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(54) **ELEVATOR DEVICE AND GUIDANCE DEVICE PROVIDED IN THE SAME**

AUFZUGSVORRICHTUNG UND DARIN VORGESEHENE FÜHRUNGSVORRICHTUNG

DISPOSITIF D'ASCENSEUR ET DISPOSITIF DE GUIDAGE PREVU DANS CELUI-CI

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Description

TECHNICAL FIELD

- 5 **[0001]** The present invention relates to an elevator device, and in particular, to a guidance device (horizontal suspension) for moving an elevator car up and down along guide rails.

BACKGROUND ART

- 10 **[0002]** JP-A-5-319739 discloses a conventional elevator device in an example, which incorporates a vibration sensor provided to an elevator car for suppressing a vibration level of an elevator car chamber, and sensors provided in the upper and lower parts of the elevator car composed of the car chamber and a car frame, for detecting displacements of guide rails. Further, actuators which are provided in the lower part of the elevator car are feedback controlled with the use of detection signals from the sensors, and further, are feed-forward controlled with the use of signals from sensors
15 for detecting displacements of the guide rails. Thus, the vibration of the elevator car is suppressed horizontally.

- [0003]** Further, JP-A-2001-122555 discloses a conventional elevator device in another example, wherein a guidance device or horizontal suspension includes an actuator stationary part and an actuator movable part, either one of which is formed of a magnet, and the other one of which is formed of a coil, for sufficiently restraining the elevator car from shaking even though any of static and dynamic displacements is caused. When the elevator car shakes, the current is
20 applied to the coil so as to reduce the shake with the use of Lorentz's force in order to restrain disturbances caused by bending of the guide rails, and stepped parts in joints thereof.

- [0004]** In the elevator device disclosed in the above-mentioned JP-A-5-319739, sensors for detecting displacements of the guide rails are adapted to detect rail surfaces. However, when the elevator car runs at a high speed, optical sensors are inappropriate if the surfaces of metal rails are glossy since it difficult to precisely detect a displacement by an optical
25 sensor due to reflection upon the glossy rail surface. Should sensors other than optical sensors be used, although the affection by the gloss could be avoided, they would be expensive or likely to be affected by damages and the like. Further, since output signals from the sensors are used in feed-forward control, a displacement should be detected before the actuator passes by, and accordingly, the sensors must be attached to the positions remote from the car frame, which are remoter than the actuator. Thus, it is difficult to aim at saving a space.

- 30 **[0005]** Meanwhile, in the elevator device disclosed in JP-A-2001-122555, in which a shake caused by move-up and -down of the elevator car is restrained by a force effected between the coil and the magnet, should the elevator car have a large size or run at a high speed, a required force generated from the coil would be larger in view of the dead weight of the elevator car and the weights of the passengers, resulting in a large-size guidance device or horizontal suspension.

- 35 **[0006]** JP 2001270668A discloses an installation accuracy measuring device and method for guide rails. The device comprises a displacement gauge for a lifting body, a horizontal and a vertical accelerometer for said lifting body and a control calculating installation accuracy of the guide rail based on the detected results.

DISCLOSURE OF THE INVENTION

- 40 **[0007]** It is the object of the invention to provide an elevator device and a guidance device comprising a compact mechanism for suppressing shakes of an elevator car.

[0008] This object is accomplished by the features of the independent claims.

- [0009]** To the end, according to the present invention, there is provided an elevator device including an elevator car which moves up and down in an elevator shaft, comprising guide rails arranged, being opposed to each other, in the
45 elevator shaft, for guiding the elevator car therealong, the guide rails being arranged in rows in the moving direction of the elevator car with joints being interposed therebetween, and markers between which joints are present and which are separated from each other at predetermined distances in both moving-up and -down directions, the elevator car incorporating therein detectors capable of detecting the markers, and guidance devices or horizontal suspensions capable of applying pressing forces to the guide rails in accordance with an output from the detectors.

- 50 **[0010]** Further, there are provided a control means for controlling the horizontal suspensions, and an acceleration detecting means for detecting an acceleration of the elevator car. The control means desirably controls the pressing forces applied by the horizontal suspensions in accordance with an output from the acceleration detecting means, and more desirably, the control means comprises a feed-back controller for feeding back a signal indicating an acceleration of an elevator body including the elevator car, and a feed-forward controller operated being base upon an signal from
55 the detector. Further, the control means may have a numerical model simulating the elevator body including the elevator car, and also may have a feed-back loop for feeding back a deviation between an output from the numerical mode and an acceleration of the elevator body detected by the acceleration detecting means by way of a gain controller. Further, there may be used, as the markers, any kinds, that is, at least ones of protrusions attached to the guide rails, notches

formed in the guide rails and bolts attached to the guide rails. The markers may be shield plates fixed to the walls of the elevator shaft in the vicinity of the joints of the guide rails, and the detecting means may be a capacitive detecting means or a magnetic detecting means which can be opposed to the shield plates.

[0011] Further, in order to achieve the above-mentioned object, according to the present invention, there are provided guidance devices or horizontal suspensions for an elevator device, for guiding an elevator car incorporated in the elevator device, along guide rails in a moving direction, comprising means for pressing the guide rails, actuators for driving the pressing means with variable pressing forces, a controller for controlling the actuators, and an acceleration detector for detecting an acceleration of the elevator car, further comprising markers located at positions which are in the vicinity of respective joints formed between the guide rails of a plurality arranged in the moving-up and -down directions, and at which the pressing means does not make into contact with the markers, and detecting means attached to the elevator car, capable of detecting the markers, wherein the controller controls the actuators in accordance with output signals from the detecting means.

[0012] Further, the horizontal suspensions may be further provided with adjusting means for automatically adjusting the pressing forces applied to the guide rails by the pressing means in accordance with an operating condition of the elevator device and an output of the acceleration detector, and a storage means for storing therein a result of the adjustment by the adjusting means, and further, the controller preferably sets the pressing forces applied to the guide rails by the pressing means to a value not larger than a predetermined value when the acceleration detector detects a marker. Further, there may be provided splice members arranged at the joints of the guide rails so as to splice the guide rails therebetween, and fixing means for fixing the splice members to the guide rails, which may be used as the markers to be detected by the detecting means, and further there may be provided shield plates arranged adjacent to the guide rails, at the respective joints of the guide rails, which may be used as the markers to be detected by the detecting means.

[0013] According to the present invention, with the provision of the markers in the vicinity of the respective joints of the guide rails in the elevator device, and of the detecting means for detecting the markers to the elevator car, the pressing forces applied to the guide rails can be changed, thereby it is possible to restrain shakes of the elevator car in a more effective manner.

BRIEF DESCRIPTION OF THE DRAWINGS:

[0014]

Fig. 1 is a front view illustrating an elevator device according to an embodiment of the present invention, Fig. 2 is a block diagram illustrating a control system incorporated in the elevator device shown in Fig. 1, Figs. 3 and 4 are views for explaining the characteristics of a feed-forward control system, Fig. 5 is a flow-chart illustrating process steps carried by the feed-forward control system; and Figs. 6 to 8 are front views respectively illustrating different elevator devices according to other embodiments of the present inventions.

