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(54) **ELEVATOR SAFETY GEAR TRIGGER**

(57) The elevator safety gear trigger (100) comprises an electromagnet (120), a longitudinal pull rod (140) having a first end (141) connected to a connection piece (130), which is drawn into connection with the electromagnet (120) when the electromagnet (120) is activated, and a second end (142) being operatively connected to at least one safety gear (70). An actuator (150) is arranged to detach the connection piece (130) and thereby also the pull rod (140) from the electromagnet (120) when the electromagnet (120) is deactivated.

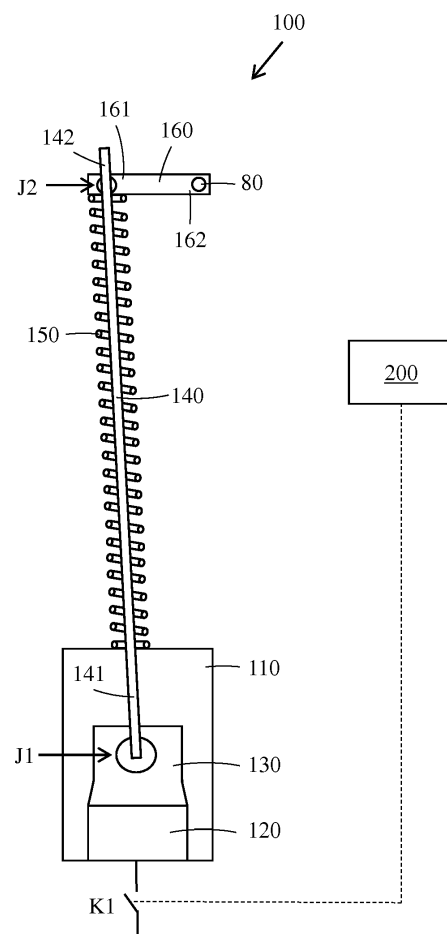


FIG. 5

Description

FIELD

[0001] The invention relates to an elevator safety gear trigger.

BACKGROUND

[0002] An elevator may typically comprise a car, an elevator shaft, a machine room, lifting machinery, ropes, and a counterweight. The elevator car may be positioned within a sling that supports the car. The lifting machinery may be positioned in the machine room and may comprise a drive, an electric motor, a traction sheave, and a machinery brake. The lifting machinery may move the car in a vertical direction upwards and downwards in the vertically extending elevator shaft. The ropes may connect the sling and thereby also the car via the traction sheave to the counterweight. The sling may further be supported with gliding means on guide rails extending along the height of the shaft. The guide rails may be supported with fastening brackets on the side wall structures of the shaft. The gliding means may engage with the guide rails and keep the car in position in the horizontal plane when the car moves upwards and downwards in the elevator shaft. The counterweight may be supported in a corresponding way on guide rails supported on the wall structure of the shaft. The elevator car may transport people and/or goods between the landings in the building. The elevator shaft may be formed so that the wall structure is formed of solid walls or so that the wall structure is formed of an open steel structure.

[0003] According to safety regulations, elevators are required to be provided with equipment for monitoring the speed of the elevator car and for stopping the movement of the elevator car if a predetermined maximum speed is exceeded or the elevator starts moving without being commanded to when standing on a landing. An overspeed situation may arise e.g. if the hoisting ropes of the elevator car start slipping due to insufficient friction between the ropes and the traction sheave, the hoisting ropes break, the control system goes berserk or if the traction sheave shaft breaks and the elevator car starts falling freely in the elevator shaft. The equipment monitoring the speed may comprise at least a speed limiter, which has been arranged to monitor the speed to ensure that the maximum speed will not be exceeded, and a safety gear mechanism. The safety gear mechanism may be formed of one or more safety gears connected to the speed limiter and attached to the elevator car or car frame. The safety gear mechanism stops the elevator car in the event of overspeed upon being activated by the speed limiter. The safety gear mechanism may comprises two safety gears, a first one of which has been arranged to grip in an overspeed situation a first guide rail guiding the elevator car while a second one has been arranged to grip a second guide rail guiding the elevator

car. The safety gear arrangement may additionally comprise a linkage system connecting the safety gears to the speed limiter.

