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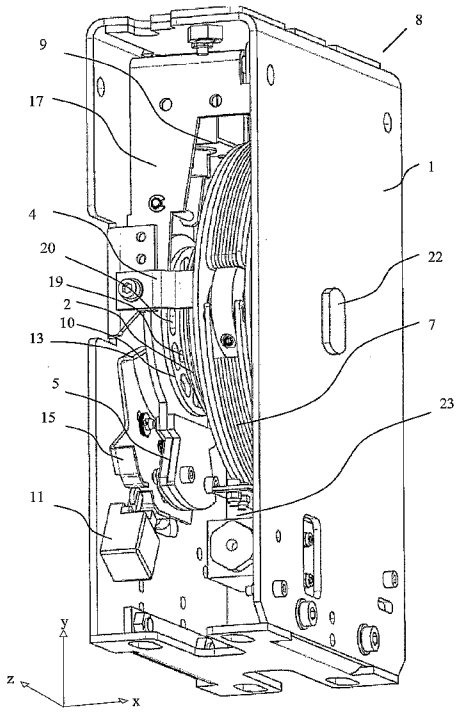
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(54) Title: OVERSPEED GOVERNOR OF AN ELEVATOR, AND ELEVATOR

FIG. 1



(57) Abstract: Overspeed governor, which comprises a frame (1), an overspeed governor pulley (2) supported by the frame (1) in a manner that allows rotation, and means (3, 4) for decelerating the speed of rotation of the overspeed governor pulley (2), which means comprise a coupling part (3) arranged to move in respect to the overspeed governor pulley (2), which coupling part (3) is arranged to move at least between the position (A) where it is engaged to the overspeed governor pulley (2) and the position (0) where it is disengaged from the overspeed governor pulley. In the engaged position (A) the coupling part (3) is arranged to be moved by the rotation movement of the overspeed governor pulley (2). The overspeed governor also comprises means (4, 5) for decelerating the movement of the coupling part (3) moved by the overspeed governor pulley (2) for slowing down the overspeed governor pulley (2). The elevator according to the invention comprises at least an elevator car (2), which is arranged to travel backwards and forwards in essentially the vertical direction along guide rails (28), and a safety gear disposed in connection with the elevator car (2), and also at least one overspeed governor, which comprises at least an overspeed governor pulley (2), which is fitted to rotate moved by the elevator car and which is connected to a safety gear that is in connection with the elevator car, preferably via an overspeed governor rope that passes around a diverting pulley and the overspeed governor pulley (2). The overspeed governor is of the type described earlier.

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OVERSPEED GOVERNOR OF AN ELEVATOR, AND ELEVATOR

FIELD OF THE INVENTION

The present invention relates to an overspeed governor as defined in the preamble of claim 1 and an elevator as defined in the preamble of claim 17.

BACKGROUND OF THE INVENTION

Generally an elevator is provided with a safety gear, the tripping of which is caused by the triggering of the overspeed governor. The conventional solution is that when the speed of the elevator increases to a limit value set in advance for the overspeed governor, the overspeed governor trips the safety gear via the same rope as the rope via which the overspeed governor monitors the speed of the elevator. Publication US4653612 describes the structure and operation of one such overspeed governor. A switch, which disconnects the supply current from the elevator motor at a slightly lower speed than the tripping speed of the safety gear, is in connection with the overspeed governor. In addition to the elevator gripping in an overspeed situation, there are situations in which the safety gear should be able to operate even though the speed of the elevator does not exceed the permitted speed. These situations include, among others, the testing of the safety gear in connection with an inspection of the elevator or the stopping of the elevator by means of safety gear if the elevator starts to move from a floor level with the doors partly or fully open.

Publications US2007/0181378A1 and FI94948B present solutions in which the overspeed governor can be stopped with a different actuator and thus gripping can be triggered irrespective of the speed of rotation of the overspeed governor pulley. Also other types of solutions are known.

In prior-art solutions a problem, among others, that occurs is that they are not able to function as an anti-creep apparatus. More particularly, a loading situation of the elevator car would produce problems, because sagging of the elevator car when loading could trip the safety gear. A known problem has also been that the actuator structure added to the overspeed governor has been sizeable and complex.

OBJECT OF THE INVENTION

The object of the invention is to eliminate, among others, the aforementioned drawbacks of prior-art solutions. The object of the invention is to achieve one or more of the following advantages, among others:

- To achieve an overspeed governor that is well suited as an anti-creep apparatus.
- To achieve a compact overspeed governor, the size of which, particularly in the radial direction, can be kept compact.
- To achieve an overspeed governor that is reliable, simple and easy to service.
- To achieve an overspeed governor that can be remotely triggered.
- To achieve an overspeed governor that can function as an unintended movement detector/stopper.
- To achieve an overspeed governor that functions well irrespective of the direction of rotation of the overspeed governor pulley.
- To achieve an overspeed governor/elevator, the properties of which are easy to adjust.
- To achieve an overspeed governor that is well suited to modernizations, because it is suited to different types of elevators, e.g. to elevators provided with a counterweight and elevators without a counterweight.

- To achieve an elevator in which a separate anti-creep apparatus and/or unintended movement detector is not necessarily needed.
- To achieve an elevator that functions well irrespective of the direction of movement of the elevator car.
- To achieve an overspeed governor that functions better than before in both directions of rotation.
- To achieve an overspeed governor with a coupling that is better protected from impact.

SUMMARY OF THE INVENTION

The overspeed governor according to the invention is characterized by what is disclosed in the characterization part of claim 1. The elevator according to the invention is characterized by what is disclosed in the characterization part of claim 17. Other embodiments of the invention are characterized by what is disclosed in the other claims. Some inventive embodiments are also discussed in the descriptive section and in the drawings of the present application. The inventive content of the application can also be defined differently than in the claims presented below. The inventive content may also consist of several separate inventions, especially if the invention is considered in the light of expressions or implicit sub-tasks or from the point of view of advantages or categories of advantages achieved. In this case, some of the attributes contained in the claims below may be superfluous from the point of view of separate inventive concepts. The features of the various embodiments can be applied within the scope of the basic inventive concept in conjunction with other embodiments.

The overspeed governor according to the invention comprises a frame, an overspeed governor pulley supported by the frame, and means for decelerating the speed of

rotation of the overspeed governor pulley, which means comprise a coupling part arranged to move in relation to the overspeed governor pulley, which coupling part is arranged to move at least between the position where it is engaged to the overspeed governor pulley and the position where it is disengaged from the overspeed governor pulley. In the engaged position the coupling part is arranged to be moved by the rotation movement of the overspeed governor pulley, and the overspeed governor also comprises means for decelerating the movement of the coupling part moved by the overspeed governor pulley for slowing down the overspeed governor pulley. One advantage, among others, is that the overspeed governor is well suited as an anti-creep apparatus, which can be switched on when the elevator stops. Another advantage is that the deceleration does not directly affect the overspeed governor pulley. Thus, for example, engagement that occurs when moving will not produce a powerful impact directly on the overspeed governor pulley.

In one embodiment of the invention the coupling part comprises a detent part for transmitting the force that decelerates the coupling part to the coupling part, and a part that engages to the overspeed governor pulley in the position, and there is a friction joint between the detent part and the part of the coupling part that engages to the overspeed governor pulley. This is particularly advantageous when it is desired to perform remote tripping (e.g. test tripping), wherein the coupling part is desired to connect quickly to the rotating overspeed governor pulley. For example, engagement at the normal driving speed of the elevator could break the parts of the overspeed governor.