BEST MODE FOR CARRYING OUT THE INVENTION

[0015] Explanation will be hereinbelow made of an embodiment of an elevator guidance device or elevator horizontal suspension according to the present invention, with reference to the accompanying drawings. Fig. 1 is a front view which shows an elevator car. Guide rails 6, 6 for guiding the elevator car 1 are laid on opposite wall surfaces of a elevator shaft which is not shown, being extended in the vertical direction. The elevator car 1 is arranged between the guide rails 1 in pair. The elevator car 1 is connected at its top part to a rope which is not shown and which is adapted to be wound up and off by the drive device (not shown) in order to move up and down the elevator car 1 in the elevator shaft.

[0016] The elevator car 1 is attached thereto on its top surface with guidance devices or horizontal suspensions 20, 20 for guiding the elevator car 1 to be moved up and down, on both guide rail 6a, 6c sides. Similarly, the elevator car 1 is attached thereto at its bottom surface with guidance devices or horizontal suspensions 30, 30 on both guide rail 6b, 6d sides. Each of the upper horizontal suspensions 20 comprises a mount base 24 serving as an attaching member with respect to the elevator car 1, a lever 22 rotatably supported at its lower end to the mount base 24 and extended in a substantially vertical direction, a roller 21 rotatably attached to the lever 22 on the upper end side thereof, and a spring 23 fixed at opposite ends to the upper end part of the lever 22 and an intermediate part of the vertical section of the mount base 24. The rollers 21, 21 of the horizontal suspensions are pressed against the respective guide rails 6a, 6c by the spring 23.

[0017] Each lower horizontal suspension 30 has the similar configuration to that of the upper horizontal suspension 20, except that an actuator 34 is interposed between the spring and the attaching member. That is, the mount base 35 has a horizontal part to which an upper end part of a lever 32 is pivotably attached, and a roller 31 is rotatably attached to the lower end part of the lever 32, and is urged against the guide rail 6b or 6d by a spring 33 having one end attached

to the lower end part of the lever 32. The other end of the spring 33 is fixed to an urging member 36 having a rear surface against which the actuator 34 secured to a vertical part of the mount base 35 (attaching member) abuts.

[0018] By the way, the guide rails 6a to 6d have a predetermined length in the longitudinal direction thereof so as to facilitate the attachment thereof. Accordingly, in the elevator device, the guide rails are laid with small gaps (joints 4a, 4b) therebetween in the vertical direction. Each of the guide rails 6a to 6d has a T-like sectional shape with its leg line being extended toward the elevator car. Further, the rollers 21, 31 abut against the end part of the section which is extended toward the elevator car. The guide rails 6a to 6d are respectively attached thereto with protrusion members 7a to 7d on the cross arm sections of the guide rails 6a to 6d with which the rollers 21, 31 do not make into contact. The protrusion members 7a to 7d are located at positions which are in the vicinity of the joints 4a, 4b by a predetermined distance therefrom.

[0019] Meanwhile, the elevator car 1 is attached thereto with detectors 8a, 8b at opposite side surfaces of the elevator car 1, only on the upper side thereof, which are capable of detecting the protrusion members 7a to 7d attached to the guide rails 6a to 6d every time when the elevator car 1 moves up or down. An accelerometer 5 for measuring vibrations of the elevator car 1 is attached to the center part of the rear side surface of the bottom panel of the elevator car 1. Outputs from the detectors 8a, 8b and the accelerometer 5 are transmitted to a controller 9 separately provided. The controller 9 computes a control signal to be delivered to the actuators 34 of the horizontal suspensions 30 provided to the lower side of the elevator car 1. The actuators 34 to which the thus computed signal is delivered control the pressing forces of the roller 31 against the guide rails 6a to 6d in order to restrain the shakes of the elevator car 1.

[0020] In the elevator device 100 having the above-mentioned configuration, when the elevator car 1 is moved up or down, the detector 8a detects the two protrusion members 7a, 7b for the detection of the joint 4a between the guide rails 6a, 6b on the left side. Similarly, the detector 8b detects the protrusion members 7c, 7d for the detection of the joint 4b between the guide rails 6c, 6d on the right side.

[0021] If the elevator car 1 moves up, the protrusion members 7b, 7d which are located below the joints 4a, 4b are detected by the detectors 8a, 8b. After a predetermined time elapses from the time when the detectors 8a, 8b detect the joints 4a, 4b, the horizontal suspensions 30 pass by the joints 4a, 4b. Similarly, if the elevator car 1 moves down, after a predetermined time elapses from the time when the detectors 8a, 8b detect the protrusion members 7a, 7c located above the joints 4a, 4b, the horizontal suspensions 30 pass by the joints 4a, 4b.

[0022] The distances between the protrusion members 7a to 7d and the joints 4a, 4b are previously found, and accordingly, it is possible to compute the timing with which the elevator car 1 passes by the joints 4a, 4b, from a moving speed of the elevator car 1. Through the detection of the protrusion members 7a to 7d by the detectors 8a, 8b, the timing with which the elevator car 1 passes by the joints 4a, 4b of the guide rails 6a to 6d can be obtained, and accordingly, the actuators 34 can be driven in association with the timing with which the actuators 34 of the horizontal suspensions 30 pass by the joints 4a, 4b. Thus, the shakes of the elevator car 1 caused when passing by the joints 4a, 4b can be surely restrained.

[0023] It is noted, in the embodiment shown in Fig. 1, that the protrusion members 7a to 7d are provided to the guide rails 6a to 6d. However, instead of the protrusion members 7a to 7d, seal-like markers may be applied to the guide rails so as to detect variations in optical reflectivity in order to measure the positions of the joints 4a, 4b.

[0024] Referring to Fig. 2 which is a block diagram illustrating the controller 9 for the horizontal suspensions 30 in the elevator device 100 shown in Fig. 1, the controller 9 comprises a feed-forward control unit 10 for feed-forward transmitting a control signal to an elevator body 11, a feedback control unit 13 provided in a feedback loop 17, a mathematical model 12 connected in parallel with the elevator body 11, and a gain controller 14 for adjusting the gain of the control signal. With the use of these components, the controller 9 reduces the shakes of the elevator car 1 of the elevator body 11 as the object to be controlled. In this phase, an output from the accelerometer 5 shown in Fig. 1 is fed back in order to control the shakes.

[0025] Specifically, an acceleration of the elevator car 1 detected by the accelerometer 5 attached to the bottom surface of the elevator car 1 is added to an acceleration of the elevator car 1 which is obtained by computing the mathematical model 12 serving as the mathematical expression of the elevator body 11, by a signal adder 16 on the output side. Then, a deviation between these two acceleration signals is delivered to the gain controller 14. The gain controller 14 adjusts the gain of the control signal, depending upon the deviation between the acceleration signals, and feeds back the thus adjusted control signal to a signal adder 15 on the input side of the elevator body 11 and the mathematical model 12 through the feedback loop 18.

[0026] With the provision of the feedback loop 18, it is possible to easily accept a variation in, for example, the vibration characteristic of the elevator body 11 caused by a variation in the superimposed load of the elevator car 1. The feed-forward control unit 10 delivers a control command in response to outputs from the detectors 8a, 8b shown in Fig. 1 with the timing with which the horizontal suspensions 30 pass by the joints 4a, 4b. In order to reduce the shakes of the elevator car 1 caused by impulsive disturbance such as the joints 4a, 4b of the guide rails, it is important to use the feed-forward control in addition to the feedback control. In this case, the feed-forward control with precise response to the timing with which the elevator car 1 passes the joints 4a, 4b, is greatly effective and advantageous.

