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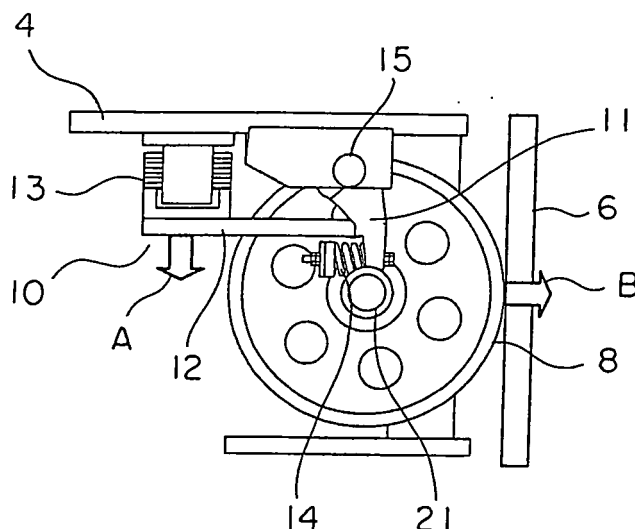
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(54) **ELEVATOR APPARATUS**

(57) An elevator apparatus includes: a car main body guided by a guide rail so as to ascend and descend inside a hoistway; a car frame disposed outside the car main body; a guide shoe fixed to the car frame so as to move

along the guide rail; and a pressing means for pressing the guide shoe toward the guide rail. The car main body is displaced toward a landing by a reaction force from the guide rail when the guide shoe is pressed against the guide rail by actuation of the pressing means.

FIG. 3



EP 1 733 993 A1

DescriptionTECHNICAL FIELD

[0001] The present invention relates to an elevator apparatus in which a gap between a doorsill of a car door and a doorsill of a landing door is reduced by displacing a car toward a landing.

BACKGROUND ART

[0002] Conventional elevator apparatuses such as that described in Japanese Patent Laid-Open No. 2000-229773 (Gazette), for example, include: an elongated blocking member disposed on a car so as to block a gap between a doorsill of a car door and a doorsill of a landing door by pivoting; and a driving mechanism coupled between the blocking member and a car door motor so as to pivot the blocking member interdependently with opening and closing actions of the car door.

[0003] In such elevator apparatuses, even if a user getting on or off the car happens to drop something, it is prevented from falling through the gap into the hoistway because the blocking member pivots synchronously with the door opening action of the car on arrival at a floor so as to block the gap between the doorsill of the car door and the doorsill of the landing door.

[0004] However, in such configurations, the blocking member itself must be highly rigid in order to support heavy loads such as freight carts, hospital stretchers, etc., when they act directly on the blocking member, and one problem has been that the driving force of the car door motor must be increased in preparation for such large loads acting on the blocking member, increasing the size of the motor and also raising manufacturing costs.

DISCLOSURE OF INVENTION

[0005] The present invention aims to solve the above problems and an object of the present invention is to provide an elevator apparatus eliminating a need for a blocking member, and also eliminating a need for an enlarged car door motor having a large driving force.

[0006] In order to achieve the above object, according to one aspect of the present invention, there is provided an elevator apparatus including: a car main body guided by a guide rail so as to ascend and descend inside a hoistway; a car frame disposed outside the car main body; a guide shoe fixed to the car frame so as to move along the guide rail; and a pressing means for pressing the guide shoe toward the guide rail, wherein: the car main body is displaced toward a landing by a reaction force from the guide rail when the guide shoe is pressed against the guide rail by actuation of the pressing means.

