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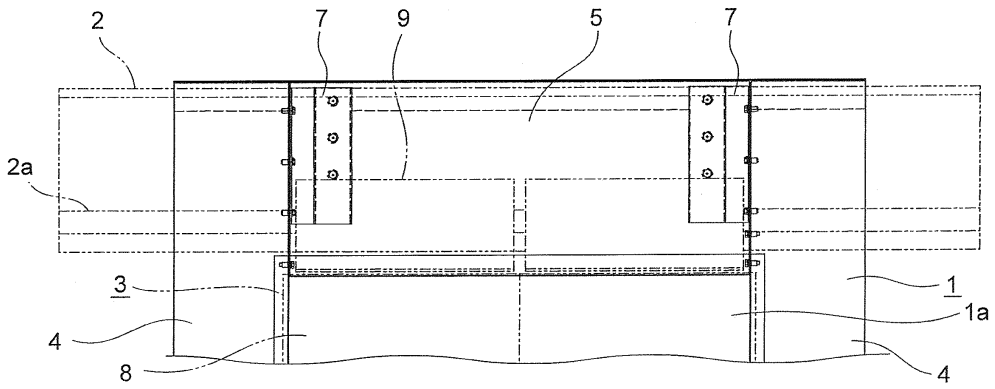
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(54) ELEVATOR CAR

(57) An elevator car has: a car frame; a cage that is supported by the car frame, and on which a car doorway is disposed; a beam that is disposed above the car doorway, and on which a hanger rail is disposed; and a car door that is moved along the hanger rail to open and close the car doorway. The cage has: a pair of wing walls that are disposed on two sides of the car doorway; and a doorway top plate that is disposed on an upper portion of the car doorway, and two end portions of which are fastened to the wing wall. A beam mounting bracket is mounted onto fastening portions between the wing wall and the doorway top plate. The beam is mounted onto the cage by means of the beam mounting bracket.

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator car and particularly relates to a mounting construction for a beam on which a hanger rail that guides opening and closing of a car door is disposed.

BACKGROUND ART

[0002] In conventional elevator cars, a beam is mounted onto a car frame that supports a cage by means of a mounting arm. A hanger rail that guides opening and closing of a car door is disposed on the beam. A reinforcing rod is linked obliquely between the mounting arm and the car frame (see Patent Literature 1, for example).

[0003] In other conventional cars, reinforcing materials are disposed on an outer surface of a cage without using a car frame. Specifically, a pair of side wall reinforcing materials are disposed on outer surfaces of a pair of side walls of the cage, and a ceiling reinforcing material is disposed on an outer surface of a ceiling of the cage. A pair of brackets are fastened between the side wall reinforcing materials and the ceiling reinforcing materials. A beam of a car door apparatus is fastened to the brackets, a doorway frame, and the ceiling (see Patent Literature 2, for example).

CITATION LIST

PATENT LITERATURE

[0004]

[Patent Literature 1]
Japanese Utility Model Laid-Open No. SHO 54-175141 (Gazette)
[Patent Literature 2]
Japanese Patent Laid-Open No. HEI 6-329370 (Gazette)

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0005] In the conventional car construction that is disclosed in Patent Literature 1, because members such as rods, a mounting arm, etc., are required in order to mount the beam onto the car frame, the number of parts is increased. Because the beam is mounted onto the car frame, installation and adjustment such as centering to align the center of the car doorway that is disposed on the cage and the center of the beam are time-consuming.

[0006] Because the conventional car construction that is disclosed in Patent Literature 2 has a simple construction that does not use a car frame, on the other hand, it can be applied only to small elevators. Because the construction does not support the cage on a car frame by means of rubber vibration isolators, riding comfort is impaired. In addition, using this construction, installation and adjustment such as centering to align the center of the car doorway and the center of the beam is also time-consuming.

[0007] The present invention aims to solve the above problems and an object of the present invention is to provide an elevator car that can facilitate installation and adjustment of a beam by a simple configuration while avoiding deterioration in riding comfort.

MEANS FOR SOLVING THE PROBLEM

[0008] In order to achieve the above object, according to one aspect of the present invention, there is provided an elevator car including: a car frame; a cage that is supported by the car frame, and on which a car doorway is disposed; a beam that is disposed above the car doorway, and on which a hanger rail is disposed; and a car door that is moved along the hanger rail to open and close the car doorway, wherein: the cage has: a pair of wing walls that are disposed on two sides of the car doorway; and a doorway top plate that is disposed on an upper portion of the car doorway, and two end portions of which are fastened to the wing wall; a beam mounting bracket is mounted onto fastening portions between the wing wall and the doorway top plate; and the beam is mounted onto the cage by means of the beam mounting bracket. According to another aspect of the present invention, there is provided an elevator car including: a car frame; a cage that is supported by the car frame, and on which a car doorway is disposed; a beam that is disposed above the car doorway, and on which a hanger rail is disposed; and a car door that is moved along the hanger rail to open and close the car doorway, wherein: a beam mounting bracket is mounted above a ceiling of the cage; the beam is mounted onto the cage by means of the beam mounting bracket; and the beam mounting bracket is disposed along a front edge portion of the ceiling over an entire width direction of the cage.

EFFECTS OF THE INVENTION

[0009] In the elevator car according to the present invention, because the cage is supported on the car frame, and the beam is mounted onto the beam mounting bracket that is mounted to the cage, an elevator car is provided that can facilitate installation and adjustment of a beam by a simple configuration while avoiding deterioration in riding comfort.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Figure 1 is a front elevation that shows an elevator cage front surface upper portion according to Em-

bodiment 1 of the present invention;
Figure 2 is a side elevation that shows the cage front surface upper portion in Figure 1;
Figure 3 is a plan that shows the cage front surface upper portion in Figure 1;
Figure 4 is a front elevation that shows an elevator cage front surface upper portion according to Embodiment 2 of the present invention;
Figure 5 is a side elevation that shows the cage front surface upper portion in Figure 4;
Figure 6 is a plan that shows the cage front surface upper portion in Figure 4;
Figure 7 is a front elevation that shows an elevator cage front surface upper portion according to Embodiment 3 of the present invention;
Figure 8 is a side elevation that shows the cage front surface upper portion in Figure 7;
Figure 9 is a front elevation that shows a beam mounting bracket from Figure 7 enlarged;
Figure 10 is a cross section that is taken along line X - X in Figure 9;
Figure 11 is a front elevation that shows an elevator cage front surface upper portion according to Embodiment 4 of the present invention;
Figure 12 is a side elevation that shows the cage front surface upper portion in Figure 11;
Figure 13 is a plan that shows the cage front surface upper portion in Figure 11;
Figure 14 is a side elevation that shows an elevator cage front surface upper portion according to Embodiment 5 of the present invention;
Figure 15 is a side elevation that shows an elevator cage front surface upper portion according to Embodiment 6 of the present invention; and
Figure 16 is a side elevation that shows an example of an elevator apparatus to which car constructions according to Embodiments 1 through 6 are applied.

DESCRIPTION OF EMBODIMENTS

[0011] Preferred embodiments of the present invention will now be explained with reference to the drawings.

