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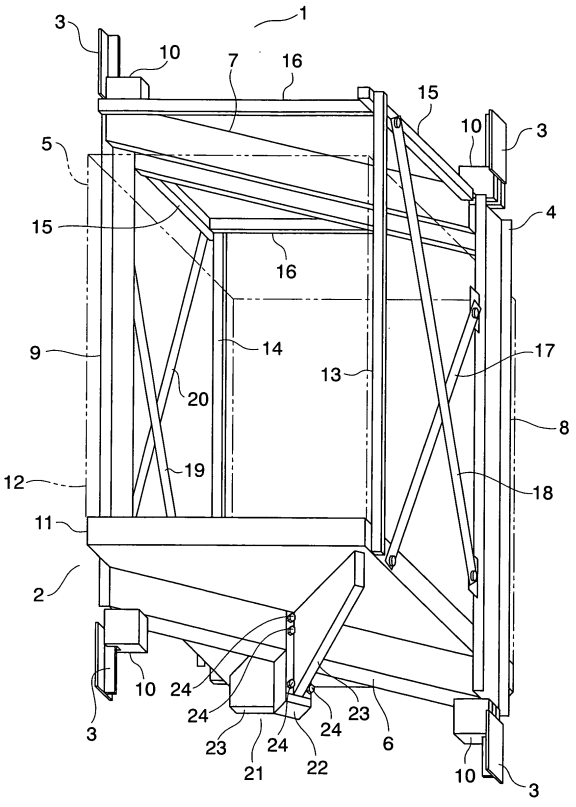
(54) ELAVATOR CAR

(57) A car frame has a lower frame extending horizontally, an upper frame disposed above the lower frame, and a pair of longitudinal frames extending vertically to joint ends of the lower frame to ends of the upper frame, respectively. A car floor is laid on the lower frame. A pair of longitudinal pillars, which are disposed so as to interpose therebetween a plane including the longitudinal frames, are fixed at lower ends thereof to edges of the car floor, respectively. A plurality oflateralmembersare fixed between upper ends of the longitudinal frames and upper ends of the longitudinal pillars, respectively. A support device for receiving a load of the car floor is provided to the lower frame at an intermediate portion thereof. The support device has a pair of support bodies disposed along an intersectional direction intersecting with a length direction of the lower frame while interposing the lower frame therebetween. A first diagonal member and a second diagonal member are each disposed at least either between one of the longitudinal frames and one of the longitudinal pillars or between the other longitudinal frame and the other longitudinal pillar. The first diagonal member is connected at one end thereof to a corresponding one of the longitudinal frames, and at the other end thereof to a corresponding one of the edges of the car floor. The second diagonal member is connected at one end thereof to the longitudinal frame, and at the other end thereof to a corresponding one of the lateral members.

FIG. 1



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Description

Technical Field

[0001] The present invention relates to a car for an elevator which is raised/lowered within a hoistway.

Background Art

[0002] Conventionally, there is proposed a car for an elevator structured such that support members are fixed to a lower frame on which a car floor is laid, with a view to supporting a biased load applied to the car floor. Each of the support members is provided to the lower frame on both sides of a longitudinal center thereof. Each of the support members is fixed at one end thereof to a region of the car floor which is separate from the lower frame, and at the other end thereof to the lower frame (see Patent Document 1).

[0003] Patent Document 1: JP 2000-191255 A

Disclosure of the Invention

Problem to be solved by the Invention

[0004] However, a large proportion of the biased load received by the car floor concentrates on lateral frames of a car frame as a bending force via the support members and the lower frame, so the lateral frames need to be reinforced. Accordingly, the lateral frames are increased in size.

[0005] The present invention has been made to solve the above-mentioned problem, and it is therefore an object of the present invention to provide a car for an elevator which makes it possible to easily support a biased load received by a car floor with a simple construction.

