abstract *		
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	* figure 1 *		

	-/--		
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		23 September 2014	Oosterom, Marcel
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 14 15 4851

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			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		23 September 2014	Oosterom, Marcel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)



Application Number

EP 14 15 4851

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☒ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

1-12

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 14 15 4851

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-5, 11, 12

Guide roller device for an elevator car.

2. claims: 6-10

Arrangement of guide roller devices mounted on an elevator car.

3. claim: 13

Replacement of a guide roller device mounted on an elevator car.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 15 4851

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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23-09-2014

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82