BRIEF DESCRIPTION OF THE DRAWINGS**[0007]**

Figure 1 is a front elevation showing an elevator apparatus according to Embodiment 1 of the present invention;

Figure 2 is a plan showing a roller guide from Figure 1;

Figure 3 is a front elevation of a pressing means for pressing a first depth direction roller from Figure 2; Figure 4 is a side elevation showing a first service state of the elevator apparatus in Figure 1;

Figure 5 is a side elevation showing a second service state of the elevator apparatus in Figure 1;

Figure 6 is a partial cross section showing an elevator apparatus according to Embodiment 2 of the present invention; and

Figure 7 is a partial cross section showing an elevator apparatus according to Embodiment 3 of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0008] Preferred embodiments of the present invention will now be explained with reference to the drawings, and members and portions identical or equivalent in each of the embodiments will be given identical numbering.

Embodiment 1

[0009] Figure 1 is a front elevation showing an elevator apparatus according to Embodiment 1 of the present invention. Please note that first depth direction rollers have been omitted from Figure 1.

[0010] A car 2 suspended by a main rope 1 and moved vertically is disposed in a hoistway of the elevator apparatus. The car 2 includes: a car main body 3; a car frame 4 disposed outside the car main body 3; and rubber vibration isolators 20 disposed between the car main body 3 or the car frame 4 so as to suppress vibration of the car main body 3. Roller guides 5 constituting a guide shoe are fixed to each of four corners of the car frame 4.

[0011] Each of the roller guides 5, as shown in Figure 2, includes: a lateral roller 7 for restricting movement of the car 2 in left and right directions (when viewed facing a car door 23 disposed on a front surface of the car main body 3); and a first depth direction roller 8 and a second depth direction roller 9 for restricting movement of the car 2 in a depth direction (toward the car 2 and toward a landing when viewed facing the car door 23), and the roller guides 5 are placed in contact with a pair of T-shaped guide rails 6 extending vertically on wall surfaces of the hoistway from each of three directions.

[0012] Pressing means 10 for pressing the first depth direction rollers 8 toward the guide rails 6, as shown in Figure 3, are disposed on each of the first depth direction rollers 8 near the landing. These pressing means 10 are

disposed on each of the first depth direction rollers 8 of the roller guides 5 at the four corners of the car frame 4.

[0013] In the pressing means 10, a generally L-shaped lever 11 is disposed such that a base end portion is pivotable around a pivot point 15 on the car frame 4. A leading end portion of the lever 11 is fixed to a shaft 21 of the first depth direction roller 8. A first end portion of an arm 12 is fixed to an intermediate portion of the lever 11. An expandable and contractible driving portion 13 fixed to the car frame 4 is placed in contact with a second end portion of the arm 12. A spring 14 for forcing an end portion of the lever 11 toward the guide rail 6 so as to place the first depth direction roller 8 in constant contact with the guide rail 6 is disposed in a vicinity of the shaft 21. The driving portion 13 is constituted by a voice coil motor made up of a coil and a magnet. Here, other methods such as electromagnetic attraction, etc., are also acceptable.

[0014] Next, action of an elevator apparatus having the above configuration will be explained.

[0015] As shown in Figure 4, when the car 2 arrives at a service floor, a door opening action is started by driving a door motor. Then, an electric current flows through the driving portion 13, driving the driving portion 13, whereby the driving portion 13 extends in the direction of arrow A as shown in Figure 3, and the lever 11 integrated with the arm 12 begins to pivot around the pivot point 15 in a counterclockwise direction, pressing the first depth direction rollers 8 toward the respective guide rail 6 as indicated by arrow B. Here, because the guide rails 6 are fixed to the wall surfaces of the hoistway, the car 2 is subjected to reaction forces from the guide rails 6 against the pressure from the four first depth direction rollers 8, whereby the car 2 displaces horizontally and approaches a landing 22, narrowing a gap between a doorsill of the car door 23 and a doorsill of a landing door (not shown), as shown in Figure 5.

[0016] On the other hand, as the doors are being closed, the driving portion 13 contracts, the lever 11 integrated with the arm 12 pivots in a clockwise direction, and the pressure pressing the first depth direction roller 8 toward the guide rail 6 decreases. Consequently, because the reaction forces from the guide rails 6 toward the car 2 against the pressure are also reduced, the car 2 displaces horizontally away from the landing 22, widening the gap between the doorsill of the car door 23 and the doorsill of the landing door.

