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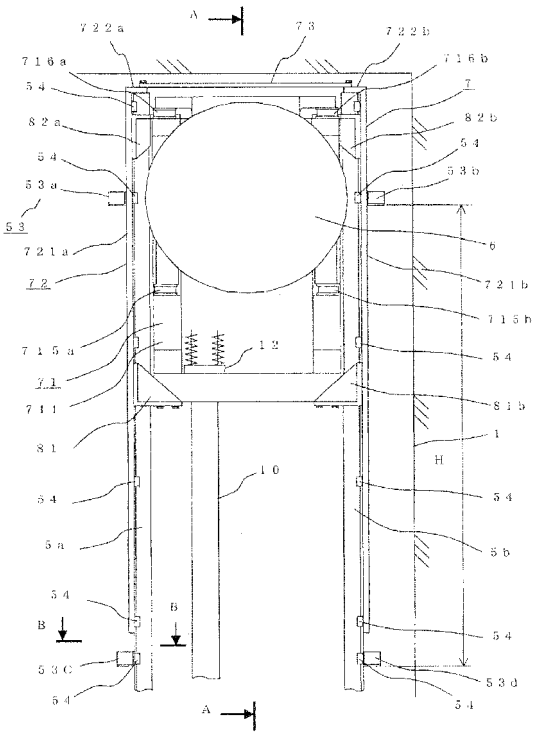
(54) **ELEVATOR DEVICE**

(57) An objective is to provide an elevator system by which a bending moment acting on a guide rail can be reduced. To achieve the objective, the elevator system includes a hoisting-machine mounting unit to which a hoisting machine is mounted and at least a portion of which comes within a longitudinal range, viewed from a horizontal direction, of a guide rail, and a rail attachment unit attached to the hoisting-machine mounting unit within a range in the longitudinal direction of the guide rail, and also attached to the guide rail along a portion thereof astride a longitudinal mounting range of the guide rail for the hoisting-machine mounting unit.

FIG. 2



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Description

TECHNICAL FIELD

[0001] The present invention relates to a mounting structure, of an elevator system in which a hoisting machine is installed in a hoistway, for mounting the hoisting machine to guide rails.

BACKGROUND ART

[0002] In a conventional elevator system, support tables are fixed to guide rails for guiding vertical movement of a counterweight, and mount members on which a hoisting machine is secured is mounted on the support tables through elastic members. Bracing members are provided, in upper and lower portions of the mount members, for retaining the mount members slidably in a longitudinal direction of the guide rails, and preventing horizontal deflection of the mount members. The guide rails are clipped with bracing members by way of the elastic members.

[0003] A hoisting machine has a sheave around which a main cable as a suspension means for suspending a car and the counterweight is to be wound, and vertically moves the car and the counterweight by driving the sheave. Vertical force acts on the hoisting machine by way of the main cable, and, due to this force, a moment acts on the mount members through the hoisting machine. The guide rails act against this moment by the bracing members provided in the upper and lower portions of the mount members, and the support tables act against the vertical component of the force acting on the hoisting machine. Thereby, vibration of the hoisting machine is prevented, by the elastic members provided on the support tables and the bracing members, from transmitting to the guide rails (refer to Patent Document 1).

[0004] [Patent Document 1] International Patent Publication No. WO02/079068. (page 8 - 10, Fig. 2)

DISCLOSURE OF THE INVENTION

Problem to be Solved by the Invention

[0005] As described above, in the conventional elevator system, because the guide rails act, by the bracing members, against the moment acting on the mount members by way of the main cable as the suspension means, a bending moment acts on the guide rails. Therefore, deformation and the like of the guide rails due to the bending moment need to have been prevented by increasing the size of the guide rails, and a problem has consequently occurred in which manufacturing and installation costs are increased.

[0006] An objective of the present invention, which is made to solve the above described problem, is to provide an elevator system by which a bending moment acting on a guide rail can be reduced.

Means for Solving the Problem

[0007] An elevator system according to the present invention includes a hoisting-machine mounting unit to which a hoisting machine is mounted and at least a portion of which comes within a range in a longitudinal direction, viewed from a horizontal direction, of a guide rail, and a rail attachment unit attached to the hoisting-machine mounting unit within a range in the longitudinal direction of the guide rail, and also attached to the guide rail along a portion thereof astride a longitudinal mounting range of the guide rail for the hoisting-machine mounting unit.

Advantageous Effect of the Invention

[0008] In the present invention, because the rail attachment unit attached to the hoisting-machine mounting unit within the range in the longitudinal direction of the guide rail, and also attached to the guide rail along a portion thereof astride a longitudinal mounting range of the guide rail for the hoisting-machine mounting unit, even if a bending moment due to force acting on the hoisting machine occurs in the guide rail through the hoisting-machine mounting unit, its cross section properties are improved in the mounting range of the hoisting-machine mounting unit; therefore, the bending moment acting on the guide rail can be reduced.

BRIEF DESCRIPTION OF DRAWINGS

[0009]

Fig. 1 is a view illustrating an entire configuration of an elevator system according to Embodiment 1;
Fig. 2 is a front view of a hoisting-machine mounting mechanism according to Embodiment 1;
Fig. 3 is a view representing the cross section A - A in Fig. 2;
Fig. 4 is a top view of Fig. 2;
Fig. 5 is a view representing the cross section B - B in Fig. 2;
Fig. 6 is views illustrating a structure of a frame in the hoisting-machine mounting mechanism according to Embodiment 1, in which (a) is a front view, and (b) is a side view;
Fig. 7 is views illustrating a guide provided at the bottom of the hoisting-machine mounting mechanism according to Embodiment 1, in which (a) is a front view, (b) is a bottom view, and (c) represents the cross section C - C of (a);
Fig. 8 is views, illustrating a guide provided at the top of the hoisting-machine mounting mechanism according to Embodiment 1, in which (a) is a front view, (b) is a bottom view, and (c) represents the cross section D - D of (a);
Fig. 9 is a flow chart representing a procedure of an installation operation of the hoisting-machine mount-

ing mechanism;
Fig. 10 is a view illustrating a state of an installation operation of the hoisting-machine mounting mechanism;
Fig. 11 is a bottom view of Fig. 9;
Fig. 12 is a front view of a hoisting-machine mounting mechanism according to Embodiment 2;
Fig. 13 is a view illustrating the cross section E - E in Fig. 11;
Fig. 14 is a front view of an enlarged view illustrating a main upper portion of the hoisting-machine mounting mechanism according to Embodiment 2;
Fig. 15 is a side view of an enlarged view illustrating the main upper portion of the hoisting-machine mounting mechanism according to Embodiment 2;
Fig. 16 is a view illustrating the cross section G - G in Fig. 14;
Fig. 17 is a view illustrating an entire configuration of an elevator system according to Embodiment 3; and
Fig. 18 is a view illustrating a hoisting-machine mounting mechanism according to Embodiment 3.

Explanation of Symbols

[0010] 1: Hoistway, 2: Car, 3a, 3b: Guide rails for car, 4: Counterweight, 5a, 5b: Guide rails for counterweight, 6: Hoisting machine, 6a: Sheave, 6b: Drive section, 7: Hoisting-machine mounting mechanism, 8: Counterweight pulley, 9: Car pulley, 10: Suspension means, 12: Suspension-means anchor section, 13: Hoisting-machine mounting mechanism, 14: Car pulley, 15: Hoisting machine, 16: Hoisting-machine mounting mechanism, 31, 51a, 51b: Rail bottom portions, 32, 52a, 52b: Rail guide portions, 53, 53a, 53b, 53c, 53d: Rail brackets, 55a, 55b: Rail mounting faces, 71: Hoisting-machine mounting unit, 72: Rail attachment unit, 711: Frame, 715a, 715b, 715c, 715d: Elastic members, 721a, 721b: Members, 722a, 722b: Contact parts, 73: Rail joint member, 74: Partial contact part, 75: Limiter, 76: Adjuster, 81a, 81b, 82a, 82b: Guides, 814, 824: Mounting means, 91: Hoisting-machine mounting unit, 92: Rail attachment unit, 912, 913: Guides, 921: Contact portion

BEST MODE FOR CARRYING OUT THE INVENTION

[0011] Hereinafter, embodiments according to the present invention are explained with reference to figures.

Embodiment 1

[0012] Fig. 1 is an entire configuration view illustrating an elevator system according to Embodiment 1 of the present invention.
In Fig. 1, a hoistway 1 includes a car 2 that carries passengers and vertically moves, guide rails 3a and 3b for the car 2, which are provided on respective both sides of the car 2, for guiding vertical movement of the car 2, a counterweight 4 that moves in the opposite direction to the vertically moving direction of the car 2, and guide rails 5a and 5b for the counterweight 4, which are provided on respective both sides of the counterweight 4, for guiding vertical movement of the counterweight 4. A hoisting machine 6 as a power source for the vertical movement of the car 2 and the counterweight 4 is provided, above the counterweight 4, in an upper portion of the hoistway 1. The hoisting machine 6 includes a sheave 6a around which a suspension means 10 for suspending the car 2 and the counterweight 4 is to be wound, and a drive section 6b for rotating the sheave 6a. Moreover, a hoisting-machine mounting mechanism 7 is provided in an upper portion of the hoistway 1 for mounting the hoisting machine 6 between the guide rails 5a and 5b. This embodiment is characterized by the hoisting-machine mounting mechanism 7, and the mechanism is described in detail later.

[0013] A counterweight pulley 8 is attached to an upper portion of the counterweight 4, while a car pulley 9 is attached to a lower portion of the car 2. Regarding the suspension means 10, one end thereof is anchored to a suspension-means anchor section 11 provided at the upper end of the guide rail 3a, while the other end is anchored to a suspension-means anchor section 12 included in the hoisting-machine mounting mechanism 7. Thus, the suspension means 10, which is wound around the counterweight pulley 8, the sheave 6a, and the car pulley 9, suspends the car 2 and the counterweight 4. In this elevator system, by rotating the sheave 6a of the hoisting machine 6, the car 2 and the counterweight 4 can be vertically moved through the suspension means 10.

[0014] Next, the hoisting-machine mounting mechanism 7 is described in detail. Fig. 2 is a front view illustrating a structure of the hoisting-machine mounting mechanism 7, Fig. 3 is the A - A cross-sectional view of Fig. 2, Fig.4 is the top view of Fig.2, and Fig. 5 is the B - B cross-sectional view of Fig. 2.

[0015] First, the guide rails 5a and 5b are explained. As represented in Fig. 2 and Fig. 4, the guide rails 5a and 5b are fixed in a longitudinal direction to a side wall of the hoistway through a plurality of rail brackets 53. Groups 53a and 53b of the plurality of rail brackets 53 are arranged in upper portions of the guide rails 5a and 5b, respectively. The other groups 53c and 53d of the rail brackets are arranged with a predetermined intervals ("H" in Fig. 2) from the groups 53a and 53b, respectively. As represented in Fig. 5, the guide rail 5a has a rail bottom portion 51a, and a rail guide portion 52a, provided so as to stand on the rail bottom portion 51a, for guiding the vertical movement of the counterweight 4. The rail bottom portion 51a of the guide rail 5a and the rail brackets 53 are clipped by clips 54; thus, the guide rail 5a and the rail brackets 53 are attached to each other. With respect to the other guide rail 5b, although the explanation is omitted, the configuration is similar to that of the guide rail 5a.

[0016] The hoisting-machine mounting mechanism 7 is configured with a hoisting-machine mounting unit 71

for mounting the hoisting machine 6 and a rail attachment unit 72 attached not only to the hoisting-machine mounting unit 71 but also to the guide rails 5a and 5b. The rail attachment unit 72 includes members 721a and 721b formed in L-shaped plates. The hoisting-machine mounting unit 71 is mounted to the members 721a and 721b, which are mounted to upper portions of the guide rails 5a and 5b, respectively.

[0017] The hoisting-machine mounting unit 71 having a frame 711 is placed, viewed from the horizontal direction, within the range in the longitudinal direction of the guide rails 5a and 5b. Fig. 6 is views illustrating a structure of the frame 711, in which (a) is a front view, while (b) is a side view. As represented in Fig. 6, the frame 711 is configured of lateral members 712a and 712b fixed to respective lower and upper portions of the longitudinal members 711a and 711b. Lower fixed bases 713a and 713b each provided on each one side of the longitudinal members 711a and 711b are mounted to lower portion of the frame 711. Upper fixed bases 714a and 714b provided on right and left sides of the lateral member 712b are mounted to upper portions of the frame 711.

[0018] As represented in Fig. 2, with respect to the frame 711, the lower portion of the hoisting machine 6 is mounted to the lower fixed bases 713a and 713b through elastic members 715a and 715b, respectively, while the upper portion of the hoisting machine 6 is mounted to the upper fixed bases 714a and 714b through elastic members 716a and 716b, respectively. Here, as represented in Fig. 3, the sheave 6a of the hoisting machine 6 is placed at a position undisturbed with the frame 711 so that the suspension means 10 wound around the sheave 6a and hanging does not contact to the frame 711. A suspension-means anchor section 12 is provided on the lower lateral member 712a. One end portion of the suspension means 10 is anchored to the suspension-means anchor section 12.

[0019] The hoisting-machine mounting unit 71 includes guides 81a, 81b, 82a, and 82b. The guides 81a and 81b are provided on both sides of lower portions of the frame 711, while the guides 82a and 82b are provided on both sides of upper portions of the frame 711. Fig. 7 is views illustrating the guides 81a and 81b in the lower portions, in which (a) is a front view, (b) is a top view, and (c) is a D - D cross-sectional view. Meanwhile, Fig. 8 is views illustrating the guides 82a and 82b in the upper portions, in which (a) is a front view, (b) is a bottom view, and (c) is a C - C cross-sectional view.