Embodiment 1

[0012] Figure 1 is a front elevation that shows an elevator cage front surface upper portion according to Embodiment 1 of the present invention, Figure 2 is a side elevation that shows the cage front surface upper portion in Figure 1, and Figure 3 is a plan that shows the cage front surface upper portion in Figure 1. An elevator car has: a car frame (not shown); a cage 1 that is supported by the car frame, and on which a car doorway 1 a is disposed; a beam 2 that is disposed above the car doorway 1 a of the cage 1, and on which a hanger rail 2a is disposed; and a pair of car doors 3 that are moved along the hanger rail 2a to open and close the car doorway 1 a.
[0013] A cage 1 has: a pair of wing walls 4 that are disposed on two sides of the car doorway 1 a; a doorway top plate 5 that is disposed on an upper portion of the car doorway 1 a, and two end portions of which are fastened to the wing walls; a rear wall (not shown) that faces the car doorway 1 a; a pair of left and right side walls (not shown); and a ceiling (a canopy) 6.
[0014] A pair of beam mounting brackets 7 are mounted onto fastening portions between the wing walls 4 and the doorway top plate 5. The beam mounting brackets 7 are fastened together with the fastening portions between the wing walls 4 and the doorway top plate 5 by a plurality of fasteners (nuts and bolts). The beam 2 is mounted onto the beam mounting brackets 7. In other words, the beam 2 is mounted onto the cage 1 by means of the beam mounting brackets 7.
[0015] Each of the car doors 3 has: a car door panel 8 that opens and closes the car doorway 1 a; and a door hanger 9 that is fixed to an upper portion of the car door panel 8. A plurality of hanger rollers 10 that roll on the hanger rail 2a are disposed on the door hanger 9. The car door panels 8 are suspended from the hanger rail 2a by means of the door hangers 9.
[0016] In an elevator car of this kind, because the beam 2 is mounted onto beam mounting brackets 7 that are mounted onto the cage 1 using the fastening portions between the wing walls 4 and the doorway top plate 5, the beam 2 can be mounted onto the cage 1 by a simple configuration using a small number of parts, enabling reductions in weight and reductions in cost to be achieved.
[0017] The beam 2 can also be mounted onto the cage 1 using the side surfaces of the wing walls 4 as references, enabling installation and adjustment such as centering to align the center of the car doorway 1 a and the center of the beam 2 to be facilitated, thereby enabling labor saving to be achieved in installation work. Gap adjustment between the car doors 3 and the cage 1 can also be simplified, and time spent on clearance control of engaging apparatus (not shown) during running can be saved.
[0018] In addition, because the beam 2 is disposed in front of the cage 1, it is possible to suppress the height of the car doors 3 even if ceiling height is increased, enabling reductions in grade and reductions in materials to be achieved.
[0019] Furthermore, because the cage 1 is supported by the car frame, a vibration absorbing material such as vibration absorbing rubber, etc., can be interposed between the car frame and the cage 1, enabling deterioration in riding comfort to be prevented.

Embodiment 2

[0020] Next, Figure 4 is a front elevation that shows an elevator cage front surface upper portion according to Embodiment 2 of the present invention, Figure 5 is a side elevation that shows the cage front surface upper portion in Figure 4, and Figure 6 is a plan that shows the cage front surface upper portion in Figure 4. In the figures,

ceiling fastening portions 7a that are fastened to a ceiling 6 are disposed on upper end portions of beam mounting brackets 7. In other words, the beam mounting brackets 7 according to Embodiment 2 are also fastened to the ceiling 6 in addition to fastening portions between the wing walls 4 and the doorway top plate 5. The ceiling fastening portions 7a are fastened together with fastening portions between the ceiling 6 and the doorway top plate 5. The rest of the configuration is similar or identical to that of Embodiment 1.

[0021] In an elevator car of this kind, if car doors 3 that have increased weight are used such as doors with windows, for example, moments that act on the beam mounting brackets 7 can be reduced, enabling the beam 2 to be prevented from displacing in a tilting direction.

Embodiment 3

[0022] Next, Figure 7 is a front elevation that shows an elevator cage front surface upper portion according to Embodiment 3 of the present invention, and Figure 8 is a side elevation that shows the cage front surface upper portion in Figure 7. In the figures, a pair of beam mounting brackets 11 are mounted onto fastening portions between wing walls 4 and a doorway top plate 5. A beam 2 is mounted onto the beam mounting brackets 11. In other words, the beam 2 is mounted onto a cage 1 by means of the beam mounting brackets 11.

[0023] Figure 9 is a front elevation that shows a beam mounting bracket 11 from Figure 7 enlarged, and Figure 10 is a cross section that is taken along line X - X in Figure 9. The beam mounting brackets 11 are divided into: a cage mounting member 12 that is mounted onto the cage 1; an upper beam mounting member 13 that is mounted onto an upper portion of the beam 2; and a lower beam mounting member 14 that is mounted onto a lower portion of the beam 2.

[0024] The respective cage mounting members 12 are fastened together with the fastening portions between the wing walls 4 and the doorway top plate 5 and also fastened together with fastening portions between the doorway top plate 5 and the ceiling 6 using a plurality of fasteners (nuts and bolts).

[0025] The upper beam mounting members 13 and the lower beam mounting members 14 are coupled so as to enable position adjustment relative to the cage mounting members 12. A vertical position of the beam 2, a position of the beam 2 in a depth direction of the cage 1, and the mounted angle of the beam 2 in the tilting direction are adjustable by adjusting the positions of the beam mounting members 13 and 14 relative to the cage mounting members 12.

[0026] Specifically, vertical adjusting mechanisms 15 for adjusting the vertical position of the beam 2 are disposed between the upper end portions of the upper beam mounting members 13 and the cage mounting members 12. Slots that allow the bolts that fasten the beam 2 to the beam mounting bracket 11 to move vertically are disposed on the beam 2.

[0027] Depth direction adjusting mechanisms 16 for adjusting the depth direction (forward and rearward) position of the beam 2 are disposed between the lower beam mounting members 14 and the cage mounting members 12. Slots that allow the bolts that fasten the beam mounting members 13 and 14 to the cage mounting members 12 to move forward and rearward are disposed on the beam mounting members 13 and 14.

[0028] In addition, tilting direction adjusting mechanisms 17 for adjusting the mounted angle of the beam 2 in the tilting direction are disposed between the upper beam mounting members 13 and the cage mounting members 12. Jack-up mechanisms that have jack-up bolts can be used as the adjusting mechanisms 15 through 17. The rest of the configuration is similar or identical to that of Embodiment 1.

[0029] In an elevator car of this kind, after centering is performed during mounting of the beam 2, if the beam 2 tilts slightly due to the weight of the car doors 3 at a stage when the car doors 3 are hung, for example, the mounted angle of the beam 2 can be readjusted precisely by operating the tilting direction adjusting mechanisms 17. The mounted position of the beam 2 can also be readjusted precisely vertically and forward and rearward.

[0030] Moreover, in Embodiment 3, the beam mounting bracket 11 is fastened to the ceiling 6, but may also be fastened only to the fastening portions between the wing walls 4 and the doorway top plate 5, in a similar manner to Embodiment 1.

Embodiment 4

[0031] Next, Figure 11 is a front elevation that shows an elevator cage front surface upper portion according to Embodiment 4 of the present invention, Figure 12 is a side elevation that shows the cage front surface upper portion in Figure 11, and Figure 13 is a plan that shows the cage front surface upper portion in Figure 11. In the figures, a beam mounting bracket 21 is mounted above a ceiling 6. A beam 2 is mounted onto a cage 1 by means of the beam mounting bracket 21.

[0032] The beam mounting bracket 21 is disposed along a front edge portion of the ceiling 6 over an entire width direction (laterally in Figure 11) of the cage 1. The beam mounting bracket 21 has: a horizontal portion 21 a that is mounted onto the ceiling 6; and wall-shaped vertical portion 21 b that protrudes vertically upward from the horizontal portion 21 a. The horizontal portion 21 a is fastened to the ceiling 6 by a plurality of fasteners. The beam 2 is fastened to the vertical portion 21 b by a plurality of fasteners. The rest of the configuration is similar or identical to that of Embodiment 1.

[0033] In an elevator car of this kind, because the beam mounting bracket 21 is disposed over the entire front edge portion of the ceiling 6, if a maintenance worker loses a tool on top of the ceiling 6, the tool can be prevented from falling from above the ceiling 6 into the hoist-

way. Specifically, a fall preventing fence is disposed on the ceiling 6 so as to surround a space above the ceiling 6 in order to prevent tool from falling into the pit, but in Embodiment 4, the beam mounting bracket 21 can also serve as a portion of the fall preventing fence, enabling the number of parts to be reduced.

[0034] Because the beam 2 is mounted onto the cage 1 by only the beam mounting bracket 21, the beam 2 can be mounted onto the cage 1 by a simple configuration using a small number of parts, enabling reductions in weight and reductions in cost to be achieved.

[0035] In addition, because the beam mounting bracket 21 is mounted onto the ceiling 6 instead of the car frame, by positioning the center of the ceiling 6 and the car doorway 1 a accurately, installation and adjustment such as centering to align the center of the car doorway 1 a and the center of the beam 2 can be facilitated, thereby enabling labor saving to be achieved in installation work.

[0036] Furthermore, because the cage 1 is supported by the car frame, a vibration absorbing material such as vibration absorbing rubber, etc., can be interposed between the car frame and the cage 1, enabling deterioration in riding comfort to be prevented.

[0037] Moreover, the beam mounting bracket 21 according to Embodiment 4 may also be fastened to the fastening portions between the wing walls 4 and the doorway top plate 5.

