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(54) **A torque limiting coupling for a hoisting machine**

(57) The invention relates to a torque limiting coupling for a traction sheave of a hoisting machine such as an elevator. The torque limiting coupling comprises a traction sheave (140, 240) and a brake wheel (101, 201). The brake wheel has a friction surface (136, 138, 268) arranged to be in contact with a traction sheave (140, 240) of a hoisting machine. The friction surface (136, 138, 268) allows a friction limited rotation of the traction sheave (140, 240).

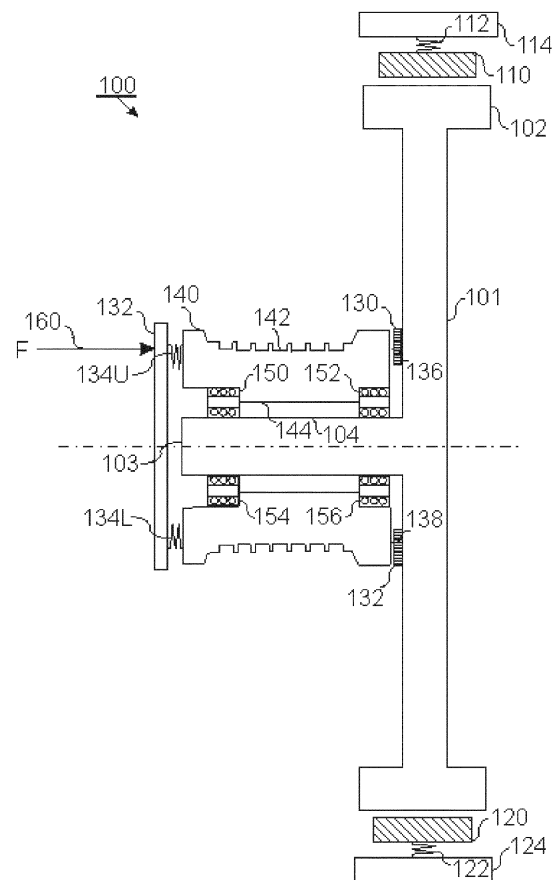


FIG. 1

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Description

BACKGROUND OF THE INVENTION

Field of the invention:

[0001] The invention relates to hoisting machines, and hoisting machine braking. Particularly, the invention relates to a torque limiting coupling for a hoisting machine.

Description of the Related Art:

[0002] When the movement of an elevator car must be stopped, it is necessary that the elevator car stops within the limit of maximum deceleration that is not to be exceeded. In normal operating mode, the elevator car is stopped smoothly by an elevator drive control. In emergency or power failure cases an elevator is stopped immediately using elevator brakes. However, too high deceleration could cause injuries for passengers inside an elevator car. Maximum limits for deceleration are thus set in elevator safety standards to mitigate the risk of injuries.

[0003] In prior art elevators the brakes used in power failure or emergency situations are arranged to stop the movement of the traction sheave directly. The deceleration of the elevator car is rendered smoother by a slight sliding of the elevator ropes or belt over the traction sheave. The sliding is enough to ensure that the deceleration is not too high, that is, to ensure that an elevator car does not stop too abruptly. The friction coefficient between the ropes and the traction sheave grooves may be, for example, 0.12.

[0004] New traction means materials are being introduced to rope or belt elevator systems. By traction means may be meant, for example, ropes or belts. Examples of new traction means materials comprise polyurethane covered traction means, carbon fiber enforced polyurethane traction means, synthetic fiber traction means, synthetic fiber polypropylene traction means, synthetic fiber polyamide traction means, synthetic fiber aramid traction means, polypropylene covered traction means, carbon fiber enforced polyurethane traction means, steel core polyurethane traction means or metal covered traction means. The friction coefficient between the traction means and the traction sheave grooves may be, for example, between 0.8 and 1 with the new traction means materials. A benefit of the new traction means materials is increased energy efficiency for the traction.

[0005] A problem with the new traction means materials and the increased friction coefficient between the traction sheave and the traction means is the inhibited sliding of the elevator traction means over the traction sheave. Therefore, it would be beneficial to have a solution that limits the deceleration.

SUMMARY OF THE INVENTION:

[0006] According to an aspect of the invention, the invention is a torque limiting coupling for a hoisting machine traction sheave. The coupling comprises a brake wheel and a traction sheave, wherein the brake wheel and the traction sheave both have friction surfaces arranged to be in contact with each other for transmitting limited rate of torque between the brake wheel and the traction sheave.

