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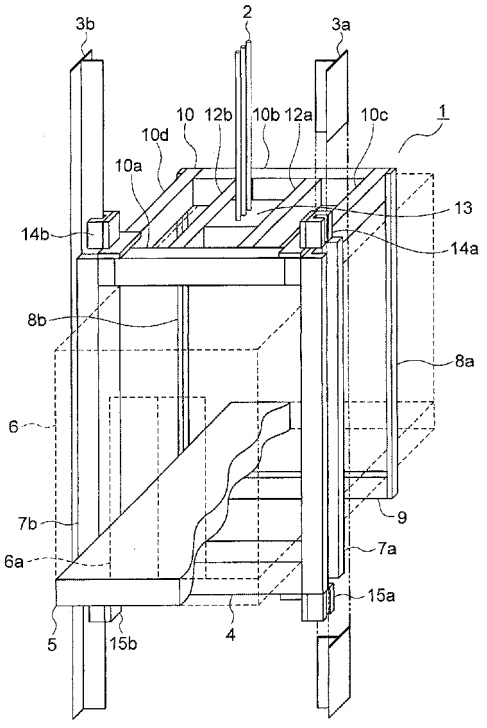
(54) **ELEVATOR CAR**

(57) In an elevator car, a car floor and a cage are disposed on a lower beam. A pair of vertical stanchions are connected to two end portions of the lower beam, and are disposed vertically on two sides of the cage. A pair of rod-shaped members are connected to the car floor, and are disposed vertically on two sides of the cage. A rectangular upper frame includes: mutually parallel first and second upper beams; and third and fourth upper beams that are connected between two end portions of the first and second upper beams, the rectangular upper frame being connected to the vertical stanchions and the rod-shaped members above the cage. A pair of mounting beams are connected between the first and second upper beams. A car suspending portion to which a suspending means is connected is disposed between the mounting beams.

FIG. 1



EP 2 154 098 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator car that is suspended inside a hoistway by a suspending means that is connected to an upper portion.

BACKGROUND ART

[0002] In conventional elevator car frames, a quadrilateral lower frame that supports a cage is constituted by: first and second floor bearing frames that are parallel to a depth direction of a car; a first auxiliary frame that is coupled between a front end portion of the first floor bearing frame and a front end portion of the second floor bearing frame; and a second auxiliary frame that is coupled between a rear end portion of the first floor bearing frame and a rear end portion of the second floor bearing frame. An upper frame that is parallel to a width direction of the cage and horizontal is disposed above the cage. Main ropes that suspend the car are connected to the upper frame.

[0003] A first side frame is fixed obliquely between a first end portion of the upper frame and the front end portion of the first floor bearing frame. A second side frame is fixed obliquely between the first end portion of the upper frame and the rear end portion of the first floor bearing frame. A third side frame is fixed obliquely between a second end portion of the upper frame and the front end portion of the second floor bearing frame. A fourth side frame is fixed obliquely between the second end portion of the upper frame and the rear end portion of the second floor bearing frame (see Patent Literature 1, for example).

[0004] [Patent Literature 1]
Japanese Utility Model Laid-Open No. SHO 60-180277 (Gazette)

DISCLOSURE OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0005] In conventional elevator car frame constructions such as that described above, since large bending moments act on the upper frame, it is necessary to increase vertical dimensions of the upper frame, increasing height dimensions of the car. In contrast to that, in conventional machine-roomless elevators, constructions in which a lower portion of a car is suspended in order to reduce height dimensions of a hoistway are often adopted. However, in constructions that suspend the lower portion of the car, it is necessary to ensure space on side portions of the car through which to pass the main ropes, increasing horizontal dimensions of the hoistway. Operations for connecting the main ropes to the car and operations for replacing the main ropes are also time-consuming.

[0006] The present invention aims to solve the above problems and an object of the present invention is to provide an elevator car that can reduce height dimensions while adopting a construction in which a suspending means is connected to an upper portion.