The vertical position of the beam, the positioning of the beam in the depth direction of the cage, and the mounted angle of the tilting direction of the beam may also be made adjustable by dividing the beam mounting bracket 21 according to Embodiment 4 into cage mounting members and beam mounting members as shown in Embodiment 3, and adjusting the position of the beam mounting members relative to the cage mounting members.

Embodiment 5

[0038] Next, Figure 14 is a side elevation that shows an elevator cage front surface upper portion according to Embodiment 5 of the present invention. In the figure, a beam bearing portion 21 c that bears a vertically downward load of the beam 2 is disposed on a beam mounting bracket 21. The beam bearing portion 21 c is a horizontal portion that is formed by bending an intermediate portion of a vertical portion 21 b. The rest of the configuration is similar or identical to that of Embodiment 4.

[0039] In an elevator car of this kind, because the weight of the beam 2 can be left on the beam bearing portion 21 c during installation of the beam 2 even before fastening the beam 2 to the vertical portion 21 b, installation work can be facilitated. Because the load is applied to the beam mounting bracket 21 in a compressive direction, downward displacement of the beam 2 can be suppressed.

[0040] Moreover, the beam bearing portion 21 c is not limited to a bent portion, and may also be a construction in which the beam 2 is engaged or hooked, for example. Examples of constructions of this kind include constructions in which an angular aperture is disposed in either one of the beam 2 and the beam mounting bracket 21, and a raised portion of metal plate that is inserted into this angular aperture is disposed on the other, for example.

Embodiment 6

[0041] Next, Figure 15 is a side elevation that shows an elevator cage front surface upper portion according to Embodiment 6 of the present invention. In the figure, a plurality of adjusting liners 22 that adjust vertical positioning of a beam mounting bracket 21 are interposed between a ceiling 6 and a beam mounting bracket 21. The rest of the configuration is similar or identical to that of Embodiment 4.

[0042] In an elevator car of this kind, because the adjusting liners 22 are disposed between the ceiling 6 and the beam mounting bracket 21, vertical positioning adjustment of the beam 2 can be facilitated by accurately adjusting vertical positioning of the beam mounting bracket 21, which is lighter than the beam 2. Similarly, angular adjustment in the tilting direction of the beam 2 can also be performed easily.

[0043] In that case, adjustment of position of the beam 2 in the depth direction is enabled by making apertures through which bolts that fasten the beam mounting bracket 21 onto the ceiling 6 pass into slots. In addition, adjustment of the lateral position of the beam 2 is unnecessary due to accurate centering between the ceiling 6 and the center of the car doorway 1 a.

[0044] Moreover, the adjusting liners 22 may also be interposed between the beam mounting bracket 21 that is shown in Embodiment 5 and the ceiling 6.

[0045] Now, Figure 16 is a side elevation that shows an example of an elevator apparatus to which car constructions according to Embodiments 1 through 6 are applied. In the figure, a pair of car guide rails 32 and a pair of counterweight guide rails 33 are installed inside a hoistway 31. A return sheave supporting member 34 is mounted onto upper end portions of the counterweight guide rails 33. First and second return sheaves 35 and 36 are mounted onto a return sheave supporting member 34.

[0046] A car 37 that is raised and lowered along the car guide rail 32, and a counterweight 38 that is raised and lowered along the counterweight guide rails 33 are disposed inside the hoistway 31. A pair of car suspending sheaves 39 are disposed on a lower portion of the car 37. A counterweight suspending sheave 40 is disposed on an upper portion of the counterweight 38.

[0047] A hoisting machine 41 that raises and lowers the car 37 and the counterweight 38 is installed inside the hoistway 31 outside a hoisting zone of the car 37 and the counterweight 38. The hoisting machine 41 has: a driving sheave 42; a hoisting machine motor that rotates the driving sheave 42; and a hoisting machine brake that

brakes rotation of the driving sheave 42. The hoisting machine 41 is supported on a supporting platform 43 that is installed in a bottom portion of the hoistway 31.

[0048] An end portion supporting member 44 is fixed to an upper end portion of the car guide rails 32. The car 37 and the counterweight 38 are suspended inside the hoistway 31 by a suspending means 45. A plurality of ropes or a plurality of belts are used as the suspending means 45.

[0049] The suspending means 45 has: a first end portion that is connected to the end portion supporting member 44; and a second end portion that is connected to the return sheave supporting member 34. The suspending means 45 is wound sequentially from the first end portion side around the car suspending sheaves 39, the first return sheave 35, the driving sheave 42, the second return sheave 36, and the counterweight suspending sheave 40.

[0050] Moreover, in Figure 16, an elevator apparatus that uses a two- to- one (2: 1) roping method is shown, but the roping method is not limited thereto, and the present invention can also be applied to an elevator apparatus that uses a one- to- one (1: 1) roping method, for example.

The overall layout of the elevator apparatus is also not limited to that in Figure 16, and the hoisting machine 41 may also be disposed in an upper portion of the hoistway, for example.

In addition, an elevator apparatus that does not have a machine room is shown in Figure 16, but the present invention can also be applied to an elevator apparatus that has a machine room.

Furthermore, in Embodiments 1 through 6, a two- door centrally- opening door apparatus is shown, but the number of car doors 3 is not limited to two, and the present invention can also be applied to a side- opening door apparatus.

Claims

1. An elevator car comprising:

a car frame;
a cage that is supported by the car frame, and on which a car doorway is disposed;
a beam that is disposed above the car doorway, and on which a hanger rail is disposed; and
a car door that is moved along the hanger rail to open and close the car doorway,
wherein:

the cage comprises:

a pair of wing walls that are disposed on two sides of the car doorway; and
a doorway top plate that is disposed on an upper portion of the car doorway, and two end portions of which are fastened to the wing wall;

a beam mounting bracket is mounted onto fastening portions between the wing wall and the doorway top plate; and
the beam is mounted onto the cage by means of the beam mounting bracket.

2. An elevator car according to Claim 1, wherein the beam mounting bracket is fastened to a ceiling of the cage.

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

the beam mounting bracket is divided into:

a cage mounting member that is mounted onto the cage; and
beam mounting member that is mounted onto the beam;

the beam mounting member is coupled so as to enable position adjustment relative to the cage mounting member; and
vertical positioning of the beam, a position of the beam in a depth direction of the cage, and a mounted angle in a tilting direction of the beam are adjustable by adjusting position of the beam mounting member relative to the cage mounting member.

4. An elevator car comprising:

a car frame;
a cage that is supported by the car frame, and on which a car doorway is disposed;
a beam that is disposed above the car doorway, and on which a hanger rail is disposed; and
a car door that is moved along the hanger rail to open and close the car doorway,
wherein:

a beam mounting bracket is mounted above a ceiling of the cage;
the beam is mounted onto the cage by means of the beam mounting bracket; and
the beam mounting bracket is disposed along a front edge portion of the ceiling over an entire width direction of the cage.

5. An elevator car according to Claim 4, wherein:

a beam bearing portion that bears a vertically downward load of the beam is disposed on the beam mounting bracket.

6. An elevator car according to Claim 4, further com-

prising an adjusting liner that is interposed between the ceiling and the beam mounting bracket to adjust vertical positioning of the beam mounting bracket.