[0027] In the elevator device 100, it is impossible to obtain a precise position of the elevator car only by the measurement of the rotation number of a winch which is not shown, due to a slip and an elongation of the rope. As a result, the timing with which the elevator car 1 passes by the joints 4a, 4b would be deviated. Accordingly, in this embodiment, the positions of the joints 4a, 4b are detected by the detectors 8a, 8b in order to adjust the timing with which the elevator car 1 passes by the joints 4a, 4b.

[0028] The feed-forward control unit 10 and the gain controller 14 can change their gains, and both have automatically adjusting functions. The gains of the feed-forward control unit 10 and the gain controller 14, having been adjusted with the use of their automatically adjusting function, are stored in a storage means which is not shown.

[0029] An example of the configuration of the feed-forward control system will be explained hereinbelow. A force $f(t)$ produced by the feed-forward control system loop is set as follows:

$$f(t) = k(t) \times \{x_c - x_r + b(t)\}$$

where x_r is a displacement of the guide rails 6a to 6d, x_c is a horizontal displacement of the elevator car 1. The displacement x_c of the elevator car 1 can be estimated from an output from the accelerometer 5. The displacement x_r of the guide rails 6a to 6d can be stored in memory under learning during move-up and -down of the elevator car 1. The variables $k(t)$ and $b(t)$ on the right side of the above-mentioned formula are both functions of a time.

[0030] Fig. 3 shows an example of the variable $k(t)$ in a time variation. $k(t)$ exhibits a maximum value K_{max} during the time zone from 0 to t_1 . Thereafter, the value of $k(t)$ gradually decreases, and becomes a minimum value K_{min} during the time zone from t_2 to t_4 . After the time t_4 , it gradually increases and becomes again the maximum value K_{max} at the time t_5 . During the time zone from t_1 to t_2 and the time zone from t_4 to t_5 , it smoothly varies between K_{max} and K_{min} .

[0031] Estimating that the horizontal suspension 30 pass by the rail joint 4a at the time t_3 , during the time zone t_2 to t_4 in which the horizontal suspension 30 passes by the rail joint 4a, the value of $k(t)$ is set to the minimum value K_{min} , and accordingly, it is possible to prevent the rail joint 4a from causing the elevator car 1 to shakes, as far as it can.

[0032] The horizontal suspensions 30 press the rollers 31 against the guide rails 6a to 6d so as to support the elevator car 1. Thus, a force not less than a predetermined force has to be applied to the guide rails 6a to 6d. Thus, the time function $b(t)$ which is adapted to be multiplied with the variable $k(t)$ so as to obtain a force is set as shown in Fig. 4. That is, setting is made such that during the time zone from t_1 to t_5 , the force which is the product of the variables $k(t)$ and $b(t)$ becomes substantially constant. The force which is the product of these variables $k(t)$ and $b(t)$ is surely applied to the guide rails, and accordingly, the shakes at the rail joints 4a, 4b can be suppressed.

[0033] $k(t)$ and $b(t)$ are set so that the force by which the rollers 31 are pressed against the guide rails 6a to 6d during the time zone from t_1 to t_5 becomes substantially equal to $f(t)$ during the time zone from 0 to t_1 and after the time t_5 . Since $k(t)$ is larger during the time zone 0 to t_1 and after the time t_5 , $b(t)$ is set to zero during these time zones. Even by the product of $k(t)$ and $(x_c - x_r)$ alone, a force which is not less than the predetermined value can be applied to the guide rails 6a to 6d.

[0034] Referring to Fig. 5 which is a flowchart for explaining the content of the process of the feed-forward control system, when the elevator car 1 starts its vertical movement, outputs from the detectors 8a, 8b are monitored. At step S1, the event that the elevator car 1 has passed by the protrusion members 7a to 7d is detected from outputs from the detector 8a, 8b provided to the elevator car 1. At step S2, the timing with which the horizontal suspensions 30 pass by the rail joints 4a, 4b is computed from the velocity of the elevator car 1 at the time when the detectors 8a, 8b pass by the protrusions members 7a to 7d.

[0035] At the timing with which the horizontal suspensions 30 pass by the rail joints 4a, 4b, at step 3, the controller 9 delivers a feed-forward command to the actuators 35. Thus, the actuators 35 controls to change the force with which the rollers 31 are pressed against the guide rails 6a to 6d in order to prevent occurrence of shakes. The operation from step 1 to step 3 is repeated until the elevator device 100 comes to a stop. Further, each time when passing by the rail joints 4a, 4b, the controller 9 delivers the feed-forward command to the horizontal suspensions 30.

[0036] Referring to Fig. 6 which is a front view illustrating another embodiment according to the present invention, this embodiment is identical with the afore-mentioned embodiment, except that guide rails 40a to 40d. The guide rails 40a to 40d are formed in their respective parts in the longitudinal direction thereof with notches 41a to 41d, which are located at positions in the vicinity of rail joints 4a, 4b of the guide rails 40a to 40d, being spaced from the joints 4a, 4b by a predetermined distance therefrom. These notches 41a to 41d are located in the surface with which the rollers 21, 31 do not make contact. The notches 41a to 41d serve as markers for the detectors 8a, 8b, similar to the protrusion members 7a to 7d shown in Fig. 1.

[0037] Referring to Fig. 7 which is a front view illustrating an elevator device according to further another embodiment of the present invention, this embodiment is identical with the above-mentioned embodiments, except that joints 4a, 4b of the guide rails 6a to 6d. The left side guide rails 6a, 6b are attached on the rear side thereof with a splice plate 45 at

the joint 4a therebetween. That is, these guide rails 6a, 6b are connected to each other by the splice plate 45 by means of bolts 46 and nuts. The bolts 46 are projected from the front surfaces of the guide rails 6a, 6b on one end side thereof, and accordingly, the detectors 8a, 8b can detect the end faces of the bolts 46. That is, the end faces of the bolts 46 serve as makers for the detectors 8a, 8b, thereby it is possible to easily detect the positions of the joints 4a, 4b.

[0038] Referring to Fig. 8 which is a perspective view illustrating an elevator device according to further another embodiment of the present invention, and in which only those relating to the detection of the joint 4a are shown and the other parts are omitted, this embodiment is different from the above-mentioned embodiment since shield plates 50a, 50b are provided at positions slightly distant from T-like sectional shape guide rails 6a to 6b. The shield plates 50a, 50b are secured to a wall of the elevator shaft in the vicinity of the rail joint 4a, being spaced at a predetermined distance in the longitudinal direction of the guide rails 6a, 6b. Further, a U-like detector 51 is attached to the top part of the elevator car 1 on one side thereof. During the vertical movement of the elevator car 1, the U-like part of the detector 51 causes the splice plates 50a, 50b to pass therethrough so as to recognize the splice plates 50a, 50b in view of a variation in capacitance or magnetic variation. Thus, the shield plates 50a, 50b can serve as markers for the detector, similar to the protrusion members, the notches and the bolts explained in the above-mentioned embodiments.

[0039] In view of the above-mentioned embodiments, in order to restrain the shakes caused by the joints of the guide rails laid in the elevator shaft, the markers for detecting the joints are provided at positions in the vicinity of the joints and separated at a predetermined distance, and are detected by the detectors mounted to the elevator car, and accordingly, the joints can be detected before the horizontal suspensions reach the joints. Thus, the horizontal suspensions can be operated under not only feedback control but also feed-forward control, thereby it is possible to surely suppress shakes of the elevator car or a rope.