[0020] As represented in Fig. 7, the guide 81a includes a first mounting portion 811a mounted to the under face of the lateral member 712a, and a second mounting portion 812a mounted to the member 721a of the rail attachment unit 72. The guide 81a includes a fitting portion 813a for surrounding and fitting the rail guide portion 52a of the guide rail 5a with the first mounting portion 811a, and is therefore configured to be slidable along the guide rail 5a. Moreover, the guide 81a is provided, at the first mounting portion 811a, with a fixing member 814 for fixing the guide, and the fixing can be performed as the guide detached from the member 721a on a projection view from the top. The mounting means 814 is, for example, configured with elongate holes 815 and bolts 816, and the guide 81a is fixed to the lateral member 712a by the bolts 816 through the elongate holes 815. The guide 81b as the other one, although explanation is omitted, is similarly configured to be slidable along the guide rail 5b, and to be mounted to the member 721b of the rail attachment unit 72.

[0021] Similarly, as illustrated in Fig. 8, the guide 82a includes a first mounting portion 821a mounted to the upper face of the lateral member 712b and a second mounting portion 822a mounted to the member 721a of the rail attachment unit 72. The guide 82a further includes a fitting portion 823a for surrounding and fitting the rail guide portion 52a of the guide rail 5a with the first mounting portion 821a, and is therefore configured to be slidable along the guide rail 5a. The guide 82a is provided, at the first mounting portion 821a, with a fixing member 824 for fixing the guide, and the fixing can be performed as the guide detached from the member 721a on a projection view from the top. The mounting means 824 is, for example, configured with elongate holes 825 and bolts 826, and the guide 82a is mounted to the lateral member 712b by the bolts 826 passing through the elongate holes 825. The guide 82b as the other one, although explanation is omitted, is configured to be slidable along the guide rail 5b, and to be mounted to the member 71b of the rail attachment unit 72.

[0022] Next, the rail attachment unit 72 is explained in detail. As described above, the rail attachment unit includes the members 721a and 721b. The guides 81a and 82a, and the guides 81b and 82b are attached to the members 721a and 721b, respectively, and the hoisting-machine mounting unit 71 is mounted to the rail attachment unit 72 within the range in the longitudinal direction of the guide rails 5a and 5b. Here, the member 721a is mounted to the guide rail 5a along the portion thereof astride the longitudinal mounting range, where the hoisting-machine mounting unit is mounted, of the guide rail 5a, that is, a range, including the guides 81a and 82a, in the longitudinal direction of the guide rail 5a.

[0023] Moreover, the member 721a mounted to the guide rail, extends to a position close to the lower group 53c of the rail brackets. That is, the member 721a is mounted to the guide rail 5a along the portion thereof astride the range practically including an interval for mounting the guide rail 5a to the hoistway wall. Here, as illustrated in Fig. 7 and Fig. 8, the guide rail 5a includes at the rail bottom portion 51a, a rail-mounting face 55a placed on the opposite side of the rail guide portion 52a; thus, the member 721a is mounted to this rail-mounting face 55a. As represented in Fig. 2, a contact portion 722a is arranged at the top of the member 721a so as to overlap, on a projection view from the top, with the upper end of the guide rail 5a. As illustrated in Fig. 7 and Fig. 8, the guide rail 5b includes a rail-mounting face 55b, in a rail

bottom portion 51b, provided on the opposite side of a rail guide portion 52b; thus, the member 721b is mounted to this rail-mounting face 55b. As represented in Fig. 2, a contact portion 722b provided on the upper portion of the member 721b is arranged, on a projection view from the top, so as to overlap with the top of guide rail 5b.

[0024] As represented in Fig. 2, Fig. 7, and Fig. 8, the member 721a is mounted to the guide rail 5a by clipping the rail bottom portion 51a using the clips 54, in predetermined intervals along the longitudinal direction of the guide rail 5a. Although explanation with respect to the other member 721b is omitted, the configuration is similar to that of the member 721a.

[0025] As described above, the rail attachment unit 72 is attached to the hoisting-machine mounting unit 71 within the range in the longitudinal direction of the guide rails 5a and 5b, and thus attached to the guide rails 5a and 5b along the portion thereof astride the longitudinal mounting range of the guide rails 5a and 5b for the hoisting-machine mounting unit 71. The rail attachment unit 72 is attached to the guide rails 5a and 5b along the range thereof substantially including the fixing intervals for mounting the guide rails 5a and 5b to the hoistway wall.

[0026] Moreover, in the hoisting-machine mounting mechanism 7, a rail joint member 73 is mounted to the contact portions 722a and 722b of the members 721a and 721b, which links together the guide rails 5a and 5b on the upper sides thereof.

[0027] Next, a method of installing the hoisting-machine mounting mechanism 7 is explained using Fig. 9, Fig. 10, and Fig. 11. Fig. 9 is a flowchart representing a procedure of an installation operation. Fig. 10 is a view illustrating a state of the installation operation, while Fig. 11 is a view illustrating a bottom view of Fig. 10.

First, the guide rails 5a and 5b are arranged as stood in the hoistway 1 by way of the rail brackets 53 and the clips 54 (S1 in Fig. 9). Next, the members 721a and 721b of the rail attachment unit 72 are attached in the upper portion of the guide rails 5a and 5b through the clips 54 (S2 in Fig. 9). Here, the guide rails 5a and 5b may be stood in a state of the members 721a and 721b having been mounted to the guide rails 5a and 5b, respectively. Next, as illustrated in Fig. 10, the hoisting machine 6 is placed on the bottom portion of the hoistway 1 in a state where the hoisting machine 6 is mounted to the frame 711 through the elastic members 715a, 715b, 716a, and 716b (S3 in Fig. 9). In this step, the hoisting machine 6 and the frame 711 are placed between the guide rails 5a and 5b. Here, the hoisting machine 6 may be mounted to the frame 711 after both of the hoisting machine 6 and the frame 711 individually placed between the guide rails 5a and 5b.

[0028] Next, the guides 81a, 82a, 81b, and 82b are mounted to the frame 711 (S4 in Fig. 9). In this step, as illustrated in Fig. 11, the guide 81a is fitted to the guide rail 5a. The guide 81a is mounted, on a projection viewed from the top, detachably from the elements 721a, using the elongate holes 815 and the bolts 816 as the mounting means 814. The guide 81b is also mounted to the frame 711 as similar to the guide 81a. Although the guides 82a and 82b are not illustrated in the figure, they are mounted to the frame 711 similarly to the steps for the guide 81a. Thereby, the hoisting machine 6 and the hoisting-machine mounting unit 71 are slidably supported by the guide rails 5a and 5b. Here, the guides 81a, 81b, 82a, and 82b may be mounted when the frame 711 is placed on the bottom portion of the hoistway 1.

[0029] Next, the hoisting machine 6 and the hoisting-machine mounting unit 71 are slidingly lifted along the guide rails 5a and 5b (S5 in Fig. 9). In this step, because the guides 81a and 82a and the guides 81b and 82b are fixed in a state that the respective elements 721a and 721b are detached therefrom, on a projection view from the top, the hoisting-machine mounting unit 71 is lifted in a state of gap spaces being generated between the interval by the member 721a and the member 721b, and that by the guides 81a and 82a and the guides 81b and 82b. After the hoisting machine 6 and the hoisting-machine mounting unit 71 have been lifted to a predetermined height, the bolts 816 are loosened, and slid along the elongate holes 815 so that the guide 81a comes in contact with the member 721a. Then, the guide 81a is fixed to the member 721a, and simultaneously fixed to the hoisting-machine mounting unit 71 by clenching the bolts 816. Although explanation with respect to the other guides 82a, 81b and 82b is omitted, they are fixed similarly to the steps for the guide 81a. Thereby, the hoisting machine 6 and the hoisting-machine mounting unit 71 are mounted to the rail attachment unit 72 (S6 in Fig. 9).

[0030] Next, as represented in Fig. 2, the rail joint member 73 is mounted to the members 721a and 721b (S7 in Fig. 9). Here, the rail joint member 73 may be installed when the members 721a and 721b are mounted to the guide rails 5a and 5b, respectively. Thus, the hoisting machine 6 is installed in the hoistway 1.

[0031] Next, force acting on the hoisting-machine mounting mechanism 7 is explained. As illustrated in Fig. 3, force F acts on the sheave 6a of the hoisting machine 6 by the suspension means 10. Because the sheave 6a is placed at a position misaligned with respect to the frame 711, a moment due to the force F acts on the hoisting-machine mounting unit 71 through the hoisting machine 6. This moment causes reaction force on the guide rails 5a and 5b and the rail attachment unit 72 at the mounting positions of the hoisting-machine mounting unit 71 and the rail attachment unit 72, that is, at the positions of the guides 81a and 82a and the guides 81b and 82b, respectively. Accordingly, a bending moment generates, in the guide rails 5a and 5b and the rail attachment unit 72, within their longitudinal-direction range including the guides 81a and 82a and the guides 81b and 82b.

[0032] The bending moment also acts on the guide rails 5a and 5b in a range including the intervals of the guide rails 5a and 5b being mounted to the hoistway wall, that is, the intervals of the rail brackets 53a and 53c, and those 53b and 53d being mounted thereto. The rail at-

tachment unit 72 is attached to the guide rails 5a and 5b astride the range substantially including the intervals for mounting the guide rails 5a and 5b to the hoistway wall, where the bending moment also acts on the rail attachment unit 72 in this range.

[0033] As described above, the hoisting-machine mounting mechanism 7 is configured with the hoisting-machine mounting unit 71 for mounting the hoisting machine 6, and the rail attachment unit 72 for attaching the hoisting-machine mounting unit 71 to the guide rails 5a and 5b, in which the rail attachment unit 72 is attached to the hoisting-machine mounting unit 71 within the range in the longitudinal direction of the guide rails 5a and 5b, and mounted to the guide rails 5a and 5b astride the mounting range, in the longitudinal direction of the guide rails 5a and 5b, of the hoisting-machine mounting unit 71. Thereby, in the longitudinal mounting range of the hoisting-machine mounting unit 71 to the guide rails 5a and 5b, the cross section properties of the hoisting-machine mounting mechanism 7 are improved in comparison with a case of only the guide rails 5a and 5b being used. Therefore, the bending moment equivalently acting on the guide rails 5a and 5b can be reduced.

[0034] Moreover, the rail attachment unit 72 is attached to the guide rails 5a and 5b astride the range substantially including the intervals for mounting the guide rails 5a and 5b to the hoistway wall. Accordingly, the cross section properties of the hoisting-machine mounting mechanism 7 are improved against the case of only the guide rails 5a and 5b being used. Therefore, the bending moment equivalently acting on the guide rails 5a and 5b can be reduced.

[0035] The guide rails 5a and 5b include the respective rail-mounting faces 55a and 55b in the rail bottom portions 51a and 51b, provided on the opposite side of the respective rail guide portions 52a and 52b, and the rail attachment unit 72 is attached to these rail-mounting faces 55a and 55b. Accordingly, the rail guide portions 52a and 52b are not impaired during attaching operation of the rail attachment unit 72 to these rail-attaching faces 55a and 55b, and therefore the rail attachment unit 72 can be configured not only with a simple structure, but also with easy operation for attaching.

[0036] Because the hoisting-machine mounting unit 71 is provided with the guides 81a, 82a, 81b, and 82b slidable in relation to the guide rails 5a and 5b, they are guided by the guide rails 5a and 5b, when the hoisting machine 6 and the hoisting-machine mounting unit 71 are installed at a predetermined height in the hoistway 1; therefore, lifting operation can be stably performed and the installation operation can be easily performed.

The guides 81a and 82a, and the guides 81b and 82b include the respective mounting means 814 and 824 mounted to the hoisting-machine mounting unit 71, detachably from the respective members 721a and 721b. Thereby, the hoisting-machine mounting unit 71 can be lifted in the state of the gap spaces being generated between the interval by the member 721a and the member 721b, and that by the guides 81a and 82a and the guides 81b and 82b. Accordingly, the installation operation can be easily performed without the members 721a and 721b being affected with the guides 81a, 82a, 81a, and 82b.

[0037] Moreover, because the guides 81a, 82a, 81b, and 82b are configured so as to be mounted to the rail attachment unit 72, and the guides 81a, 82a, 81b, and 82b can be shared in design with a common member, the number of the variety of parts can be resultantly reduced. Furthermore, the guides 81a, 82a, 81b, and 82b can be mounted at arbitrary positions with respect to the rail attachment unit 72; thereby, the mounting height of the hoisting machine 6 can be freely selected.

[0038] For example, when the top of the hoistway 1 is provided at a higher portion of a building, because the upper ends of the guide rails 5a and 5b are supported by a building beam at the top of the hoistway 1, the upper ends of the guide rails 5a and 5b are also needed to be high. In this case, if the mounting position of the hoisting machine 6 is uniform from the upper ends of the guide rails 5a and 5b, because the hoisting machine 6 is also installed at a higher position of the hoistway 1, an installation worker and a maintenance worker work at an unduly higher place, accordingly. In this embodiment, because the height where the hoisting machine 6 is to be mounted can be freely selected, the hoisting machine 6 does not need to be installed at such an undue and higher place; therefore, the installation operation and the maintenance operation become easy.