FIG. 1

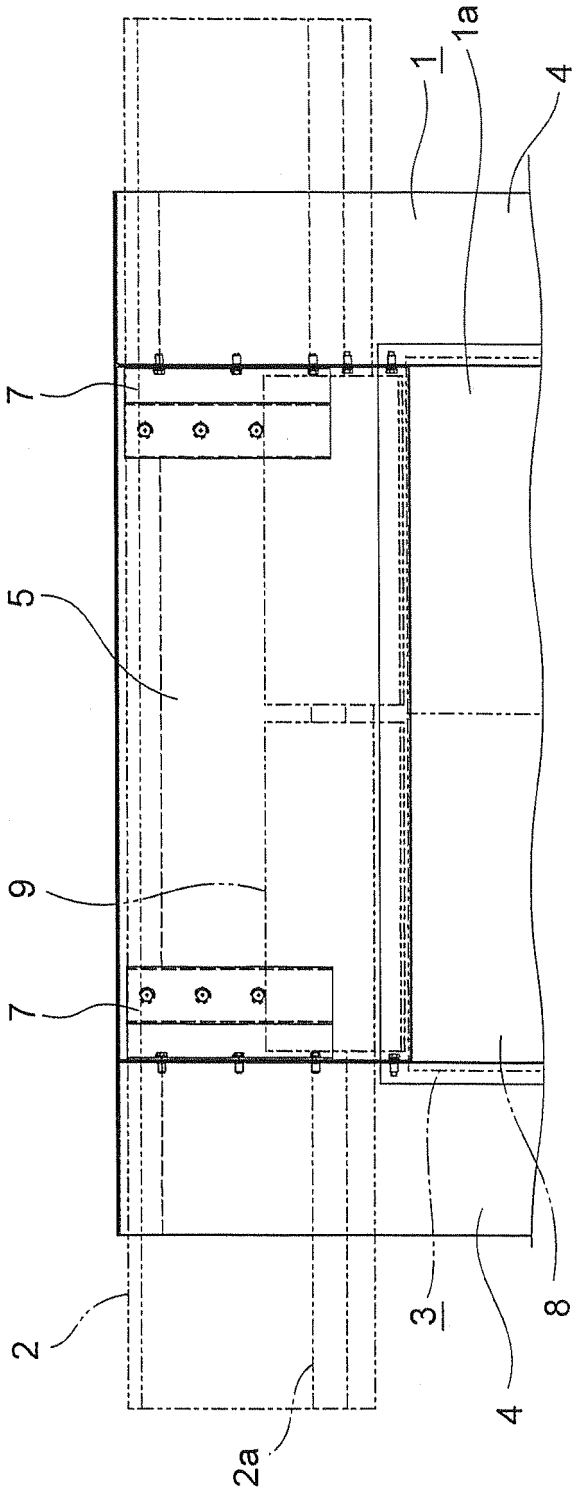


FIG. 2

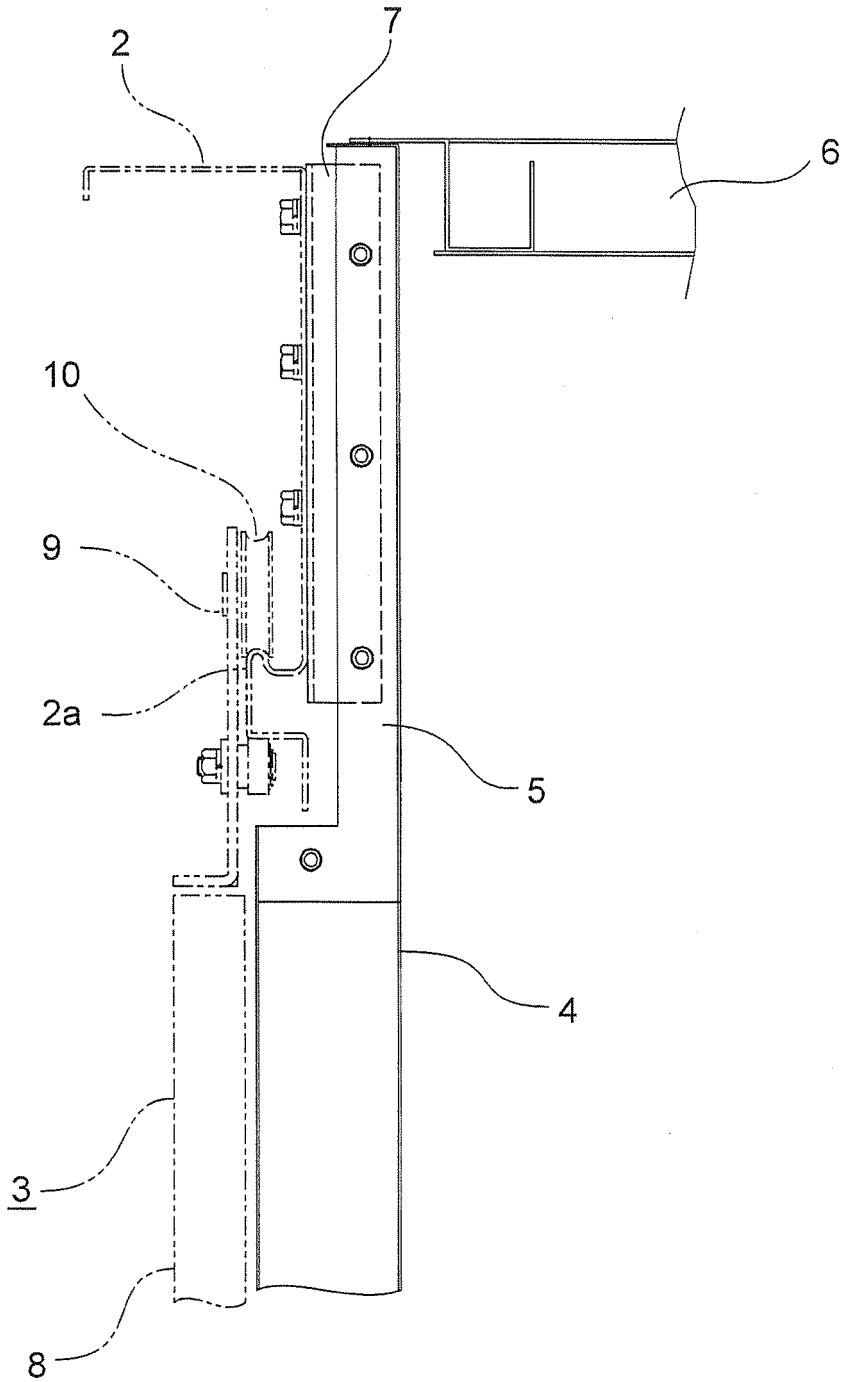


FIG. 3

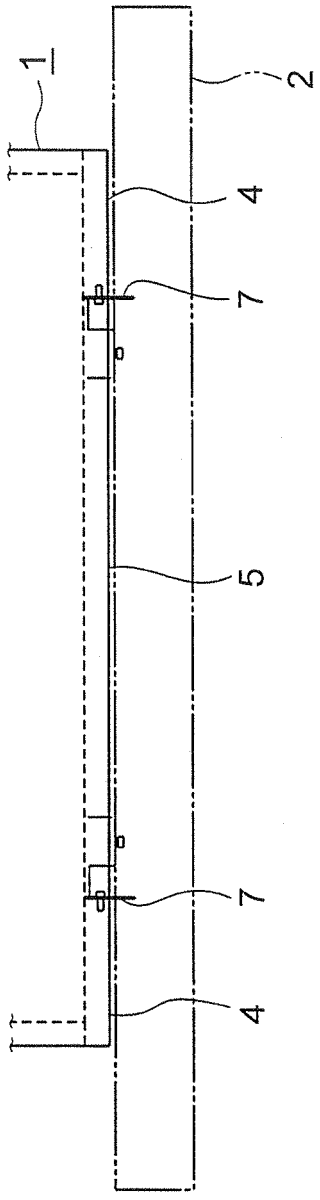


FIG. 4

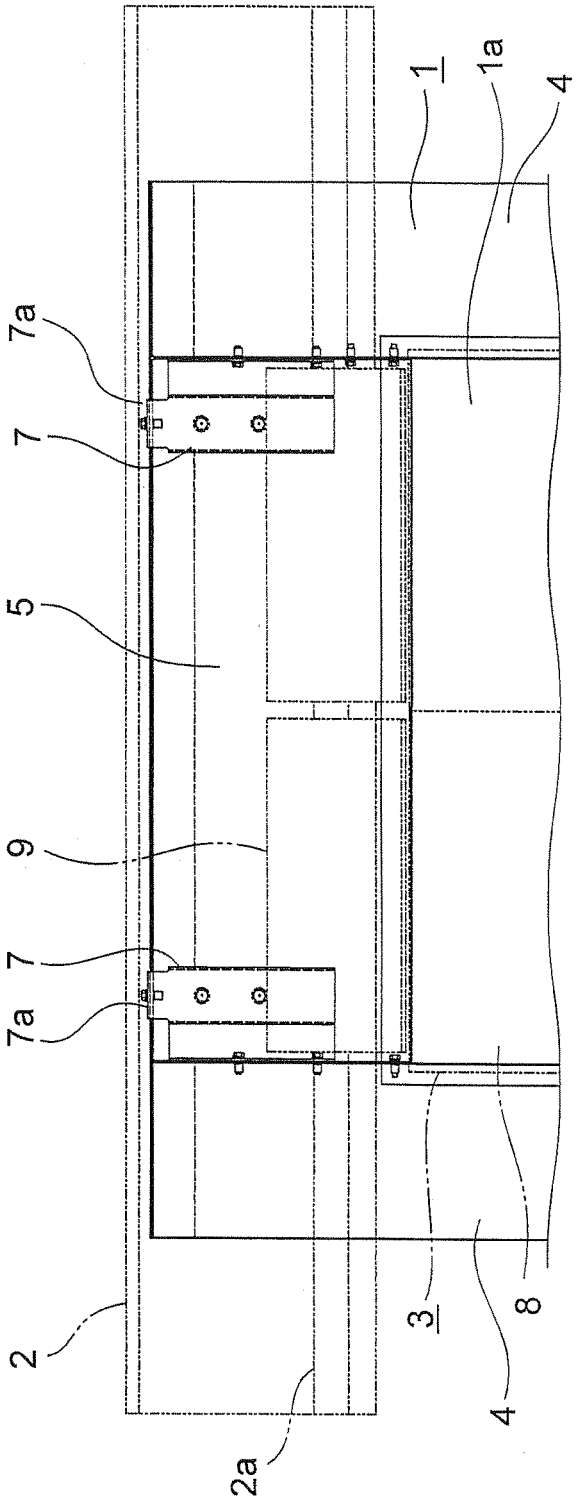


FIG. 5

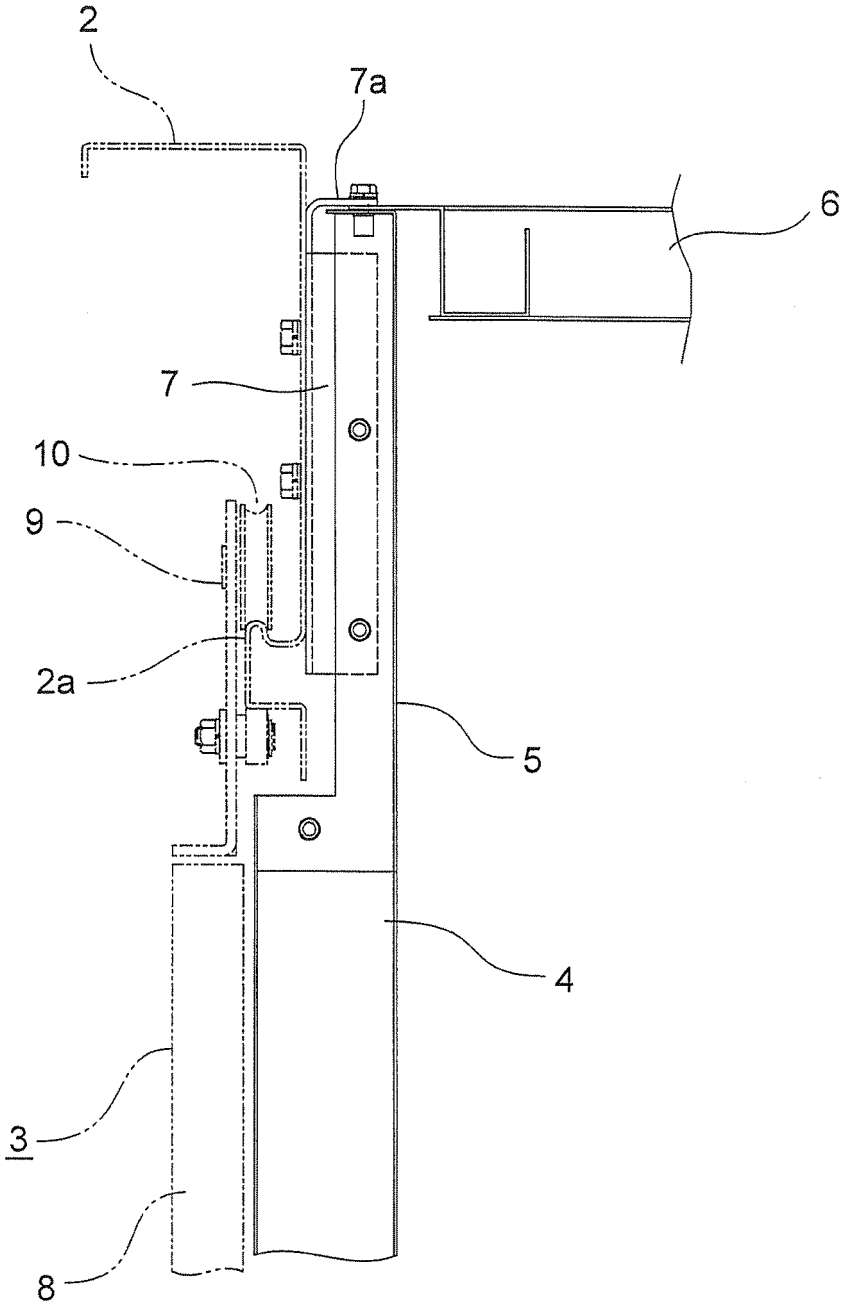


FIG. 6

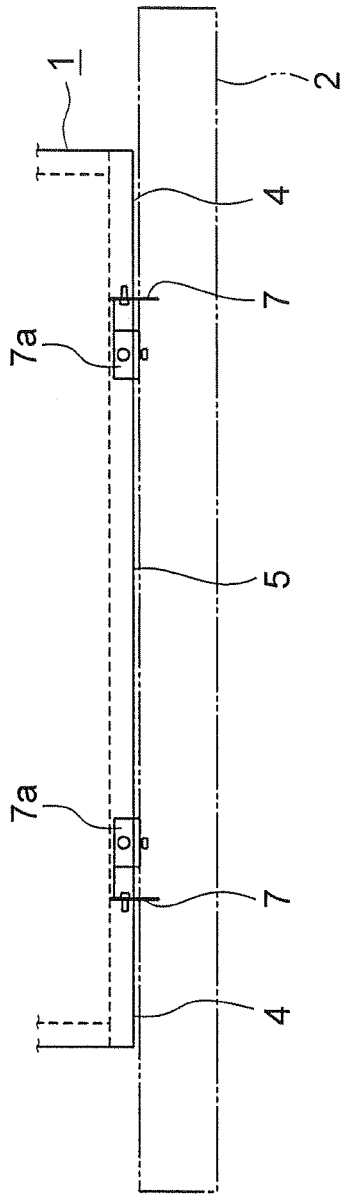


FIG. 7

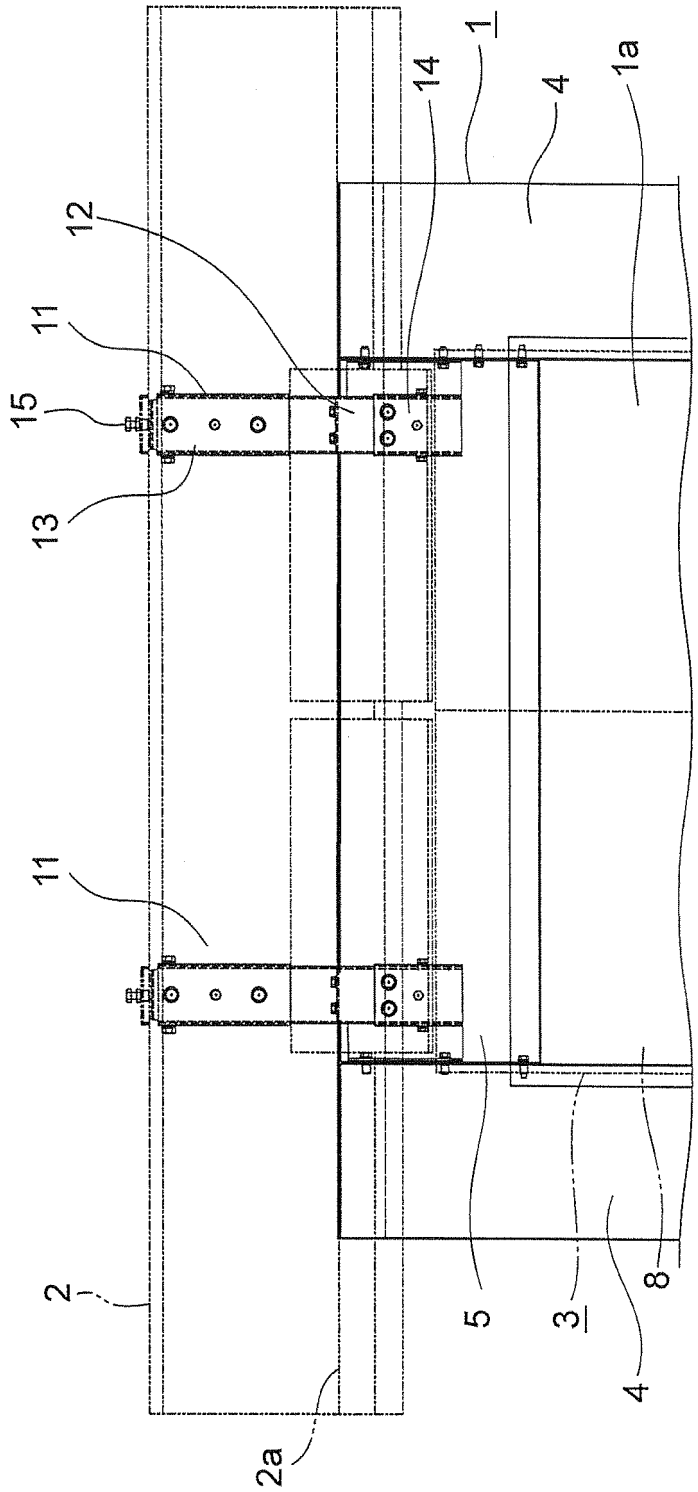


FIG. 8

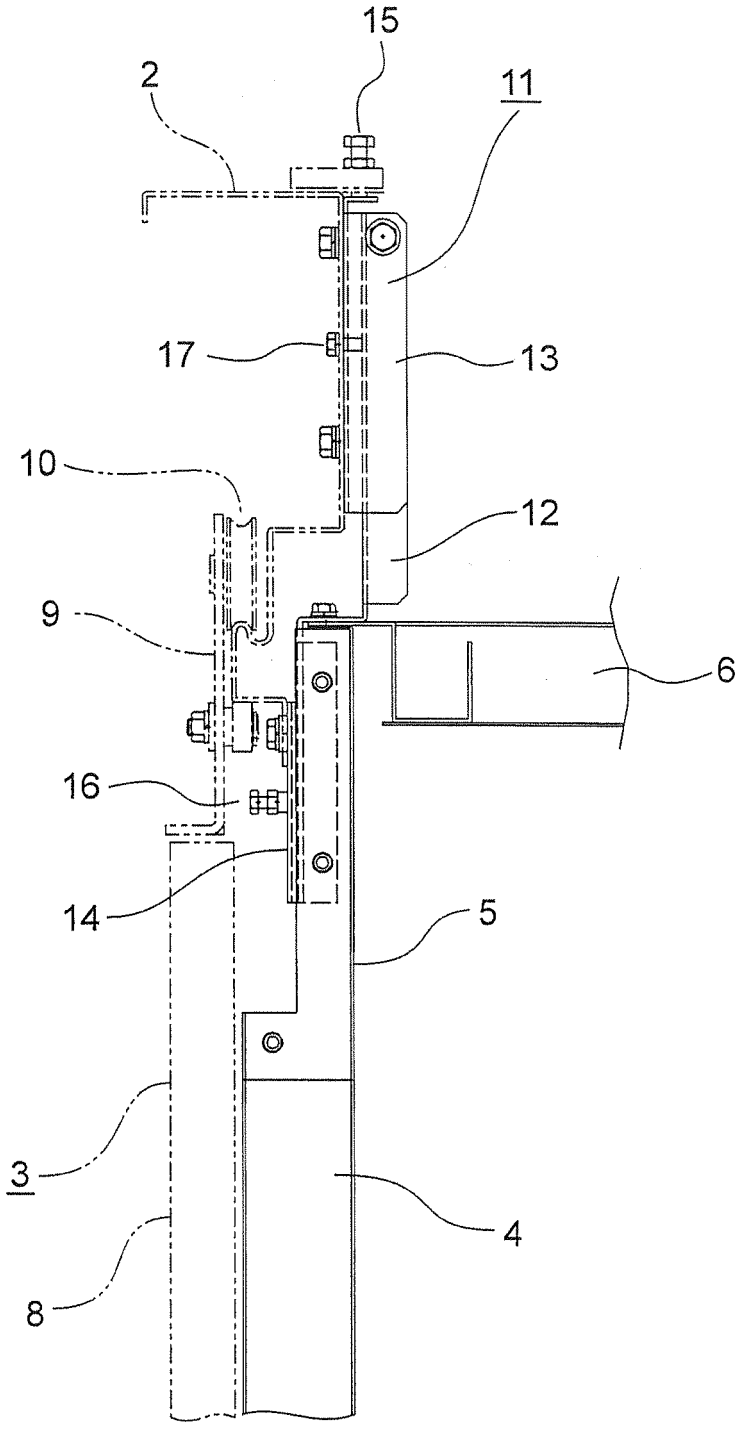


FIG. 9