[0017] As explained above, using an elevator apparatus of this kind, because the car 2 is displaced toward the landing 22 by a reaction force from the guide rails 6 when the first depth direction rollers 8 press on the guide rails 6 due to actuation of the pressing means 10, the need for the blocking member required conventionally is eliminated, and problems expressly requiring an enlarged car door motor having a large driving force in anticipation of large loads acting on a blocking member can be solved.

[0018] Moreover, in the above embodiment, the press-

ing means 10 was disposed on each of the first depth direction rollers 8 of the roller guides 5 on the four corners of the car frame 4, but the pressing means may also be disposed in two places, on each of the right and left depth direction rollers near the car door doorsill.

Embodiment 2

[0019] Figure 6 is a partial cross section showing an elevator apparatus according to Embodiment 2 of the present invention.

[0020] In this elevator apparatus, an optical sensor 25 constituting a distance sensor for detecting a gap distance between a car main body 3 and a landing 22 is disposed on a car floor 24 of the car main body 3 near the landing 22.

[0021] In this elevator apparatus, the gap distance between the main body 3 and the landing 22 is detected by the optical sensor 25, and driving of the driving portion 13 is stopped by a signal from the optical sensor 25 before the car main body 3 collides with the landing 22.

[0022] Moreover, the distance sensor may also be a mechanical sensor such as a micro switch, for example, instead of an optical sensor.

[0023] The distance sensor may also be mounted to the landing so as to face the car floor 24.

Embodiment 3

[0024] Figure 7 is a partial cross section showing an elevator apparatus according to Embodiment 3 of the present invention.

[0025] In this elevator apparatus, a pressing means 26 is disposed between the car frame 4 and a car floor 24. In this pressing means 26, a first magnetic pole 27 and a second magnetic pole 29 are mounted to the car frame 4. A first coil 28 facing the first magnetic pole 27 and a second coil 30 facing the second magnetic pole 29 are each mounted to the car floor 24. A first sensor 31 for detecting a distance between the first magnetic pole 27 and the first coil 28 is mounted to the first coil 28. A second sensor 32 for detecting a distance between the second magnetic pole 29 and the second coil 30 is mounted to the second coil 30. The car floor 24 and the car frame 4 are each connected at two end portions by deforming members 33 having a U-shaped cross section.

[0026] Moreover, a first coil and a second coil may also be mounted to a car frame, and a first magnetic pole and a second magnetic pole mounted to a car floor.

[0027] In an elevator apparatus according to this embodiment, when a car 2 arrives at a service floor, an electric current is passed through the first coil 28, attracting the first magnetic pole 27 toward the first coil 28 as indicated by arrow C, and pressing the first depth direction rollers 8 toward the guide rails 6 through the car frame 4. Here, because the guide rails 6 are fixed to the wall surfaces of a hoistway, the car 2 is subjected to reaction forces from the guide rails 6 against the pressure through

the first depth direction rollers 8 and the car frame 4, whereby the car 2 moves and approaches a landing 22, narrowing a gap between a doorsill of a car door 23 and a doorsill of a landing door.

[0028] On the other hand, as the doors are being closed, an electric current is passed through the second coil 30, attracting the second magnetic pole 29 toward the second coil 30 as indicated by arrow D and reducing the force pressing the first depth direction rollers 8 toward the guide rails 6, and because the reaction force against the pressure from the guide rails 6 toward the car 2 is consequently also reduced, the car 2 separates from the landing 22, widening the gap between the doorsill of the car door 23 and the doorsill of the landing door.

[0029] Moreover, the passage of electric current to the first coil 28 and the second coil 30 is switched on and off by signals from the first sensor 31 and the second sensor 32 to ensure appropriate gaps between the doorsill of the car door and the doorsill of the landing door when the car door 23 is in an open state and a closed state.