[0040] By the way, a wind pressure which is caused when an elevator car and a counter balance weight pass by each other is one of causes inducing shakes of the elevator. The position of the pass-by between the elevator car and the counter balance weight can be determined to a predetermined position in view of the length of the rope and the like, and accordingly, of the markers which are provided for detecting the guide rails, those provided in the vicinity of the position of the pass-by may be utilized for computing the timing that the elevator car and the counter balance weight pass by each other in order to carry out forward-feed control for reducing the affection by the wind pressure.

Claims

1. An elevator device comprising an elevator car (1) moving up and down in a elevator shaft, and guide rails (6, 40) for guiding the elevator car being arranged to be opposed to each other in the elevator shaft and laid in moving-up and -down directions of the elevator car with joints (4) therebetween,
characterized in that
markers (7, 41) are provided between which the joints are located, said markers are spaced from the joints by a prede-termined distance therefrom in both move-up and -down directions, and
said elevator car is provided with detectors (8) capable of detecting the markers, and guidance devices or horizontal suspensions (20, 30) capable of applying pressing forces to said guide rails in accordance with outputs from said detectors.
2. The elevator device as set forth in claim 1,
further comprising control means (9) for controlling said horizontal suspensions, and acceleration detecting means (5) for detecting acceleration of said elevator car, said control means controlling the pressing force applied by the horizontal suspensions, in accordance with an output from said acceleration detecting means.
3. The elevator device as set forth in claim 2,
wherein said control means comprises a feedback control unit (13) for feeding back a signal exhibiting an acceleration of the elevator body including the elevator car, and a feed-forward control (10) unit in response to signals from said detectors.
4. The elevator device as set forth in claim 3,
wherein said control means comprises a mathematical model (12) simulating the elevator body including the elevator car, and a feedback loop (18) for feeding back a deviation between an output from the mathematical model and an acceleration of the elevator body detected by said acceleration detecting means by way of a gain controller (14).
5. The elevator device as set forth in claim 1,
wherein said markers are at least either of protrusion members attached to said guide rails, notches formed in said guide rails, and bolts attached to said guide rails.

6. The elevator device as set forth in claim 1,
wherein said makers are shield plates secured to a wall of the elevator shaft in the vicinity of the joints of said guide rails, and said detecting means is capacitance detecting means or magnetic detecting means, which is capable of facing said shield plates.
7. A guidance device or horizontal suspension in an elevator device having an elevator car, for guiding the elevator car along guide rails, comprising an acceleration detector (5) for detecting an acceleration of the elevator car, **characterised in** further comprising means (31-33) for pressing the guide rails, actuators (34) for driving said pressing means with variable pressing force, a controller (9) for controlling said actuators, markers (7, 41) arranged at positions where the pressing means does not contact with the markers, in the vicinity of joints (4) between the guide rails which are arranged in the moving-up and -down directions of the elevator car, and detecting means (8) attached to the elevator car, capable of detecting the markers, wherein said controller controls said actuators in accordance with a signal from said detecting means.
8. The horizontal suspension in the elevating device as set forth in claim 7, further comprising adjusting means for automatically adjusting the forces of said pressing means pressing against the guide rails in accordance with an operating condition of the elevator device and an output from said acceleration detector, and storage means for storing a result of the adjustment.
9. The horizontal suspension in the elevator device as set forth in claim 8, wherein said controller sets the forces of said pressing means pressing against the guide rails to a value not greater than a predetermined value when said acceleration detector detects said markers.
10. The horizontal suspension in the elevator device as set forth in claim 7, further comprising splice members (45) arranged at the joints of the guide rails so as to splice the guide rails therebetween, and fixing means (46) for fixing said splice members to the guide rails, said detecting means detecting said fixing means as the markers.
11. The horizontal suspension in the elevator device as set forth in claim 7, wherein shield plates (50) are provided at the joints of the guide rails, adjacent to the guide rails, and said detecting means detects said shield plates as the markers.

Patentansprüche

1. Aufzugsvorrichtung, die aufweist:

eine Aufzugskabine (1), die sich in einem Aufzugsschacht aufwärts und abwärts bewegt, und Führungsschienen (6, 40) zur Führung der Aufzugskabine, die so angeordnet sind, dass sie im Aufzugsschacht einander gegenüberliegen, und in der Richtung der Aufwärts- und Abwärtsbewegung der Aufzugskabine mit dazwischen liegenden Stoßverbindungen (4) vorgesehen sind,

dadurch gekennzeichnet, dass

Markierungseinrichtungen (7, 41) vorgesehen sind, zwischen denen die Stoßverbindungen angeordnet sind, wobei die Markierungseinrichtungen in Richtung der Aufwärtsbewegung und in Richtung der Abwärtsbewegung durch einen vorgegebenen Abstand von den Stoßverbindungen beabstandet sind, und die Aufzugskabine mit Detektoren (8), die befähigt sind, die Markierungseinrichtungen zu erfassen, sowie mit Führungsvorrichtungen oder horizontalen Federeinrichtungen (20, 30) versehen ist, die befähigt sind, entsprechend Ausgängen von den Detektoren Druckkräfte auf die Führungsschienen auszuüben.

2. Aufzugsvorrichtung nach Anspruch 1, die ferner eine Regeleinrichtung (9) zur Regelung der horizontalen Federeinrichtungen sowie eine Beschleunigungserfassungseinrichtung (5) zur Erfassung der Beschleunigung der Aufzugskabine aufweist, wobei die Regeleinrichtung die durch die horizontalen Federeinrichtungen ausgeübte Druckkraft entsprechend einem Ausgang von der Beschleunigungserfassungseinrichtung regelt.
3. Aufzugsvorrichtung nach Anspruch 2, bei der die Regeleinrichtung eine Regeleinheit (13) zur Rückkopplung eines

Signals, das eine Beschleunigung des Aufzugskörpers einschließlich der Aufzugskabine darstellt, und eine Vorsteuereinheit (10) aufweist, die auf Signale von den Detektoren anspricht.