Means for solving the Problem

[0006] A car for an elevator according to the present invention includes: a car frame having a lower frame extending horizontally, an upper frame disposed above the lower frame, and a pair of longitudinal frames extending vertically to joint ends of the lower frame to ends of the upper frame, respectively; a car floor disposed between the longitudinal frames and laid on the lower frame; a pair of longitudinal pillars disposed so as to interpose therebetween a plane including the longitudinal frames, having lower ends fixed to edges of the car floor, respectively, and extending vertically; a plurality of lateral members fixed between upper ends of the longitudinal frames and upper ends of the longitudinal pillars, respectively; a support device having a pair of support bodies provided to the lower frame at an intermediate portion thereof while interposing the lower frame therebetween and disposed along an intersectional direction intersecting with a length direction of the lower frame, for receiving a load of the car floor; a first diagonal member disposed at least either between one of the longitudinal frames and one of the longitudinal pillars or between the other longitudinal frame and the other longitudinal pillar, and connected at one end thereof to a corresponding one of the longitudinal frames and at the other end thereof to a corresponding one of the edges of the car floor; and a second diagonal member disposed at least either between the one of the longitudinal frames and the one of the longitudinal pillars or between the other longitudinal frame and the other longitudinal pillar, and connected at one end thereof to a corresponding one of the longitudinal frames and at the other end thereof to a corresponding one of the lateral members.

Brief Description of the Drawings

[0007] Fig. 1 is a perspective view showing a car for an elevator according to Embodiment 1 of the present invention.

Fig. 2 is a sectional view showing the car floor of Fig. 1 and the support device of Fig. 1.

Fig. 3 is a sectional view showing the car floor, the support device, and a car floor level adjusting device, with which the car for an elevator according to Embodiment 2 of the present invention is provided.

Fig. 4 is an exploded perspective view showing the car floor leveling adjustment device of Fig. 3.

Fig. 5 is an enlarged view showing the car floor leveling adjustment device of Fig. 3.

Fig. 6 is an enlarged view showing the car floor leveling adjustment device when the cylinder portion of Fig. 5 is rotated counterclockwise.

Fig. 7 is an enlarged view showing the car floor leveling adjustment device when the cylinder portion of Fig. 5 is rotated clockwise.

Fig. 8 is a sectional view showing the car floor, the support device, and a car floor leveling adjustment device, with which the car for an elevator according to Embodiment 3 of the present invention is provided.

Fig. 9 is an exploded perspective view showing the car floor leveling adjustment device of Fig. 8.

Fig. 10 is an enlarged view showing the car floor leveling adjustment device of Fig. 8.

Fig. 11 is an enlarged view showing the car floor leveling adjustment device when the cylinder portion of Fig. 10 is rotated counterclockwise.

Fig. 12 is an enlarged view showing the car floor leveling adjustment device when the cylinder portion of Fig. 10 is rotated clockwise.

Fig. 13 is a perspective view showing a car for an elevator according to Embodiment 4 of the present invention.

Fig. 14 is a front view showing a support device with which a car for an elevator according to Embodiment 5 of the present invention is provided.

Fig. 15 is a lateral view showing the support device of Fig. 14.

Fig. 16 is a front view showing the support device when the block is displaced in such a direction as to widen the clearance between the pin and the block shown in Fig. 14.

Fig. 17 is a perspective view showing a car for an elevator according to Embodiment 6 of the present invention.

Fig. 18 is a perspective view showing a car for an elevator according to Embodiment 7 of the present invention.

Fig. 19 is a perspective view showing a car for an elevator according to Embodiment 8 of the present invention.

Best Modes for carrying out the Invention

[0008] Preferred embodiments of the present invention will be described hereinafter with reference to the drawings.

Embodiment 1

[0009] Fig. 1 is a perspective view showing a car for an elevator according to Embodiment 1 of the present invention. It should be noted that Fig. 1 is a perspective view showing the car viewed from a point located diagonally below. Referring to Fig. 1, a car 2 for an elevator is suspended within a hoistway 1 by a plurality of main ropes (not shown). The main ropes are moved due to a driving force of a hoisting machine (not shown) provided within the hoistway 1. Owing to the movement of the main ropes, the car 2 is raised/lowered within the hoistway 1 along a pair of car guide rails 3 installed within the hoistway 1.

[0010] The car 2 has a car frame 4, and a car chamber 5 disposed within the car frame 4. The car frame 4 has a lower frame 6 extending horizontally, an upper frame 7 disposed above the lower frame 6, and a pair of longitudinal frames 8 and 9 extending vertically to joint ends of the lower frame 6 to ends of the upper frame 7. A plurality of guide shoes 10, which are guided by each of the car guide rails 3, are provided at both ends of the lower frame 6 and both ends of the upper frame 7. Note that the main ropes are connected to the upper frame 7.