In one embodiment of the invention a friction joint permits movement of the parts 10 and 5 with respect to each other only after the torque between them exceeds a certain preset limit, preferably however such that the

friction joint maintains in its slipping such a great friction force that the force decelerating the overspeed governor pulley that is transferred to the overspeed governor pulley via the part exceeds in its magnitude the force needed to trigger the safety gears.

In one embodiment of the invention the friction joint gives way before the grip between the rope groove of the overspeed governor pulley and the overspeed governor rope that rotates the overspeed governor pulley fails.

In one embodiment of the invention the coupling part is arranged to move in the axial direction of the overspeed governor pulley between the position where it is engaged to the overspeed governor pulley and the position where it is disengaged from the overspeed governor pulley. This has numerous advantages. The overspeed governor can, among other things, be arranged if so desired such that the decelerating force can be easily exerted on the overspeed governor pulley symmetrically without exerting any radial forces on it. It is also possible if so desired to achieve with a simple arrangement a large and evenly distributed contact surface area between the coupling part and the overspeed governor pulley. The susceptibility to breakage of the parts thus remains small. This is advantageous particularly when engaging to an overspeed governor pulley that is moving. The overspeed governor can also be kept small in size in the z direction.

In one embodiment of the invention when in the engaged position the coupling part is arranged to move, being be moved by the rotation movement of the overspeed governor pulley, a predetermined distance before the means for decelerating the movement of the coupling part moved by the overspeed governor pulley start decelerating the movement of the coupling part. Another advantage, among

others, is that it is possible to achieve a margin for movement in which the safety gears of the elevator do not yet trip.

In one embodiment of the invention the overspeed governor comprises second means for decelerating the speed of rotation of the overspeed governor pulley, which second means are preferably arranged to activate on the centrifugal principle depending on the speed of rotation of the overspeed governor pulley.

In one embodiment of the invention the overspeed governor comprises means, preferably a solenoid, for moving the coupling part between the position where it is engaged to the overspeed governor pulley and the position where it is disengaged from the overspeed governor pulley.

In one embodiment of the invention the overspeed governor comprises means for detecting the moving of the coupling part along with the overspeed governor pulley and/or for determining the length of the distance moved.

In one embodiment of the invention the coupling part comprises a part that is discoidal and is fitted to move along with the overspeed governor pulley when the coupling part is in the engaged position. One advantage, among others, is an extensive area of engagement.

In one embodiment of the invention the coupling part is supported with an axle eccentrically in respect to its center of mass, for positioning the coupling part in position.

In one embodiment of the invention engagement of the coupling part and the overspeed governor pulley is arranged with the shape locking principle, preferably of the indentation-protrusion type.

In one embodiment of the invention the coupling part comprises a detent part for transmitting the force that decelerates the coupling part to the coupling part. If the detent part is detachable, an advantage, among others, is that a worn detent part can be replaced.

In one embodiment of the invention there is a friction joint between the detent part and the part engaging the overspeed governor pulley in the position. One advantage is a longer service life of the parts.

In one embodiment of the invention the coupling part is arranged to move in the engaged position by turning co-axially with the overspeed governor pulley.

In one embodiment of the invention the overspeed governor pulley comprises means, such as e.g. a rope groove, for transmitting movement of the elevator car to the overspeed governor pulley.

The elevator according to the invention comprises at least an elevator car, which is arranged to travel backwards and forwards in essentially the vertical direction, preferably along guide rails, and a safety gear disposed in connection with the elevator car, and also at least one overspeed governor, which comprises at least an overspeed governor pulley, which is fitted to rotate moved by the elevator car and which is connected to a safety gear that is in connection with the elevator car, preferably via an overspeed governor rope that passes around a diverting pulley and the overspeed governor pulley. The overspeed governor is one of the type described earlier. The advantages, among others, are that a separate anti-creep apparatus and/or unintended movement detector are not necessarily needed in the elevator.

In one embodiment of the invention the coupling part is arranged to be in a position disengaged from the overspeed governor pulley in normal drive of the elevator.

In one embodiment of the invention the coupling part is arranged to be in the engaged position when the elevator is at a floor.

In one embodiment of the invention the overspeed governor, which comprises an overspeed governor pulley, which overspeed governor pulley comprises one or more parts (7) that are arranged to move in the radial direction of the overspeed governor pulley, and a switch (23), which is arranged to detect the position of the aforementioned part (7) in the radial direction of the overspeed governor pulley. Between the switch (23) and the overspeed governor pulley (2) is a contact part (A10) comprising an impact surface (A19) that is symmetrical in relation to the radius (R) of the overspeed governor pulley (2) for transmitting the movement of the part (7) to the switch (A23). This sensing solution can form a separate invention, separately or combined with the following embodiments, each separately or in combinations of them.

In one embodiment of the invention the contact part (A10) is a plate.

In one embodiment of the invention the part (7) is a centrifugal part that moves in the radial direction of the overspeed governor pulley.

In one embodiment of the invention the contact part (A10) comprises an impact surface (A19) that is essentially tangential in relation to the overspeed governor pulley (2).

In one embodiment of the invention the impact surface (A19) is a straight plane.

In one embodiment of the invention the impact surface (A19) is concave.

In one embodiment of the invention the contact part (A10) is supported at one of its ends.

In one embodiment of the invention the contact part (A10) is supported at both of its ends.

In one embodiment of the invention the sensor is essentially at the point of the imaginary continuation of the radius of the overspeed governor pulley.

In one embodiment of the invention the sensor is at the side of the point of the imagined continuation of the radius of the overspeed governor pulley.

In one embodiment of the invention the impact surface (A19) is horizontal.

In one embodiment of the invention the plate (A10) is an elongated thin plate directly or indirectly supported on the frame (1).

LIST OF FIGURES

In the following, the invention will be described in detail by the aid of some embodiments with reference to the attached drawings, wherein

Fig. 1 presents a three-dimensional view of an overspeed governor according to the invention.

Fig. 2 presents an explosion drawing of an overspeed governor, depicted three-dimensionally, according to Fig. 1.

Fig. 3 presents a partly three-dimensional view of an overspeed governor according to Fig. 1.
Fig. 4 presents an elevator according to the invention.
Fig. 5 presents a coupling arrangement of an overspeed governor according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 depicts an overspeed governor 8 according to the invention. Figs. 2 and 3 present the parts of the overspeed governor 8 according to Fig. 1 detached from each other for the sake of clarity.

The overspeed governor comprises a frame 1, which supports the overspeed governor pulley 2 that rotates with respect to the frame 1. The overspeed governor also comprises means (3, 4) for decelerating the speed of rotation of the overspeed governor pulley 2, by means of which the speed of rotation of the overspeed governor pulley 2 can be slowed down and preferably even stopped.