4. Aufzugsvorrichtung nach Anspruch 3, bei der die Regeleinrichtung aufweist: ein mathematisches Modell (12), das den Aufzugskörper einschließlich der Aufzugskabine simuliert, und eine Rückführungsschleife (18) zur Rückführung einer Abweichung zwischen einem Ausgang des mathematischen Modells und einer durch die Beschleunigungserfassungseinrichtung erfassten Beschleunigung des Aufzugskörpers mittels eines Verstärkungsreglers (14).
5. Aufzugsvorrichtung nach Anspruch 1, bei der die Markierungseinrichtungen an den Führungsschienen angebrachte vorstehende Elemente und/oder in den Führungsschienen ausgebildete Nuten und/oder an den Führungsschienen angebrachte Bolzen sind.
6. Aufzugsvorrichtung nach Anspruch 1, bei der die Markierungseinrichtungen Abschirmplatten sind, die an einer Wand des Aufzugsschachts in der Nähe der Stoßverbindungen der Führungsschienen angebracht sind, und die Detektoreinrichtung eine kapazitive Detektoreinrichtung oder eine magnetische Detektoreinrichtung ist, die den Abschirmplatten gegenüberliegen kann.
7. Führungsvorrichtung oder horizontale Federeinrichtung bei einer Aufzugsvorrichtung mit einer Aufzugskabine zur Führung der Aufzugskabine längs von Führungsschienen, die einen Beschleunigungsdetektor (5) zur Erfassung einer Beschleunigung der Aufzugskabine aufweist,
dadurch gekennzeichnet, dass sie ferner aufweist:
eine Druckeinrichtung (31 - 33) zur Ausübung von Druck auf die Führungsschienen, Betätigungseinrichtungen (34) zur Beaufschlagung der Druckeinrichtung mit variabler Druckkraft, einen Regler (9) zur Regelung der Betätigungseinrichtungen, Markierungseinrichtungen (7, 41), die an Positionen angeordnet sind, wo die Druckeinrichtung nicht mit den Markierungseinrichtungen in Kontakt kommt, in der Nähe von Stoßverbindungen (4) zwischen den Führungsschienen, die in der Richtung der Aufwärts- und Abwärtsbewegung der Aufzugskabine angeordnet sind, und eine Detektoreinrichtung (8), die an der Aufzugskabine angebracht und befähigt ist, die Markierungseinrichtungen zu erfassen, wobei der Regler die Betätigungseinrichtungen entsprechend einem Signal von der Detektoreinrichtung regelt.
8. Horizontale Federeinrichtung bei der Aufzugsvorrichtung nach Anspruch 7, die ferner aufweist: eine Einstelleinrichtung zur automatischen Einstellung der Kräfte der Druckeinrichtung, die entsprechend einem Betriebszustand der Aufzugsvorrichtung und einem Ausgang vom Beschleunigungsdetektor auf die Führungsschienen ausgeübt werden, und eine Speichereinrichtung zur Speicherung eines Ergebnisses der Einstellung.
9. Horizontale Federeinrichtung bei der Aufzugsvorrichtung nach Anspruch 8, bei welcher der Regler die Kräfte der Druckeinrichtungen, die auf die Führungsschienen ausgeübt werden, auf einen Wert einstellt, der nicht größer ist als ein vorgegebener Wert, wenn der Beschleunigungsdetektor die Markierungseinrichtungen erfasst.
10. Horizontale Federeinrichtung bei der Aufzugsvorrichtung nach Anspruch 7, die ferner aufweist: Stoßverbindungselemente (45), die an den Stoßverbindungen der Führungsschienen so angeordnet sind, dass sie die Führungsschienen dazwischen überbrücken, und Befestigungsmittel (46) zur Befestigung der Stoßverbindungselemente an den Führungsschienen, wobei die Detektoreinrichtung die Befestigungsmittel als Markierungseinrichtungen erfasst.
11. Horizontale Federeinrichtung bei der Aufzugsvorrichtung nach Anspruch 7, bei der Abschirmplatten (50) an den Stoßverbindungen der Führungsschienen benachbart zu den Führungsschienen vorgesehen sind und die Detektoreinrichtung die Abschirmplatten als Markierungseinrichtungen erfasst.

Revendications

1. Dispositif d'ascenseur comprenant une cabine d'ascenseur (1) qui monte et descend dans une gaine d'ascenseur, et des rails de guidage (6, 40) destinés à guider la cabine d'ascenseur qui sont disposés de manière à être opposés l'un par rapport à l'autre dans la gaine d'ascenseur et placés dans des directions de montée et de descente de la cabine d'ascenseur avec des joints (4) entre eux,
caractérisé en ce que
des marqueurs (7, 41), entre lesquels les joints sont situés, sont fournis, lesdits marqueurs étant espacés des joints d'une distance déterminée au préalable dans les directions de montée et de descente, et

ladite cabine d'ascenseur est munie de détecteurs (8) capables de détecter les marqueurs, et de dispositifs de guidage ou de suspensions horizontales (20, 30) capables d'appliquer des forces de pression sur lesdits rails de guidage en fonction des sorties desdits détecteurs.

- 5 **2.** Le dispositif d'ascenseur selon la revendication 1, comprenant en outre un moyen de commande (9) destiné à commander lesdites suspensions horizontales, et un moyen de détection d'accélération (5) destiné à détecter l'accélération de ladite cabine d'ascenseur, ledit moyen de commande commandant la force de pression appliquée par les suspensions horizontales, en fonction d'une sortie dudit moyen de détection d'accélération.
- 10 **3.** Le dispositif d'ascenseur selon la revendication 2, dans lequel ledit moyen de commande comprend une unité de commande rétroactive (13) destinée à renvoyer un signal présentant une accélération du corps d'ascenseur incluant la cabine d'ascenseur, et une unité de commande prédictive (10) en réponse aux signaux provenant desdits détecteurs.
- 15 **4.** Le dispositif d'ascenseur selon la revendication 3, dans lequel ledit moyen de commande comprend un modèle mathématique (12) simulant le corps d'ascenseur incluant la cabine d'ascenseur, et une boucle de rétroaction (18) permettant de renvoyer un écart entre une sortie du modèle mathématique et une accélération du corps d'ascenseur détectée par ledit moyen de détection d'accélération au moyen d'un dispositif de commande de gain (14).
- 20 **5.** Le dispositif d'ascenseur selon la revendication 1, dans lequel lesdits marqueurs sont au moins des éléments en saillie fixés auxdits rails de guidage, des encoches formées dans lesdits rails de guidage, ou des boulons fixés auxdits rails de guidage.
- 25 **6.** Le dispositif d'ascenseur selon la revendication 1, dans lequel lesdits marqueurs sont des plaques de protection fixées à une paroi de la gaine d'ascenseur à proximité des joints desdits rails de guidage, et ledit moyen de détection est un moyen de détection de capacité ou un moyen de détection magnétique, qui peut faire face auxdites plaques de protection.
- 30 **7.** Dispositif de guidage ou suspension horizontale dans un dispositif d'ascenseur ayant une cabine d'ascenseur, destiné à guider la cabine d'ascenseur le long des rails de guidage, comprenant un détecteur d'accélération (5) destiné à détecter une accélération de la cabine d'ascenseur,
caractérisé en ce qu'il comprend en outre
un moyen (31-33) destiné à exercer une pression sur les rails de guidage, des actionneurs (34) destinés à entraîner ledit moyen de pression avec une force de pression variable, un dispositif de commande (9) destiné à commander lesdits actionneurs, des marqueurs (7, 41) disposés dans des positions où le moyen de pression n'entre pas en
35 contact avec les marqueurs, à proximité des joints (4) entre les rails de guidage qui sont disposés dans les directions de montée et de descente de la cabine d'ascenseur, et un moyen de détection (8) fixé à la cabine d'ascenseur, capable de détecter les marqueurs, ledit dispositif de commande commandant lesdits actionneurs en fonction d'un signal provenant dudit moyen de détection.
40 **8.** La suspension horizontale dans le dispositif d'ascenseur selon la revendication 7, comprenant en outre un moyen d'ajustement destiné à ajuster automatiquement les forces dudit moyen de pression exerçant une pression contre les rails de guidage selon un état de fonctionnement du dispositif d'ascenseur et une sortie dudit détecteur d'accélération, et un moyen de stockage destiné à stocker un résultat de l'ajustement.
45 **9.** La suspension horizontale dans le dispositif d'ascenseur selon la revendication 8, dans laquelle ledit dispositif de commande établit les forces dudit moyen de pression exerçant une pression contre les rails de guidage à une valeur qui n'est pas supérieure à une valeur déterminée au préalable quand ledit détecteur d'accélération détecte lesdits marqueurs.
50 **10.** La suspension horizontale dans le dispositif d'ascenseur selon la revendication 7, comprenant en outre des éléments de jonction (45) disposés au niveau des joints des rails de guidage afin de joindre les rails de guidage entre eux, et un moyen de fixation (46) destiné à fixer lesdits éléments de jonction aux rails de guidage, ledit moyen de détection détectant ledit moyen de fixation sous forme de marqueurs.
55 **11.** La suspension horizontale dans le dispositif d'ascenseur selon la revendication 7, dans laquelle les plaques de protection (50) sont fournies au niveau des joints des rails de guidage, de manière adjacente aux rails de guidage, et ledit moyen de détection détecte lesdites plaques de protection sous forme de marqueurs.