MEANS FOR SOLVING THE PROBLEM

[0007] In order to achieve the above object, according to one aspect of the present invention, there is provided an elevator car including: a lower beam; a car floor that is disposed on the lower beam; a cage that is disposed on the car floor; a pair of vertical stanchions that are connected to two end portions of the lower beam, and that are disposed vertically on two sides of the cage; a pair of rod-shaped members that are connected to the car floor, and that are disposed vertically on two sides of the cage; a rectangular upper frame that includes: mutually parallel first and second upper beams; and third and fourth upper beams that are connected between two end portions of the first and second upper beams, the rectangular upper frame being connected to the vertical stanchions and the rod-shaped members above the cage; a pair of mounting beams that are connected between the first and second upper beams; and a car suspending portion that is disposed between the mounting beams, and to which a suspending means is connected.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Figure 1 is a perspective that shows an elevator car according to Embodiment 1 of the present invention;
Figure 2 is a plan that shows the car from Figure 1;
Figure 3 is a perspective that shows an elevator car according to Embodiment 2 of the present invention;
Figure 4 is a plan that shows the car from Figure 3; and
Figure 5 is a perspective that shows an elevator car according to Embodiment 3 of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0009] Preferred embodiments of the present invention will now be explained with reference to the drawings.

Embodiment 1

[0010] Figure 1 is a perspective that shows an elevator car according to Embodiment 1 of the present invention, and Figure 2 is a plan that shows the car from Figure 1.

[0011] In the figures, a car 1 is suspended inside a hoistway by a plurality of main ropes 2 that constitute a suspending means, and is raised and lowered inside the hoistway by a driving force from a driving machine (not shown). A pair of car guide rails 3a and 3b that guide the raising and lowering of the car 1 are installed inside the

hoistway.

[0012] A lower beam 4 that is parallel to a width direction of the car 1 and horizontal is disposed on a lower portion of the car 1. A flat car floor 5 that supports passengers, loads, etc., is disposed on the lower beam 4. A horizontal shape of the car floor 5 is a rectangular shape (a rectangle). A cage 6 is disposed on the car floor 5. The cage 6 has: a front surface in which a car doorway 6a is disposed; a back surface that is opposite the front surface; first and second side surfaces that are opposite each other; and a ceiling surface.

[0013] A pair of vertical stanchions 7a and 7b are disposed vertically on two sides of the cage 6. The lower end portions of the vertical stanchions 7a and 7b are connected to two end portions of the lower beam 4. The vertical stanchions 7a and 7b are disposed at identical positions in a depth direction of the cage 6.

[0014] A pair of rod-shaped members 8a and 8b are also disposed vertically on two sides of the cage 6. The rod-shaped members 8a and 8b are disposed at identical positions in a depth direction of the cage 6 behind the vertical stanchions 7a and 7b. A vertical stanchion 7a and a rod-shaped member 8a face the first side surface of the cage 6, and a vertical stanchion 7b and a rod-shaped member 8b face the second side surface of the cage 6.

[0015] Lower end portions of the rod-shaped members 8a and 8b project below the car floor 5. A tie beam 9 is connected between the lower end portions of the rod-shaped members 8a and 8b. The car floor 5 is supported on the lower beam 4 and the tie beam 9. The rod-shaped members 8a and 8b are connected to the car floor 5 by means of the tie beam 9. The tie beam 9 is parallel to the width direction of the cage 6 and horizontal.

[0016] A rectangular upper frame (a four-sided frame) 10 is connected to the vertical stanchions 7a and 7b and the rod-shaped members 8a and 8b above the cage 6. The upper frame 10 has: mutually parallel first and second upper beams (a front beam and a rear beam) 10a and 10b; and mutually parallel third and fourth upper beams (a right side beam and a left side beam) 10c and 10d that are connected between two end portions of the first and second upper beams 10a and 10b.

[0017] In this example, the first and second upper beams 10a and 10b are disposed parallel to the width direction of the cage 6 so as to be spaced apart from each other in the depth direction of the cage 6. The third and fourth upper beams 10c and 10d are disposed parallel to the depth direction of the cage 6 so as to be spaced apart from each other in the width direction of the cage 6. An upper end portion of a vertical stanchion 7a and an upper end portion of a rod-shaped member 8a are connected to a side surface of the third upper beam 10c. An upper end portion of a vertical stanchion 7b and an upper end portion of a rod-shaped member 8b are connected to a side surface of the fourth upper beam 10d.

[0018] The vertical stanchions 7a and 7b are disposed at adjacent corner portions of a quadrilateral (a rectangle) 11 (Figure 2) that is constituted by four straight lines that join centers of the vertical stanchions 7a and 7b and centers of the rod-shaped members 8a and 8b in a vertically projected plane. In addition, two end surfaces of the upper frame 10 in the width direction of the cage 6 (the side surface of the third upper beam 10c and the side surface of the fourth upper beam 10d) are positioned directly above two width direction end surfaces of the car floor 5.