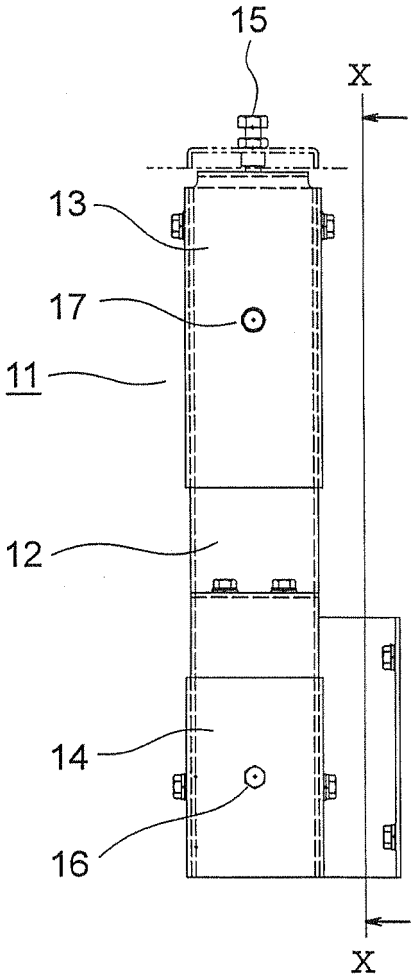


FIG. 10

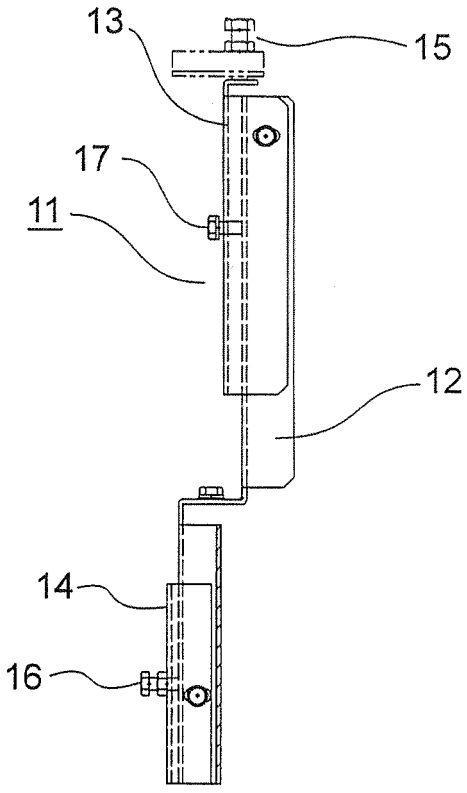


FIG. 11

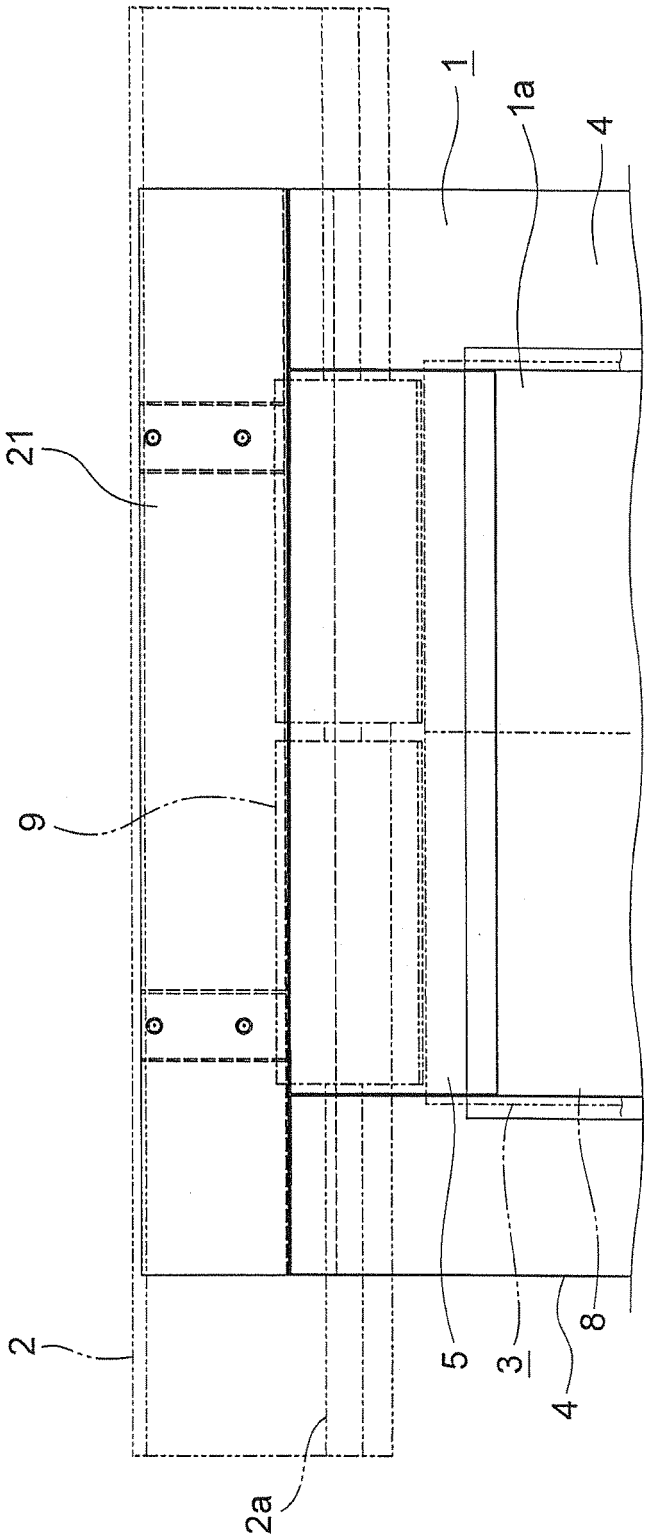


FIG. 12

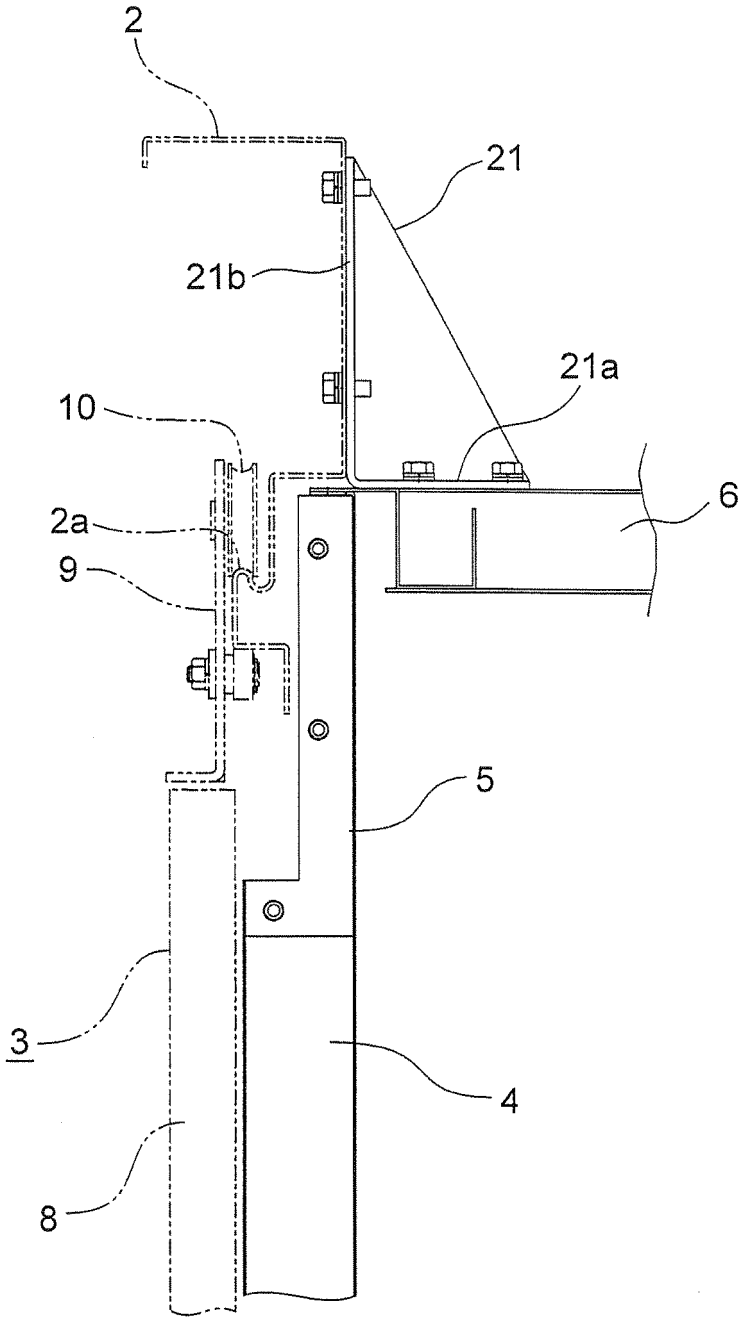


FIG. 13

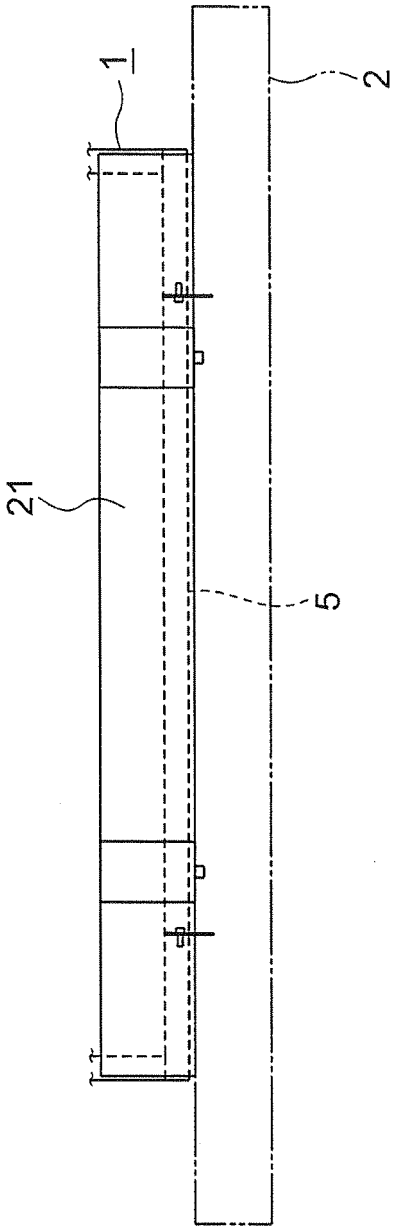


FIG. 14

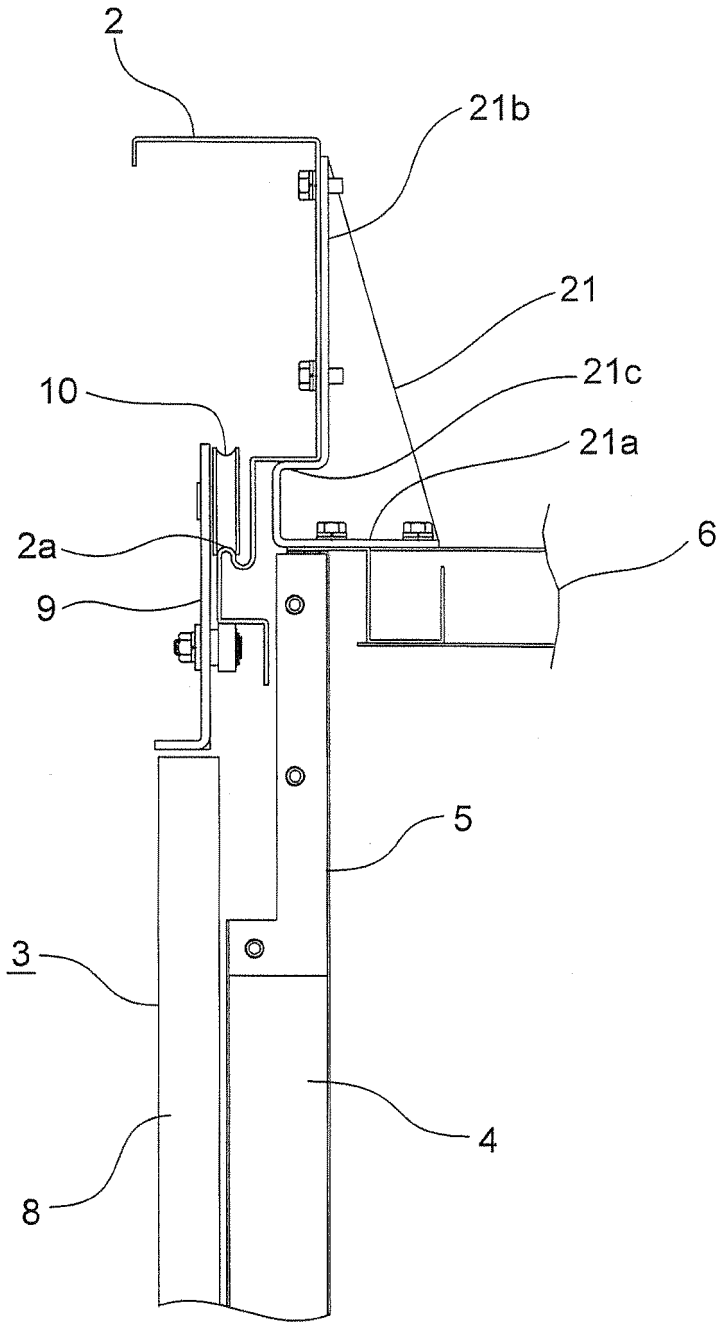


FIG. 15

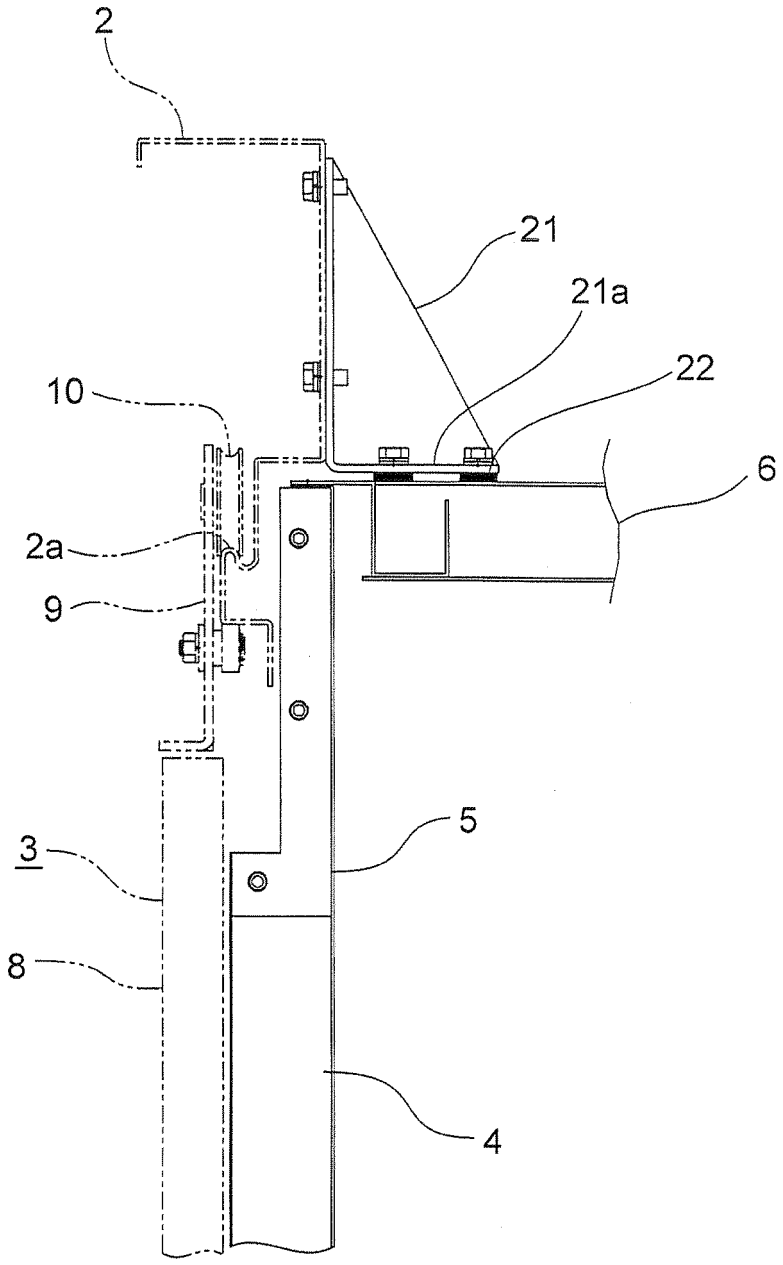
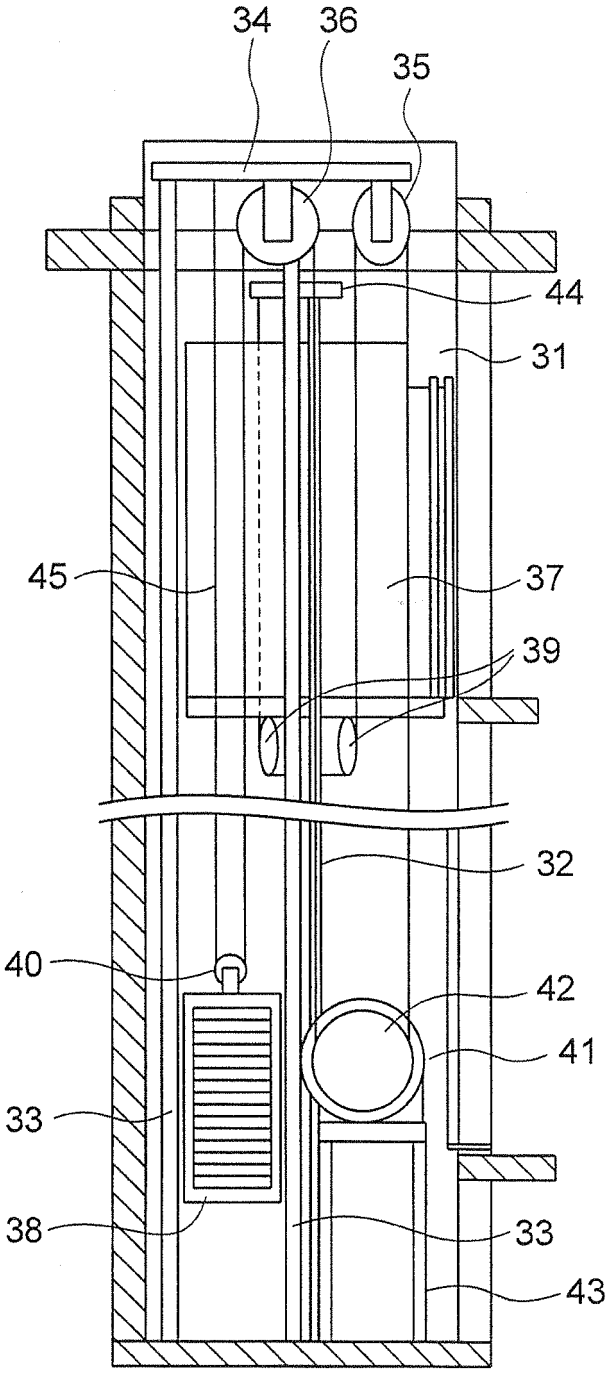


FIG. 16



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/070794

A. CLASSIFICATION OF SUBJECT MATTER
E05D15/06(2006.01)i, *B66B11/02*(2006.01)i, *B66B13/30*(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)
E05D15/06, B66B11/02, B66B13/30

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 1996-2011
Kokai Jitsuyo Shinan Koho 1971-2011 Toroku Jitsuyo Shinan Koho 1994-2011

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 6-329370 A (Mitsubishi Electric Corp.), 29 November 1994 (29.11.1994), entire text; all drawings (Family: none)	1-6
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 73182/1978(Laid-open No. 175141/1979) (Mitsubishi Electric Corp.), 11 December 1979 (11.12.1979), entire text; all drawings (Family: none)	1-6

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

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 February, 2011 (24.02.11)	08 March, 2011 (08.03.11)
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/JP2010/070794

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. 159126/1985(Laid-open No. 68986/1987) (Fujitec Co., Ltd.), 30 April 1987 (30.04.1987), entire text; all drawings (Family: none)	1-6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP SHO54175141 B, Gazette **[0004]**
- JP HEI6329370 B, Gazette **[0004]**