The purpose of decelerating the overspeed governor pulley in elevators is normally to change the ratio of the speed of the elevator car and the rim speed of the overspeed governor pulley, resulting from which change e.g. the safety gear on the elevator car can be tripped. Generally the overspeed governor is installed at the end of the elevator hoistway and the movement of the elevator car is transmitted to the overspeed governor with a rope fixed to the elevator car, which rope passes around the overspeed governor pulley and a diverting pulley fixed to the opposite end of the elevator hoistway. The rope is fixed to the safety gear on the elevator car and is fitted to pull a brake wedge fixed to an elevator car that is still moving when the overspeed governor pulley is decelerating against the guide rails of the elevator car.

What is essential from the standpoint of the operation of the overspeed governor according to this invention is how the speed and/or movement margin of the overspeed governor pulley 2 is affected. The overspeed governor according to the invention is suited for use e.g. in the type of arrangement defined above. The means (3, 4) are fitted to decelerate, and at their maximum to even stop, the overspeed governor pulley 2. They comprise a coupling part 3 arranged to move in relation to the overspeed governor pulley 2, which coupling part is arranged to move at least between the position A where it is engaged to the overspeed governor pulley 2 and the position 0 where it is disengaged from the overspeed governor pulley (in Fig. 2: between the positions 0-A in the direction indicated by the arrow). In the engaged position A the coupling part 3 is in connection with the overspeed governor pulley 2 and arranged to be moved by the rotation movement of the overspeed governor pulley. In the position 0 the coupling part 3 is disengaged from the overspeed governor pulley and resting on the axle 22 that is not rotating with respect to the frame part 1, which axle 22 is preferably common with the overspeed governor pulley 2. The support part 17 fixed in a moveable manner to the frame part 1 functions as a positioner of the coupling part 3 in the x direction. The means (3, 4) for decelerating the overspeed governor pulley comprise means (4, 5) for decelerating the movement of the coupling part 3 moved by the overspeed governor pulley 2. Thus in this way the rotation of the overspeed governor pulley 2 can be decelerated, and preferably even stopped, in the engaged position A via the engaged coupling part 3. The aforementioned means (4,5) comprise a detent 4 supported on the frame part and a detent 5 incorporated in the coupling part 3, which detent 5 is fitted in the engaged position A to move towards the detent 4 and to collide with it if the overspeed governor pulley rotates sufficiently far. The distance of the detents 4 and 5

enables the length of the rotation distance preceding deceleration of the speed of rotation of the overspeed governor pulley to be controlled. Thus in this way the means (4, 5) for decelerating the movement of the coupling part 3 moved by the overspeed governor pulley 2 is fitted to slow down the movement of the coupling part 3 only after the coupling part has rotated a certain predefined distance moved by the overspeed governor pulley 2. During the time between engagement and deceleration of the coupling part 3, the coupling part is preferably allowed to rotate without restriction along with the overspeed governor pulley. The overspeed governor according to the invention, by virtue of the margin of essentially free movement described above, can be used as an anti-creeping apparatus. For example, when the elevator car is loaded with the overspeed governor in the engaged position, the elevator car has a pre-defined sagging margin, which the car can sag before the overspeed governor triggers the safety gear and prevents additional sagging. Correspondingly, creeping upwards can be prevented, which is important especially in elevators provided with a counterweight. The distance of the detents can be adjusted by moving the detent 4. It is obvious that the distance could also be set to almost zero, but it is preferred that the distance produces rotation of 25-90 degrees, most preferably 25-60 degrees. Most preferably the margin for sagging is fitted to be such that the elevator car can sag 70 mm. This margin for sagging can preferably be used in both the directions of movement of the elevator car, i.e. in both the directions of rotation of the overspeed governor pulley. The detent 4 can also function as a jump-guard. In the figure, the detent 4 is a separate piece but it can if so desired be constructed also as a fixed part of the frame 1, e.g. the supporting fold distancing the part 4 from the frame 1 in Figs. 1-3 can function as a detent.

The moving of the coupling part 3 between the position O and A can be implemented e.g. by means of a solenoid 9, which is arranged to move the coupling part 3 in the x direction via the support part 17. In the figures this is implemented by means of the support part 17, which is supported on the frame part 1 in a manner that allows movement, rocking on the axle 18. The axle 18 is supported via the part 24 fixed to the frame part 1. When the support part 17 is rocked with the solenoid 9 around the axle 18, it produces in the coupling part 3 a force/movement in the x direction. For the sake of safety, it is advantageous to fit the coupling part 3 to function so that to keep it in the position 0 the solenoid 9 must be electromotively energized against some force that is independent of electricity. The coupling part 3 is arranged to try to move towards the position A in the embodiment presented in Figs. 1-3 utilizing gravity by disposing the tilting axle 18 at a distance from the center of mass of the support part 17 in the direction of the overspeed governor pulley. As an addition or alternatively, magnetism or a spring disposed between the frame 1 and the coupling part 3, which pulls against the solenoid in the position 0, can be used to produce the force trying to engage.

The overspeed governor preferably, but not necessarily, also comprises means (11, 13, 15) for detecting movement of the coupling element 3 along with the overspeed governor pulley 2 and/or for determining the length of the distance moved. This is implemented in Figs. 1-3 by supporting the detent 13 on the frame 1 of the overspeed governor in a manner allowing movement on the path of movement of the detent 5. The detent 13 is in connection with the detent 15, on the path of movement of which is the sensor 14. Thus when the coupling part 3 moves sufficiently the detent 5 strikes the detent 13, which starts to move along with the detent 5 and to move the detent 15, which trips the sensor

11. The detent 5 is fitted to strike the detent 13 before striking the detent 4. In this way information about the movement can be sent to the elevator control before rotation of the overspeed governor pulley 2 is acted on with the detent 4 and there is still time for gripping to be avoided with actions. The apparatus can thus be utilized as an unintended movement detector. These actions can include acting on the traction sheave or e.g. triggering a separate braking apparatus, such as a guide rail brake.

Engagement between the overspeed governor pulley 2 and the coupling part 3 is implemented in Figs. 1-3 with shape locking. In shape locking the coupling part 3 and the overspeed governor pulley 2 preferably comprise one or more groove-protrusion counterpairs (19, 20), in which case a reliable joint is achieved. The grooves are preferably greater in the direction of the rim of the overspeed governor than the protrusions, which increases the certainty of correct mating. The protrusions 19 settle into the grooves 20 in the position A and meet the edges of the grooves 20 as the overspeed governor pulley 2 moves and thus also move the coupling part 3. Alternatively the engagement can be performed e.g. magnetically or with friction. In Fig. 1 the overspeed governor is in the disengaged position 0, so the protrusions 19 are at a distance from the grooves 20.

The coupling part 3 is preferably such that its center of mass is at a distance in its radial direction from its center of rotation. Thus the coupling part always seeks to gravitate to the same position when it is in the position 0. This position is such that the detent part 5 hangs below the axle 22, preferably so that the detent surfaces of the detent 5 are symmetrically positioned in relation to the radius of the axle. Most preferably the coupling part is a piece, e.g. a rotationally symmetrical piece, from which the detent 5, possibly with its support

structures, protrudes. Thus the mass of the detent moves the center point away from the hub. Most preferably the coupling part 3 is balanced in such a way that the detent part 5 is in the direction of the center of mass when viewed from the centre hub. The distances of the detent surfaces on both sides of the detent part 5 to the detents 4 of them are preferably equidistant when the detent part 5 is in the gravitationally centered position. It is advantageous to install the overspeed governor according to the invention in the attitude presented in Figs. 1-3 so that the detent part 5 of the coupling part 3 is downwards. The detent part 5 comprises two detent surfaces, as a consequence of which the apparatus operates in the same way in both directions of rotation. For this reason also each detent surface of the detent part 5 is preferably at the same distance from the detent 4 that it would strike as a consequence of its rotation. The detent surfaces of the detent part 5 and the detents 4 are thus situated symmetrically as viewed from the x direction.