FIG. 1

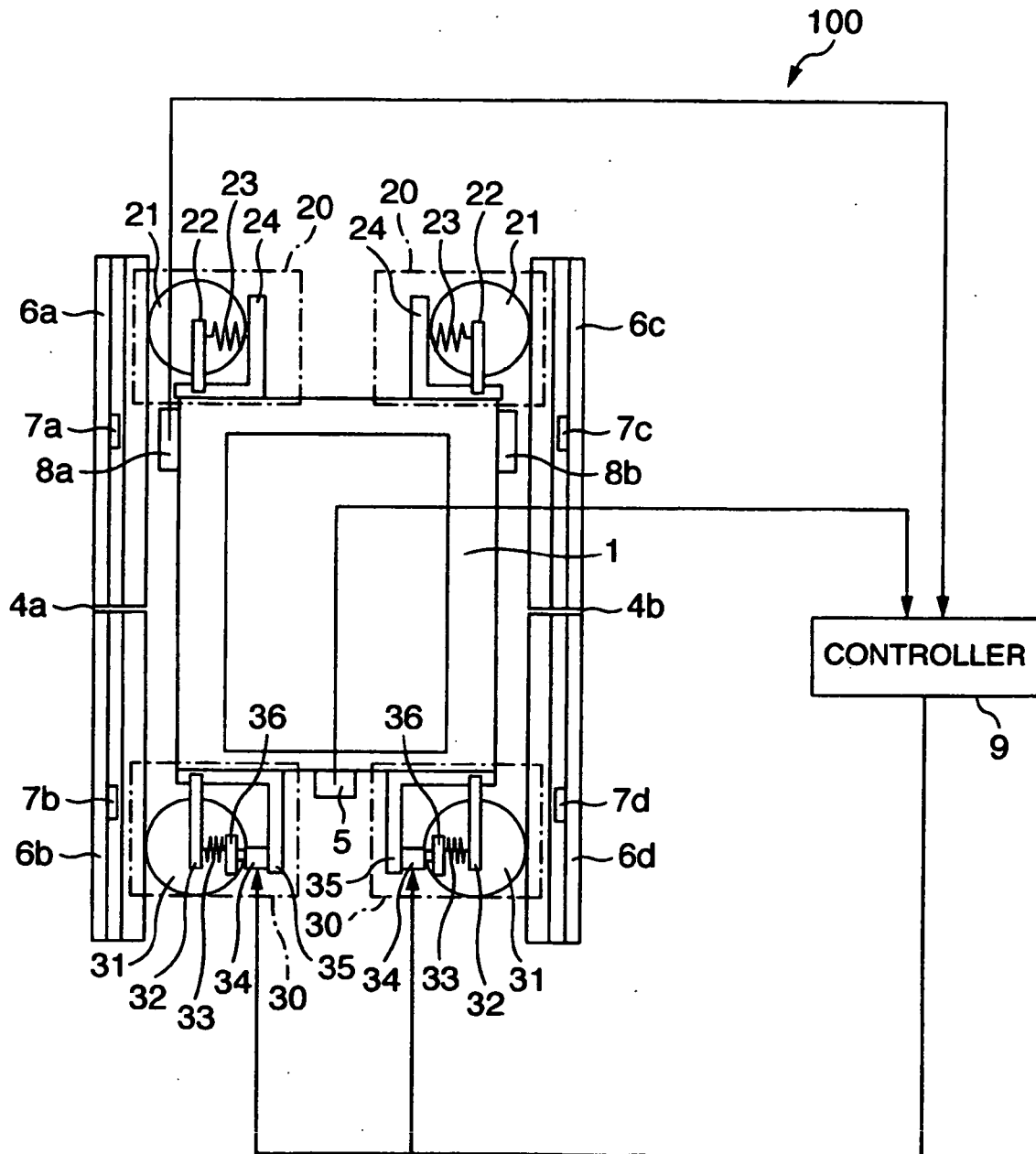


FIG.2

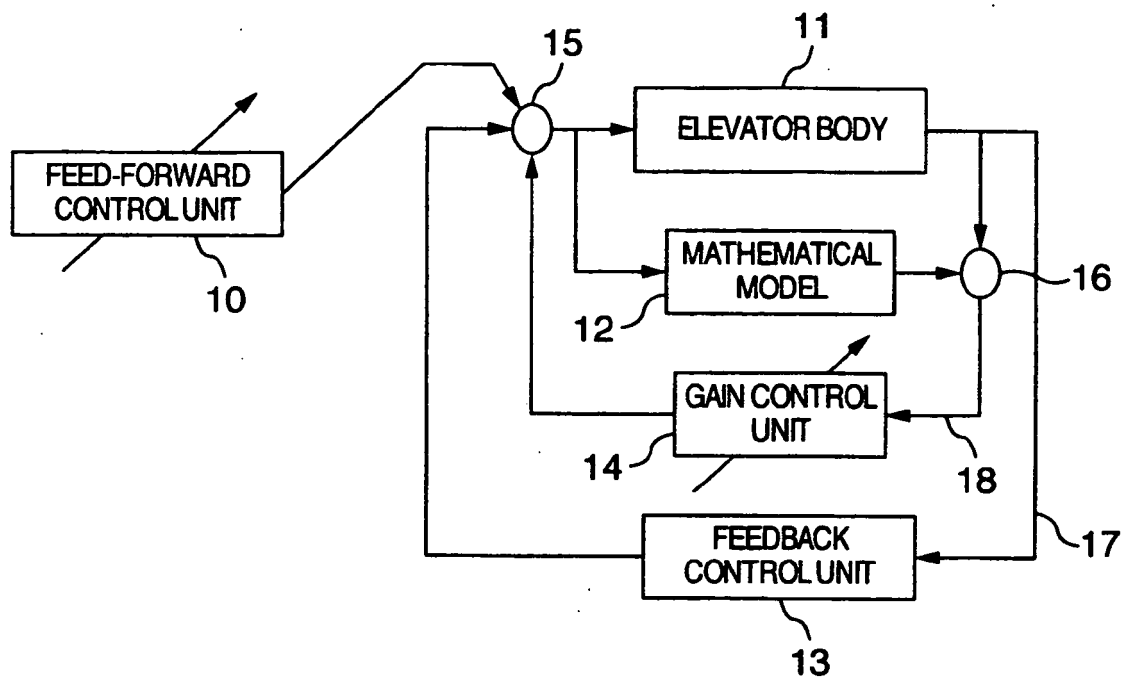


FIG.3

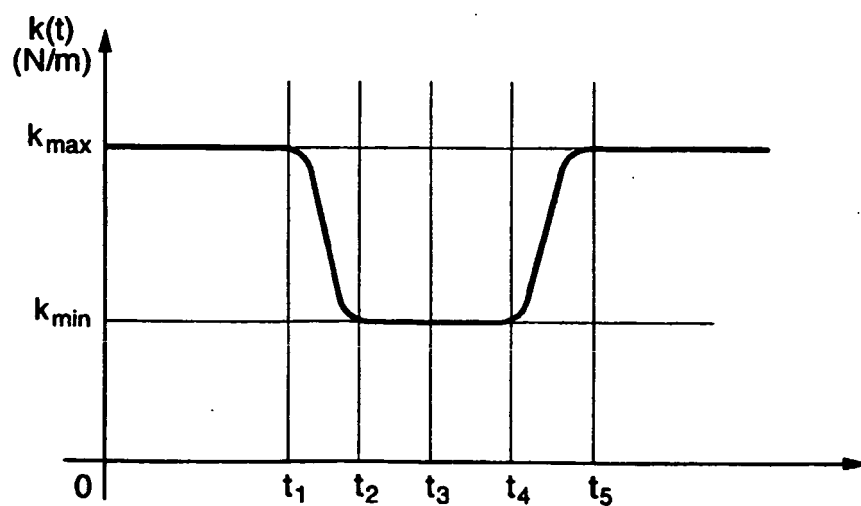


FIG.4