[0030] Moreover, in each of the above embodiments, cases in which roller guides are used have been explained, but of course the present invention can also be applied to sliding guides.

Claims

1. An elevator apparatus comprising:

a car main body guided by a guide rail so as to ascend and descend inside a hoistway;
a car frame disposed outside said car main body;
a guide shoe fixed to said car frame so as to move along said guide rail; and
a pressing means for pressing said guide shoe toward said guide rail,

wherein:

said car main body is displaced toward a landing by a reaction force from said guide rail when said guide shoe is pressed against said guide rail by actuation of said pressing means.

2. The elevator apparatus according to Claim 1, wherein:

said pressing means is disposed between said car frame and said guide shoe.

3. The elevator apparatus according to Claim 1, wherein:

said pressing means is disposed between said car main body and said car frame.

4. The elevator apparatus according to any one of Claims 1 through 3, wherein:

a distance sensor for sensing a gap distance between said car main body and said landing is disposed between said car main body and said landing such that said car main body is stopped before colliding with said landing by a signal from said distance sensor.

5. The elevator apparatus according to Claim 2, wherein:

said pressing means comprises:

a lever having a base end portion disposed pivotably on said car frame and a leading end portion disposed pivotably on said guide shoe;

an arm having a first end portion connected to said lever; and

a driving portion disposed between a second end portion of said arm and said car frame, said driving portion pressing said guide shoe against said guide rail by extending to pivot said lever by means of said arm.

6. The elevator apparatus according to Claim 3, wherein:

said pressing means comprises:

a magnetic pole disposed on a first part selected from said car frame and a car floor of said car main body; and
a coil disposed so as to face said magnetic pole on a second part selected from said car frame and said car floor, and

an attractive force is generated between said coil and said magnetic pole by passage of an electric current.

7. The elevator apparatus according to Claim 6, wherein:

a distance sensor for sensing a gap distance between said coil and said magnetic pole is disposed on a first part selected from said coil and said magnetic pole such that said car main body is stopped before colliding with said landing by a signal from said distance sensor.