[0019] A pair of mounting beams 12a and 12b are connected between the first and second upper beams 10a and 10b. The mounting beams 12a and 12b are disposed parallel to the depth direction of the cage 6 so as to be spaced apart from each other in the width direction of the cage 6. A car suspending portion 13 to which the main ropes 2 are connected is fixed between the mounting beams 12a and 12b.

[0020] The car suspending portion 13 is disposed at a central portion of the quadrilateral 11 in the vertically projected plane, and is disposed directly above an overall center of gravity g of the car 1 (Figure 2). A pair of upper guide shoes 14a and 14b that engage with the car guide rails 3a and 3b are mounted to an upper portion of the upper frame 10. The upper guide shoes 14a and 14b are disposed directly above the vertical stanchions 7a and 7b. A pair of lower guide shoes 15a and 15b that engage with the car guide rails 3a and 3b are mounted to a lower portion of the lower beam 4. The lower guide shoes 15a and 15b are disposed directly below the vertical stanchions 7a and 7b.

[0021] In an elevator car 1 of this kind, load on the car floor 5 is supported in a state of suspension by the vertical stanchions 7a and 7b and the rod-shaped member 8a and 8b via the lower beam 4 and the tie beam 9. In addition, the suspended load that acts on the vertical stanchions 7a and 7b and the rod-shaped member 8a and 8b is borne by the third and fourth upper beams 10c and 10d, and is ultimately supported by the main ropes 2 at the car suspending portion 13 through the first and second upper beams 10a and 10b and the mounting beams 12a and 12b.

[0022] Bending moments that correspond to distances from the third and fourth upper beams 10c and 10d act on connected portions between the first and second upper beams 10a and 10b and the mounting beams 12a and 12b, but magnitude thereof is significantly smaller than if one beam were disposed between the first and second upper beams 10a and 10b. Since lengths of the mounting beams 12a and 12b are shorter than those of the first and second upper beams 10a and 10b, bending moments that act on the mounting beams 12a and 12b are also smaller. Because of this, height dimensions of the upper frame 10 and the mounting beams 12a and 12b can be reduced while adopting a construction in which the main ropes 2 are connected the upper portion, enabling overall height dimensions of the car 1 to be reduced.

[0023] Because it is not necessary to dispose braces on side portions of the cage 6 for suspending the car floor

5, and only the vertical stanchions 7a and 7b and the rod-shaped member 8a and 8b are disposed outside a region of the cage 6 and the car floor 5 in the vertically projected plane, space on side portions of the car 1 can be utilized effectively to dispose hoistway equipment.

[0024] In addition, since the car floor 5 is supported on the lower beam 4 and the tie beam 9, bending moments that act on the car floor 5 can be suppressed, enabling the car floor 5 to be constructed thinly and lightly.

[0025] Because the two end surfaces of the upper frame 10 in the width direction of the cage 6 are positioned directly above the two width direction end surfaces of the car floor 5, and the car suspending portion 13 is also disposed at a central portion of the quadrilateral 11 in the vertically projected plane, and is disposed directly above the center of gravity g, loads that act on each of the members are distributed uniformly, enabling bending moments to be reduced.

Embodiment 2

[0026] Next, Figure 3 is a perspective that shows an elevator car according to Embodiment 2 of the present invention, and Figure 4 is a plan that shows the car from Figure 3. In the figures, vertical stanchions 7a and 7b are disposed at corner portions that are positioned at opposite angles of a quadrilateral 11 in a vertically projected plane. Rod-shaped members 8a and 8b are disposed at remaining corner portions of the quadrilateral 11 in the vertically projected plane. A rod-shaped member 8a and a vertical stanchion 7b are disposed at identical positions in a depth direction of a cage 6. A rod-shaped member 8b and a vertical stanchion 7a are also disposed at identical positions in the depth direction of the cage 6.

[0027] A lower beam 4 is connected between lower end portions of the vertical stanchions 7a and 7b. Because of this, the lower beam 4 is disposed below a car floor 5 so as to be oblique relative to a width direction of the car floor 5. A tie beam 9 is connected between lower end portions of the rod-shaped members 8a and 8b so as to cross the lower beam 4 above the lower beam 4. In other words, the tie beam 9 is disposed so as to be inclined in a reverse direction to the lower beam 4 relative to the width direction of the car floor 5. The lower beam 4 and the tie beam 9 intersect directly below an overall center of gravity of a car 1.