[0039] Because the guides 81a, 81b, 82a, and 82b are mounted to the rail attachment unit 72, and the hoisting machine 6 is mounted to the hoisting-machine mounting unit 71 through the elastic members 715a, 715b, 716 a, and 716b, a vibration-proofing effect can be obtained in which vibration generated in the hoisting machine 6 is prevented to propagate to the guide rails 5a and 5b. Vibration proofing need not be performed by providing elastic members between each of the guides 81a, 82a, 81b, and 82b and the guide rails 5a and 5b, that is, the vibration proofing can be performed only by the elastic members 715a, 715b, 716a, and 716b mounted to the hoisting machine 6, and the vibration-proofing effect can, therefore, be obtained by the small number of parts.

[0040] Because vibration due to the deflection of the hoisting machine 6, in a direction represented by an arrow J in Fig. 3, is received by the elastic members 715a, 715b, 716a, and 716b arranged upper and lower portions of the hoisting machine 6, the vibration-proofing effect can be further improved. Here, two elastic members have been provided for each of the upper and the lower portions of the hoisting machine 6; however, the invention are not limited to this embodiment; for example, the hoisting machine may be configured that a single piece of elastic member is provided in the upper center and another single piece thereof is provided in the lower center of the hoisting machine, and also configured that three or more of elastic members are provided for each of the upper and the lower portions.

[0041] Because the hoisting-machine mounting mechanism 7 includes the rail joint member 73 for linking together the guide rails 5a and 5b on the upper sides thereof, possible expansion of the gap between the guide rails 5a and 5b can be prevented; thereby, the high-reliable elevator system can be obtained. Here, the rail joint member 73 may be directly fixed to the tops of the guide rails 5a and 5b in place of the members 721a and 721b.

[0042] The rail attachment unit 72, which includes the contact portions 722a and 722b overlapping, on a projection view from the top, the upper ends of the guide rails 5a and 5b, is fixed so that the contact portions 722a and 722b come in contact with the upper ends of the guide rails 5a and 5b. Accordingly, even if their joint between the rail attachment unit 72 and the guide rails 5a and 5b is loosened, the force F acting on the hoisting machine 6 is received by the contact portions 722a and 722b; therefore, the high-reliable elevator system can be obtained by the simple configuration.

[0043] However, even if the rail attachment unit 72 is fixed in a state that the contact portions 722a and 722b do not contact to the upper ends of the guide rails 5a and 5b, and the joint between the rail attachment unit 72 and the guide rails 5a and 5b may occasionally slide to move the rail attachment unit 72 downward, the contact portions 722a and 722b are trapped to the upper ends of the guide rails 5a and 5b, so as to support the force F acting on the hoisting machine 6; therefore, the high-reliable elevator system can be obtained.

[0044] On the other hand, in the case where the rail attachment unit 72 is attached to the guide rails 5a and 5b by providing fixation holes in the guide rails followed by bolt jointing using bolts passing through the fixation holes, even if slide occurs on this joint structure, the force F acting on the hoisting machine 6 is received by such an engaging structure of the bolts with the fixation holes. It is needless to say that, in this case, the fixation holes are needed to be processed in the guide rails 5a and 5b, the cross section properties in the fixation-hole portions of the guide rails 5a and 5b are deteriorated, and the strength of the guide rails 5a and 5b is resultantly deteriorated. However, according to this embodiment, because the force acting on the hoisting machine 6 is received by the contact portions 722a and 722b, the fixation holes are not needed to be processed in the guide rails 5a and 5b; therefore, the strength is not also deteriorated.

[0045] Moreover, because the suspension-means anchor section 12 for anchoring the suspension means 10 is provided on the hoisting-machine mounting unit 71, the other elements for attaching the suspension means are not needed; therefore, the number of elements can be reduced.

If a beam is provided on the guide rails 5a and 5b, and the hoisting machine 6 is placed on the beam, the size of the hoistway 1 in the vertical direction is needed to be increased; however, in this embodiment, because the hoisting machine 6 and the hoisting-machine mounting unit 71 are placed within the range in the longitudinal direction of the guide rails 5a and 5b, the hoisting machine can be placed without increasing in the vertical direction of the hoistway 1.

Here, in this embodiment, the hoisting-machine mounting unit 71 is placed, viewed from the horizontal direction, within the range in the longitudinal direction of the guide rails 5a and 5b; however, the hoisting-machine mounting unit 71 may be placed in such a way that a portion thereof comes out of the range in the longitudinal direction of the guide rails 5a and 5b.

Embodiment 2.

[0046] Fig. 12, Fig. 13, Fig. 14, Fig. 15, and Fig. 16 illustrate a hoisting-machine mounting mechanism of an elevator system according to embodiment 2 of the present invention, in which Fig. 12 is a front view, Fig. 13 is a cross-sectional view of a cross section E - E in Fig. 12, Fig. 14 is a front view of an enlarged view illustrating the main upper portion of the hoisting-machine mounting mechanism, Fig. 15 is a side view, and Fig. 16 is a view illustrating a cross section G - G. In addition to Embodiment 1, Embodiment 2 provides partial contact parts 74, limiters 75, and adjusters 76, at the upper portions of the rail attachment unit 72. Because the other configurations are similar to those in Embodiment 1, their explanation is omitted. Here, the same numerals as those in Embodiment 1 represent corresponding elements.

[0047] The partial contact part 74, the limiter 75, and the adjuster 76 placed on the side of the guide rail 5a are explained using Fig. 14, Fig. 15 and Fig. 16. As shown in these figures, the partial contact part 74 is provided between the contact portion 722a of the rail attachment unit 72 and the upper end of the guide rail 5a. The partial contact part 74 is placed, on a projection view from the top, so as to partially overlap with a portion of the center on the upper end of the guide rail 5a. Moreover, the partial contact part 74 is fixed to the contact portion 722a.

[0048] The limiter 75 is configured with a rod shaped limiter such as a pair of bolts 75a and 75b, which is provided at the upper portion of the rail attachment unit 72. The bottom faces of the bolts 75a and 75b are positioned under the upper end of the guide rail 5a, and are placed on both sides of the guide 52a of the guide rail 5a. Thereby, the limiter 75 limits the movement of the rail attachment unit 72 in a horizontal direction thereof. The bolts 75a and 75b are jointed together with the rail joint member 73 to the contact portion 722a.

[0049] The adjuster 76, which is formed in plate-like shape, is placed between the contact portion 722a and the upper end of the guide rail 5a. Here, the adjuster 76 is placed between the partial contact part 74 and the upper end of the guide rail 5a. Due to construction misalignment of the guide rail 5a, a margin of error may occur in the gap between the contact portion 722a and the upper end of the guide rail 5a. In this case, by placing the number of the adjusters 76 corresponding to the error of the gap, the gap between the contact portion 722a and

the upper end of the guide rail 5a is adjusted. Holes are formed in the adjuster 76, through which the bolts 75a and 75b pass. Here, although explanation is omitted for those on the side of the guide rail 5b, the configuration is similar to those of the side of the guide rail 5a.

[0050] As described above, in a hoisting-machine mounting mechanism 13 according to Embodiment 2, the partial contact parts 74 each provided between the respective contact portions 722a and 722b at the upper portion of the rail attachment unit 72 and the respective upper edges of the guide rails 5a and 5b are placed, on the projection view from the top, so as to overlap with respective portions of the centers of the upper edges of the guide rails 5a and 5b. Thereby, when the contact portions 722a and 722b support the force F acting on the hoisting machine 6, even though flatness of upper edge faces of the guide rails 5a and 5b is poor, because the partial contact parts 74 each provided on the contact portions 722a and 722b come in contact with the respective centers of the guide rails 5a and 5b, weight distortion is not easily to act on the rail attachment unit 72. Generally, the hoistway height has a deviation due to a margin of error etc., under building. Therefore, upper portions of the guide rails 5a and 5b are cut off so as to meet the required height of the hoistway, in the installation field. Generally, flatness of the cut-off faces is poor; however, according to Embodiment 2, even though the flatness is poor, because this problem in flatness can be resolved by the simple configuration, the economical and easily installable elevator system can be obtained.

[0051] The limiters 75 provided at the upper portions of the rail attachment unit 72 limit the movement, in a horizontal direction, of the rail attachment unit 72, the bolts 75a and 75b as the limiters 75 are placed at respective both sides of the rail guide portions 52a and 52b. Thereby, even if any of the clips 54 that links the rail attachment unit 72 with the guide rails 5a and 5b goes away, and thus the members 721a and 721b tend to move in a direction perpendicular to the gap direction between the guide rails 5a and 5b, because the bolts 75a or 75b comes in contact with the side face of the rail guide portion 52a or 52b, the movement of the members 721a and 721b are restricted. Therefore, the rail attachment unit 72 can surely receive the force F acting on the hoisting machine 6 without the contact portions 722a and 722b departing in a direction perpendicular to the gap direction between the guide rails 5a and 5b; thus, the elevator system can be obtained with a higher reliability.

[0052] On the other side, Because the adjusters 76 are placed between the upper ends of the guide rails 5a and 5b and the contact portions 722a and 722b, respectively, by adjusting the gaps between the upper edges of the guide rails 5a and 5b and the contact portions 722a and 722b, respectively, even though the construction errors of the guide rails 5a and 5b are implied, the rail attachment unit 72 can be accurately fixed in the vertical direction, and because the contact portions 722a and 722b are supported by the guide rails 5a and 5b, the force F acting on the hoisting machine 6 can be surely received. Here, although the adjusters 76 have been placed between the partial contact parts 74 and the upper ends of the guide rails 5a and 5b, the invention is not limited to that configuration. The partial contact parts 74 may contact to the upper ends of the guide rails 5a and 5b, and the adjusters 76 may be placed between the contact portions 721a and 721b and the partial contact parts 74. The adjusters 76 may be placed, in a state without the partial contact parts 74, between the contact portions 722a and 722b and the upper ends of the guide rails 5a and 5b.

[0053] The holes are formed in the adjusters 76, through which the bolts 75a and 75b as the rod-shaped limiters pass. Thereby, even if the fixation between the rail attachment unit 72 and the guide rails 5a and 5b is loosened and thus the adjusters 76 tend to be detached the adjusters 76 are held to be engaged with the bolts 75a and 75b, and the detachment thereof can be resultantly prevented. Therefore, the rail attachment unit 72 can surely support, with the installation height of the hoisting machine 6 being maintained, the force F acting on the hoisting machine, and the elevator system can be obtained with a much higher reliability.

[0054] Here, in this embodiment, although the bolts 75a and 75b as the limiters 75 have been provided at both sides of the guides 52a and 52b; however, the invention is not limited to that configuration. For example, the bolts 75a and 75b may be configured to be provided at both sides of the rail bottom portions 51a and 51b. In this case, because the bolts 75a and 75b also come in contact with the side faces of the rail bottom portions 51a and 51b, and thus limit the movement of the rail attachment unit 72, the contact portions 722a and 722b never depart in a direction perpendicular to the gap direction between the guide rails 5a and 5b.

[0055] In addition to the configuration in which the bolts 75a and 75b have been provided at both sides of the guides 52a and 52b, limiters may also be provided on the head sides of the rail guide portions 52a and 52b. In this case, the limiters provided at both sides of the rail guide portions 52a and 52b limit movement both in the perpendicular direction and in the gap direction between the guide rails 5a and 5b of the rail attachment unit 72. Meanwhile, the limiters provided on the head sides of the rail guide portions 52a and 52b limit movement in the gap direction berween the guide rails 5a and 5b of the rail attachment unit 72. Therefore, the rail attachment unit 72 can further surely support the force F acting on the hoisting machine 6 without the contact portions 722a and 722b departing both in the perpendicular direction and in the gap direction berween the guide rails 5a and 5b.

Embodiment 3.

[0056] Fig. 17 and Fig. 18 illustrate an elevator system according to Embodiment 3 of the present invention, in which Fig. 17 is an entire configuration view of the elevator system, and Fig. 18 is an enlarged view of its hoist-

ing-machine mounting mechanism. Although, in Embodiments 1 and 2, the hoisting-machine mounting mechanisms 7 and 13 have been provided on the guide rails 5a and 5b of the counter weight, the invention is not limited to the configurations, and the mechanism may be provided on the guide rails 3a and 3b of the car 2. An example is represented in Embodiment 3. Because the other configuration is similar to those in Embodiments 1 and 2, the detailed explanation is omitted. Here, the same numerals as those in Embodiments 1 and 2 represent corresponding elements.

In the figures, car pulleys 14 are provided on the upper portions of the car 2, the suspension means 10, whose one end is anchored to the suspension-means anchor section 11 provided in the upper portion of the guide rail 3a of the car, is suspended around the car pulleys 14and wound around a hoisting machine 15 placed on the upper portion of the hoistway 1. The hoisting machine 15 that is drum-type moves the car 2 by winding the suspension means 10 therearound. A hoisting-machine mounting mechanism 16 for mounting the hoisting machine 15 to the guide rail 3b of the car is provided in the upper portion of the hoistway 1.

[0057] The hoisting-machine mounting mechanism 16 is configured with a hoisting-machine mounting unit 91 for mounting the hoisting machine 15, and a rail attachment unit 92 that is attached to the hoisting-machine mounting unit 91 and also mounted in the upper portion of the guide rail 3b.

As illustrated in Fig. 18, the hoisting-machine mounting unit 91 having a frame 911 is placed, viewed in a horizontal direction, within the range in the longitudinal direction of the guide rail 3b. Similarly to Embodiment 1 or 2, the hoisting machine 15 is mounted to the frame 911 through an elastic member that is not illustrated in the figure. Guides 912 and 913 slidable on the guide rail 3b are provided upper and lower portions of the frame 911, respectively. By fixing the guide 912 and 913 to the rail attachment unit 92, the hoisting-machine mounting unit 91 is mounted to the rail attachment unit 92. Thereby, similarly to Embodiment 1 or 2, the hoisting-machine mounting unit 91 is configured to be slidable on the guide rail 3b and mounted to the rail attachment unit 92.