[0004] Prior art elevator speed limiters are often based on mechanical pulley and rope systems, comprising a speed limiter pulley positioned e.g. in the upper part of the elevator shaft, a tensioning pulley positioned in the lower part of the elevator shaft and a speed limiter rope fitted to run in a substantially tight closed loop around these pulleys. The safety gears may be connected via a linkage system to the speed limiter rope, which, when the elevator car is moving, runs around the speed limiter pulley and the tensioning pulley. If the elevator car and therefore the speed limiter rope move at an excessive speed, then the rotation of the speed limiter pulley in the upper part of the elevator shaft is stopped by a mechanism activated e.g. by centrifugal force, consequently the speed limiter rope also stops moving, with the result that the speed limiter rope exerts a pull on the linkage system arranged in connection with the elevator car that is still moving, whereby the linkage system activates the safety gears to grip the guide rails guiding the elevator car so that the elevator car stops moving.

[0005] In some elevators, such as e.g. those made for large hoisting heights, i.e. so-called high-rise or mega-high-rise elevators, for reasons of design dimensioning, two safety gear pairs may be used instead of one. Both safety gear pairs may be connected to the same speed limiter rope. The safety gear pairs may be arranged to grip the guide rails simultaneously or one pair after the other with a delay.

[0006] Speed limiter ropes are typically steel ropes. In high-rise elevators the weight and inertia of these ropes become challenging for the design of the speed limiter mechanism.

SUMMARY

[0007] An object of the present invention is an improved elevator safety gear arrangement.

[0008] The elevator safety gear trigger according to the invention is defined in claim 1.

[0009] The elevator safety gear trigger comprises:

an electromagnet,
a longitudinal pull rod, a first end of the pull rod being connected to a connection piece, which is drawn into connection with the electromagnet when the electromagnet is activated, a second end of the pull rod being operatively connected to at least one safety gear,
an actuator arranged to detach the connection piece and thereby also the pull rod from the electromagnet when the electromagnet is deactivated.

[0010] The safety gear trigger according to the invention may eliminate at least the pulleys and the speed limiter rope used in prior art safety gear systems for trig-

gering the safety gears.

[0011] The safety gear trigger according to the invention may further eliminate also the linkage system used in prior art systems between the speed limiter rope and the safety gears. The safety gear trigger is then connected directly to the safety gears.

[0012] Any kind of overspeed detection system or overspeed detection means may be used in connection with the safety gear trigger. The overspeed detection system may be based on electronical devices e.g. it may be based on one or more acceleration sensors or it may be based on encoder data. The encoder may be used to measure the rotation speed of the electric motor driving the traction sheave. The overspeed detection system may on the other hand be based on mechanical devices e.g. a roller acting on the car guide rail.

[0013] The safety gear trigger can be used in connection with any kind of safety gear. The safety gear may be provided only in connection with one guide rail or in connection with both guide rails or there may be more than one safety gear on each guide rail.

[0014] The safety gear trigger can be used in connection with any kind of elevators. The safety gear trigger is especially suitable to be used in high-rise or mega-high rise buildings in which the elimination of a speed limiter rope running over pulleys in the upper and in the lower portion of the shaft is a big advantage.

DRAWINGS

[0015] The invention will in the following be described in greater detail by means of preferred embodiments with reference to the attached drawings, in which

Figure 1 shows a vertical cross section of an elevator,
Figure 2 shows a safety gear arrangement in an elevator,
Figure 3 shows a first cross sectional view of a safety gear,
Figure 4 shows a further cross sectional view of the safety gear,
Figure 5 shows a vertical cross sectional view of a safety gear trigger according to the invention.

DETAILED DESCRIPTION

[0016] Fig. 1 shows a vertical cross section in the side to side direction of a first embodiment of an elevator.

[0017] The elevator may comprise a car 10, an elevator shaft 20, a machine room 30, lifting machinery 60, ropes 42, and a counterweight 41. A separate or an integrated sling 11 may surround the car 10.

[0018] The lifting machinery 60 may be positioned in the machine room 30. The lifting machinery may comprise a drive 61, an electric motor 62, a traction sheave 63, and a machinery brake 64. The lifting machinery 60 may move the car 10 in a vertical direction Z upwards and downwards in the vertically extending elevator shaft

20. The machinery brake 64 may stop the rotation of the traction sheave 63 and thereby the movement of the elevator car 10.

[0019] The sling 11 may be connected by the ropes 42 via the traction sheave 63 to the counterweight 41. The sling 11 may further be supported with gliding means 27 at guide rails 25 extending in the vertical direction in the shaft 20. The gliding means 27 may comprise rolls rolling on the guide rails 25 or gliding shoes gliding on the guide rails 25 when the car 10 is moving upwards and downwards in the elevator shaft 20. The guide rails 25 may be attached with fastening brackets 26 to the side wall structures 21 in the elevator shaft 20. The gliding means 27 keep the car 10 in position in the horizontal plane when the car 10 moves upwards and downwards in the elevator shaft 20. The counterweight 41 may be supported in a corresponding way on guide rails that are attached to the wall structure 21 of the shaft 20.