[0028] A plurality of block-shaped padding members 16 (only one shown in Figure 3) are disposed on two end portions of the lower beam 4. The car floor 5 is supported on the tie beam 9 and the padding members 16. Guide shoes 14a, 14b, 15a, and 15b are disposed at corner portions that are positioned at opposite angles of the quadrilateral 11 in a similar manner to the vertical stanchions 7a and 7b. Consequently, positions of the car guide rails 3a and 3b are offset from each other in the depth direction of the car 1. The rest of the configuration is similar to that of Embodiment 1.

[0029] In an elevator car 1 of this kind, because bending moments that act on connected portions between the first and second upper beams 10a and 10b and the mounting beams 12a and 12b are small, and bending moments that act on the mounting beams 12a and 12b are also small, height dimensions can also be reduced while adopting a construction in which the main ropes 2 are connected to the upper portion.

Embodiment 3

[0030] Next, Figure 5 is a perspective that shows an elevator car according to Embodiment 3 of the present invention. In the figure, a pair of auxiliary beams 17a and 17b are connected between mounting beams 12a and 12b. The auxiliary beams 17a and 17b are disposed parallel to a width direction of a cage 6 so as to be spaced apart from each other in a depth direction of the cage 6. A car suspending portion 13 is fixed between the auxiliary beams 17a and 17b. In other words, the car suspending portion 13 is mounted to the auxiliary beams 17a and 17b. The rest of the configuration is similar to that of Embodiment 1.

[0031] If width dimensions of the car floor 5 are increased, bending moments that act on the first and second upper beams 10a and 10b are increased since the first and second upper beams 10a and 10b are lengthened and distances from connected portions between the first and second upper beams 10a and 10b and the mounting beams 12a and 12b to the third and fourth upper beams 10c and 10d are increased. In answer to that, by interposing the auxiliary beams 17a and 17b between the mounting beams 12a and 12b and the car suspending portion 13, distances from the connected portion between the first and second upper beams 10a and 10b and the mounting beams 12a and 12b to the third and fourth upper beams 10c and 10d can be reduced. Because of this, height dimensions of the upper frame 10 and the mounting beams 12a and 12b can be reduced even if width dimensions of the car floor 5 are large, enabling overall height dimensions of the car 1 to be reduced.

[0032] Moreover, the tie beam 9 may also be omitted, and lower end portions of the rod-shaped members 8a and 8b connected directly to the car floor 5.

In Embodiments 1 and 3, the rod-shaped members 8a and 8b were disposed behind the vertical stanchions 7a and 7b, but the vertical stanchions 7a and 7b may also be disposed behind the rod-shaped members 8a and 8b.

In addition, the mounting beams 12a and 12b may also be disposed parallel to the width direction of the cage 6 so as to be spaced apart from each other in the depth direction of the cage 6.

The car 1 may also be suspended using a two-to-one (2:1) roping method by disposing a car suspension sheave on the car suspending portion 13.

Claims

1. An elevator car comprising:

   a lower beam;
   a car floor that is disposed on the lower beam;
   a cage that is disposed on the car floor;
   a pair of vertical stanchions that are connected to two end portions of the lower beam, and that are disposed vertically on two sides of the cage;
   a pair of rod-shaped members that are connected to the car floor, and that are disposed vertically on two sides of the cage;
   a rectangular upper frame that comprises: mutually parallel first and second upper beams; and third and fourth upper beams that are connected between two end portions of the first and second upper beams, the rectangular upper frame being connected to the vertical stanchions and the rod-shaped members above the cage;
   a pair of mounting beams that are connected between the first and second upper beams; and
   a car suspending portion that is disposed between the mounting beams, and to which a suspending means is connected.

2. An elevator car according to Claim 1, wherein:

   two end surfaces of the upper frame in a width direction of the cage are positioned directly above two width direction end surfaces of the car floor; and
   the car suspending portion is disposed at a central portion of a quadrilateral that is constituted by four straight lines that join centers of the vertical stanchions and centers of the rod-shaped members in a vertically projected plane, and is disposed directly above an overall center of gravity.

3. An elevator car according to Claim 2, wherein the vertical stanchions are disposed at adjacent corner portions of the quadrilateral in the vertically projected plane.

4. An elevator car according to Claim 3, further comprising a tie beam that is connected between lower end portions of the rod-shaped members,
   the car floor being supported on the lower beam and the tie beam.

5. An elevator car according to Claim 2, wherein the vertical stanchions are disposed at corner portions that are positioned at opposite angles of the quadrilateral in the vertically projected plane.