[0058] Moreover, the rail attachment unit 92 is attached to the hoisting-machine mounting unit 91 within the range in the longitudinal direction of the guide rail 3b. The rail attachment unit 92 is attached to the guide rail 3b along the portion thereof astride the longitudinal range of the guide rail 3b for the hoisting-machine mounting unit 91, that is, a range, including the guides 912 and 913, in a longitudinal direction of the guide rail 3b. The rail attachment unit 92 having a contact portion 921 thereabove, and the contact portion 921 is placed, on a projection viewed from the top, so as to overlap with the upper end of the guide rail 3b. The guide rail 3b includes a rail bottom portion 31, and a rail guide portion 32, standing on the rail bottom portion 31, for guiding up and down the car 2. The rail attachment unit 92 is fixed to a face opposite to the rail guide portion 32 of the rail bottom portion 31.

As described above, in Embodiment 3, similarly to Embodiment 1 or 2, the hoisting machine 15 is mounted to the guide rail 3b, and an effect similar to those in Embodiments 1 and 2 can be obtained.

Industrial Applicability

[0059] As described above, the present invention can be applied to elevator systems in which a hoisting machine is mounted to a guide rail.

Claims

1. An elevator system comprising:

a guide rail, provided in a hoistway, for guiding vertical movement of a car or that of a counterweight;
a hoisting machine for driving the vertical movement of the car or that of the counterweight;
a hoisting-machine mounting unit to which the hoisting machine is mounted and at least a portion of which comes within a longitudinal range, viewed from a horizontal direction, of the guide rail; and
a rail attachment unit attached to the hoisting-machine mounting unit within a range in the longitudinal direction of the guide rail, and also attached to the guide rail along a portion thereof astride a longitudinal mounting range of the guide rail for the hoisting-machine mounting unit.

2. An elevator system as recited in claim 1, wherein:

the guide rail is fixed to a wall of the hoistway at a predetermined fixing interval in the longitudinal direction thereof, and
the rail attachment unit is attached to the guide rail along a range thereof substantially including the fixing interval.

3. An elevator system as recited in claim 1 or 2, wherein:

the guide rail includes a rail bottom portion, a rail-guide portion standing on the rail bottom portion for guiding the car or guiding the counterweight, and a rail mounting face provided, opposite to the rail-guide portion, on the rail bottom portion, and
the rail attachment unit is attached to the rail mounting face.

4. An elevator system as recited in claim 1 or 2, where-

in:

the hoisting-machine mounting unit includes a guide slidable in the longitudinal direction of the guide rail, and
the guide is attached to the rail attachment unit.

5. An elevator system as recited in claim 4, wherein the guide includes a fixing means for fixing the guide to the hoisting-machine mounting unit, and said fixing can be performed as the guide detached from the rail attachment unit on a projection view from the top.

6. An elevator system as recited in claim 1 or 2, wherein an elastic member is provided between the hoisting machine and the hoisting-machine mounting unit.

7. An elevator system as recited in claim 6, wherein at least one said elastic member is provided at each of the top and the bottom of the hoisting machine.

8. An elevator system as recited in claim 1 or 2, wherein the guide rail is constituted of a first guide rail and a second guide rail, and the system further comprising a rail joint member for linking together the first and the second guide rails in an upper portion of the first and the second guide rails.

9. An elevator system as recited in claim 1 or 2, wherein the rail attachment unit includes a contact portion overlapping with the upper end of the guide rail on a projection view from the top.

10. An elevator system as recited in claim 9, further comprising a partial contact portion, overlapping with a part of the upper-end central portion of the guide rail on a projection viewed from the top, provided between the upper end of the guide rail and the contact portion.

11. An elevator system as recited in claim 9, further comprising a limiter for limiting movement, with respect to the guide rail, of the rail attachment unit in a horizontal direction.

12. An elevator system as recited in claim 9, further comprising an adjuster, arranged between the contact portion and the upper end of the guide rail, for adjusting a gap between the contact portion and the upper end of the guide rail.

13. An elevator system as recited in claim 12, further comprising a rod-shaped limiter for limiting movement of the rail attachment unit in a horizontal direction with respect to the guide rail, wherein the adjuster has a hole for the limiter passing therethrough.

14. An elevator system as recited in claim 1 or 2, wherein the hoisting-machine mounting unit includes a suspension-means anchor section for anchoring a suspension means for suspending the car or suspending the counterweight.

15. A method of installing the elevator system as recited in claim 4, comprising:

a standing step of standing the guide rail in the hoistway, and attaching the rail attachment unit to the guide rail;
a mounting step of slidably engaging the guide with the guide rail in a longitudinal direction thereof, and mounting the guide to the hoisting-machine mounting unit;
a lifting step, after the mounting step, of slidingly lifting, in a state of the hoisting machine having been mounted to the hoisting-machine mounting unit, the hoisting-machine mounting unit in a longitudinal direction of the guide rail; and
a placing step, after the lifting step, of placing the hoisting machine by attaching the guide to the rail attachment unit.

FIG. 1

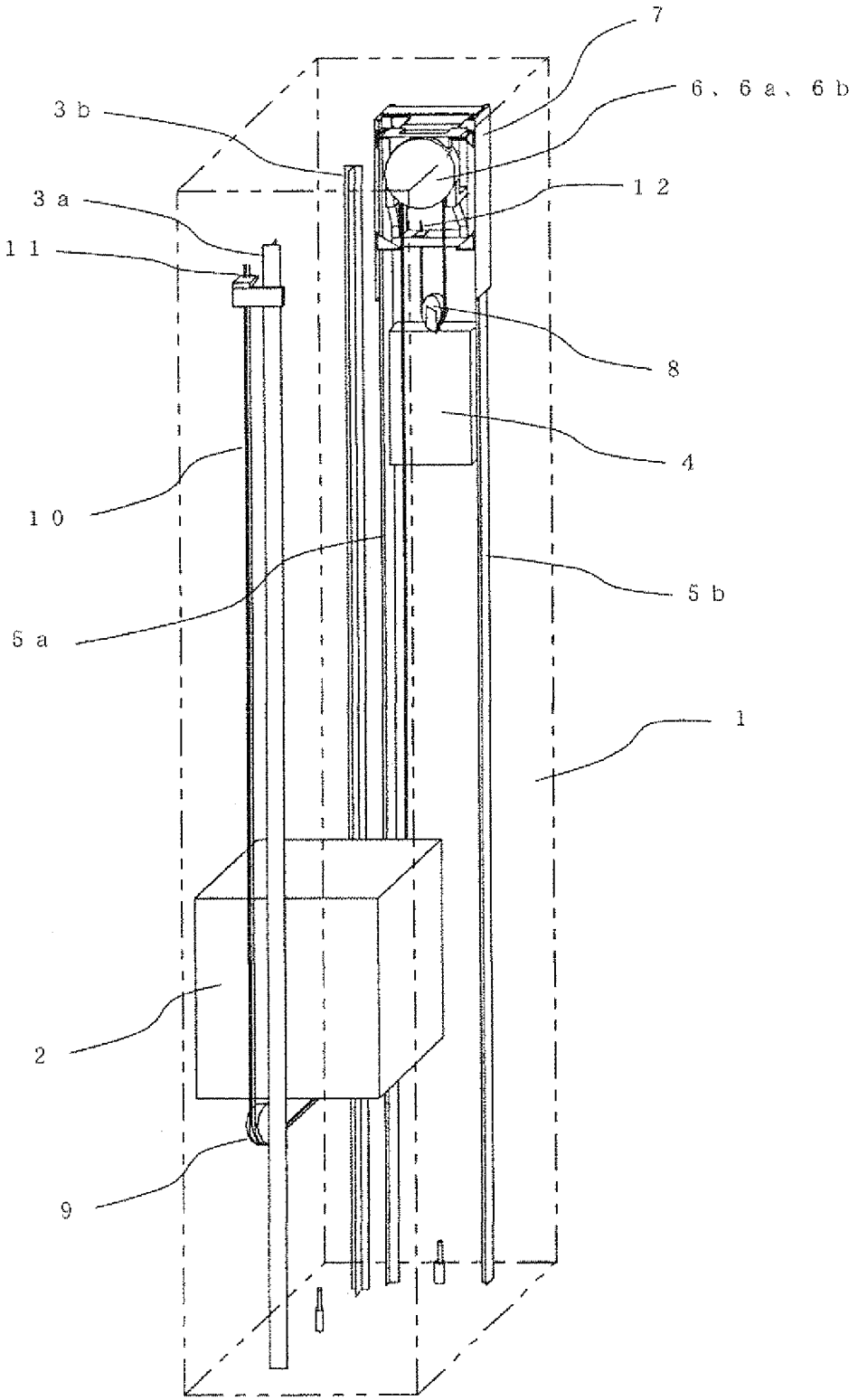
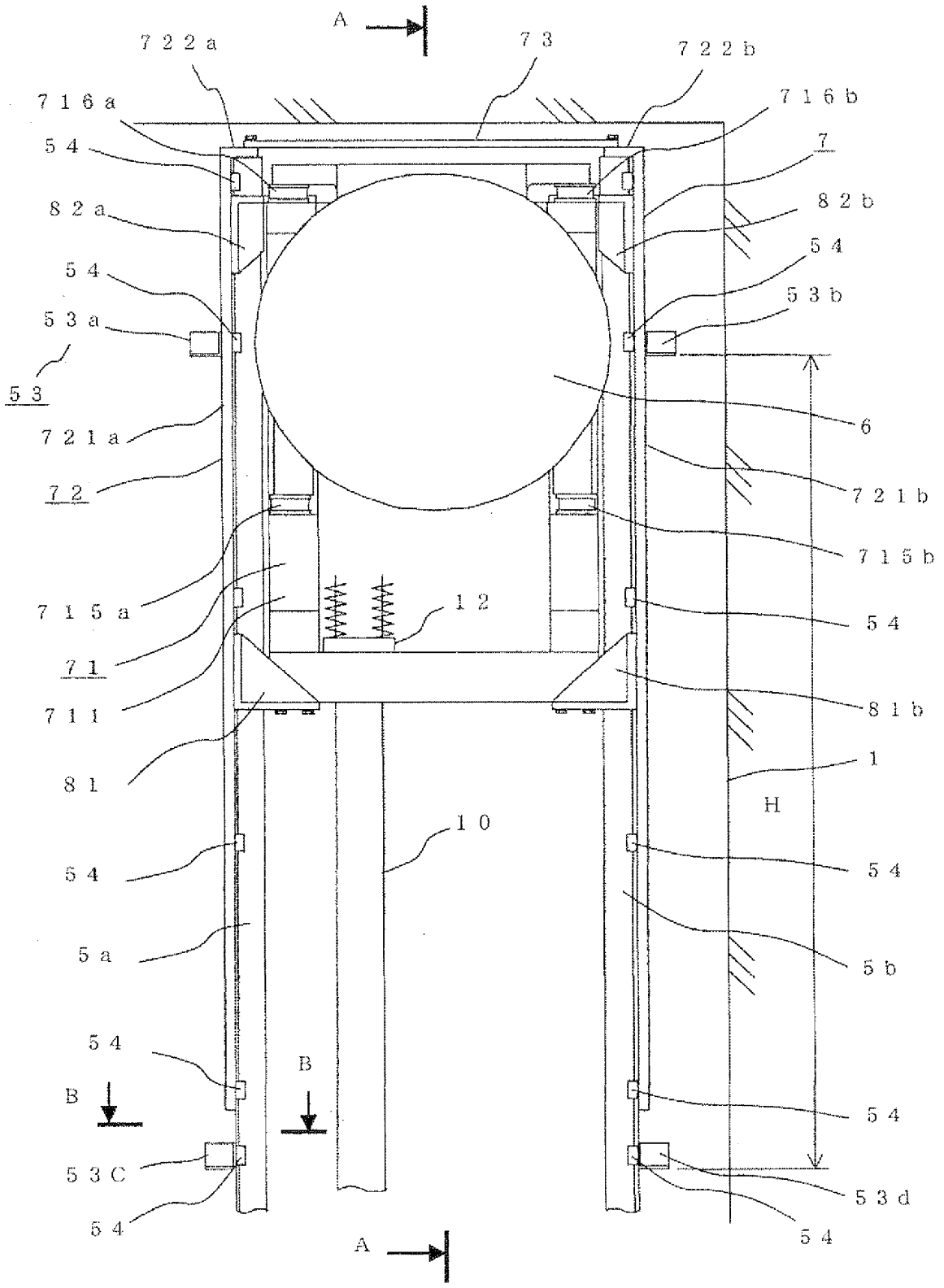


FIG. 2


A
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7 3
7 2 2 b
7 1 6 a
7 1 6 b
5 4
7
8 2 a
8 2 b
5 4
5 4
5 3 b
5 3 a
5 3
6
7 2 1 a
7 2 1 b
7 2
7 1 5 b
7 1 5 a
1 2
5 4
7 1
8 1 b
7 1 1
1
8 1
H
1 0
5 4
5 4
5 a
5 b
5 4
B
B
5 4
5 3 C
5 3 d
5 4
5 4
A