The overspeed governor preferably, but not necessarily, also comprises a second means 7 for decelerating the speed of rotation of the overspeed governor pulley 2. The second means 7 are preferably arranged to be fixed to the overspeed governor pulley 2 and to activate in some prior-art way, e.g. on the centrifugal principle depending on the speed of rotation of the overspeed governor pulley 2. In the figures a sensor 23 for monitoring the status of the centrifugally operated means 7 is in connection with the means 7, on the basis of which status information the speed of the elevator can be reduced when an overspeed situation is detected.

The overspeed governor pulley further comprises means, such as e.g. a rope groove 25, for transmitting movement of the elevator car to the overspeed governor pulley. The

triggering of gripping can be transmitted to the safety gears via these means. The rope groove can be integrated in the structure of the overspeed governor pulley 2 itself or in a part fixed to it.

The overspeed governor preferably, but not necessarily, also comprises means for controlling the actuator 9, such as the solenoid presented, used to engage the coupling part. The means can be e.g. the electrical control current of a solenoid. Preferably the overspeed governor also comprises means for receiving a wireless signal, with which means control data can be supplied to the overspeed governor from a distance. Wireless data transfer can occur with some prior-art method, such as e.g. as electromagnetic radiation or as acoustic signals. It is obvious that the information can, if so desired, also be transmitted along a wire.

The coupling part 3 can form one piece, but preferably comprises a number of parts, most preferably in the manner presented in Figs. 1-3 (parts 5, 10, 21, 16). The part 10, which in the engaged position A rotates along with the overspeed governor pulley 2, is connected to the detent part 5 preferably in such a way that there is a friction joint at some point between them to improve the durability of the parts. The friction joint gives way (starts to slide) before the parts become broken. The parts of the apparatus might break e.g. in a situation in which the overspeed governor pulley moved by the elevator car forcibly tries to turn the detent 5 towards the detent 4. The friction joint can be e.g. between the part 21 fixed to the part 10 and the part 16 surrounding it. What is essential is that the friction surfaces slip only when a certain pre-defined torque is exceeded, which torque is preferably higher the torque required to trigger the safety gears.

Thus the part 10 that rotates along with the overspeed governor pulley 2 can still continue rotating after the movement of the detent part 5 has decelerated so that it has stopped after colliding with the detent 4. Deceleration of the overspeed governor pulley triggers the safety gear, because as a consequence of the deceleration the speed of the rope or corresponding decreases below the speed of movement of the elevator car.

When there is a friction joint between the part 10 of the coupling part 3 engaging the overspeed governor pulley, this friction joint gives way before the parts break and allows movement between the parts 5 and 10 after the torque prevailing between the parts 5 and 10 has exceeded a certain limit. It is advantageous to dimension the friction joint in terms of its strength such that the friction joint gives way before the grip between the overspeed governor pulley 2 and the overspeed governor rope that it rotates fails.

The friction joint can be made with some prior-art method. For example, the part 10 can be compressed around the part 21 with a shrink-fit joint. In this case there is not a shape locking between them, but instead a friction joint. This friction joint allows movement between the parts 10 and 21 against each other, preferably however maintaining friction, which is sufficient in its magnitude for triggering the safety gears. The friction joint can be arranged at some point between the parts 5 and 10 depending on whether the parts are directly or indirectly joined to each other. When the aforementioned torque exceeding a certain limit is not prevailing between the parts 5 and 10, no slipping occurs between them and they behave together in the manner of one solid part. The friction joint could alternatively be made by compressing the plate surface fixed in the detent

part 5 strongly against the plate surface fixed in the part 21 that engages with the overspeed governor pulley. In this case a friction joint would be formed from the interaction known from disc brake technology prevailing between the plate surfaces. The compression between the plate parts could be arranged e.g. with bolt tightening. The friction joint is not however necessary. Without the friction joint the detent 4 decelerates movement of the overspeed governor pulley 2 via the coupling part 3 by stopping it in its position immediately it meets the detents 4 and 5.

The elevator according to the invention comprises some overspeed governor presented in this application installed in the elevator system. Fig. 4 illustrates an elevator according to the invention, which comprises an elevator car 26 and car guide rails 28. The elevator also comprises means for moving the elevator car, such as e.g. ropes connected to the elevator car, and a traction sheave. The overspeed governor pulley 2 of the overspeed governor 8 is fitted to rotate moved by the elevator car and is connected to a safety gear 12 that is in connection with the elevator car. The overspeed governor 8 is preferably installed in the elevator hoistway supported by the frame 1 in the manner presented in Fig. 4, or alternatively in the machine room, and connected to the safety gear 12 via the overspeed governor rope 10 passing around the overspeed governor pulley 2. The rope 10 is also preferably arranged to pass around a diverting pulley 27 in the elevator hoistway or elsewhere in the building. The overspeed governor pulley 2 thus rotates according to the movement of the elevator car via the rope 10. The elevator according to the invention could alternatively operate in such a way that the overspeed governor 8 is installed on the elevator car supported by the frame 1 and is connected to the guide rail of the elevator or to some rope in the elevator hoistway and receives from it

the speed of rotation comparable to the movement speed of the elevator car. For example the hoisting rope of the elevator or a rope positioned in the elevator hoistway can well be used for this purpose. In this case the detent 4 can be connected to the safety gear on the car, which safety gear triggers the detent 5 when it collides against the detent 4.

In normal drive, when the elevator moves the coupling part 3 is disconnected from the overspeed governor pulley 2 pulled by the solenoid 9, which coupling part can in this case rotate freely. When using the overspeed governor according to the invention as an anti-creeping apparatus the coupling part 3 is moved to the position A by disconnecting the current of the solenoid when the car stops, e.g. at the position of the landing. If the elevator car in this situation moves in either direction, caused e.g. by loading or rope slip, exceedance of the movement margin of the coupling part 3 causes in the manner described above deceleration of the overspeed governor pulley and triggering of the safety gear occurring via the overspeed governor rope.

The overspeed governor described above can be used also to trigger gripping of a moving elevator car by connecting the coupling part 3 to the moving overspeed governor pulley 2, as a consequence of which the movement of the overspeed governor pulley decelerates and gripping starts. Thus gripping can be triggered irrespective of the speed of rotation of the overspeed governor pulley. This can be desirable to do e.g. in an emergency situation or when testing the overspeed governor and/or the gripping.

All the features, e.g. the features 7, 11, 13, 15 and 23, are not necessary from the viewpoint of the operation of the invention. The invention can be utilized also as embodiments in which the second stopping means 7 do not

exist or are of a different type. The means 4 could also be of a different type. Deceleration of the coupling part 3 could be implemented e.g. with a magnet supported on the frame part, with a spring supported on the frame part, or with a loose braid fixed between the frame part and the coupling part that allows only a pre-defined distance of travel. In addition, the presence of the solenoid 9 is also not necessary because at its simplest the apparatus could be used manually.