[0020] The car 10 may transport people and/or goods between the landings in the building. The elevator shaft 20 may be formed so that the wall structure 21 is formed of solid walls or so that the wall structure 21 is formed of an open steel structure.

[0021] The figure shows a prior art speed limiter system based on a mechanical pulley and a rope system. The system comprises a speed limiter pulley 52 mounted e.g. in the upper part of the elevator shaft 20, a tensioning pulley 53 mounted in the lower part of the elevator shaft 20 and a speed limiter rope 51 fitted to run in a substantially tight closed loop around these pulleys 52, 53. A mechanical linkage system may connect to the speed limiter rope 51 and to the safety gears 70 positioned in connection with the car 10. The speed limiter rope 51 runs around the speed limiter pulley 52 and the tensioning pulley 53 when the car 10 is moving. If the elevator car 10 and thereby also the speed limiter rope 51 move at an excessive speed, then the rotation of the speed limiter pulley 52 in the upper part of the elevator shaft 20 is stopped by a mechanism activated e.g. by centrifugal force and at the same time the speed limiter rope 51 also stops moving. The stationary speed limiter rope 51 will activate the mechanical linkage system, causing the safety gears 70 to grip the guide rails 25 guiding the elevator car 10 and thereby stop the car 10.

[0022] Figure 2 shows a safety gear arrangement in an elevator.

[0023] The prior art safety gear arrangement shown in the figure comprises a mechanical linkage system 80 supported on the sling 11. The mechanical linkage system 80 comprises a pair of first linkage parts 81A, 81 B, a pair of second linkage parts 82A, 82B, and a pair of third linkage parts 83A, 83B. The first linkage parts 81A, 81 B are positioned on opposite sides of the car 10 above the car 10. Each of the first linkage parts 81A, 81 B is connected with an articulated joint J11, J12 to the horizontal upper bar of the sling 11. The second linkage parts 82A, 82B are also positioned on opposite sides of the car 10 above the car 10. Each of the second linkage parts

82A, 82B is connected from the middle with an articulated joint J21, J22 to the horizontal upper bar of the sling 11. The third linkage parts 83A, 83B are positioned on opposite sides of the car 10 below the car 10. Each of the third linkage parts 83A, 83B is connected from the middle with an articulated joint J31, J32 to the horizontal lower bar of the sling 11.

[0024] An inner end of each of the second linkage parts 82A, 82B is connected with a pull rod 84A, 85A to an inner end of the respective third linkage part 83A, 83B. An outer end of each of the third linkage parts 83A, 83B is connected with a pull rod 84B, 85B to an outer end of the respective first linkage part 81A, 81 B. The first linkage parts 81A, 81 B are connected with crosswise running pull bars 86A, 86B to each other. Outer ends of the first linkage parts 81A, 81 B are further connected with pull bars 87A, 87B to a respective outer end of the second linkage part 82A, 82B.

[0025] An outer end of the first linkage part 81A is further connected with an articulated joint J41 to the speed limiter rope 51. There is a safety gear 70 at each side of the car 10 below the car 10 i.e. in connection with each guide rail 25 (not shown in the figure). The safety gears 70 are positioned in connection with the third linkage part 83A, 83B. The safety gears 70 may be identical.

[0026] The function of the safety gear arrangement will be described in the following.

[0027] If the car 10, when moving downwards, starts to overspeed, then the speed governor 52 will be activated preventing overspeeding of the speed limiter rope 51, which therefore moves slower than the car 10, thereby tripping the linkage system 80 and activating the safety gears 70. Tripping of the linkage system 80 means that the outer end of the first linkage part 81A on the left hand side in the figure is turned upwards around the articulated joint J11. The crosswise running pull bars 86A, 86B thus turn the outer end of the first linkage part 81 B on the right hand side in the figure also upwards around the articulated joint J12. As a result of this, the outer vertical pull rods 84B, 85B will be pulled upwards, whereby both safety gears 70 are activated.

[0028] If the car 10, when moving upwards, starts to overspeed, then the speed governor 52 will be activated preventing overspeeding of the speed limiter rope 51, which therefore moves slower than the car 10, thereby tripping the linkage system 80 and activating the safety gears 70. Tripping of the linkage system 80 means that the outer end of the first linkage part 81A on the left hand side in the figure is turned downwards around the articulated joint J11. The crosswise running pull bars 86A, 86B thus turn the outer end of the first linkage part 81 B on the right hand side in the figure also downwards around the articulated joint J12. As a result of this, the inner vertical pull rods 84A, 85A will be pulled upwards, whereby both safety gears 70 are activated.