[0007] According to a further aspect of the invention, the invention is a method comprising: performing elevator braking using a brake wheel rotated by an electrical motor, a traction sheave of the elevator and the brake wheel having a friction surface allowing a friction limited movement of the traction sheave and the brake wheel in relation to each other; measuring elevator car deceleration using an accelerometer; determining a deviation from a maximum allowed elevator car deceleration; and controlling friction between the brake wheel and the traction sheave using a compression member arranged to bring the traction sheave and the brake wheel in closer contact via the friction surface in order to adjust friction force in the friction surface.

[0008] According to a further aspect of the invention, the invention is an apparatus comprising at least one processor and at least one memory including computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to perform: performing elevator braking using a brake wheel rotated by an electrical motor, a traction sheave of the elevator and the brake wheel having a friction surface allowing a friction limited movement of the traction sheave and the brake wheel in relation to each other; measuring elevator car deceleration using an accelerometer; determining a deviation from a maximum allowed elevator car deceleration; and controlling friction between the brake wheel and the traction sheave using a compression member arranged to bring the traction sheave and the brake wheel in closer contact via the friction surface in order to adjust friction force in the friction surface.

[0009] According to a further aspect of the invention, the invention is an elevator control computer comprising the apparatus.

[0010] According to a further aspect of the invention, the invention is a computer program comprising code adapted to cause the following when executed on a data-processing system: performing elevator braking using a brake wheel rotated by an electrical motor, a traction sheave of the elevator and the brake wheel having a friction surface allowing a friction limited movement of the traction sheave and the brake wheel in relation to each other; measuring elevator car deceleration using an accelerometer; determining a deviation from a maximum allowed elevator car deceleration; and controlling friction between the brake wheel and the traction sheave using a compression member arranged to bring the traction

sheave and the brake wheel in closer contact via the friction surface in order to adjust friction force in the friction surface.

[0011] According to a further aspect of the invention, the invention is a computer program product comprising the computer program.

[0012] In one embodiment of the invention, transmitting of the limited rate of torque between the brake wheel and the traction sheave occurs when traction means are placed on the traction sheave, the traction means may support or suspend an elevator car and a balance weight.

[0013] In one embodiment of the invention, the traction means comprises a plurality of ropes. On the traction sheave may be a plurality of grooves for the plurality of ropes.

[0014] In one embodiment of the invention, the traction means comprises at least one belt.

[0015] In one embodiment of the invention, the coupling comprises at least one brake pad or shoe arranged to be pressed against the brake wheel when braking.

[0016] In one embodiment of the invention, the coupling comprises a compression member arranged to press the friction surfaces of the traction sheave and brake wheel against each other in order to adjust the torque transmitting friction force.

[0017] In one embodiment of the invention, the brake wheel comprises an axial plug, the traction sheave comprises an axial receptacle to fit the plug, and the friction surface allows a friction limited rotation of the traction sheave around the axial plug.

[0018] In one embodiment of the invention, the friction surface comprises at least one friction pad arranged to face a side of the traction sheave and the axial plug.

[0019] In one embodiment of the invention, the at least one friction pad is circular and is arranged on the brake wheel coaxially with the axial plug.

[0020] In one embodiment of the invention, the axial receptacle is an axial cylinder, the compression member is arranged to force the traction sheave closer to the brake wheel along the axial plug and between an inner surface of the axial receptacle and the outer surface of the axial plug there is a plurality of bearings.

[0021] In one embodiment of the invention, the friction surface is an annular ring coaxial with the axial plug and comprises ratchet teeth and the side of the traction sheave that faces the annular ring comprises matching ratchet teeth.

[0022] In one embodiment of the invention, the compression member comprises a disc coaxial with the axial plug and movable along the axial plug relative to the traction sheave and a plurality of springs mounted on the disc to press the traction sheave towards the brake wheel and in tighter contact with the at least one friction pad.

[0023] In one embodiment of the invention, the axial plug is arranged to seat into the axial receptacle, a diameter of a section of the axial plug decreases in a direction away from the brake wheel, a diameter of a corresponding section of the axial receptacle increases in a direction

towards the side of the traction sheave facing the brake wheel and the friction surface is arranged between the section of the axial plug and the corresponding section of the axial receptacle.

[0024] In one embodiment of the invention, the compression member comprises a disc fixed to the axial plug and a bolt extending through the disc to move the traction sheave into tighter contact with the axial plug.

[0025] In one embodiment of the invention, the brake wheel is a rotor wheel of a motor of the hoisting machine.

[0026] In one embodiment of the invention, the hoisting machine motor is a permanent magnet motor.

[0027] In one embodiment of the invention, the hoisting machine motor is axial flux motor.