FIG. 3

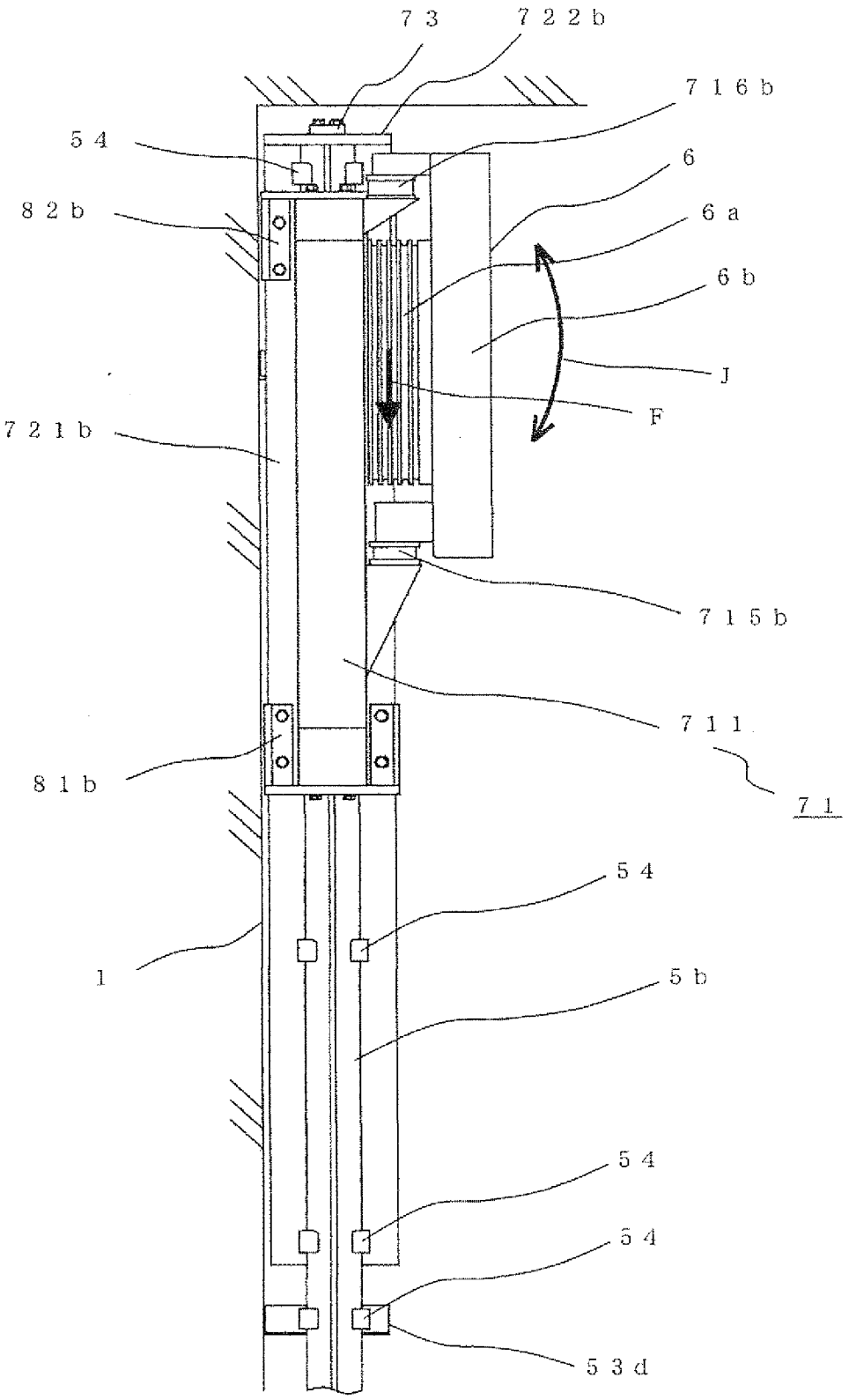

7 3
7 2 2 b
7 1 6 b
5 4
6
8 2 b
6 a
6 b
J
F
7 2 1 b
7 1 5 b
7 1 1
8 1 b
7 1
5 4
1
5 b
5 4
5 4
5 3 d

FIG. 4

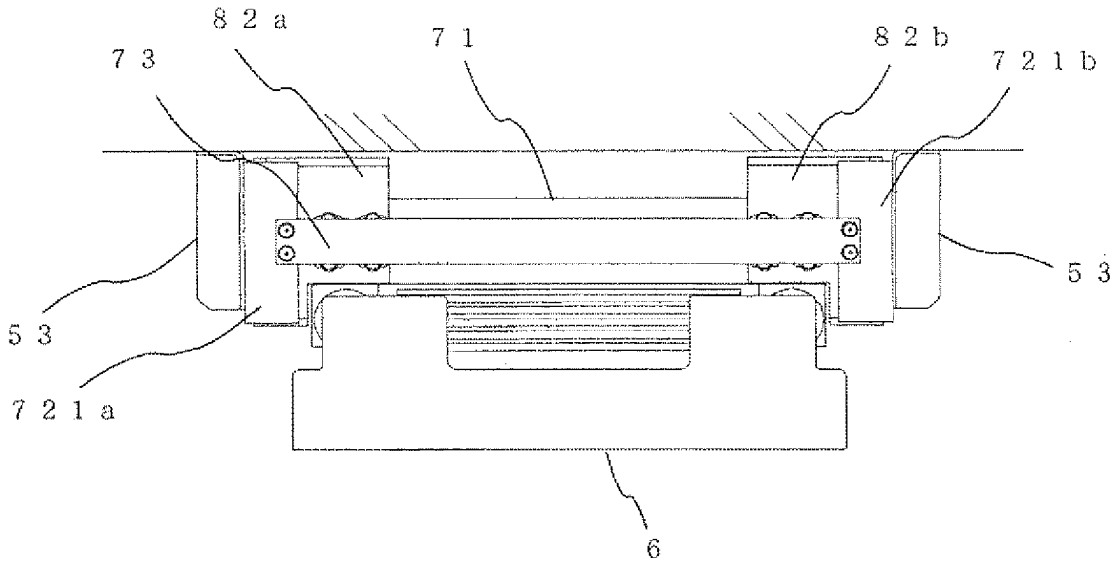


FIG. 5

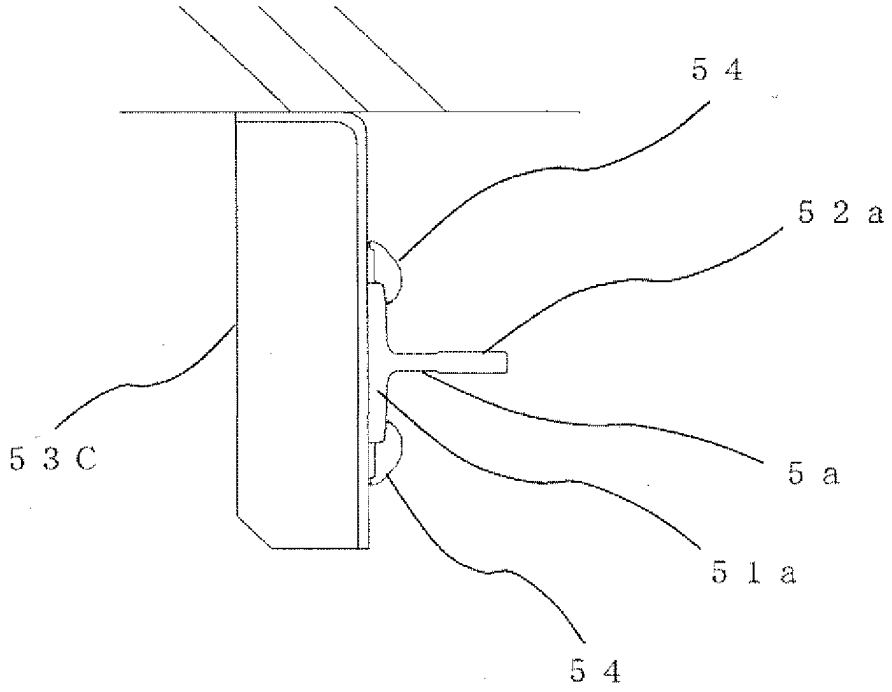


FIG. 6

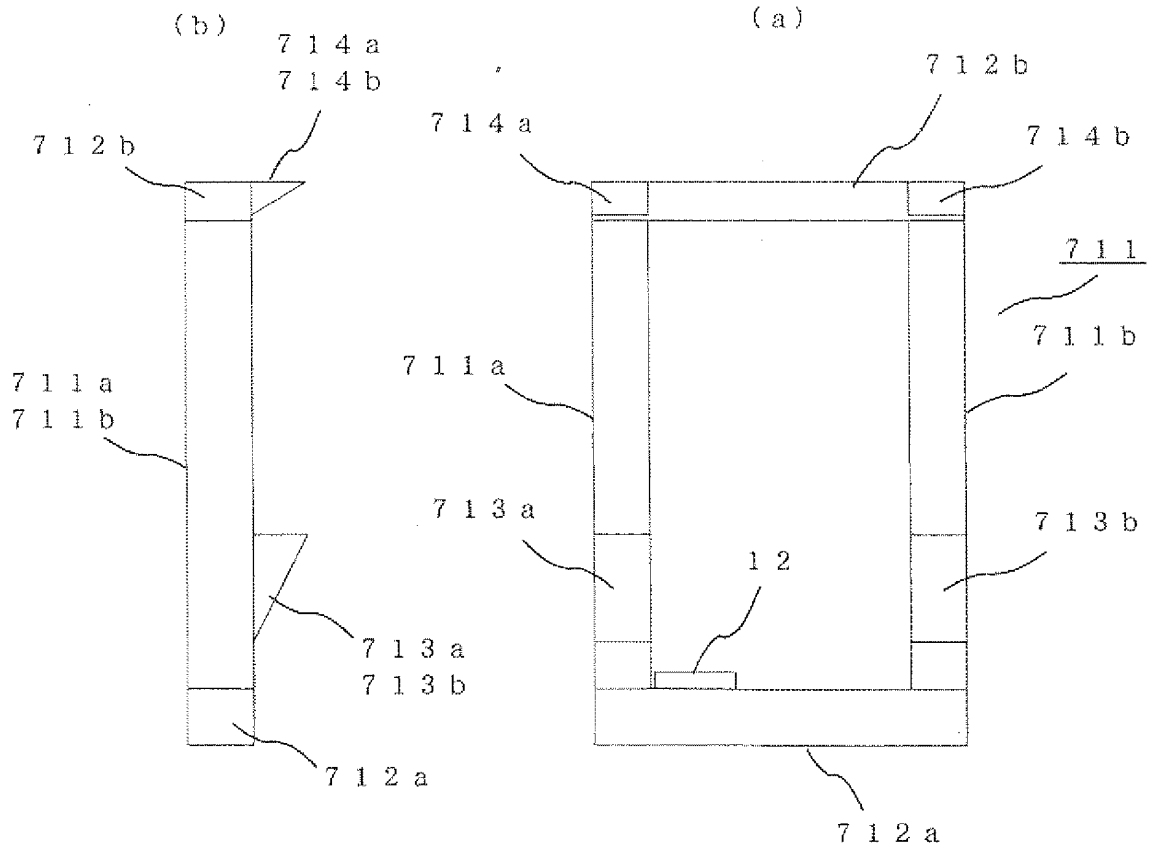

(b)
714a
714b
712b
711a
711b
713a
713b
712a
(a)
712b
714a
714b
711
711b
711a
713a
713b
12
712a

FIG. 7

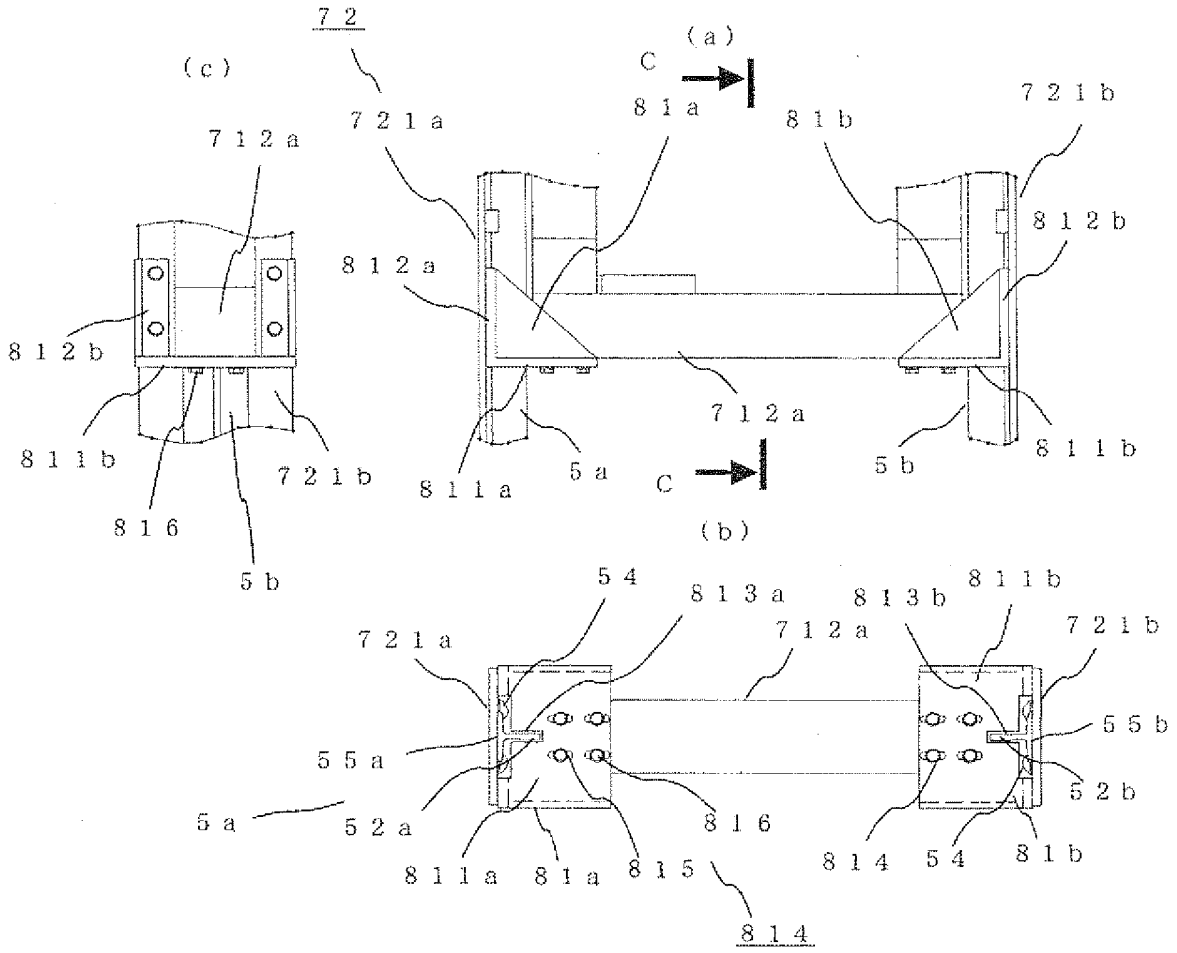

72
(a)
C
721a
812a
811a
5a
811b
721b
812b
5b
712a
816
(b)
54
813a
813b
811b
721a
712a
721b
555a
552a
552b
5a
816
811a
81a
815
814
814
54
81b