In this application, engagement of the coupling part 3 to the overspeed governor pulley means that the coupling part connects directly or indirectly via other parts to the overspeed governor pulley 2 in such a way that movement of the overspeed governor pulley is transmitted to the coupling part 3. Preferably engagement is of the shape locking type, but it could also be based on friction or other corresponding means. In the disengaged position A the coupling part 3 is detached from the overspeed governor pulley so that the rotation movement of the overspeed governor pulley is not transmitted to the coupling part 3. The term deceleration is understood to also comprise stopping.

Fig. 5 describes the sensor system of the overspeed governor according to the invention. For the sake of clarity the support of the second end of the axle is not presented in the figure. The overspeed governor pulley 2 comprises a part 7 for braking the speed of rotation of the overspeed governor pulley 2, by means of which the speed of rotation of the overspeed governor pulley 2 can be slowed down and at most even stopped. The part 7 is arranged to move in the radial direction of the overspeed governor pulley and is preferably a type activated with the centrifugal principle. The overspeed governor also comprises a switch A23, which is arranged to detect the position of parts that have moved in the radial direction

from the effect of an increased speed of rotation of the overspeed governor pulley, more particularly of parts that have protruded from its rim. The switch A23 is preferably adjusted so that it triggers before the occurrence of a mechanical stopping by means of the centrifugal parts of the overspeed governor, if they exist. Between the switch A23 and the overspeed governor pulley 2 is a contact part A10, which is preferably formed from plate. The contact part A10 comprises an impact surface A19 that is symmetrical in relation to the radius R of the overspeed governor pulley 2 for transmitting the movement of the part A7 to the switch A23 when the part 7 hits the part A10. As presented in the figure, the contact part 10, which in this embodiment is a plate, comprises an impact surface 19 that is essentially tangential in relation to the overspeed governor pulley 2. By virtue of the contact part, the part(s) 7, such as e.g. the eccentric weights, do not directly strike the limit switch, but instead triggering occurs via the contact part 10. The situation presented in Fig. 5, in which the part 7 is just striking the contact surface 19 of the plate A10, i.e. the surface at the point of the movement range of the part 7 on the side of the part 7. In the figure the roll A13 of the switch A23 is almost at the point of the imaginary radius starting from the center of rotation of the overspeed governor pulley A2 The roll can alternatively be disposed farther to the side from the line of the radius, in which case the operation of the switch is more sensitive. Preferably the switch is the on-off type, but it can also be without a limit value, in which case the limit value can be set e.g. in the control of the elevator.

The plate A10 forming the contact part is preferably flexible. Preferably it is steel, most preferably spring steel. Thus the plate does not break from the force of impacts and is able to transmit movement to the sensor

A23. Alternatively the plate could also turn supported by a joint, in which case flexibility of the plate is not necessary. The plate presented in the figures comprises a bending capacity, but at its simplest the plate can be formed to be flat throughout its entirety. The plate A10 is fixed at one of its ends to the bracket A16, bit it could if so desired be fixed at both of its ends, in which case an advantage, among others, would be a more rigid and more symmetrical construction. The switch A23 is fixed to its bracket A16 such that the roll A13 presses the plate A10 against the flange 18 in its bracket 16 without any play. The switch A23 can be adjusted so that the lever A12 turns so far that it is close to the triggering point. In this way the state of the coupling element can be fitted to change with the smallest possible movement. The switch A23 preferably comprises a frame part A11, which detects the movement of the roll A13 and sends information electrically onwards, e.g. to the control of the elevator.

What is essential from the standpoint of the coupling solution is that the part(s) 7 striking the contact part strike the same type of surface when moving in both their directions of rotation. The plate thus comprises the type of impact surface that is symmetrical in relation to the radius R of the overspeed governor pulley when viewing the overspeed governor in the direction of the center of rotation. In other words the part of the impact surface A19 on the left-hand side of the radius R seen in Fig. 5 is a mirror image of the contact surface on the right-hand side of the radius R. An advantage of this is that the same adjustments are valid in both directions and the overspeed governor operates completely bi-directionally. The contact part according to one embodiment of the invention could be formed to comprise a curved impact surface, in which the concave impact surface is on the side of the overspeed governor pulley. In this case the

contact part can be formed from e.g. a metal plate bent to be curved.

In this application the term impact surface is understood to mean the surface of the contact part A10 that the part(s) 7 can strike. A part moving in the radial direction means a part, which part is fully or at least partially arranged to be able to move in the direction of the radius. The part 7 is connected to the overspeed governor pulley such that it is able to rotate along with the overspeed governor pulley. When the part is formed as a centrifugal part, it is meant that the force enabling movement in the radial direction is centrifugal force, which is exerted on the part 7 directly or indirectly. It is advantageous to place a spring or corresponding to oppose radial movement. The part 7 is arranged to reach, after having moved a certain predefined distance in the radial direction, a path of movement on which when it rotates it strikes the plate A10. Preferably at least a part of the part 7 can be moved in the radial direction to a track on a point of which the plate is disposed. The part 7 can e.g. be supported by leverage, in which case at least some part of the lever moves in the radial direction. The sensor system solution described in Fig. 5 can form a separate invention independent of the function of the coupling part 3 or of other features presented in this application, and can be utilized in the sensor systems of all types of overspeed governors.

It is obvious to the person skilled in the art that the invention is not limited to the embodiments described above, in which the invention is described using examples, but that many adaptations and different embodiments of the invention are possible within the scope of the inventive concept defined by the claims presented below. Thus it is obvious that the frame 1 can be formed of one or more parts. It is also obvious that

the parts 2, 7 and 25 can be discrete or integrated. What is essential is that they move as a single structure.

CLAIMS

1. Overspeed governor, which comprises a frame (1), an overspeed governor pulley (2) supported by the frame (1) in a manner allowing rotation, and means (3, 4) for decelerating the speed of rotation of the overspeed governor pulley (2), which means comprise a coupling part (3) arranged to move in respect to the overspeed governor pulley (2), which coupling part (3) is arranged to move at least between the position (A) where it is engaged to the overspeed governor pulley (2) and the position (0) where it is disengaged from the overspeed governor pulley, characterized in that in the engaged position (A) the coupling part (3) is arranged to be moved by the rotation movement of the overspeed governor pulley (2), and in that the overspeed governor further comprises means (4, 5) for decelerating the movement of the coupling part (3) moved by the overspeed governor pulley (2) for slowing down the overspeed governor pulley (2).

2. Overspeed governor according to claim 1, characterized in that the coupling part (3) comprises a detent part (5) for transmitting the force decelerating the coupling part (3) to the coupling part (3), and a part (10) engaging to the overspeed governor pulley (2) in the position (A), and in that there is a friction joint between the detent part (5) and the part (10) of the coupling part that engages to the overspeed governor pulley (2).

3. Overspeed governor according to claim 1 or 2, characterized in that the friction joint permits movement of the parts 10 and 5 with respect to each other only after the torque between them exceeds a certain preset limit, preferably however such that the friction joint maintains in its slipping such a great friction force that the force decelerating the overspeed governor

pulley that is transferred to the overspeed governor pulley via the part 10 exceeds in its magnitude the force needed to trigger the safety gears.