[0028] In one embodiment of the invention, the hoisting machine is direct-drive hoisting machine without gear.

[0029] In one embodiment of the invention, the elevator car may also be referred to as elevator cage. The elevator car may be elevator cage.

[0030] In one embodiment of the invention, the traction means comprises a plurality of ropes. On the traction sheave may be a plurality of grooves for the plurality of ropes.

[0031] In one embodiment of the invention, the traction means comprises at least one belt.

[0032] In one embodiment of the invention, the computer program is stored on a non-transitory computer readable medium. The non-transitory computer readable medium may be, but is not limited to, a removable memory card, a removable memory module, a magnetic disk, an optical disk, a holographic memory or a magnetic tape. A removable memory module may be, for example, a USB memory stick, a PCMCIA card or a smart memory card.

[0033] In one embodiment of the invention, an apparatus comprising at least one processor and at least one memory including computer program code, the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus at least to perform a method according to any of the method steps.

[0034] The embodiments of the invention described hereinbefore 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. A method, a coupling, a device, a computer program or a computer program product to which the invention is related may comprise at least one of the embodiments of the invention described hereinbefore.

[0035] 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.

[0036] The benefits of the invention are related to safer elevator braking with limited deceleration of an elevator car.

BRIEF DESCRIPTION OF THE DRAWINGS:

[0037] 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. 1 illustrates an elevator deceleration control device with friction material arranged on brake wheel in one embodiment of the invention;

Fig. 2 illustrates an elevator deceleration control device with a friction surface arranged between an axial plug sitting into an axial receptacle formed by the traction sheave in one embodiment of the invention; and

Fig. 3 is a flow chart illustrating a method for elevator deceleration setting in one embodiment of the invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS:

[0038] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0039] Figure 1 illustrates an elevator deceleration control device 100 with friction material arranged on brake wheel in one embodiment of the invention in one embodiment of the invention.

[0040] In Figure 1 there is illustrated a cross section of a brake wheel 101 and a traction sheave 140 for an elevator (not shown). The brake wheel 101 may be a rotor wheel of an electrical motor (not shown) of the elevator. Brake wheel 101 may have a wider outer peripheral portion 102. Brake wheel 101 rotation is stopped with brakes that grab brake wheel 101, for example, with brake pads 110 and 120. Brake pads 110 and 120 may be forced to contact with brake wheel 101 with springs 112 and 122 mounted on supports 114 and 124, respectively. The brake pads 110 and 120 may be held in open position at a distance from brake wheel 101 with the presence of an electrical current provided to an opening device (not shown). If the electrical current is no longer supplied, brake pads 110 and 120 move to closed position grabbing brake wheel 101 by the force of springs 112 and 122, respectively.

[0041] Brake wheel 101 has an axial protrusion, that is, an axial plug 103. Axial plug 103 is arranged to fit into an axial receptacle or hole, that is, an axial cylinder 144 that traction sheave 140 forms. A surface 104 of axial plug 103 may be in connection with a surface of axial cylinder 144 via a plurality of bearings such as bearings 150, 152, 154 and 156, which may be ball bearings. The surface of axial cylinder 144 forms an inner circumference of traction sheave 140. Traction sheave 140 may comprise a plurality of grooves such as grooves 142 in Figure 1 to fit a plurality of elevator ropes that may be

connected to an elevator car (not shown) and a balancing weight (not shown). Traction sheave 140 may be used for traction of a belt in which case there are no grooves for ropes or there is a single groove for the belt. A surface of brake wheel 101 facing traction sheave 140 may comprise at least one friction pad such as friction pads 130 and 132 or a friction surface. The at least one friction pad may be circular and is arranged on the brake wheel coaxially with the axial plug 103. Thus, friction pads 130 and 132 may be a single friction pad.

[0042] In one embodiment of the invention, the friction surface is an annular ring coaxial with axial plug 103 and comprises ratchet teeth. On the side of traction sheave 140 facing the annular ring there are matching ratchet teeth. The teeth on the opposite sides are held in place until brakes are applied to brake wheel 101.

[0043] In Figure 1 there is also illustrated a compression member 132, for example, a compression disc or a plate which may be arranged coaxially with axial plug 103. Compression member 132 is arranged to bring traction sheave 140 and brake wheel 101 in closer contact via the friction surface such as friction pads 130 and 132 in order to adjust friction in a friction surface such as friction surfaces 136 and 138. The friction surface may be circular and coaxial with an axis of brake wheel 101. On a surface of the compression member 132 facing traction sheave 132 may be placed at least one spring such as springs 134U and 134L which force traction sheave 140 in tighter contact with friction pads 130 and 132, or a single circular friction surface on brake wheel 101. Traction sheave 140 is movable along the axial plug 103. The normal force F achieved with compression member 132 to friction surface between traction sheave 140 and brake wheel 101 is illustrated with arrow 160.