[0029] Figure 3 shows a first cross sectional view of a safety gear and figure 4 shows a further cross sectional view of the safety gear.

[0030] The safety gear 70 may comprise a frame 74, a force element 73, a brake surface 71, and a support surface 72. The frame 74 may have a shape of a letter C, whereby the guide portion of the guide rail 25 protrudes into the opening in the letter C. The brake surface 71 is at a distance from a first side surface of the guide portion 25A of the guide rail 25 and the support surface 72 is at a distance from an opposite, second side surface of the guide portion 25A of the guide rail 25. The force element 73 may be a roll rotating on a shaft 76. An outer end of the shaft 76 may be supported on a shield 75 of the frame 74. The outer end of the shaft 76 may pass through an oblong guide opening in the shield 75. The oblong guide opening in the shield 75 has the same form as the support surface 72. The support surface 72 may form a straight inclined track as shown in figure 2 or the support surface 72 may have any other form. The support surface 72 may form one or several curved tracks or one or several curved tracks and straight tracks positioned after each other in any order as shown in figure 4. The curvature of the curved tracks may be the same or they may have a different curvature.

[0031] The general idea is that the roll 73 is pressed in the figures to the left towards the side surface of the guide portion 25A of the guide rail 25 when the shaft 76 of the roller 73 moves upwards in the guide opening in the shield 75. The form of the support surface 72 will determine the time it takes for the roller 73 to come into contact with the side surface of the guide portion 25A of the guide rail 25 at a certain speed of the elevator car 10. Once the roller 73 comes into contact with the side surface of the guide portion 25A and is further urged towards the side surface of the guide portion 25A of the guide rail 25 by the support surface 72, the safety gear 70 will be moved to the right so that the brake surface 71 comes into contact with the opposite side surface of the guide portion 25A of the guide rail 25. The safety gear 70 will thereby start braking with the brake surface 71. The roll 73 can still after this move a bit upwards whereby the braking force of the brake surface 71 is intensified. The rotation of the roll 73 will at the upper end of the support surface 72 be stopped, whereby the outer surface of the roll 73 forms a second brake surface against the side surface of the guide portion 25A of the guide rail 25.

[0032] The roller 73 in the safety gear 70 may be connected to the respective vertical support rods 84A, 84B; 85A, 85B so that when either of the vertical support rods 84A, 84B; 85A, 85B move upwards, then also the roller 73 moves upwards along the support surface 72, whereby the safety gear 70 starts to brake.

[0033] Figure 5 shows a vertical cross section of a safety gear trigger according to the invention.

[0034] The safety gear trigger 100 may comprise a casing 110, an electromagnet 120, a connection piece 130, a longitudinal pull rod 140, an actuator 150, and an arm 160.

[0035] The electromagnet 120 may be positioned at

the bottom of the casing 110. The lower end of the connection piece 130 may be connected to the electromagnet 120 so that the connection piece 130 remains attached to the electromagnet 120 when current flows through the electromagnet 120 i.e. the electromagnet 120 is activated. The connection piece 130 is released from the electromagnet 120 when the current flow through the electromagnet 120 is interrupted, i.e. the electromagnet 120 is deactivated.

[0036] The connection piece 130 may form an armature for the electromagnet 120, whereby the connection piece 130 can be made of standard structural steel.

[0037] A first end 141 of the pull rod 140 may be connected to the connection piece 130 via a first articulated joint J1. The first articulated joint J1 may be a spherical joint so that a second opposite end 142 of the pull rod 140 can move in all directions except for the axial direction. The first end 141 of the pull rod 140 may thus protrude into the casing 110 from an upper end of the casing 110.

[0038] A second end 142 of the pull rod 140 may be connected to a first end 161 of the arm 160 via a second articulated joint J2. A second opposite end 162 of the arm 160 may be connected to the linkage system 80 acting on the safety gears.

[0039] The pull rod 140 may be formed of a threaded rod with a circular cross section, whereby also the second articulated joint J2 may be threaded.

[0040] The actuator 150 may be formed of spring means 150. The spring means 150 may be formed as one or several consecutive coil springs surrounding the pull rod 140 and extending between the arm 160 and the casing 110. The compression of the spring 150 and the distance between the arm 160 and the upper end of the casing 110 may be adjusted by adjusting the position of the joint J2 on the threaded pull rod 140. The spring 150 or springs 150 may be supported by plastic bushings in order to hold the springs 150 in line.