[0011] The car chamber 5 has a car floor 11 laid on the lower frame 6, and a car chamber body 12 provided on the car floor 11. The car chamber body 12 is provided with a car doorway (not shown).

[0012] The car floor 11 is disposed horizontally between the respective longitudinal frames 8 and 9. In this example, the car floor 11 is a rectangular plate member. Accordingly, edges of the car floor 11 are composed of a pair of longitudinal edges extending parallel to each other, and a pair of lateral edges extending perpendicularly to the respective longitudinal edges and parallel to each other. The car floor 11 is disposed such that the respective longitudinal edges extend perpendicularly to a width direction of the car chamber 5 (direction of a frontage of the car doorway or horizontal direction of Fig. 1), and that the respective lateral edges extend perpendicularly to a depth direction of the car chamber 5. In this example, the car floor 11 has four corner portions. While two of those corner portions which are located diagonally to each other are referred to as first corner portions, the other two corner portions are referred to as second corner portions.

[0013] The longitudinal frame 8 is opposed to one of the longitudinal edges, and the longitudinal frame 9 is opposed to the other longitudinal edge. Each of the longitudinal frames 8 and 9 is disposed at a position shifted inward in the depth direction of the car chamber 5 from a corresponding one of the first corner portions by a dimension equal to or smaller than a quarter of a depth dimension of the car chamber 5. Accordingly, the lower frame 6 is inclined in the depth direction of the car chamber 5 with respect to the width direction of the car chamber 5. A plane including each of the longitudinal frames 8 and 9 is inclined with respect to a plane including the car doorway.

[0014] A pair of longitudinal pillars 13 and 14 extending vertically are fixed at each lower end thereof to the edge of the car floor 11. The longitudinal pillars 13 and 14 are disposed so as to interpose therebetween the plane including the longitudinal frames 8 and 9, respectively. In this example, each of the longitudinal pillars 13 and 14 is fixed to the longitudinal edge at the second corner portion.

[0015] A pair of depth-direction lateral members 15 extending in the depth direction of the car chamber 5, and a pair of width-direction lateral members 16 extending in the width direction of the car chamber 5 are fixed between upper ends of the longitudinal frames 8 and 9 and upper ends of the longitudinal pillars 13 and 14, respectively.

[0016] There are disposed between one of the longitudinal frames 8 and one of the longitudinal pillars 13 a first diagonal member 17 connected at one end thereof to the longitudinal frame 8 and at the other end thereof to the longitudinal edge of the car floor 11, and a second diagonal member 18 connected at one end thereof to the longitudinal frame 8 and at the other end thereof to one of the depth-direction lateral members 15.

[0017] The first diagonal member 17 is connected at the above-mentioned one end thereof to an upper portion of the longitudinal frame 8. The second diagonal member 18 is connected at the above-mentioned one end thereof to a lower portion of the longitudinal frame 8. That is, the above-mentioned one end of the second diagonal member 18 is located below the above-mentioned one end of the first diagonal member 17. The first diagonal member 17 is connected at the other end thereof to that region of the longitudinal edge which is closer to the longitudinal pillar 13 with respect to the longitudinal frame 8. The second diagonal member 18 is connected at the other end thereof to that region of the above-mentioned one of the depth-direction lateral members 15 which is closer to the longitudinal pillar 13 with respect to the longitudinal frame

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[0018] There are disposed between the other longitudinal frame 9 and the other longitudinal pillar 14 a first diagonal member 19 connected at one end thereof to the longitudinal frame 9 and at the other end thereof to the longitudinal edge of the car floor 11, and a second diagonal member 20 connected at one end thereof to the longitudinal frame 9 and at the other end thereof to the other depth-direction lateral member 15.

[0019] The first diagonal member 19 is connected at the above-mentioned one end thereof to an upper portion of the longitudinal frame 9. The second diagonal member 20 is connected at the above-mentioned one end thereof to a lower portion of the longitudinal frame 9. That is, the above-mentioned one end of the second diagonal member 20 is located below the above-mentioned one end of the first diagonal member 19. The first diagonal member 19 is connected at the other end thereof to that region of the longitudinal edge which is closer to the longitudinal pillar 14 with respect to the longitudinal frame 9. The second diagonal member 20 is connected at the other end thereof to that region of the other depth-direction lateral member 15 which is closer to the longitudinal pillar 14 with respect to the longitudinal frame 9.