4. Overspeed governor according to claim 1, 2 or 3, characterized in that the friction joint gives way before the grip between the rope groove (25) of the overspeed governor pulley (2) and the overspeed governor rope (10) that rotates the overspeed governor pulley (2) fails.

5. Overspeed governor according to any of claims 1-4, characterized in that the coupling part (3) is arranged to move in the axial direction (x) of the overspeed governor pulley (2) between the position (A) where it is engaged to the overspeed governor pulley (2) and the position (0) where it is disengaged from the overspeed governor pulley.

6. Overspeed governor according to any of claims 1-5 above, characterized in that the when in the engaged position (A) the coupling part (3) is arranged to be moved by the rotation movement of the overspeed governor pulley (2) a predetermined distance before the means (4, 5) for decelerating the movement of the coupling part (3) moved by the overspeed governor pulley (2) start decelerating the movement of the coupling part (3).

7. Overspeed governor according to any of claims 1-6 above, characterized in that the overspeed governor comprises second means (7) for decelerating the speed of rotation of the overspeed governor pulley (2), which second means (7) are preferably arranged to activate on the principle of inertia (e.g. on the centrifugal principle) depending on the speed of rotation of the overspeed governor pulley (2).

8. Overspeed governor according to any of claims 1-7 above, characterized in that the overspeed governor comprises means, preferably a solenoid (9), for moving the coupling part (3) between the position (A) where it is engaged to the overspeed governor pulley (2) and the position (0) where it is disengaged from the overspeed governor pulley.

9. Overspeed governor according to any of claims 1-8 above, characterized in that the overspeed governor comprises means (11, 13, 15) for detecting movement of the coupling part (3) along with the overspeed governor pulley and/or for determining the length of the distance moved.

10. Overspeed governor according to any of claims 1-9 above, characterized in that the coupling part (3) comprises a part (10), which is discoidal and which is fitted to move along with the overspeed governor pulley (2) when the coupling part (3) is in the engaged position (A).

11. Overspeed governor according to any of claims 1-10 above, characterized in that the coupling part (3) is supported with an axle (22) eccentrically in respect to its center of mass, for positioning the coupling part (3) when it is in the position (0).

12. Overspeed governor according to any of claims 1-11 above, characterized in that engagement of the coupling part (3) and the overspeed governor pulley (2) is arranged with the shape locking principle, preferably of the indentation-protrusion type.

13. Overspeed governor according to any of claims 1-12 above, characterized in that the coupling part (3) comprises a detent part (5) for transmitting the force

that decelerates the coupling part (3) to the coupling part (3).

14. Overspeed governor according to any of claims 1-13 above, characterized in that there is a friction joint between the detent part (5) and the part (10) that is engaged to the overspeed governor pulley (2) in the position (A).

15. Overspeed governor according to any of claims 1-14 above, characterized in that the coupling part is arranged to move in the engaged position (A) by turning co-axially with the overspeed governor pulley (2).

16. Overspeed governor according to any of claims 1-15 above, characterized in that the overspeed governor pulley (2) comprises means, such as e.g. a rope groove (25), for transmitting movement of the elevator car to the overspeed governor pulley.

17. Elevator, which elevator comprises at least an elevator car (26), which is arranged to travel backwards and forwards in essentially the vertical direction, preferably along guide rails (28), and a safety gear (12) disposed in connection with the elevator car (26), and also at least one overspeed governor (8), which comprises at least an overspeed governor pulley (2), which is fitted to rotate moved by the elevator car, and which is connected to a safety gear (12) that is in connection with the elevator car, preferably via an overspeed governor rope (10) that passes around a diverting pulley (27) and the overspeed governor pulley (2), characterized in that the overspeed governor (8) is according to any of claims 1-13.

18. Elevator according to claim 14, characterized in that the coupling part is

arranged to be in the position (0) separate from the overspeed governor pulley in normal drive of the elevator.