[0041] The spring means 150 need not necessarily be positioned on the pull rod 140 as shown in the figures. The spring means 150 could be positioned in connection with the pull rod 140 or in connection with the connection piece 130.

[0042] The use of one or several coil springs 150 as the actuator 150 is an advantageous embodiment, but also other actuators suitable for this application may be used. Any mechanical actuator being able to separate the connection piece 130 from the electromagnet 120 when the electromagnet 120 is deactivated would be suitable.

[0043] The safety gear trigger 100 may be operated in two states. The arm 160 may, in the first state, be turned into a position in which the linkage system 80 keeps the safety gears 70 open. For the second state, the arm 160 may be turned into a position in which the linkage system 80 activates the safety gears 70. The first end 161 of the arm 160 may, in the first state, be in a lower position when the connection piece 130 is drawn into connection

with the energised i.e. activated electromagnet 120. This means that the linkage system 80 of the safety gears 70 is in a position in which the safety gears 70 are open i.e. the lifting machinery 60 can move the elevator car 10 freely up and down in the shaft 20. When the overspeed detection system 200 detects an overspeed of the elevator car 10, then the overspeed detection system 200 disconnects the current supply to the electromagnet 120 e.g. by opening a contact K1. The disconnection of the current supply to the electromagnet 120 means that the electromagnetic force exerted by the electromagnet 120 is disconnected. The connection piece 130 and thereby also the pull rod 140 will thus be disconnected from the electromagnet 120, whereby the spring 150 presses the first end 161 of the arm 160 upwards into an upper position. This means that the linkage system 80 acting on the safety gears 70 will be turned into a position in which the safety gears 70 are activated i.e. the elevator car 10 is stopped.

[0044] The safety gear trigger 100 according to the invention may be used in connection with any prior art speed limiter system i.e. not only with the prior art speed limiter system disclosed in figure 2.

[0045] The safety gear trigger 100 according to the invention may on the other hand eliminate the need of a traditional prior art speed limiter system.

[0046] The safety gear trigger 100 according to the invention could be used in connection with any prior art speed limiter system so that the pulleys 52, 53 and the rope 51 are left out and the safety gear trigger 100 is connected to the linkage system 80 of the prior art speed limiter system. may thus be left out when the safety trigger 100 is used.

[0047] The safety trigger 100 according to the invention could further be connected directly to the safety gears 70 eliminating also the need of the linkage system 80 in prior art speed limiter systems.

[0048] Any kind of overspeed detection system 200 or overspeed detection means 200 may be used in connection with the safety gear trigger 100. The overspeed detection system 200 may be based on electronical devices e.g. it may be based on one or more acceleration sensors or it may be based on encoder data. The encoder may be used to measure the rotation speed of the electric motor 62 driving the traction sheave 63. The overspeed detection system may on the other hand be based on mechanical devices e.g. a roller acting on the car guide rail 25.

[0049] A mechanical detent may furthermore be provided in the upper portion and in the lower portion of the shaft 20 in order to define a refuge space in the upper portion and in the lower portion of the shaft 20. The mechanical detent may be activated when the car 10 passes the detent. Activation of the mechanical detent may open the contact K1, whereby the electric power to the electromagnet 120 is interrupted and the safety gear 70 is activated.

[0050] The safety gear trigger 100 can be used in con-

nection with any kind of safety gear. The safety gear may be provided only in connection with one guide rail 25 or in connection with both guide rails or there may be more than one safety gear on each guide rail 25. The use of the safety gear trigger 100 is thus not limited to the safety gear 70 shown in figures.

[0051] The safety gear trigger 100 can naturally also be used in connection with the counterweight 41 if a safety gear 70 is used in connection with the counterweight 41.

[0052] The second end 162 of the arm 160 of the safety gear 100 is operatively connected to at least one safety gear 70. The operative connection is in the figures realized via the linkage system 80 acting on both safety gears 70. The operative connection can be realized in any suitable way e.g. with levers or chains or other force transmitting equipment so that turning of the second end 162 of the arm 160 causes the safety gear 70 to connect the brake and start braking or to disconnect the brake.

[0053] The safety gear trigger 100 is, in the figures, shown in a more or less vertical position i.e. the pull rod 140 extends upwards from the casing 110. The safety gear trigger 100 could instead be turned 180 degrees i.e. the pull rod 140 would extend downwards from the casing 110. The safety gear trigger 100 could also be positioned in a more or less horizontal position or in an inclined position in relation to the horizontal plane.