FIG. 8

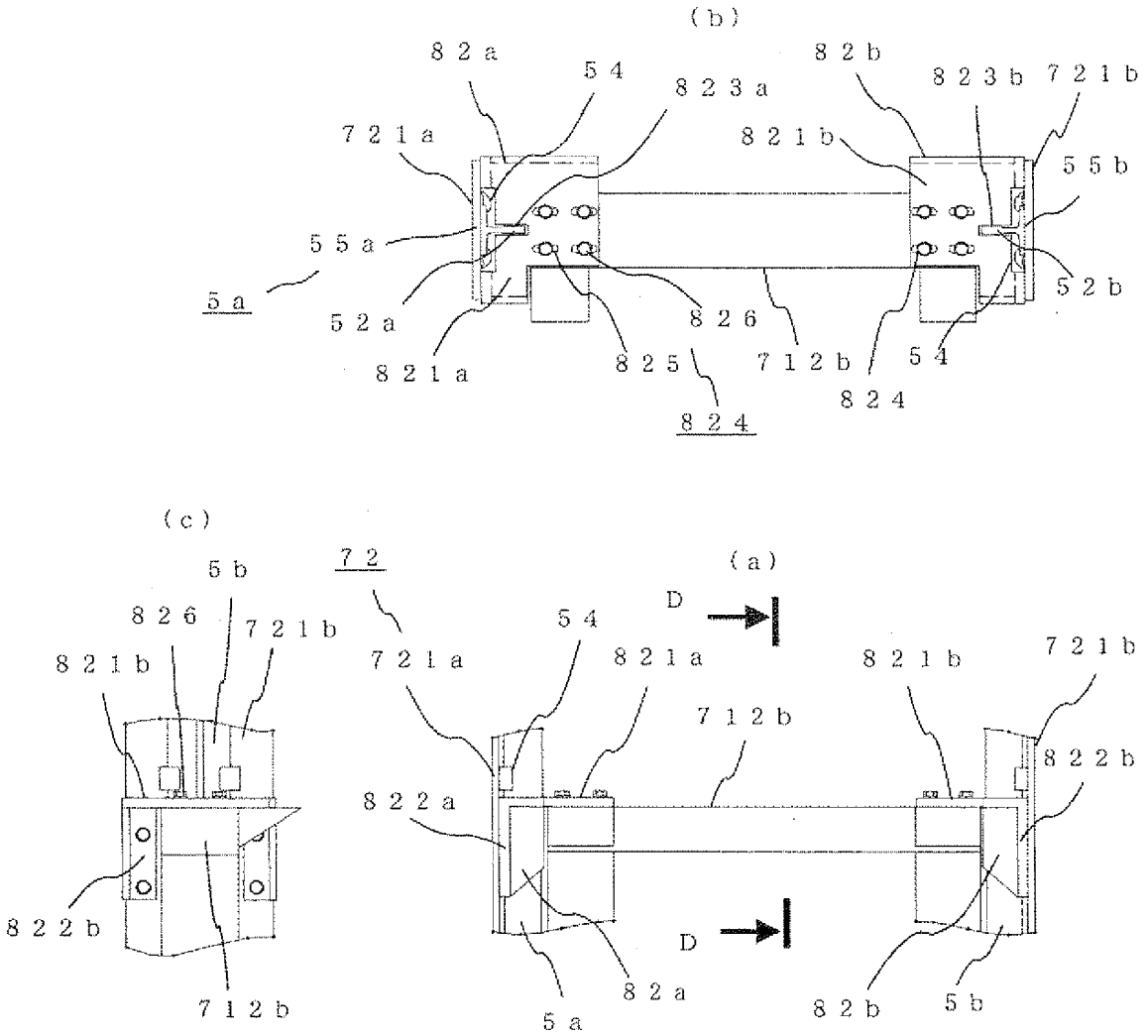

(b)
8 2 a
5 4
8 2 3 a
8 2 b
8 2 3 b
7 2 1 b
7 2 1 a
8 2 1 b
5 5 b
5 5 a
5 2 b
5 a
5 2 a
8 2 6
8 2 1 a
8 2 5
7 1 2 b
5 4
8 2 4
8 2 4
(c)
5 b
7 2
(a)
8 2 6
7 2 1 b
D
5 4
8 2 1 b
7 2 1 a
8 2 1 a
8 2 1 b
7 2 1 b
7 1 2 b
8 2 2 b
8 2 2 a
D
8 2 2 b
7 1 2 b
8 2 a
8 2 b
5 b
5 a

FIG. 9

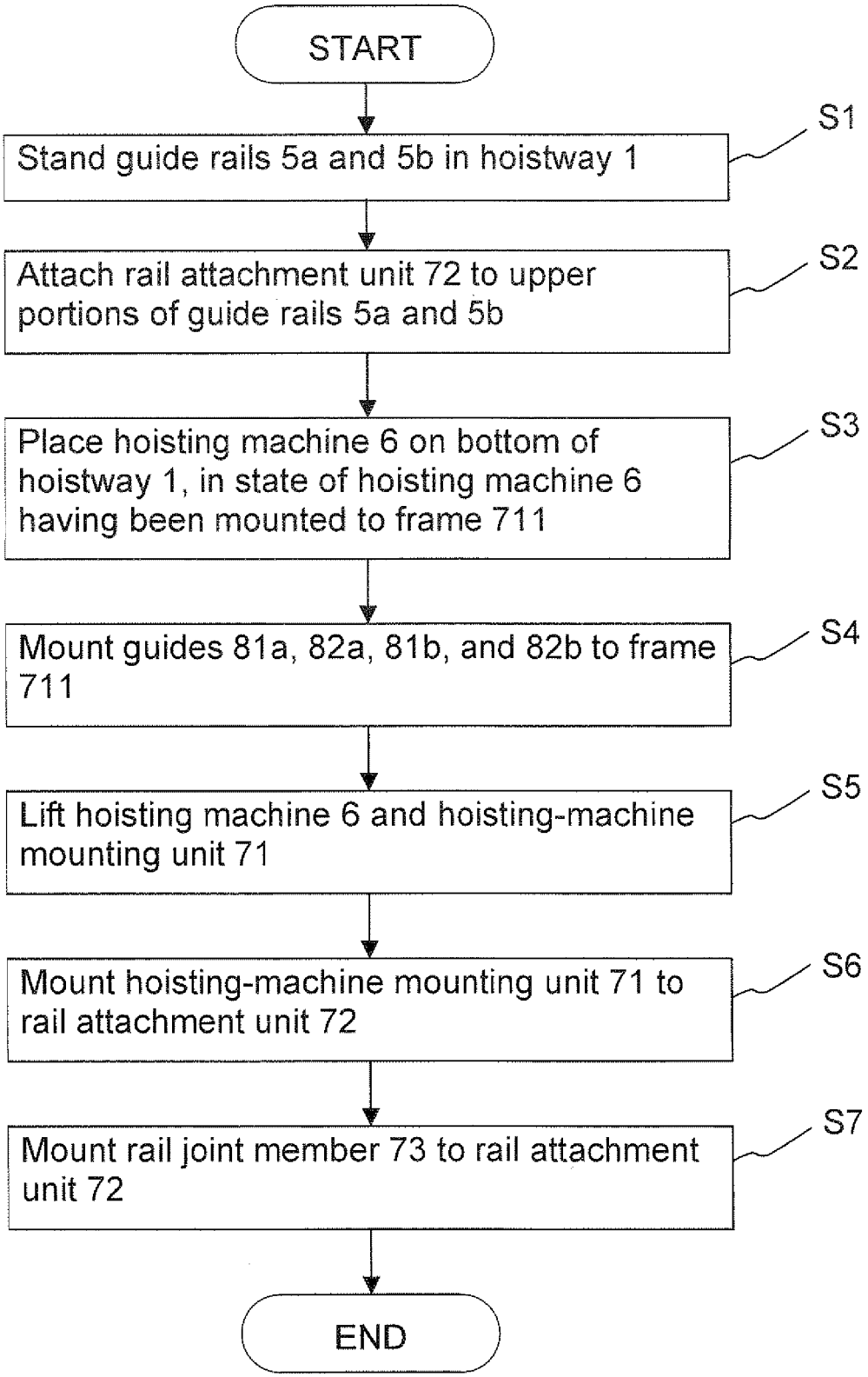

START
Stand guide rails 5a and 5b in hoistway 1
S1
Attach rail attachment unit 72 to upper portions of guide rails 5a and 5b
S2
Place hoisting machine 6 on bottom of hoistway 1, in state of hoisting machine 6 having been mounted to frame 711
S3
Mount guides 81a, 82a, 81b, and 82b to frame 711
S4
Lift hoisting machine 6 and hoisting-machine mounting unit 71
S5
Mount hoisting-machine mounting unit 71 to rail attachment unit 72
S6
Mount rail joint member 73 to rail attachment unit 72
S7
END

FIG. 10

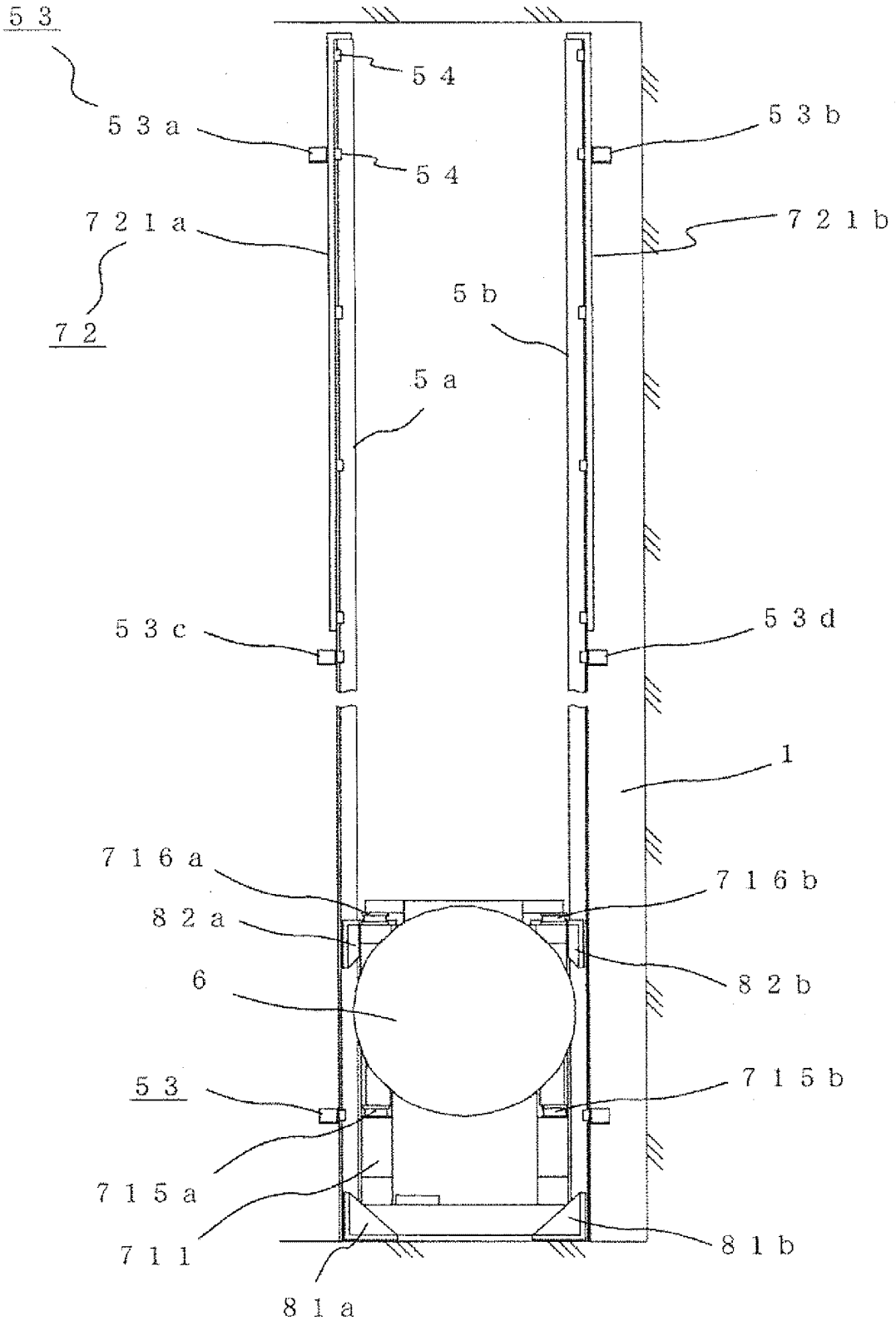

5 3
5 3 a
5 4
5 4
5 3 b
7 2 1 a
7 2 1 b
7 2
5 b
5 a
5 3 c
5 3 d
1
7 1 6 a
7 1 6 b
8 2 a
8 2 b
6
5 3
7 1 5 b
7 1 5 a
7 1 1
8 1 b
8 1 a