FIG. 1

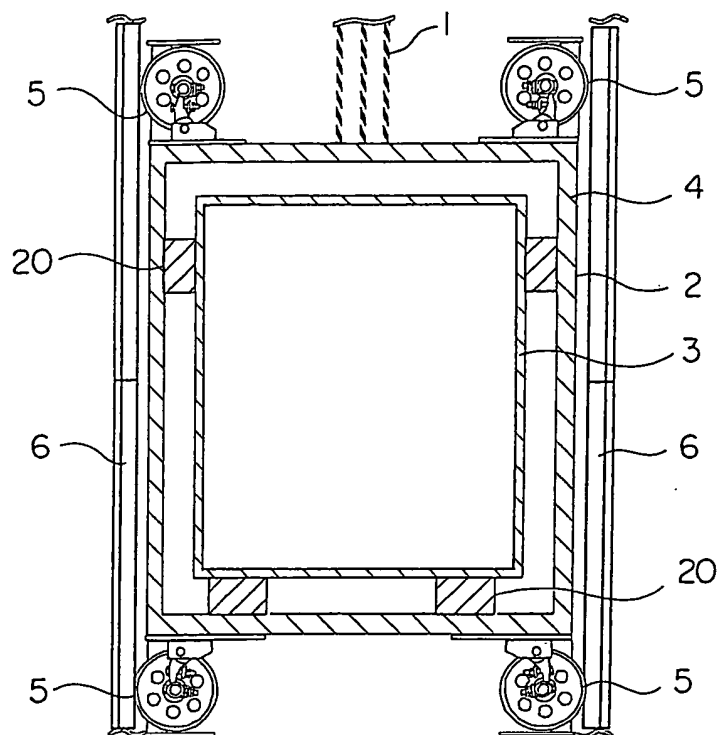


FIG. 2

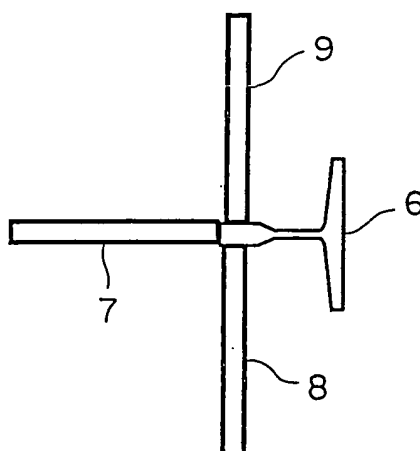


FIG. 3

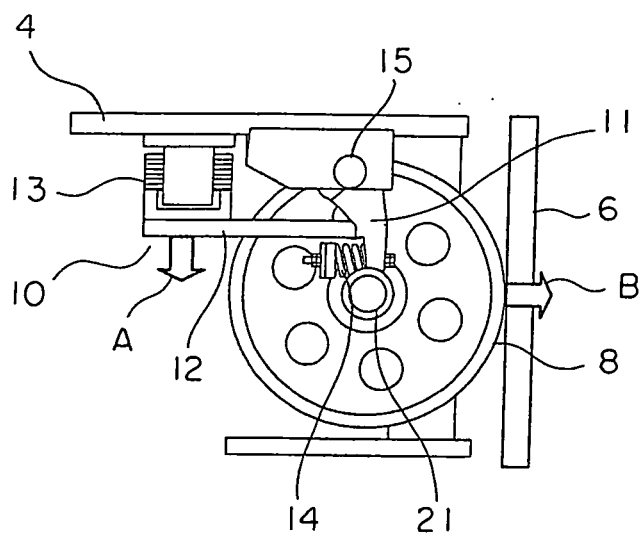


FIG. 4

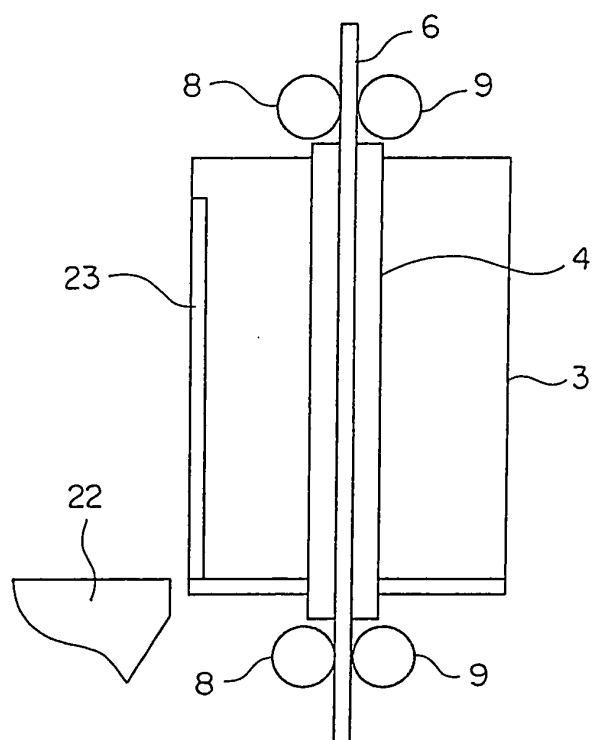


FIG. 5

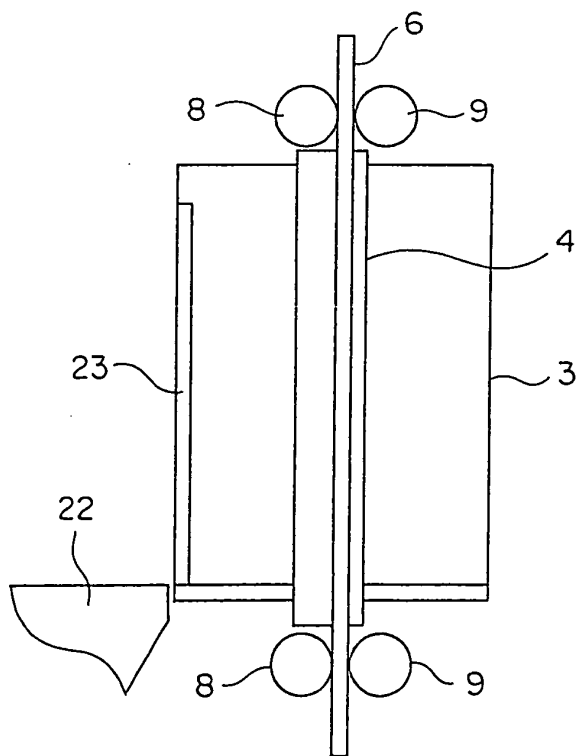


FIG. 6

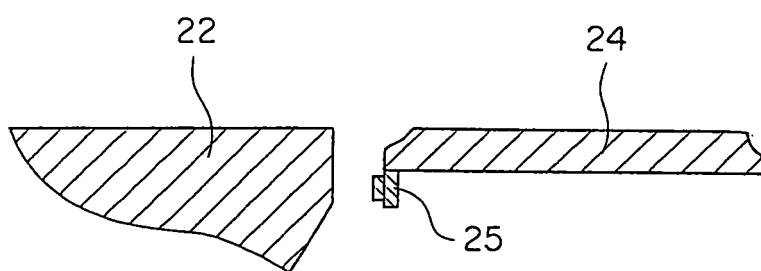
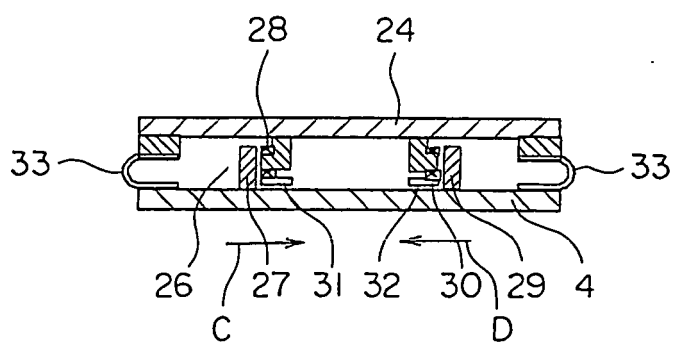


FIG. 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2004/005063

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. ⁷ B66B11/02, 7/04, 13/28		
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) Int.Cl. ⁷ B66B7/00-13/30		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2005 Kokai Jitsuyo Shinan Koho 1971-2005 Toroku Jitsuyo Shinan Koho 1994-2005		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E, X E, A	JP 2004-284813 A (Toshiba Elevator and Building Systems Corp.), 14 October, 2004 (14.10.04), Pay attention to Par. Nos. [0018] to [0020], [0023] to [0027] (Family: none)	1-2 3-7
A	JP 1-288593 A (Mitsubishi Electric Corp.), 20 November, 1989 (20.11.89), Pay attention to Claims (Family: none)	3
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
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Date of the actual completion of the international search 06 January, 2005 (06.01.05)		Date of mailing of the international search report 25 January, 2005 (25.01.05)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2004/005063

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 74143/1974 (Laid-open No. 4057/1976) (Tokyo Shibaura Electric Co., Ltd.), 13 January, 1976 (13.01.76), Pay attention to description; page 3, lines 2 to 18 (Family: none)	1-2
A	JP 2002-179373 A (Mitsubishi Electric Corp.), 26 June, 2002 (26.06.02), Pay attention to abstract (Family: none)	1-2
A	JP 6-255948 A (Toshiba Corp.), 13 September, 1994 (13.09.94), Pay attention to abstract (Family: none)	1-2

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REFERENCES CITED IN THE DESCRIPTION

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- JP 2000229773 A [0002]