[0020] A support device 21 for receiving a load of the car floor 11 is provided to the lower frame 6 at an intermediate portion thereof. The support device 21 has a protrusion member 22 protruding downward from the lower frame 6, and a pair of support members (support bodies) 23 fixed to the lower frame 6 and the protrusion member 22 while interposing the lower frame 6 therebetween.

[0021] Each of the support members 23 is disposed along a direction intersecting with a length direction of the lower frame 6 (intersectional direction). In this example, each of the support members 23 is disposed on a line connecting a corresponding one of the second corner portions of the car floor 11 to a center portion of the lower frame 6.

[0022] Each of the support members 23 has a larger vertical dimension on the lower frame 6 side than on the second corner portion side. That is, each of the support members 23 is a trapezoidal plate member formed such that the vertical dimension thereof decreases as the distance from the lower frame 6 increases.

[0023] Each of the support members 23 is fixed to the lower frame 6 and the protrusion member 22 by a plurality of screws 24 disposed vertically apart from one another.

[0024] Fig. 2 is a sectional view showing the car floor 11 of Fig. 1 and the support device 21 of Fig. 1. Referring to Fig. 2, a car floor leveling adjustment device 25 for making an adjustment to level the car floor 11 is provided between the car floor 11 and one of the support members 23. In this example, the car floor leveling adjustment device 25 is provided at a distal tip of the support member 23 with respect to the lower frame 6.

[0025] The car floor leveling adjustment device 25 has a fixed portion 26 fixed horizontally to the support member 23, an adjusting bolt 27 screwed into a screw hole of the fixed portion 26 to be passed through the fixed portion 26 perpendicularly thereto, and a locking nut 28 for holding the adjusting bolt 27 in position with respect to the fixed portion 26.

[0026] One of the second corner portions of the car floor 11 is laid on the adjusting bolt 27. In this example, the adjusting bolt 27 abuts against a lower surface of the car floor 11. The vertical position of the adjusting bolt 27 with respect to the fixed portion 26 can be adjusted by adjusting an amount by which the adjusting bolt 27 is screwed into the screw hole of the fixed portion 26. Accordingly, the inclination of the car floor 11 with respect to the support member 23 is adjusted by adjusting the amount by which the adjusting bolt 27 is screwed into the screw hole of the fixed portion 26. As a result, the car floor 11 is adjusted to be leveled.

[0027] The car floor 11 and the support member 23 are also provided with a positioning device 29 for holding the car floor 11 in position with respect to the support member 23. The positioning device 29 has a fixation bracket 30 fixed to the lower surface of the car floor 11, and a fastening attachment bolt 31 for attaching the fixation bracket 30 to the support member 23 through fastening.

[0028] The fixation bracket 30 is disposed along a lateral surface of the support member 23. A long hole 32 is provided vertically through the fixation bracket 30. The fixation bracket 30 is fastened to the support member 23 by the fastening attachment bolt 31 passed through the long hole 32. The fixation bracket 30 is held in position with respect to the support member 23 by attaching the fastening attachment bolt 31 to the support member 23 through fastening. The fixation bracket 30 can be displaced along the long hole 32 with respect to the support member 23 by loosening the fastening attachment bolt 31.

[0029] Next, the procedure of leveling the car floor 11 will be described. First of all, the fastening attachment bolt 31 and the locking nut 28 are loosened. After that, the amount by which the adjusting bolt 27 is screwed is adjusted to level the car floor 11. After that, the locking nut 28 is tightened to hold the adjusting bolt 27 in position with respect to the fixed portion 26. After that, the fastening attachment bolt 31 is tightened to hold the fixation bracket 30 in position with respect to the support member 23.

[0030] In the car for the elevator constructed as described above, the support device 21 for receiving a load of the car floor 11 is provided at the intermediate portion of the lower frame 6 on which the car floor 11 is laid, the first diagonal member 17 is connected to the longitudinal frame 8 and the edge of the car floor 11, and the second diagonal member 18 is connected to the longitudinal frame 8 and the depth-direction lateral member 15. Therefore, even in a case where, for example, the load concentrates on one of the second corner portions of the car floor 11 and hence the car floor 11 receives a biased

load, the biased load can be dispersed, so the bending stress applied to each of the longitudinal frames 8 and 9 can be reduced.