FIG. 11

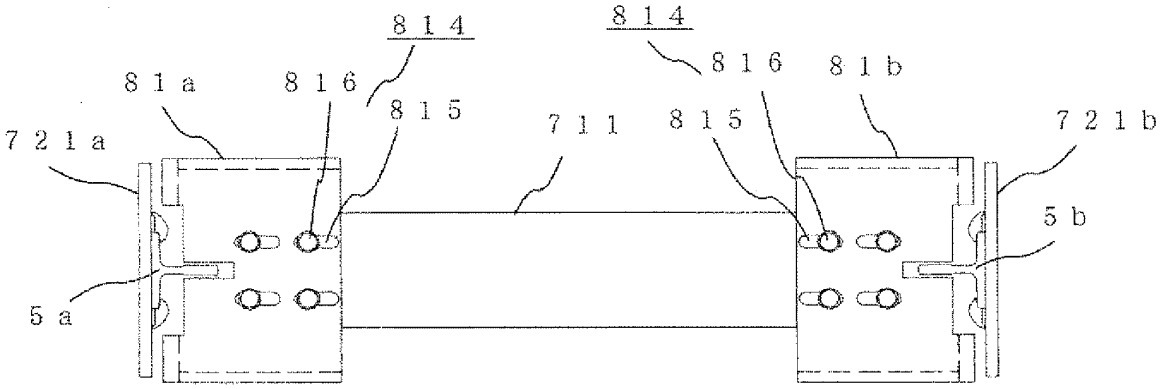
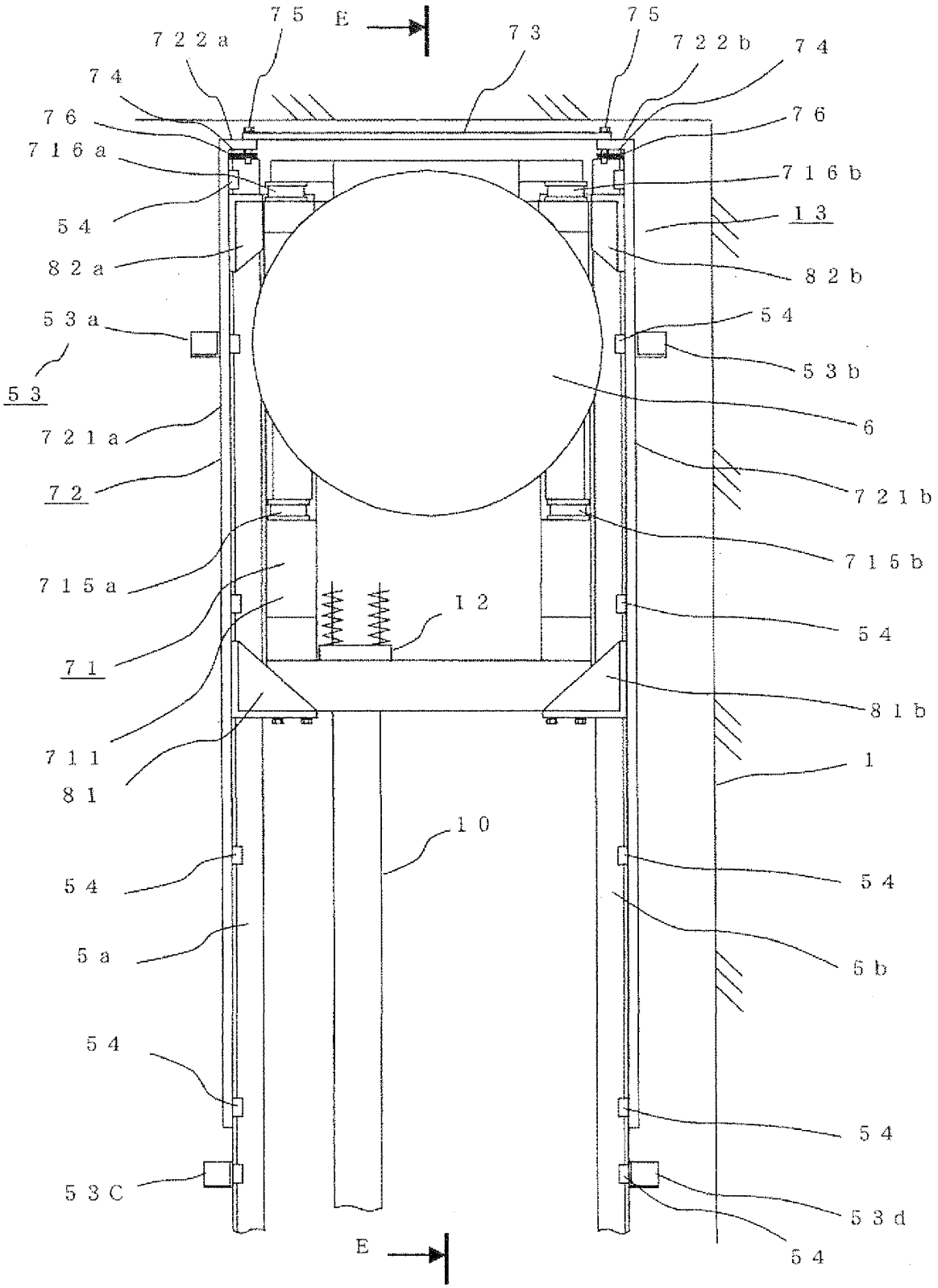


FIG. 12


7 5
E
7 2 2 a
7 3
7 5
7 2 2 b
7 4
7 4
7 6
7 6
7 1 6 a
7 1 6 b
5 4
1 3
8 2 a
8 2 b
5 3 a
5 4
5 3
5 3 b
7 2 1 a
6
7 2
7 2 1 b
7 1 5 a
7 1 5 b
1 2
5 4
7 1
8 1 b
7 1 1
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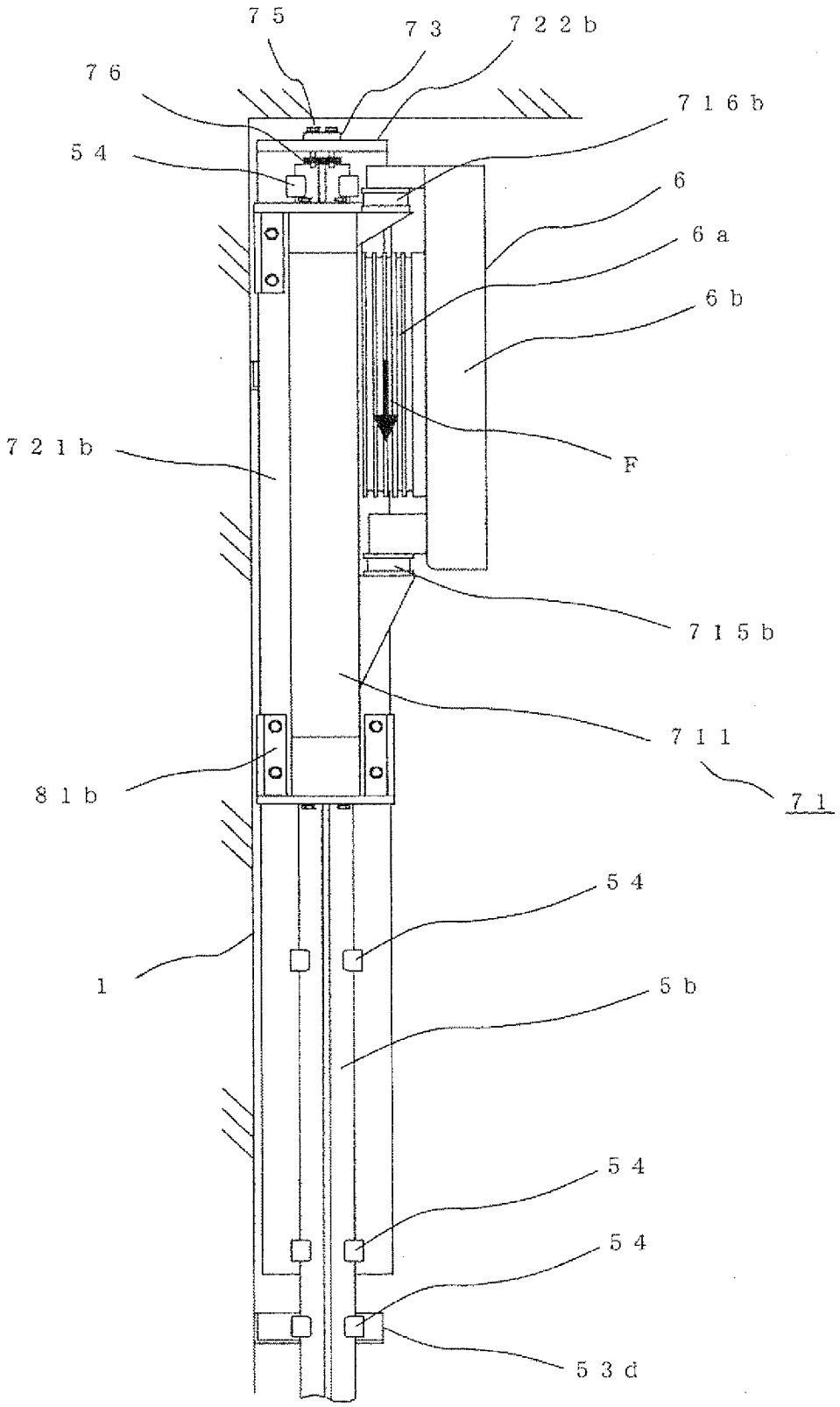
5 4
5 4
5 a
5 b
5 4
5 4
5 3 C
5 3 d
E
5 4

FIG. 13


7 5
7 3
7 2 2 b
7 6
7 1 6 b
5 4
6
6 a
6 b
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F
7 1 5 b
7 1 1
8 1 b
7 1
5 4
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5 b
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5 4
5 3 d