[0044] In one embodiment of the invention compression member 132 is coaxial with axial plug 103 and the position of compression member 132 may be fixed relative to axial plug 103, for example, with at least one compression bolt (not shown). The compression bolts may be used to secure the compression member to a position on an axle (not shown), which may be located at the same axis as axial plug 103.

[0045] Figure 2 illustrates an elevator traction sheave deceleration control device 200 with a friction surface arranged between an axial plug that sits into an axial cylinder formed by the traction sheave, in one embodiment of the invention.

[0046] In Figure 2 there is illustrated a cross section of a brake wheel 201 and a traction sheave 240 for an elevator (not shown). Figure 3 illustrates three dimensionally a section of traction sheave 240 and brake wheel 201 in one embodiment of the invention. Brake wheel 201 may be a rotor wheel of an electrical motor (not shown) of the elevator. Brake wheel 201 may have a wider outer peripheral portion 202. Brake wheel 201 rotation is stopped with brakes that grab brake wheel 201, for example, with brake pads 210 and 220. Brake pads 210 and 220 may be forced to contact with brake wheel

201 with springs 212 and 222 mounted on supports 214 and 224, respectively. The brake pads 210 and 220 may be held in open position at a distance from brake wheel 201 with the presence of an electrical current provided to an opening device (not shown). If the electrical current is no longer supplied, brake pads 210 and 220 move to closed position grabbing brake wheel 201 by the force of springs 212 and 222, respectively.

[0047] Brake wheel 201 has an axial protrusion, that is, an axial plug 203. Axial plug 203 further forms an axial receptacle 204 into which is fitted an axle 270 and bearings 250, 252, 254 and 256, which may be ball bearings, arranged between axle 270 and axial receptacle 204 surface. Axial plug 203 is arranged to seat into an axial hole, that is, an axial receptacle 244 that traction sheave 240 forms. Traction sheave 240 may comprise a plurality of grooves 242 to fit a plurality of elevator ropes that may be connected to an elevator car (not shown) and a balancing weight (not shown). Traction sheave 240 may be used for traction of a belt in which case there are no grooves for ropes or there is a single groove for the belt. Axial plug 203 may comprise a section 206 with uniform diameter. Axial plug 203 comprises a section 205 where the diameter of axial plug 203 decreases in the direction away from the brake wheel. Outer surface of section 205 of axial plug 203 is arranged to fit a corresponding section of traction sheave 240 where the diameter of axial receptacle 244 decreases in the direction away from the brake wheel. Friction contact area 268 is thereby arranged where section 205 of axial plug and corresponding section of axial receptacle 244. In Figure 2 there is illustrated a compression plate 262, for example, an axial plate fixed around axial plug 203. Compression plate 262 comprises at least one bolt 264 extending through compression plate 262 to move traction sheave 240 into closer contact with axial plug 203 via friction contact area 268. Friction normal force F is illustrated with arrow 266.

[0048] The embodiments of the invention described hereinbefore in association with Figures 1 and 2 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.

[0049] Figure 4 is a flow chart illustrating a method for elevator selection in one embodiment of the invention.

[0050] At step 400 elevator braking is performed using brakes contacting a brake wheel rotated by an electrical motor, wherein a traction sheave of the elevator and the brake wheel have a friction surface allowing a friction limited movement of the traction sheave and the brake wheel in relation to each other. The braking may be performed by a request of a computer such as an elevator control computer.

[0051] At step 402 elevator car deceleration is measured using an accelerometer. The accelerometer may be communicatively connected to the computer.

[0052] At step 404 a deviation is determined from a maximum allowed elevator car deceleration. The deviation may be performed using the computer.

[0053] At step 406 friction between the brake wheel and the traction sheave is controlled using a compression member arranged to bring the traction sheave and the brake wheel in closer contact via the friction surface in order to adjust friction in the friction surface. The compression member may be controlled by the computer. The friction may be controlled using a screw, bolt or any other adjustment mechanism that brings the traction sheave and the brake wheel in closer contact via the friction surface.

[0054] Thereupon, the steps 400, 402 and 404 may be repeated to verify the result of the friction controlling step. The method may be repeated if the result is not within desired limits.

[0055] In one embodiment of the invention, the steps may be performed in the order of numbering.