6. An elevator car according to Claim 5, further comprising:

   a tie beam that is connected between lower end portions of the rod-shaped members so as to cross the lower beam above the lower beam; and
   a padding member that is disposed on the lower beam,
   the car floor being supported on the tie beam and the padding member.

7. An elevator car according to Claim 1, wherein:

   a pair of auxiliary beams are connected between the mounting beams; and
   the car suspending portion is mounted to the auxiliary beams.

FIG. 1

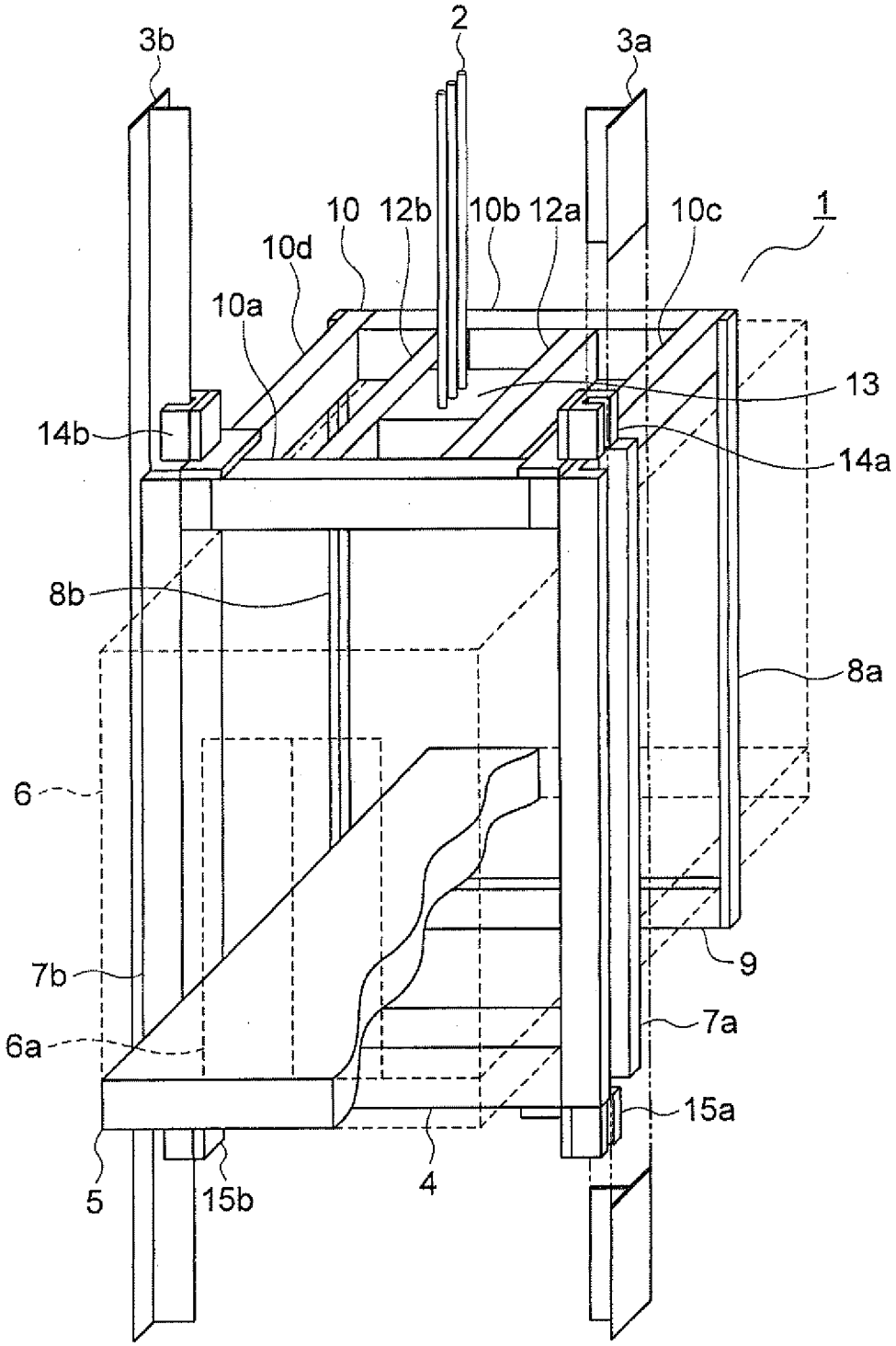

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FIG. 2

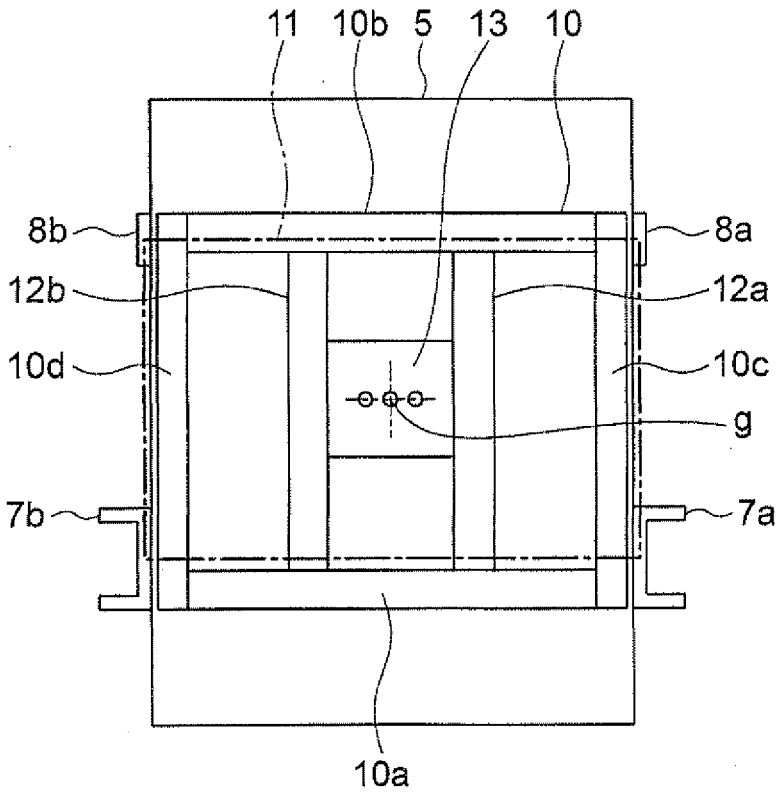

FIG. 3

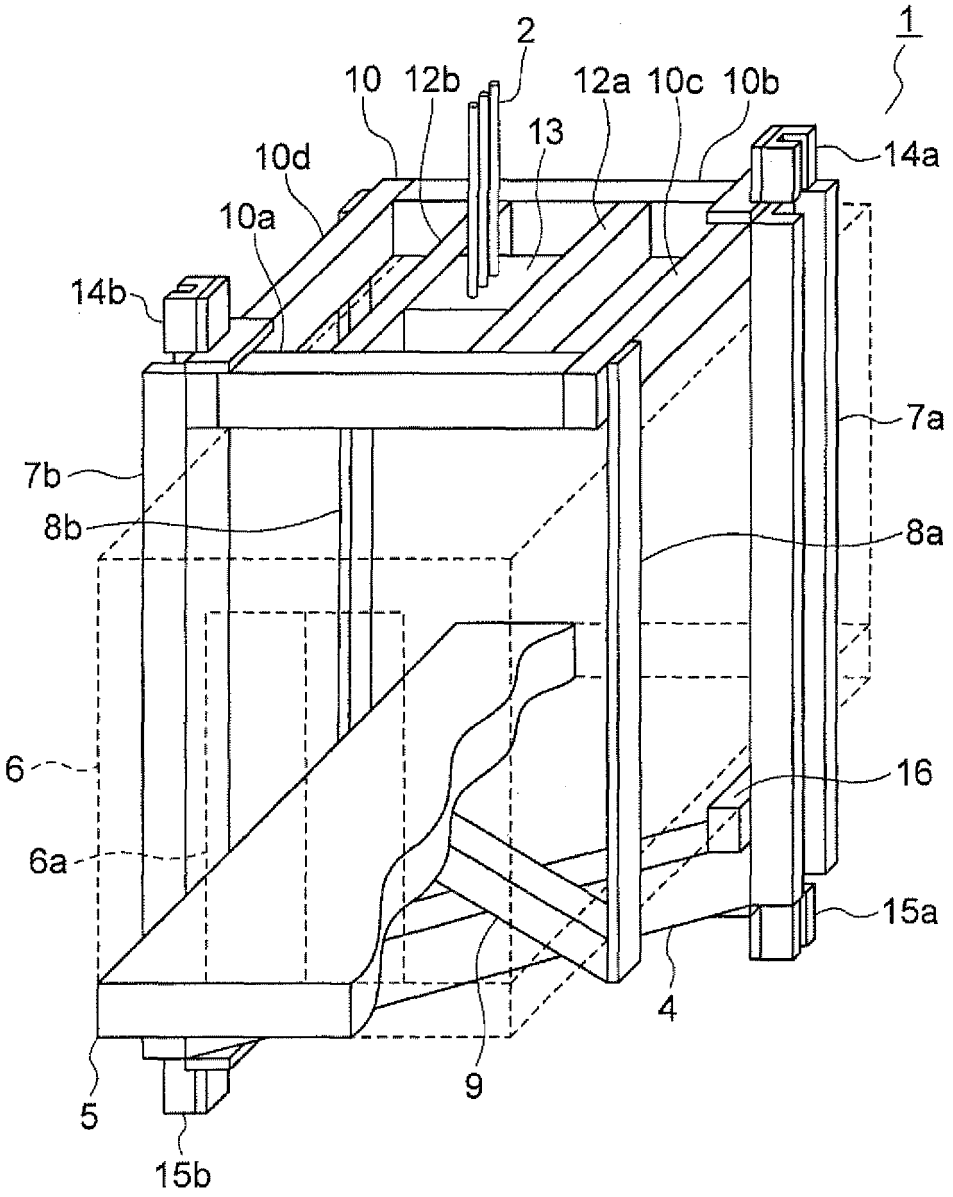
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FIG. 4