FIG. 14

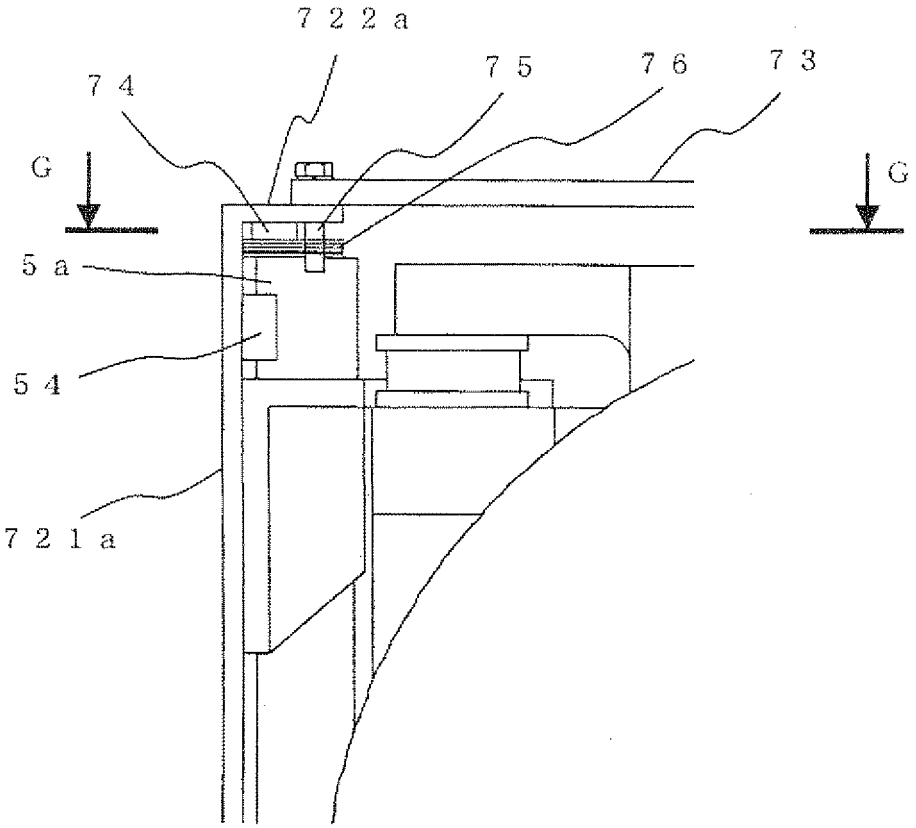


FIG. 15

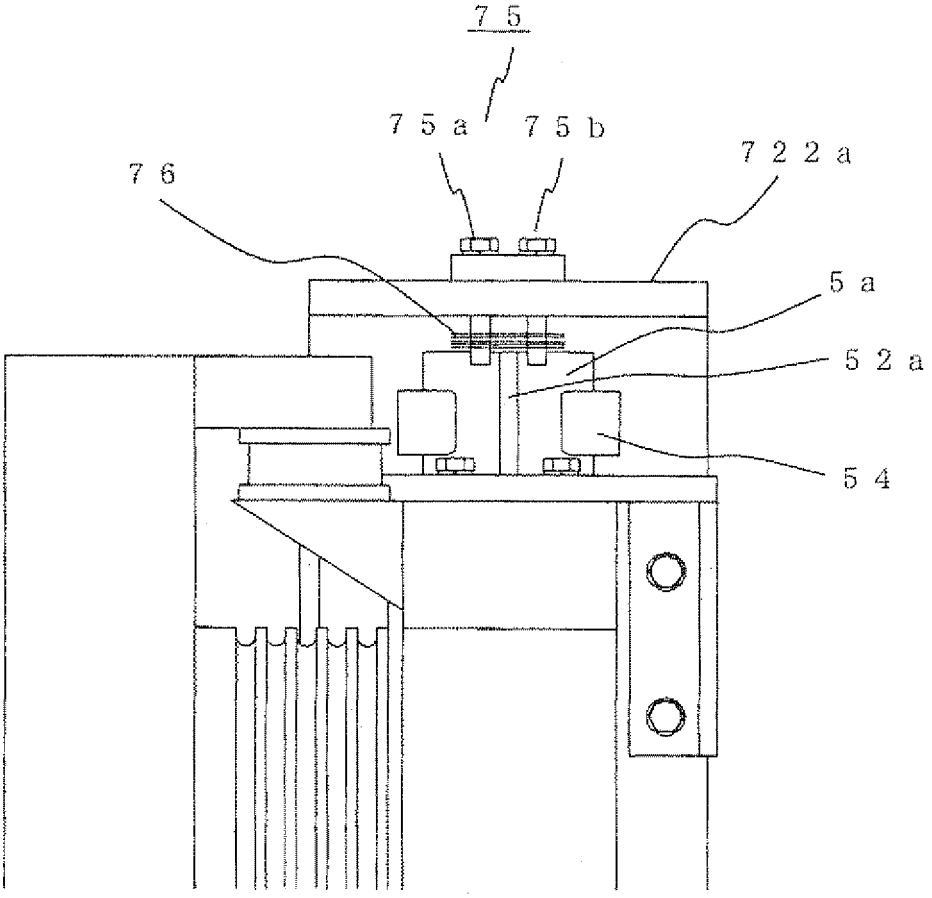


FIG. 16

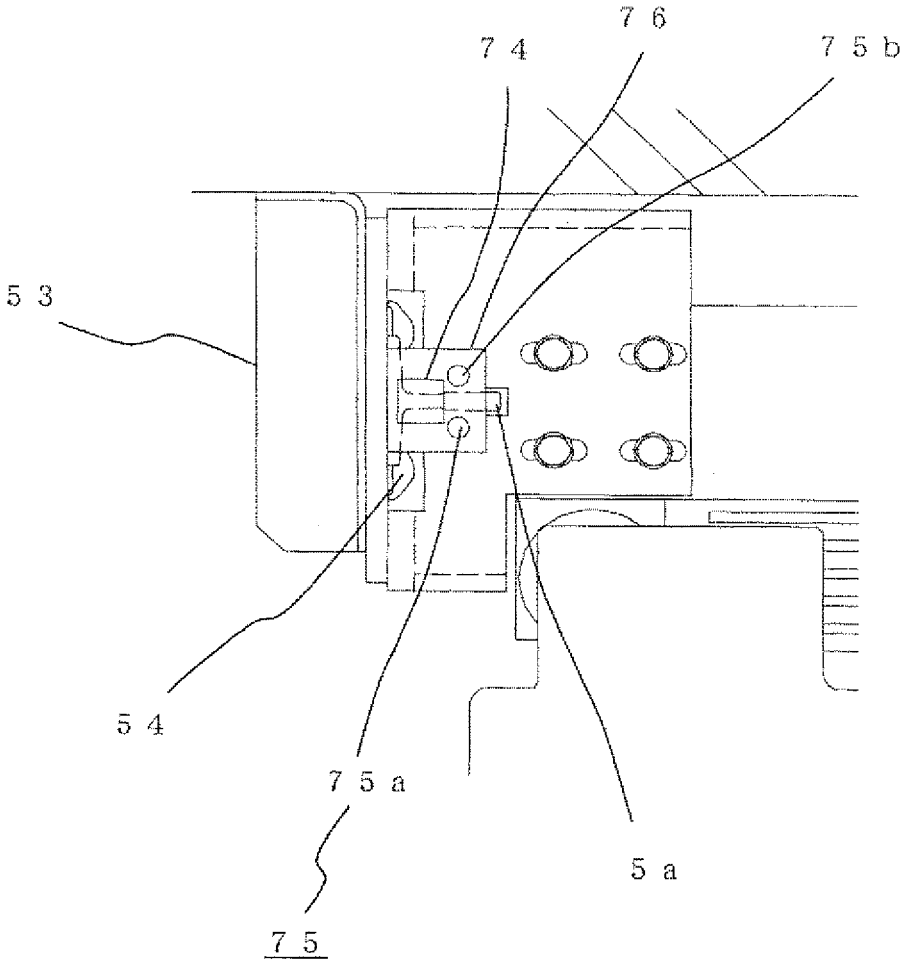


FIG. 17

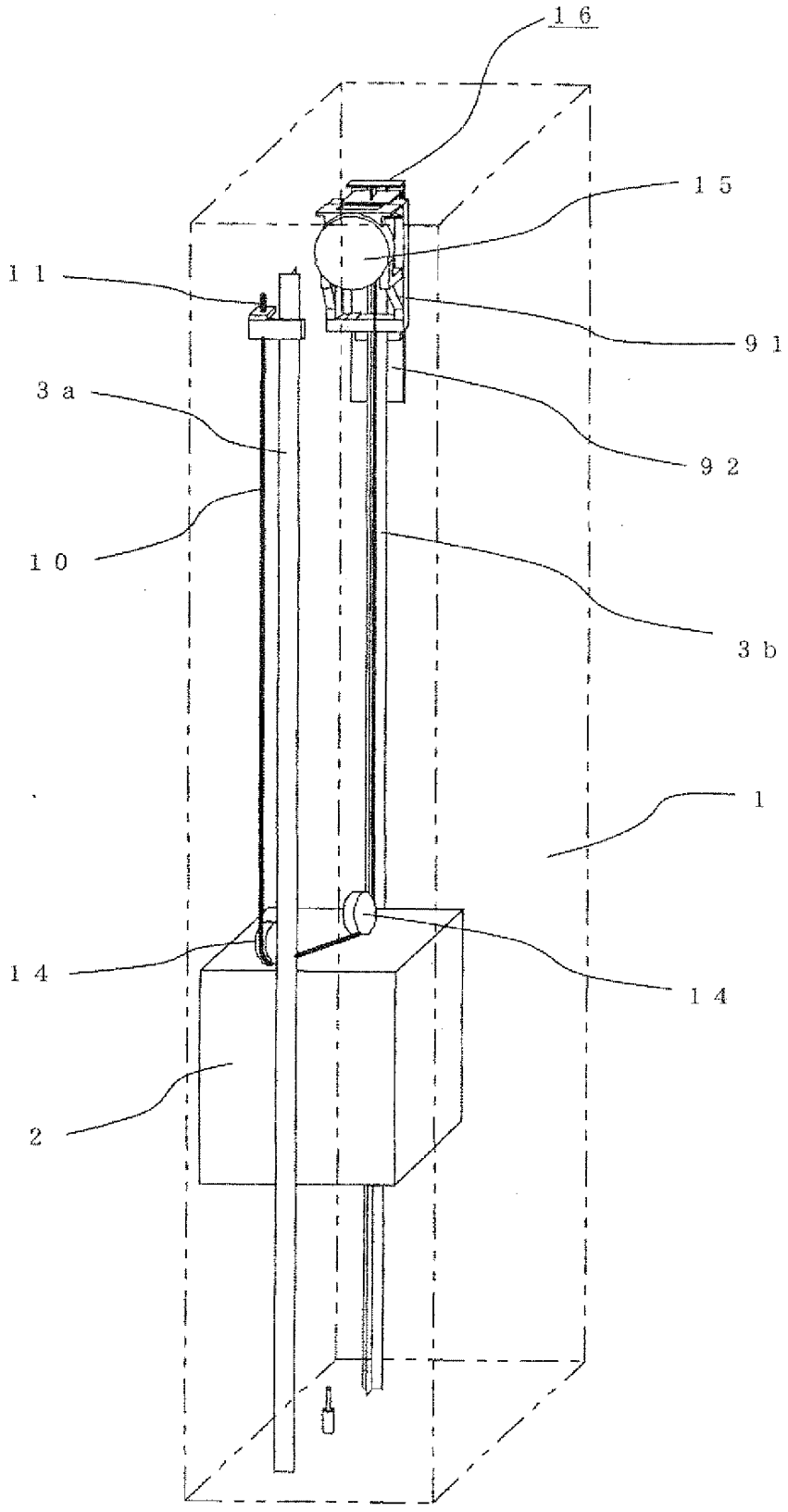
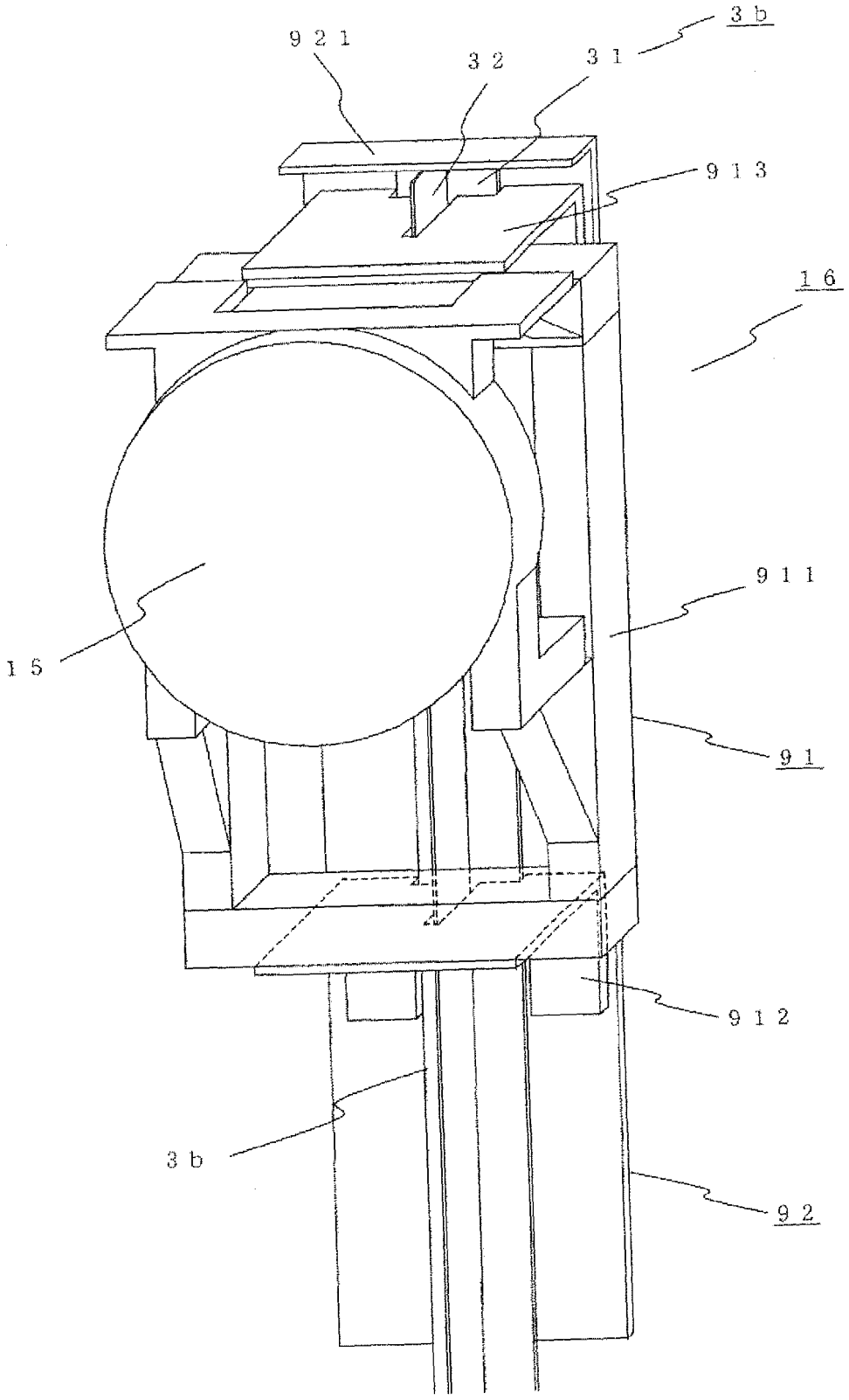


FIG. 18



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/319406

A. CLASSIFICATION OF SUBJECT MATTER
B66B11/04(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)
B66B1/00-B66B20/00

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 1996-2007
Kokai Jitsuyo Shinan Koho 1971-2007 Toroku Jitsuyo Shinan Koho 1994-2007

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.
Y	WO 2002/079068 A1 (Mitsubishi Electric Corp.), 10 October, 2002 (10.10.02), & EP 1380530 A1	1-11,14-15
Y A	JP 2001-247279 A (Hitachi, Ltd.), 11 September, 2001 (11.09.01), (Family: none)	1-11,14-15 12-13
Y	WO 2002/079067 A1 (Mitsubishi Electric Corp.), 10 October, 2002 (10.10.02), & EP 1405812 A1	4-5,15
A	JP 11-139730 A (Toshiba Corp.), 25 May, 1999 (25.05.99), & EP 0905081 A2 & CN 1212948 A	1-15

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

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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
12 June, 2007 (12.06.07)	26 June, 2007 (26.06.07)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 02079068 A **[0004]**