[0031] That is, for example, when the load concentrates on one of the second corner portions and hence the car floor 11 receives a biased load, a part of the biased load is transmitted to one of the longitudinal frames 8 via a truss structure composed of the first diagonal member 17, which is located close to the one of the second corner portions that has received the biased load, and the longitudinal edge of the car floor 11, and a part of the rest of the biased load is transmitted from one of the support members 23 to the lower frame 6, the other support member 23, and the other longitudinal pillar 14 in this order and then to the other longitudinal frame 9 via a truss structure composed of the other depth-direction lateral member 15 and the other second diagonal member 20. The loads transmitted to the longitudinal frames 8 and 9 are supported by the car guide rails 3 via the guide shoes 10. Accordingly, a part of the biased load received by the car floor 11 can be transmitted to each of the longitudinal frames 8 and 9 via the truss structure, so the bending stress applied to each of the longitudinal frames 8 and 9 can be reduced.

[0032] Thus, there is no need to reinforce the car floor 11, the longitudinal frames 8 and 9, and the lower frame 6, so the cost of material and the weight of the car 2 can be prevented from increasing. Accordingly, the components such as the car guide rails 3, the main ropes, and the hoisting machine can be designed according to standard specifications, so the biased load received by the car floor 11 can be easily supported with a simple construction.

[0033] With the above-mentioned structure, even when the car floor 11 receives a biased load, the bending force applied to the car floor 11 or the tensile force applied to the car floor 11 can be reduced. Therefore, the degree of freedom of the structure of the car floor 11 can be enhanced. For example, the car floor 11 can be structured with vibration-proof materials incorporated therein, so riding comfort of passengers within the car 2 can be prevented from deteriorating. In this case, the car floor 11 is composed of a rectangular floor support frame laid on the lower frame 6, a vibration-proof material disposed at each of four corners of the floor support frame, and a floor member laid on each of the vibration-proof materials. The support members 23, the first diagonal member 17, and the longitudinal pillars 13 and 14 are connected to the floor support frame.

[0034] The support members 23 are fixed to the lower frame 6 by the plurality of the screws 24 disposed vertically apart from one another, so fixing strength of each of the support members 23 with respect to the lower frame 6 in the vertical direction can be increased. Accordingly, even when the car floor 11 receives a biased load, the car floor 11 can further be prevented from bending sharply.

[0035] Further, the car floor leveling adjustment device 25 for making an adjustment to level the car floor 11 is provided between each of the support members 23 and the car floor 11. Therefore, even when the car floor 11 inclines for some reason, an adjustment can be made to level the car floor 11.

[0036] Further, the car floor leveling adjustment device 25 has the adjusting bolt 27 on which the car floor 11 is laid, and the car floor 11 is adjusted to be leveled through a positional adjustment of the adjusting bolt 27 with respect to each of the support members 23 in the vertical direction. Therefore, the car floor 11 can be adjusted to be leveled with a simple construction.

Embodiment 2

[0037] Fig. 3 is a sectional view showing the car floor 11, the support device 21, and a car floor level adjusting device, with which the car 2 for an elevator according to Embodiment 2 of the present invention is provided. Further, Fig. 4 is an exploded perspective view showing the car floor leveling adjustment device of Fig. 3. Referring to Figs. 3 and 4, a car floor leveling adjustment device 41 for making an adjustment to level the car floor 11 is provided between the car floor 11 and each of the support members 23. The car floor leveling adjustment device 41 has a car floor fixation member 42 fixed to the car floor 11, and an adjusting bolt 43 and a fastening nut 44 for attaching the car floor fixation member 42 to the support member 23 through fastening.

[0038] The adjusting bolt 43 has a rod-shaped passage portion 46, a head portion 47, and a cylinder portion 48. The passage portion 46 is passed through a bolt passage hole 45 provided through the support member 23. The head portion 47 is provided at one end of the passage portion 46. The cylinder portion 48 is disposed adjacent to the head portion 47 in an axial direction of the passage portion 46, fixed to the passage portion 46, and decentered with respect to the axis of the passage portion 46. Accordingly, the central axes of the cylinder portion 48 and the passage portion 46 are different from each other and parallel to each other. The fastening nut 44 is screwed onto the passage portion 46.