[0054] The use of the invention is not limited to the elevator disclosed in the figures, but the invention can be used in any type of elevator e.g. also in elevators lacking a machine room and/or a counterweight. The counterweight could be positioned on either side wall or on both side walls or on the back wall of the elevator shaft. The drive, the motor, the traction sheave, and the machine brake could be positioned in the machine room or somewhere in the elevator shaft. The car guide rails could be positioned on opposite side walls of the shaft or on a back wall of the shaft in a so called ruck-sack elevator.

[0055] The invention can be used in connection with the elevator car and/or in connection with the counterweight.

[0056] It will be obvious to a person skilled in the art that, as the technology advances, the inventive concept can be implemented in various ways. The invention and its embodiments are not limited to the examples described above but may vary within the scope of the claims.

Claims

1. An elevator safety gear trigger comprising:

an electromagnet (120),
a longitudinal pull rod (140), a first end (141) of the pull rod (140) being connected to a connection piece (130), which is drawn into connection

with the electromagnet (120) when the electromagnet (120) is activated, a second end (142) of the pull rod (140) being operatively connected to at least one safety gear (70),

an actuator (150) arranged to detach the connection piece (130) and thereby also the pull rod (140) from the electromagnet (120) when the electromagnet (120) is deactivated.

2. The elevator safety gear trigger according to claim 1, wherein the electromagnet (120) and the connection piece (130) is positioned within a casing (110).

3. The elevator safety gear trigger according to claim 1 or 2, wherein the second end (142) of the pull rod (140) is attached to a first end (161) of an arm (160), a second end (162) of the arm (160) being operatively connected to at least one safety gear (70).

4. The elevator safety gear trigger according to any one of claims 1 to 3, wherein the actuator is formed of spring means (150).

5. The elevator safety gear trigger according to claim 4, wherein the spring means (150) surround the pull rod (140) and extends between the arm (160) and the casing (110).

6. The elevator safety gear trigger according to any one of claims 1 to 5, wherein the first end (141) of the pull rod (140) is connected via a first articulated joint (J1) to the connection piece (130).

7. The elevator safety gear trigger according to claim 6, wherein the first articulated joint (J1) is a spherical joint.

8. The elevator safety gear trigger according to any one of claims 3 to 7, wherein the second end (142) of the pull rod (140) is connected to the first end (161) of the arm (160) with a second articulated joint (J2).

9. An elevator comprising an elevator car (10) moving upwards and downwards on guide rails (25) in an elevator shaft (20), at least one safety gear (70) supported on the elevator car (10) and acting on the guide rail (25), wherein an elevator safety gear trigger (100) according to any one of claims 1 to 8 is supported on the elevator car (10).

10. The elevator according to claim 9, wherein the elevator comprises a first safety gear (70) acting on a first guide rail (25) and a second safety gear (70) acting on a second guide rail (25), both safety gears (70) being operated in synchronism via a linkage system (80), the second end (162) of the arm (160) of the safety gear trigger (100) being connected to the linkage system (80).

11. The elevator according to claim 9 or 10, wherein the elevator comprises a speed detection system (200) detecting the speed of the elevator car (10), whereby the current supply to the electromagnet (120) is controlled by the speed detection system (200).

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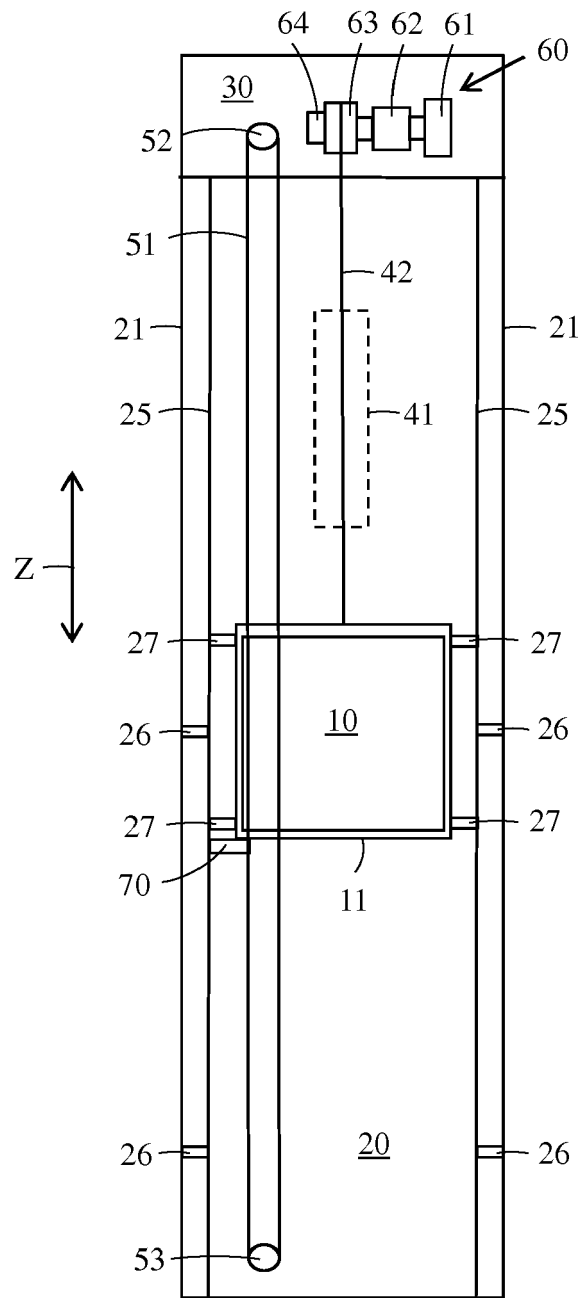