[0056] The embodiments of the invention described hereinbefore in association with Figures 1, 2, 3 and 4 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.

[0057] It is to be understood that the exemplary embodiments are for exemplary purposes, as many variations of the specific hardware used to implement the exemplary embodiments are possible, as will be appreciated by those skilled in the hardware art(s). For example, the functionality of one or more of the components of the exemplary embodiments can be implemented via one or more hardware devices, or one or more software entities such as modules.

[0058] 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.

[0059] 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. Several of the embodiments may be combined together to form a further embodiment of the invention.

[0060] 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. A torque limiting coupling for a hoisting machine traction sheave, the coupling comprising:

a brake wheel; and
a traction sheave, wherein the brake wheel and

the traction sheave both have friction surfaces arranged to be in contact with each other for transmitting limited rate of torque between the brake wheel and the traction sheave.

2. The coupling according to claim 1, wherein the coupling comprises at least one brake pad or shoe arranged to be pressed against the brake wheel when braking.

3. The coupling according to claim 1 or 2, wherein the coupling comprises a compression member arranged to press the friction surfaces of the traction sheave and brake wheel against each other in order to adjust the torque transmitting friction force.

4. The coupling according to any of the claims 1 - 3, wherein the brake wheel comprises an axial plug, the traction sheave comprises an axial receptacle to fit the plug, the friction surface allowing a friction limited rotation of the traction sheave around the axial plug.

5. The coupling according to claim 4, wherein the friction surface comprises at least one friction pad arranged to face a side of the traction sheave and the axial plug.

6. The coupling according to claim 5, wherein the at least one friction pad is circular and is arranged on the brake wheel coaxially with the axial plug.

7. The coupling according to claim 5, wherein the axial receptacle is an axial cylinder, the compression member is arranged to force the traction sheave closer to the brake wheel along the axial plug and between an inner surface of the axial receptacle and the outer surface of the axial plug there is a plurality of bearings.

8. The coupling according to claim 7, wherein the friction surface is an annular ring coaxial with the axial plug and comprises ratchet teeth and the side of the traction sheave that faces the annular ring comprises matching ratchet teeth.

9. The coupling according to claim 7, wherein the compression member comprises a disc coaxial with the axial plug and movable along the axial plug relative to the traction sheave and a plurality of springs mounted on the disc to press the traction sheave towards the brake wheel and in tighter contact with the at least one friction pad.

10. The coupling according to claim 4, wherein the axial plug is arranged to seat into the axial receptacle, a diameter of a section of the axial plug decreases in a direction away from the brake wheel, a diameter

of a corresponding section of the axial receptacle increases in a direction towards the side of the traction sheave facing the brake wheel and the friction surface is arranged between the section of the axial plug and the corresponding section of the axial receptacle.

11. The coupling according to claim 10, wherein the compression member comprises a disc fixed to the axial plug and a bolt extending through the disc to move the traction sheave into tighter contact with the axial plug.

12. The coupling according to any of the preceding claims 1 - 11, wherein the brake wheel is a rotor wheel of a motor of the hoisting machine.

13. The coupling according to claim 12, wherein the hoisting machine motor is a permanent magnet motor.

14. The coupling according to claim 12, wherein the hoisting machine motor is axial flux motor.

15. The coupling according to any of the preceding claims wherein the hoisting machine is direct-drive hoisting machine without gear.