[0039] The car floor fixation member 42 is disposed along a lateral surface of the support member 23. A through-hole 49 through which the passage portion 46 is loosely passed is provided through the car floor fixation member 42. The through-hole 49 is larger in inner diameter than the bolt passage hole 45. The car floor fixation member 42 is provided with a cylindrical fitting portion (recess portion) 50 into which the cylinder portion 48 is fitted. The fitting portion 50 is larger in inner diameter than the through-hole 49. The fitting portion 50 is provided in the car floor fixation member 42 coaxially with the through-hole 49. Accordingly, due to rotation of the cylinder portion 48 fitted in the fitting portion 50 in a circumferential direction, the passage portion 46 passed through the through-hole 49 is moved on a circumference within the through-hole 49.

[0040] The car floor fixation member 42 is attached to the support member 23 through fastening by the passage portion 46, which has been passed through the through-hole 49 and the bolt passage hole 45 in this order, and the fastening nut 44, which has been screwed on a tip of the passage portion 46. The position of the car floor fixation member 42 with respect to the support member 23 in the vertical direction is adjusted by adjusting an angle of the cylinder portion 48 fitted in the fitting portion 50 in the circumferential direction. Accordingly, the car floor 11 can be adjusted to be leveled through a positional adjustment of the car floor fixation member 42 with respect to the support member 23. Embodiment 2 of the present invention is identical to Embodiment 1 of the present invention in other constructional details.

[0041] Next, the procedure followed in leveling the car floor 11 will be described. Fig. 5 is an enlarged view showing the car floor leveling adjustment device 41 of Fig. 3. Further, Fig. 6 is an enlarged view showing the car floor leveling adjustment device 41 when the cylinder portion 48 of Fig. 5 is rotated counterclockwise. Still further, Fig. 7 is an enlarged view showing the car floor leveling adjustment device 41 when the cylinder portion 48 of Fig. 5 is rotated clockwise. First of all, the adjusting bolt 43 and the fastening nut 44 are loosened. After that, while the cylinder portion 48 fitted in the fitting portion 50 is turned, the angle of the cylinder portion 48 is adjusted to level the car floor 11. In this case, when the cylinder portion 48 is turned counterclockwise, the clearance between the car floor 11 and the support member 23 is narrowed, so the lower surface of the car floor 11 is displaced downward from a reference position A (Fig. 6). On the other hand, when the cylinder portion 48 is turned clockwise, the clearance between the car floor 11 and the support member 23 is widened, so the lower surface of the car floor 11 is displaced upward from the reference position A (Fig. 7).

[0042] After that, with the car floor 11 leveled, the fastening nut 44 is tightened to hold the car floor fixation member 42 in position with respect to the support member 23.

[0043] In the car for the elevator constructed as described above, the adjusting bolt 43 is provided with the cylinder portion 48 decentered with respect to the axis of the adjusting bolt 43, the car floor fixation member 42 is provided with the fitting portion 50 into which the cylinder portion 48 is fitted, and the car floor 11 is adjusted to be leveled through an adjustment of the angle of the cylinder portion 48. Therefore, the car floor 11 can be easily adjusted to be leveled. Further, the car floor 11 can be held in position with respect to the support member 23 by tightening the adjusting bolt 43 and the fastening nut 44. Therefore, there is no need to separately provide a positioning device for holding the car floor 11 in position, so a structural simplification can be achieved.

Embodiment 3

[0044] Fig. 8 is a sectional view showing the car floor 11, the support device 21, and a car floor leveling adjustment device, with which the car 2 for an elevator according to Embodiment 3 of the present invention is provided. Fig. 9 is an exploded perspective view showing the car floor leveling adjustment device of Fig. 8. Referring to Figs. 8 and 9, a car floor leveling adjustment device 61 for making an adjustment to level the car floor 11 is provided between the car floor 11 and each of the support members 23. The car floor leveling adjustment device 61 has a car floor fixation member 62 fixed to the car floor 11, and a fastening bolt 63 and an adjusting nut 64 for attaching the car floor fixation member 62 to the support member 23 through fastening.

[0045] The fastening bolt 63 has a rod-shaped passage portion 66 passed through a bolt passage hole 65 provided through the support member 23, and a head portion 67 provided at one end of the passage portion 66.