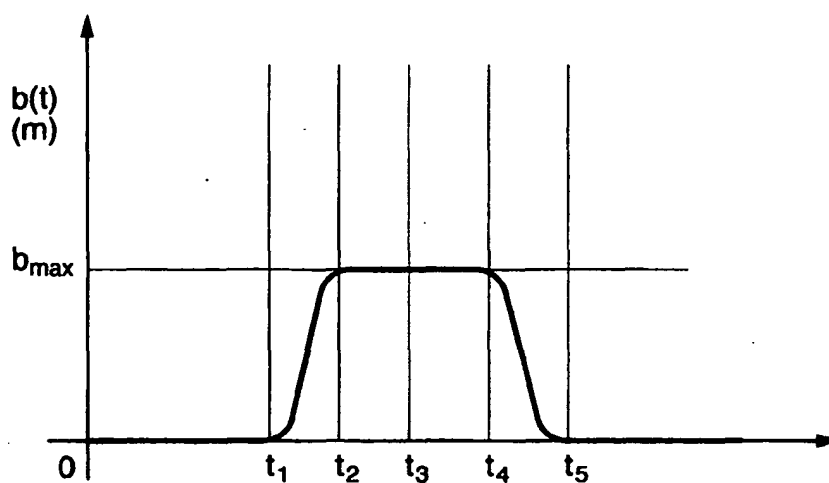


FIG.5

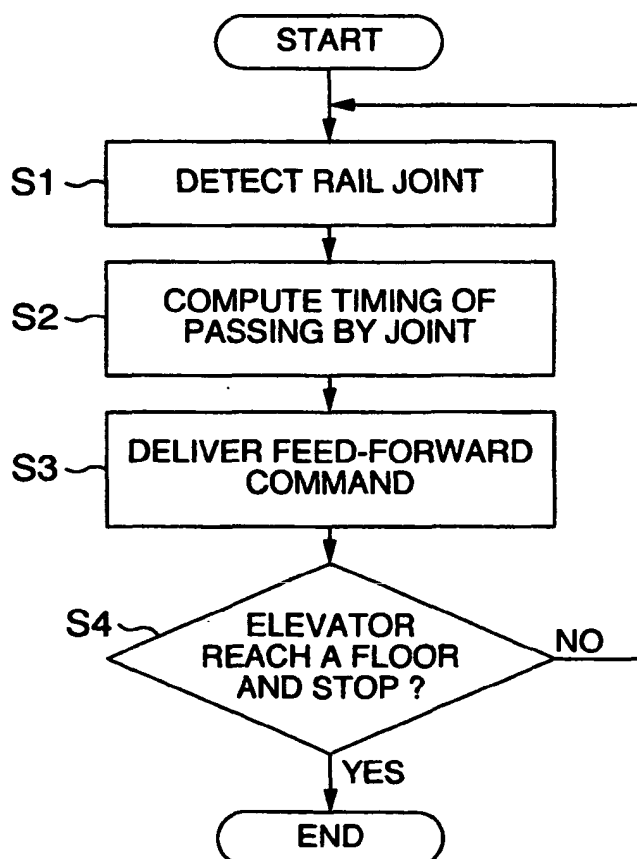


FIG.6

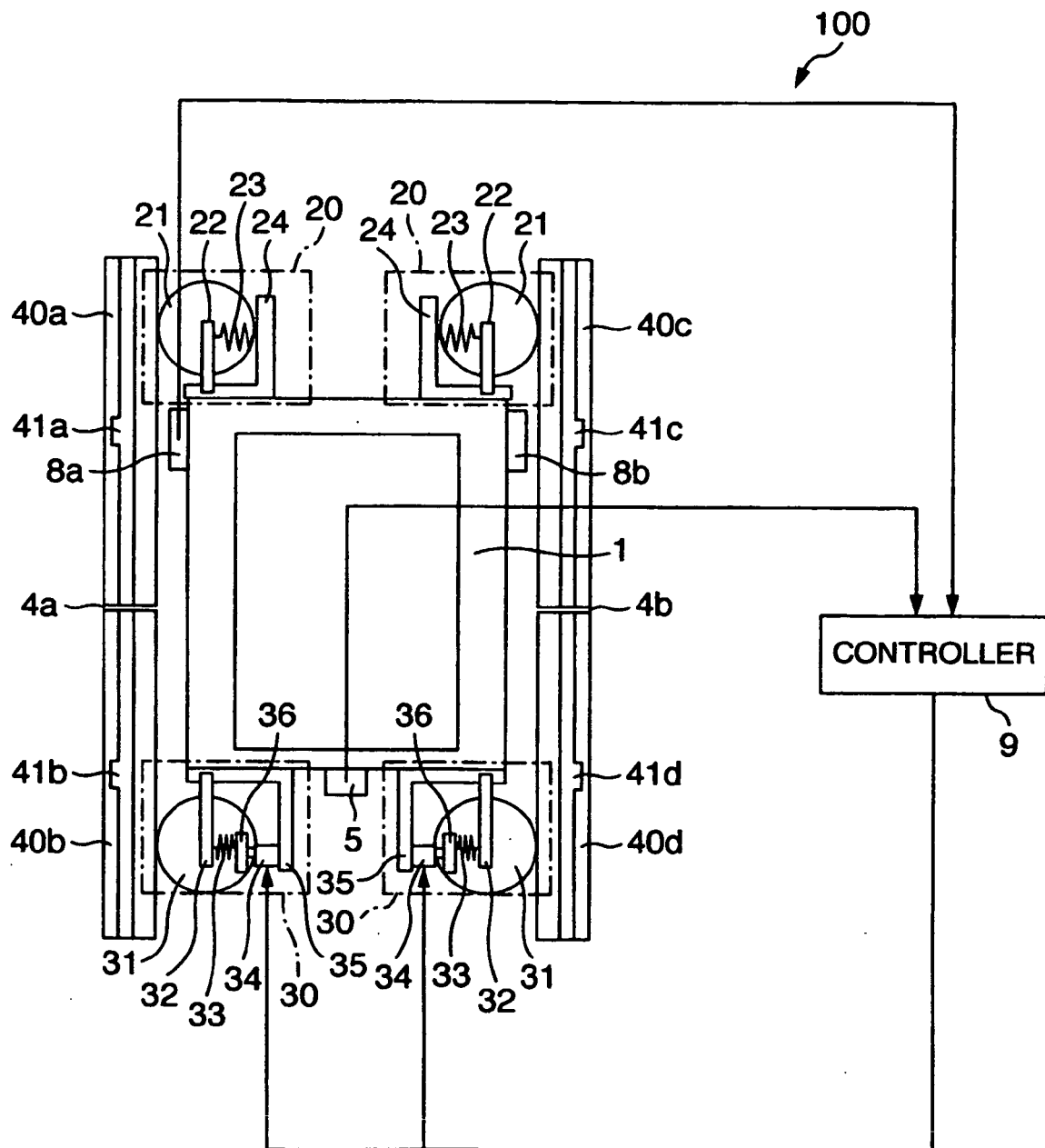


FIG.7