FIG. 1

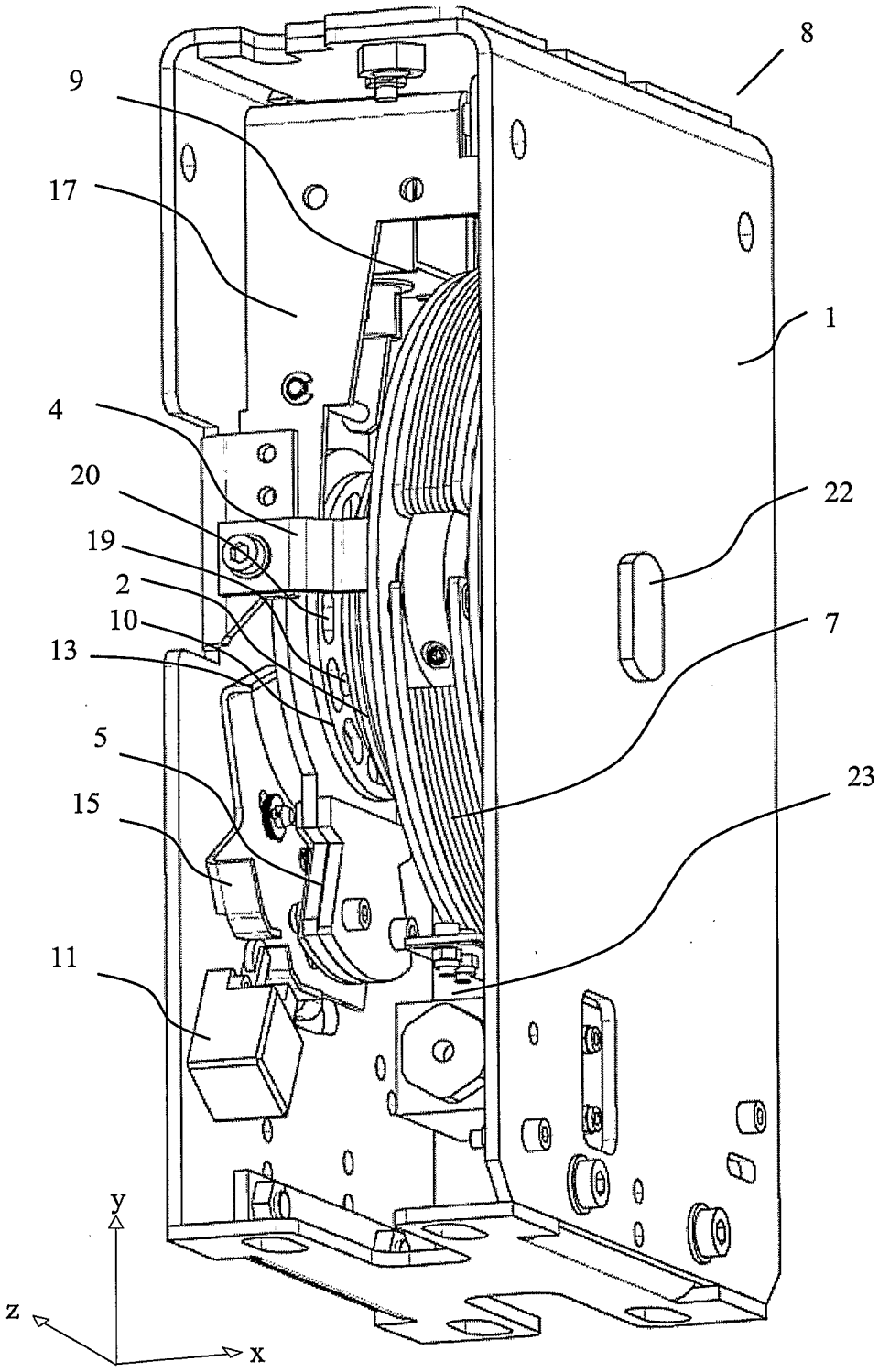


FIG. 2

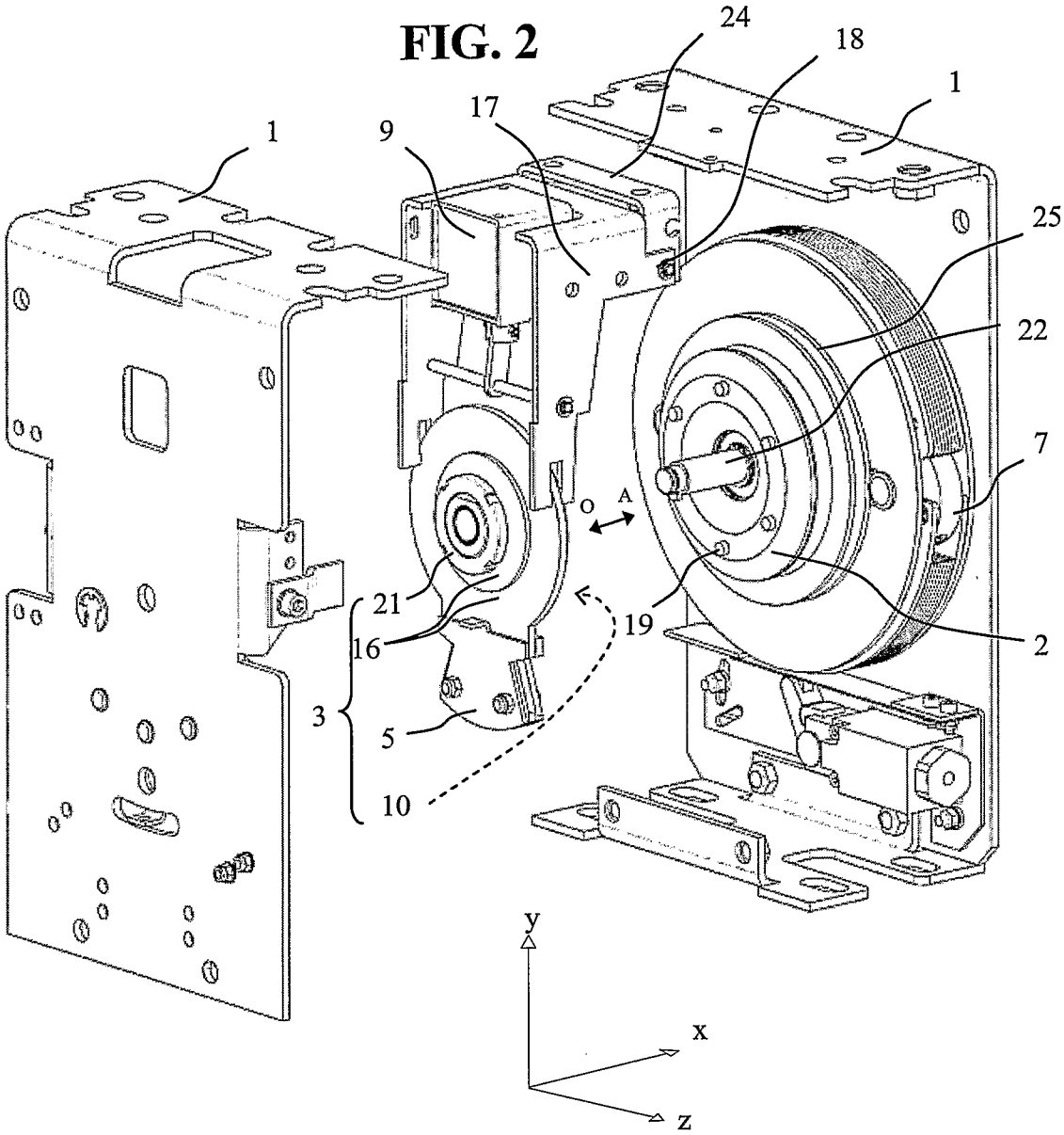


FIG. 3

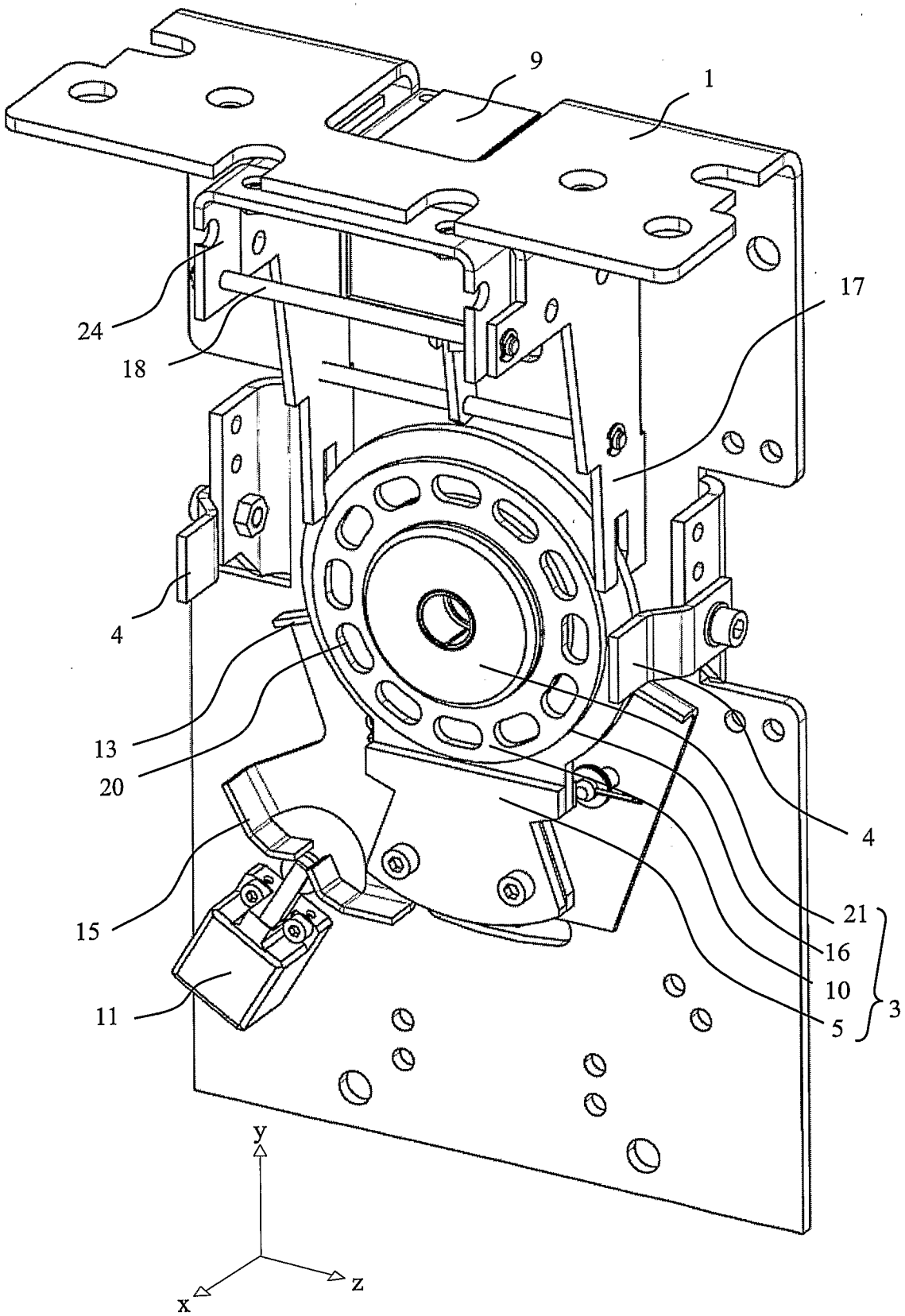


FIG. 4

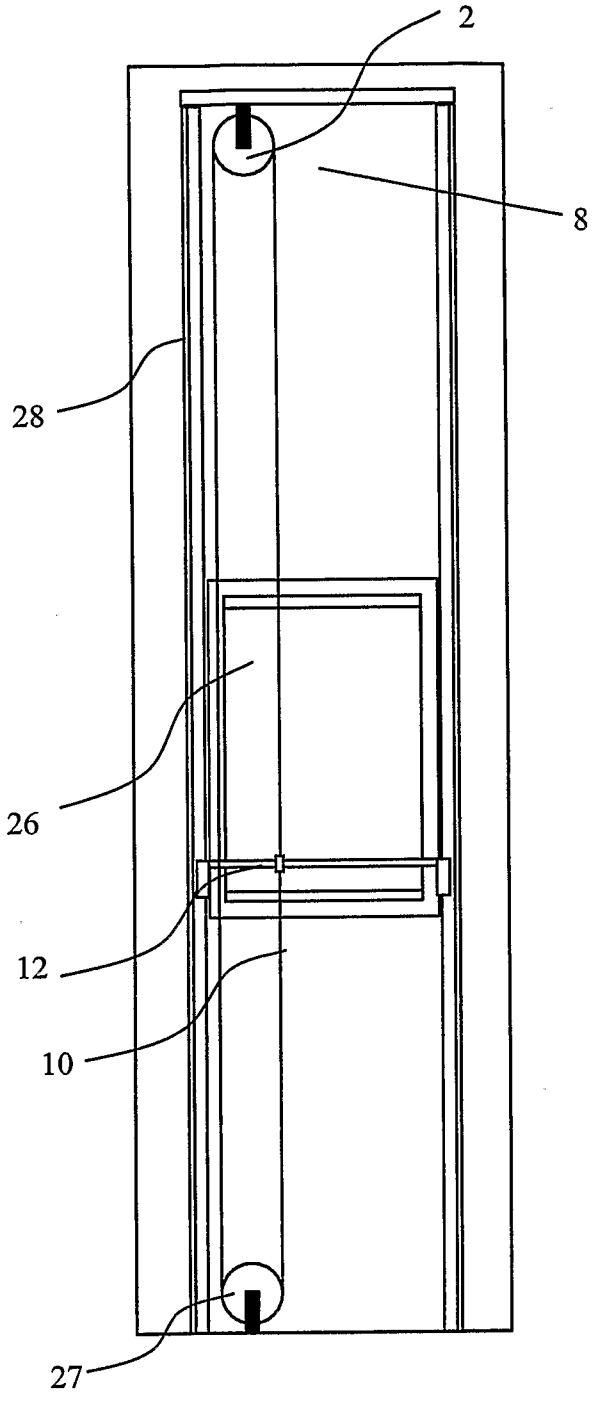
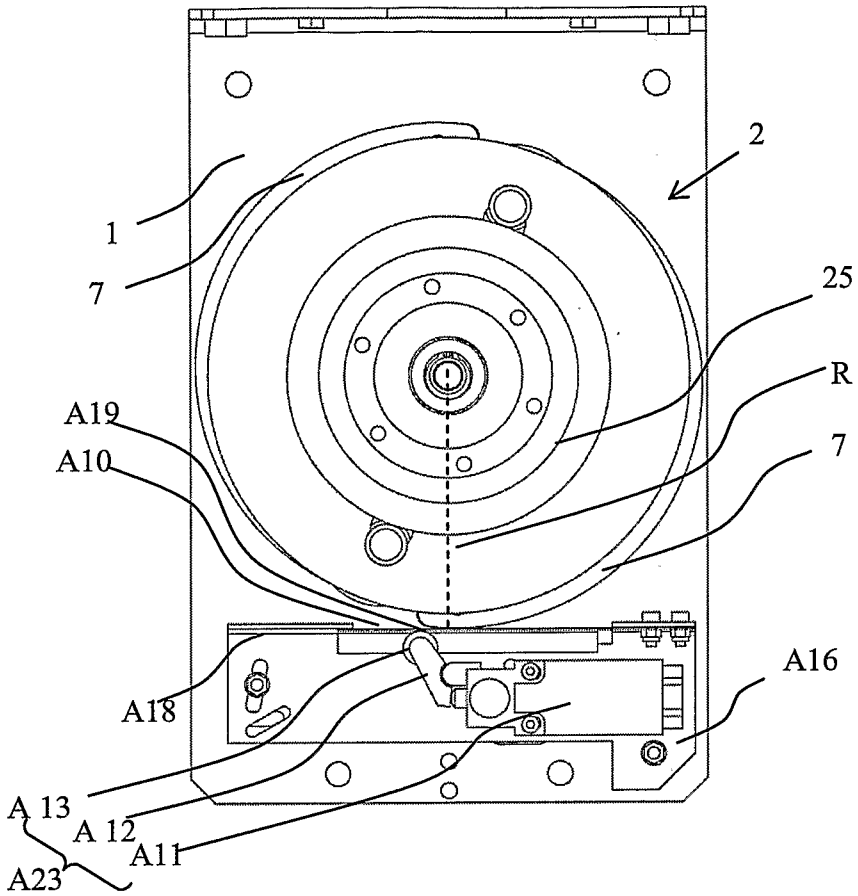


Fig. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2009/000052

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B66B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

FI, SE, NO, DK

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1088782 A1 (THYSSEN AUFZUGSWERKE GMBH) 04 April 2001 (04.04.2001), whole document	1, 5-10, 13, 15, 16, 17, 18
A	DE 3700578 A1 (BONGERS & DEIMANN) 27 August 1987 (27.08.1987)	
A	WO 2007122282 A1 (KONE CORP et al.) 01 November 2007 (01.11.2007)	

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 July 2009 (13.07.2009)	14 July 2009 (14.07.2009)

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/FI2009/000052

Patent document cited in search report	Publication date	Patent family members(s)	Publication date
EP 1088782 A1	04/04/2001	ES 2160429T T3 AT 202539T T	01/11/2001 15/07/2001
DE 3700578 A1	27/08/1987	None	
WO 2007122282 A1	01/11/2007	None	

INTERNATIONAL SEARCH REPORT

International application No.
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CLASSIFICATION OF SUBJECT MATTER

Int.Cl.
B66B 5/04 (2006.01)