[0046] A cylinder portion 68 is fixed to the adjusting nut 64. A screw hole 69 into which the passage portion 66 is screwed penetrates the adjusting nut 64 and the cylinder portion 68. The cylinder portion 68 is decentered with respect to the axis of the screw hole 69. That is, the central axes of the cylinder portion 68 and the screw hole 69 are different from each other and parallel to each other.

[0047] The car floor fixation member 62 is disposed along a lateral surface of the support member 23. The car floor fixation member 62 is provided with a cylindrical fitting portion 70 into which the cylinder portion 68 fixed to the adjusting nut 64 is fitted. The fitting portion 70 penetrates the car floor fixation member 62. The fitting portion 70 is larger in inner diameter than the bolt passage hole 65. Due to rotation of the cylinder portion 68 fitted in the fitting portion 70, the screw hole 69 is moved on a circumference within the fitting portion 70.

[0048] The passage portion 66 passed through the bolt passage hole 65 is screwed into the adjusting nut 64 to which the cylinder portion 68 fitted in the fitting portion 70 is fixed. The car floor fixation member 62 is attached to the support member 23 through fastening by the passage portion 66 passed through the bolt passage hole 65 and the adjusting nut 64 screwed on the passage portion 66. The position of the car floor fixation member 62 with respect to the support member 23 in the vertical direction is adjusted by adjusting an angle of the cylinder portion 68 fitted in the fitting portion 70 in a circumferential direction. Accordingly, the car floor 11 can be adjusted to be leveled through a positional adjustment of the car floor fixation portion 62 with respect to the support member 23. Embodiment 3 of the present invention is identical to Embodiment 1 of the present invention in other constructional details.

[0049] Next, the procedure followed in making an adjustment to level the car floor 11 will be described. Fig. 10 is an enlarged view showing the car floor leveling ad-

justment device 61 of Fig. 8. Further, Fig. 11 is an enlarged view showing the car floor leveling adjustment device 61 when the cylinder portion 68 of Fig. 10 is rotated counterclockwise. Still further, Fig. 12 is an enlarged view showing the car floor leveling adjustment device 61 when the cylinder portion 68 of Fig. 10 is rotated clockwise. First of all, the fastening bolt 63 and the adjusting nut 64 are loosened. After that, while the adjusting nut 64 is turned, the angle of the cylinder portion 68 fitted in the fitting portion 70 is adjusted to level the car floor 11. In this case, when the adjusting nut 64 is turned counterclockwise, the clearance between the car floor 11 and the support member 23 is narrowed, so a back surface of the car floor 11 is displaced downward from the reference position A (Fig. 11). On the other hand, when the adjusting nut 64 is turned clockwise, the clearance between the car floor 11 and the support member 23 is widened, so the back surface of the car floor 11 is displaced upward from the reference position A (Fig. 12).

[0050] After that, with the car floor 11 leveled, the fastening bolt 63 is turned to tighten the fastening bolt 63 and the adjusting nut 64, so the car floor fixation member 62 is held in position with respect to the support member 23.

[0051] By providing the adjusting nut 64 with the cylinder portion 68 and providing the car floor fixation member 62 with the fitting portion 70 into which the cylinder portion 68 is fitted as described above as well, the position of the car floor fixation member 62 with respect to the support member 23 in the vertical direction can be adjusted, so the car floor 11 can be easily adjusted to be leveled. Further, by tightening the fastening bolt 63 and the adjusting bolt 64, the car floor 11 can be held in position with respect to the support member 23. Therefore, there is no need to separately provide a positioning device for holding the car floor 11 in position, so a structural simplification can be achieved.

Embodiment 4

[0052] Fig. 13 is a perspective view showing a car for an elevator according to Embodiment 4 of the present invention. Referring to Fig. 13, a support device 81 for receiving a load of the car floor 11 is provided to the lower frame 6 at the intermediate portion thereof. The support device 81 has a protrusion member 82 protruding downward from the lower frame 6, and a pair of support bodies 83 fixed to the lower frame 6 and the protrusion member 82 while interposing the lower frame 6 therebetween.

[0053] Each of the support bodies 83 is disposed along the direction intersecting with the length direction of the lower frame 6 (intersectional direction). In this example, each of the support bodies 83 is disposed on the line connecting a corresponding one of the second corner portions of the car floor 11 to the center portion of the lower frame 6.