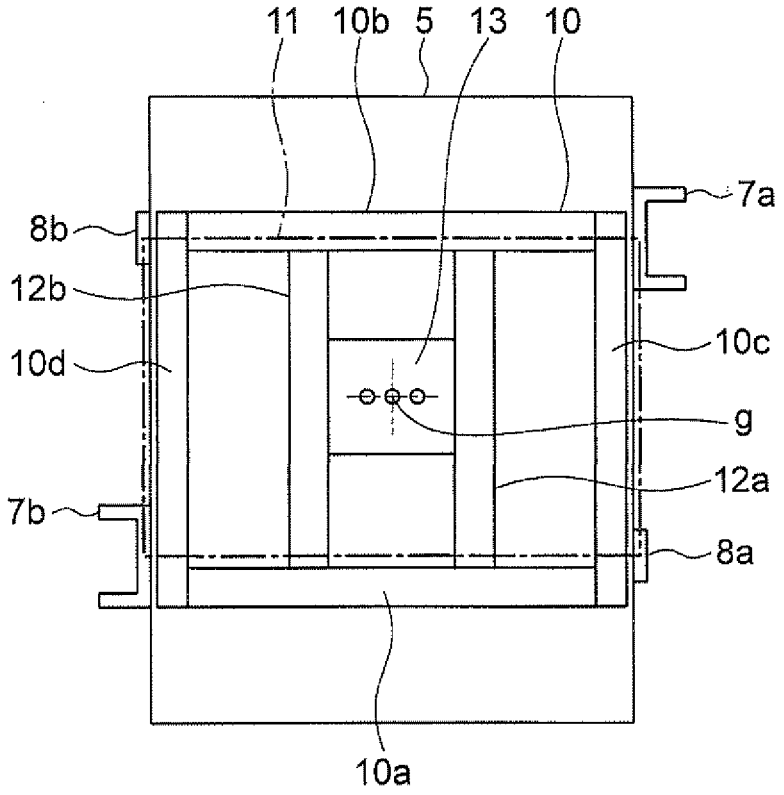
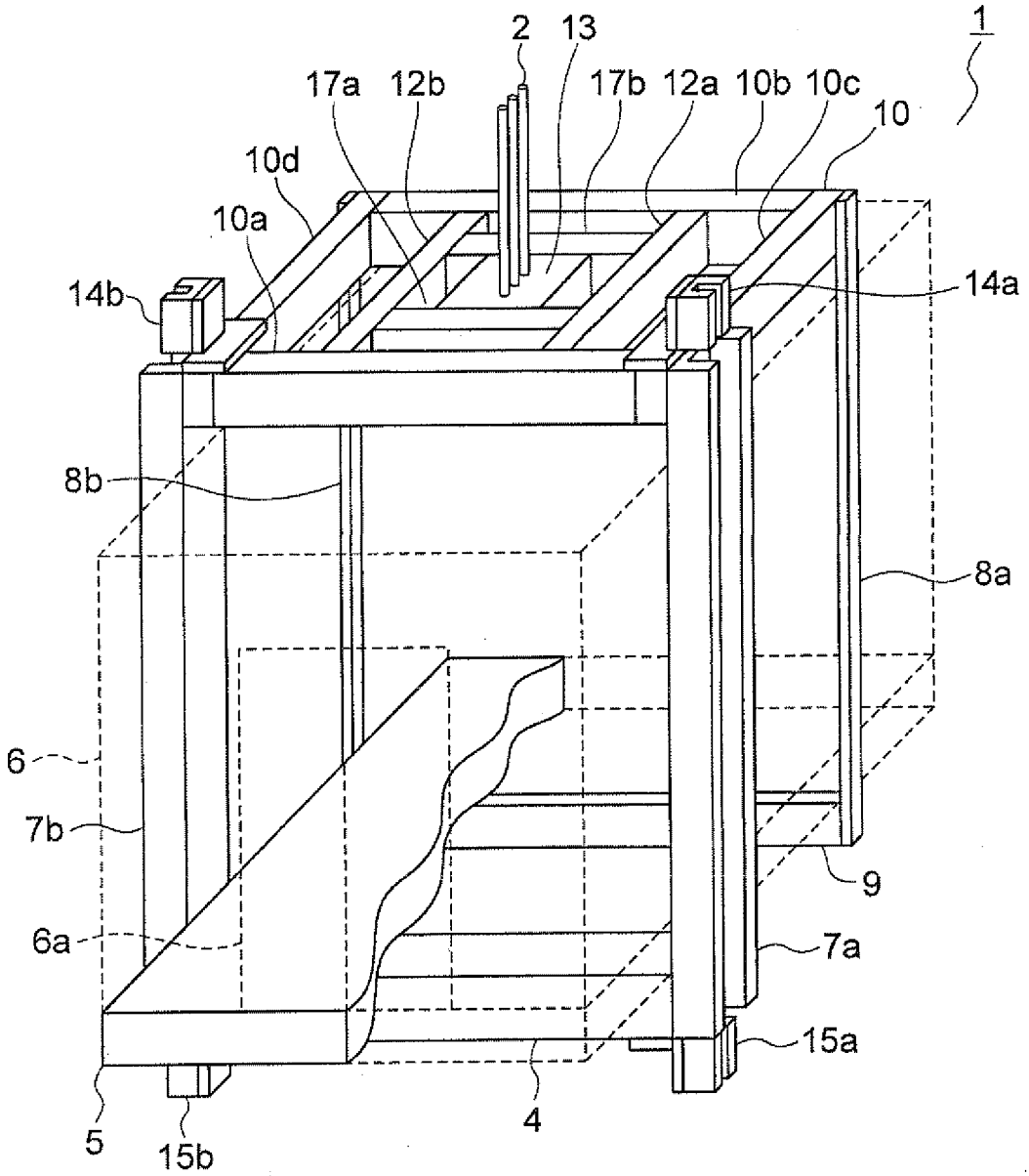