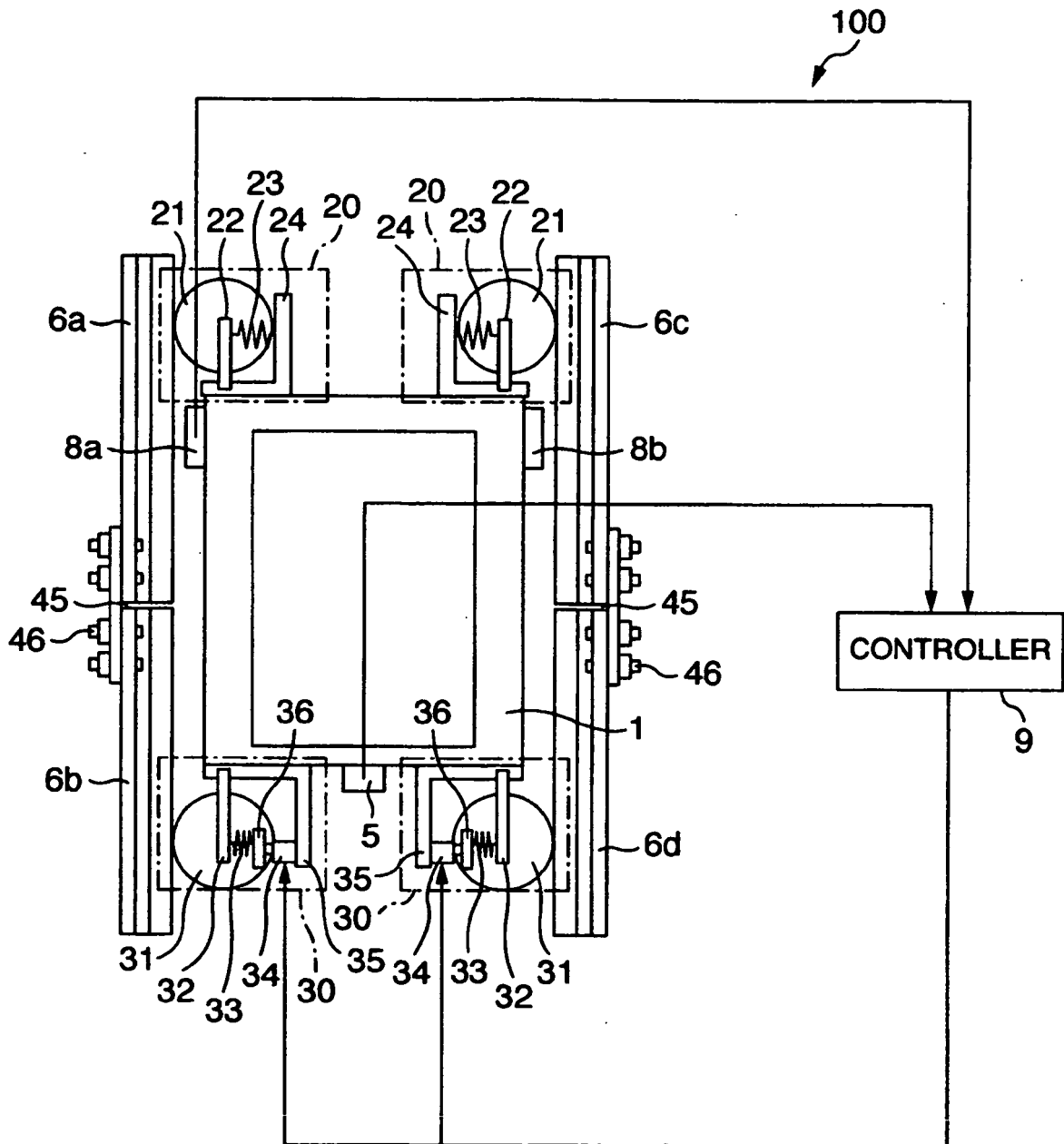
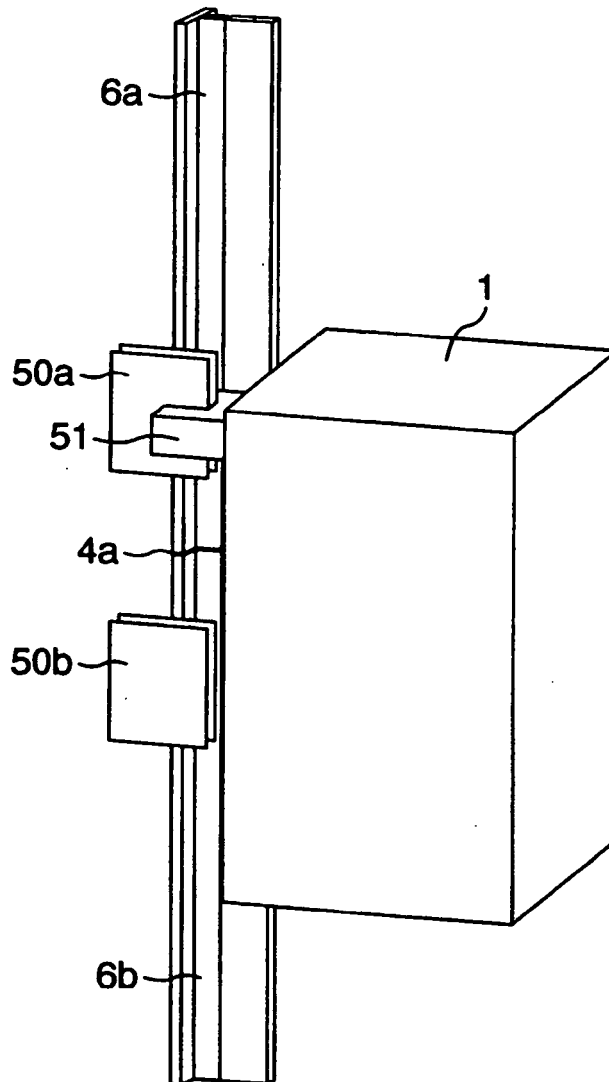


FIG.8



REFERENCES CITED IN THE DESCRIPTION

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