FIG. 1

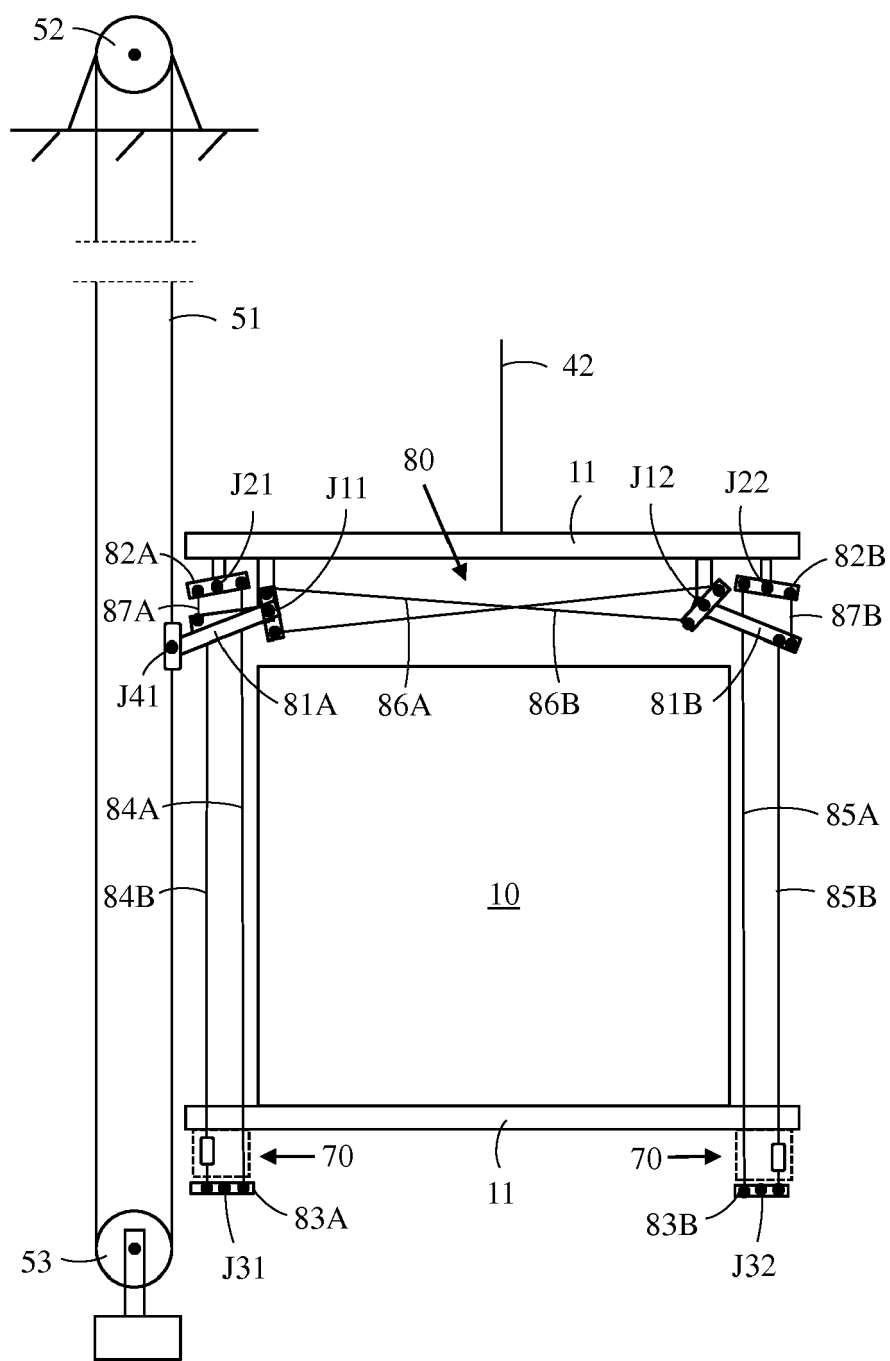


FIG. 2

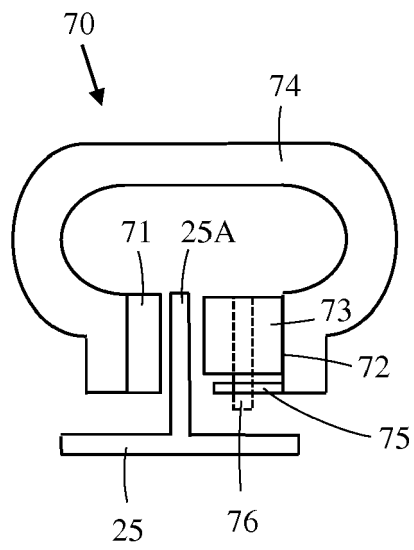


FIG. 3

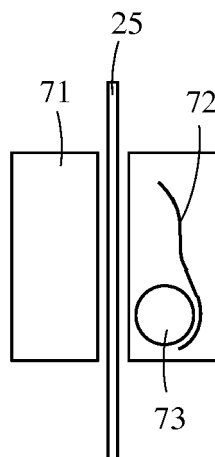


FIG. 4

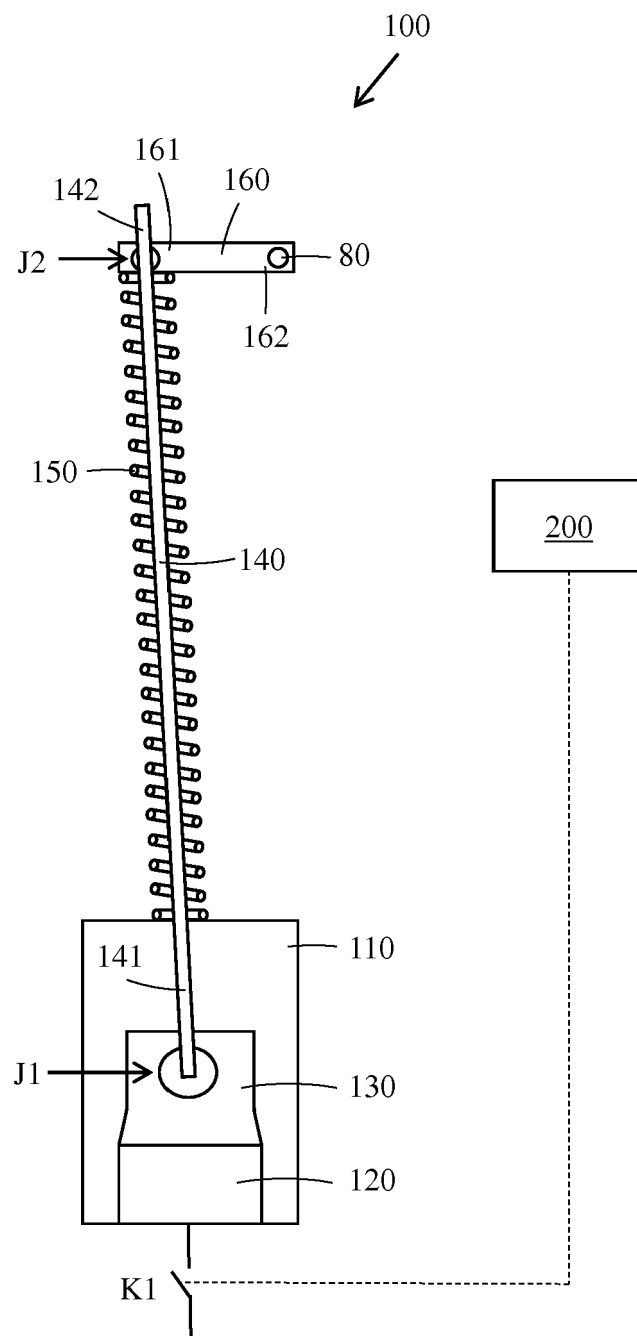


FIG. 5



EUROPEAN SEARCH REPORT

Application Number
EP 17 20 0723

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EPO FORM 1503 03.82 (P04C01)

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A	* pages 1-16, paragraph 0108; figures 1-16 *		TECHNICAL FIELDS SEARCHED (IPC)
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A	* abstract; figures 1,3 *		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 May 2018	Examiner Lohse, Georg
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			

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

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