FIG. 5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7b
6a
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7a
15a
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15b
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/061526

A. CLASSIFICATION OF SUBJECT MATTER
B66B11/02(2006.01)i

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)
B66B11/02

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 1996-2008
Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008

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.
A	JP 53-054026 Y2 (Mitsubishi Electric Corp.), 23 December, 1978 (23.12.78), Column 3, line 5 to column 4, line 6; Figs. 4 to 5 (Family: none)	1-7
A	JP 60-248586 A (Mitsubishi Electric Corp.), 09 December, 1985 (09.12.85), Page 2, upper right column, line 8 to lower left column, line 4; Figs. 1 to 2 (Family: none)	1-7

☒ 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	Date of mailing of the international search report
15 February, 2008 (15.02.08)	26 February, 2008 (26.02.08)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/061526

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. 066739/1984 (Laid-open No. 180277/1985) (Toshiba Corp.), 29 November, 1985 (29.11.85), Description, page 2, line 19 to page 4, line 18; Figs. 1 to 2 (Family: none)	1-7
A	JP 53-008972 B2 (Hitachi, Ltd.), 03 April, 1978 (03.04.78), (Family: none)	1-7
A	JP 2004-359368 A (Hitachi, Ltd.), 24 December, 2004 (24.12.04), Par. Nos. [0015] to [0019]; Figs. 1 to 4 (Family: none)	5
A	JP 57-042945 Y2 (Sansei Kenki Kabushiki Kaisha), 21 September, 1982 (21.09.82), (Family: none)	5

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP SHO60180277 B **[0004]**