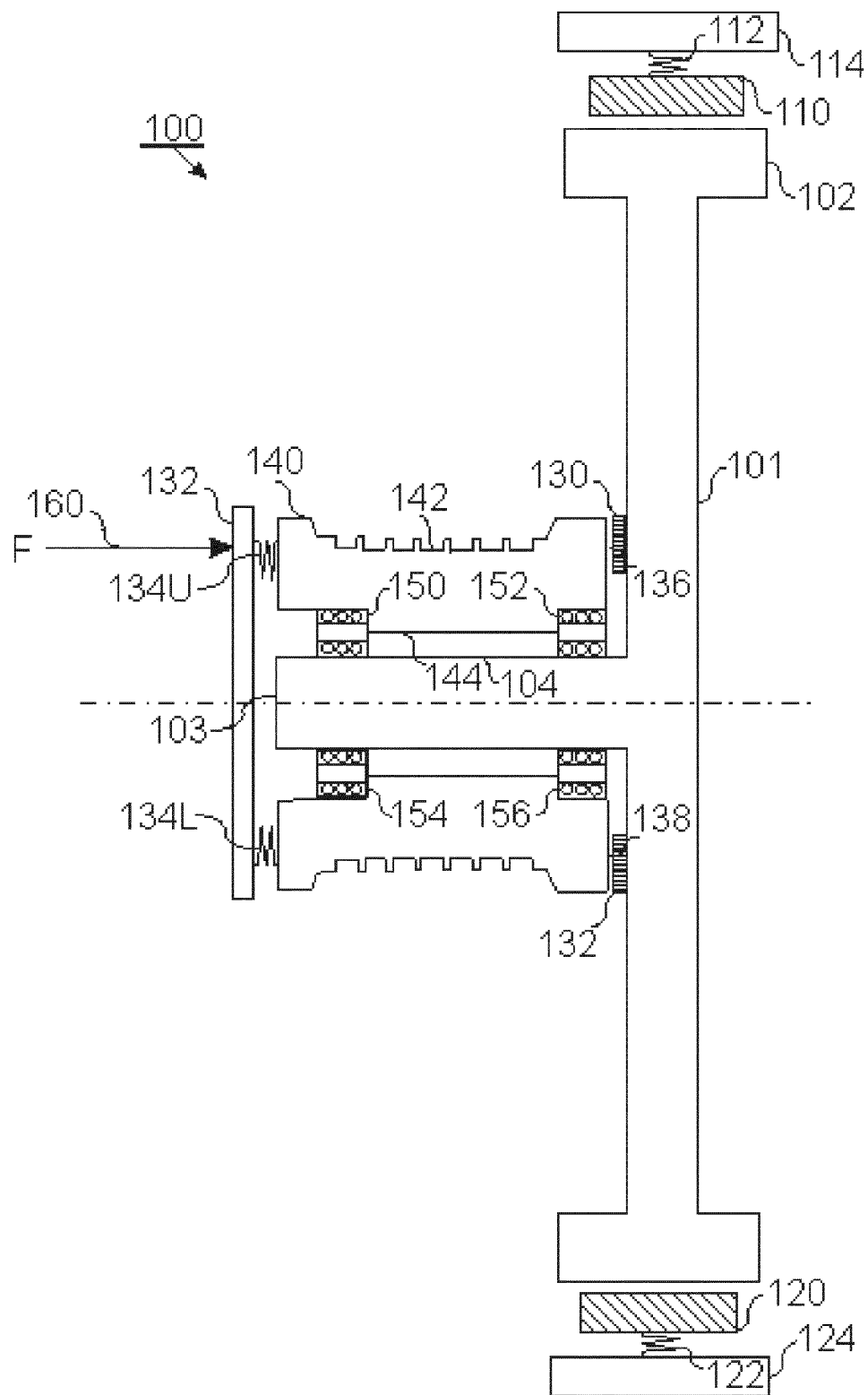


FIG. 1

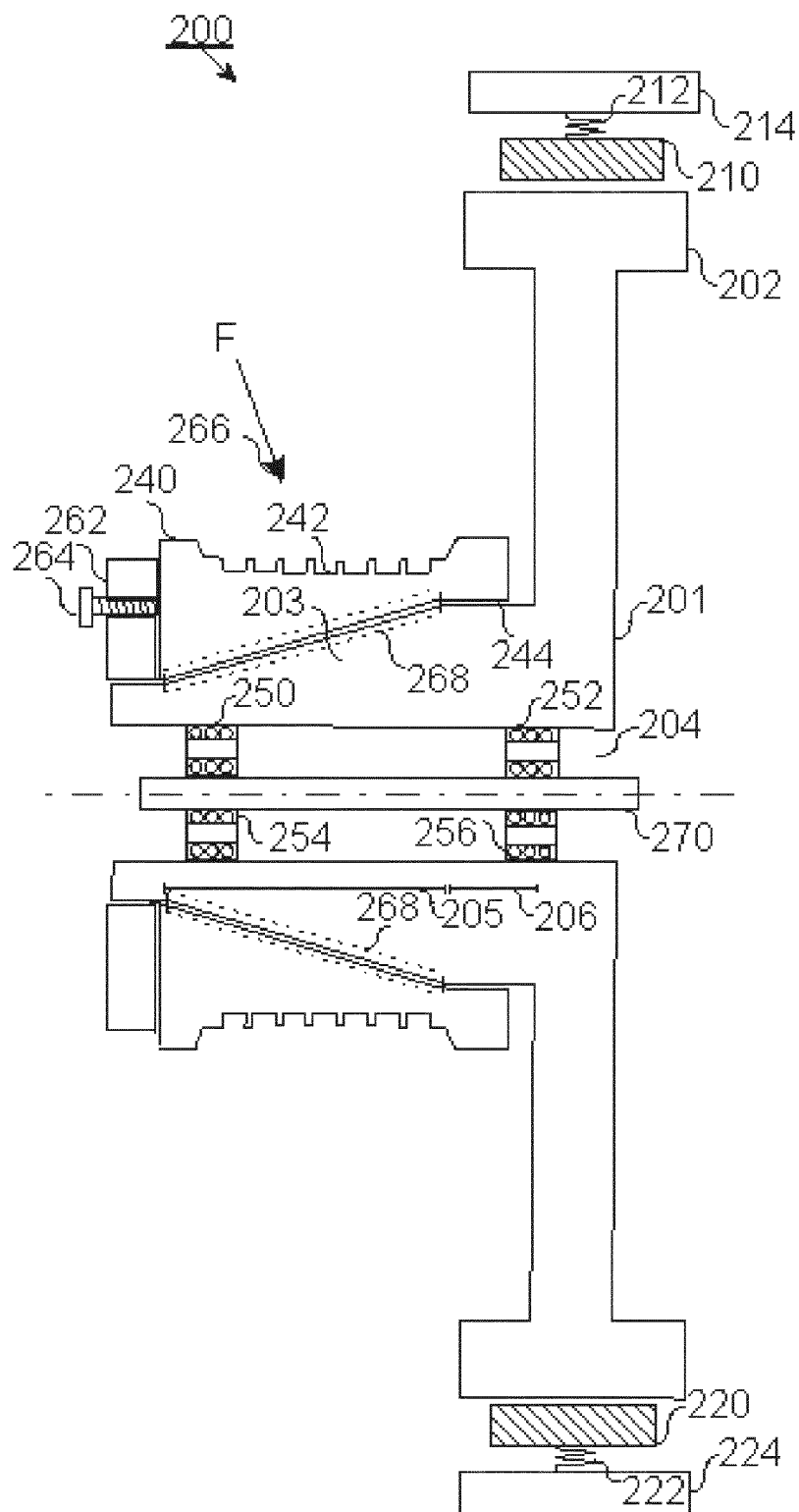


FIG. 2

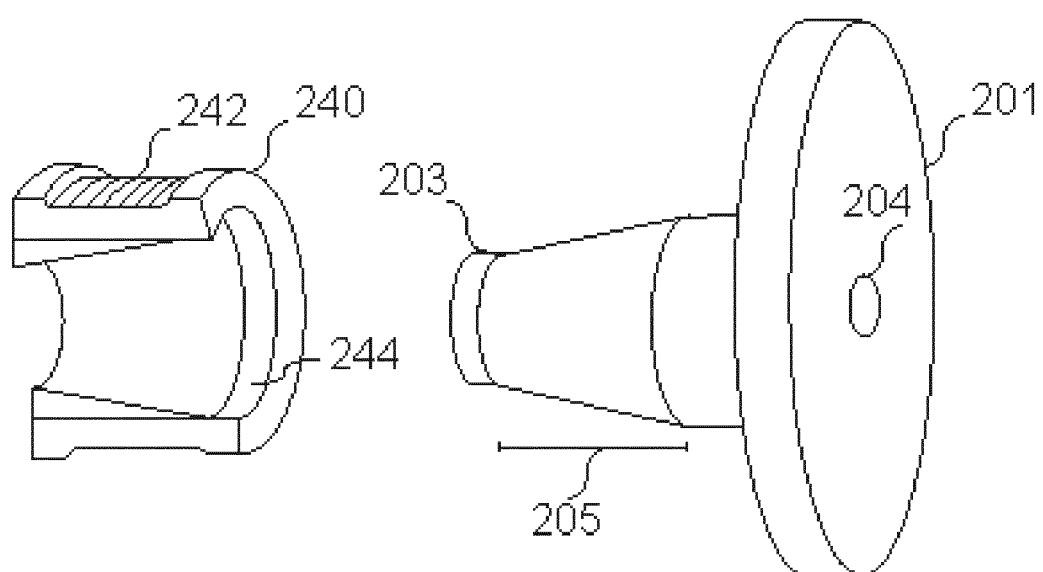


FIG. 3

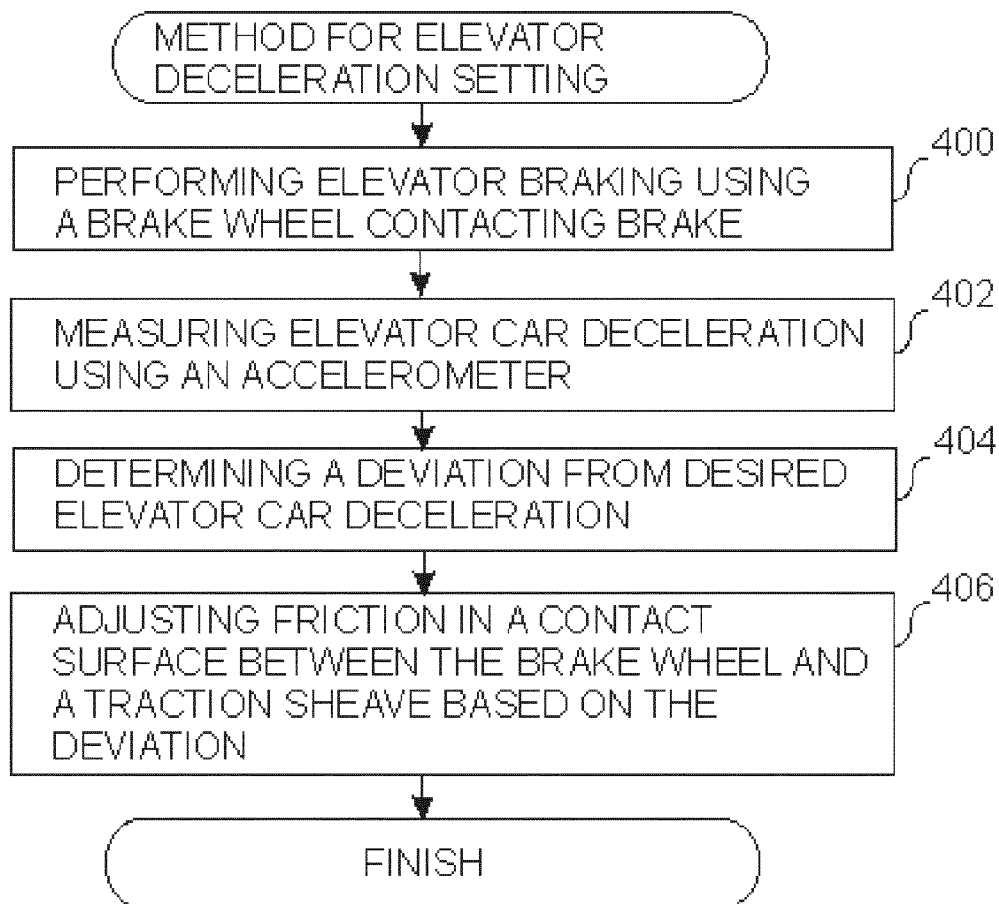


FIG. 4



EUROPEAN SEARCH REPORT

 Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2009 132471 A (MITSUBISHI ELECTRIC CORP) 18 June 2009 (2009-06-18) * abstract; figures 1-16 *	1-7,9, 12-15	INV. B66B11/04 B66B15/04
X	GB 238 441 A (JOHN BERTRAM MORTON KNUTSEN) 20 August 1925 (1925-08-20) * figures 5,6 * * page 6, lines 14-111 *	1-3,15	
A	DE 613 078 C (HANS MANGELSDORFF) 13 May 1935 (1935-05-13) * the whole document *	1-15	
A	EP 2 574 584 A1 (INVENTIO AG [CH]) 3 April 2013 (2013-04-03) * the whole document *	1-15	
A	WO 2007/113374 A1 (KONE CORP [FI]; MUSTALAHTI JORMA [FI]; AULANKO ESKO [FI]) 11 October 2007 (2007-10-11) * abstract; figures 1-3 * * pages 6, 7 *	1-15	
A	EP 1 493 708 A2 (SASSI ALBERTO SPA [IT]) 5 January 2005 (2005-01-05) * abstract; figures 1-24 *	1-15	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) B66B
Place of search The Hague		Date of completion of the search 24 September 2013	Examiner Bleys, Philip
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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24-09-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2009132471 A	18-06-2009	JP 5183170 B2 JP 2009132471 A	17-04-2013 18-06-2009
GB 238441 A	20-08-1925	NONE	
DE 613078 C	13-05-1935	NONE	
EP 2574584 A1	03-04-2013	NONE	
WO 2007113374 A1	11-10-2007	AU 2007233604 A1 CN 101410319 A EP 2001783 A1 FI 20060329 A HK 1130755 A1 US 2009223748 A1 WO 2007113374 A1	11-10-2007 15-04-2009 17-12-2008 05-10-2007 14-10-2011 10-09-2009 11-10-2007
EP 1493708 A2	05-01-2005	NONE	

EPO FORM P0459

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