[0054] Each of the support bodies 83 has a rod-shaped horizontal member 84 fixed to the lower frame 6 and disposed horizontally along the intersectional direction, and a rod-shaped inclined member 85 coupling a lower end of the protrusion member 82 to a tip of the horizontal member 84. The horizontal member 84 and the inclined member 85 are fixed at each end thereof to a common connection member 86. Accordingly, when the connection member 86 receives a downward force, the horizontal member 84 and the inclined member 85 receive a tensile force and a compressive force, respectively.

[0055] A car floor leveling adjustment device constructed in the same manner as the car floor leveling adjustment device 25 of Embodiment 1 of the present invention is provided between each connection member 86 and the car floor 11 so that the car floor 11 can be adjusted to be leveled. Embodiment 4 of the present invention is identical to Embodiment 1 of the present invention in other constructional details.

[0056] In the car 2 for the elevator constructed as described above, the support members 83, each of which has the horizontal member 84 fixed to the lower frame 6 and the inclined member 85 coupling the lower end of the protrusion member 82 protruding downward from the lower frame 6 to the tip of the horizontal member 84, receive the load of the car floor 11. Therefore, the amount of a material for the support bodies 83 can be efficiently reduced by saving the material only for those regions of the support bodies 83 which effectively contribute to the strength thereof in the vertical direction. Thus, the cost of manufacturing the support device 81 can be reduced, and the weight of the car 2 can also be reduced.

[0057] In the foregoing example, the car floor leveling adjustment device constructed in the same manner as the car floor leveling adjustment device 25 of Embodiment 1 of the present invention is provided between each connection member 86 and the car floor 11 so that the car floor 11 can be adjusted to be leveled. However, a car floor leveling adjustment device constructed in the same manner as the respective car floor leveling adjustment device 41 or 61 of Embodiment 2 or 3 of the present invention may be provided between each connection member 86 and the car floor 11.

Embodiment 5

[0058] Fig. 14 is a front view showing a support device with which a car for an elevator according to Embodiment 5 of the present invention is provided. Fig. 15 is a lateral view showing the support device of Fig. 14. Referring to Figs. 14 and 15, a support device 91 for receiving a load of the car floor 11 is provided to the lower frame 6 at the intermediate portion thereof. The support device 91 has a protrusion member 92 protruding downward from the lower frame 6, and a pair of support bodies 93 provided to the lower frame 6 and the protrusion member 92 while interposing the lower frame 6 therebetween.

[0059] Each of the support bodies 93 are disposed along the direction intersecting with the length direction of the lower frame 6 (intersectional direction). In this ex-

ample, each of the support bodies 93 is disposed along the line connecting a corresponding one of the second corner portions of the car floor 11 to the center portion of the lower frame 6. A fixation bracket 94 disposed along each of the support bodies 93 is fixed to the lower surface of the car floor 11.

[0060] Each of the support bodies 93 has a horizontal member 96 turnable around a pin (turning shaft) 95 provided to the lower frame 6, and an inclined member 98 turnable around a pin (turning shaft) 97 provided at a lower end of the protrusion member 92.

[0061] The inclined member 98 is inclined with respect to the horizontal member 96. The inclined member 98 has an inclined member body 99, and a block 100 provided to the inclined member body 99 so as to be adjustable in position with respect thereto.

[0062] The inclined member body 99 has a column portion 101 mounted on the pin 97, and a screw stock 102 fixed to the column portion 101 and extending in a length direction thereof. The block 100 is provided to the screw stock 102.

[0063] The screw stock 102 is passed through a screw stock passage hole 103 provided through the block 100. Thus, the block 100 can be displaced along a length direction of the screw stock 102. A pair of positioning nuts 104 interposing the block 100 therebetween in the length direction of the screw stock 102 are screwed on the screw stock 102. The position of the block 100 with respect to the screw stock 102 is adjusted through a positional adjustment of each of the positioning nuts 104 with respect to the screw stock 102. A clearance L between the pin 97 and the block 100 is adjusted through a positional adjustment of the block 100 with respect to the screw stock 102.

[0064] A rod-shaped bolt portion 105 parallel to the pin 97 is fixed to the block 100. The bolt portion 105 is passed through a through-hole 106 provided through the horizontal member 96 at the other end thereof, and a through-hole 107 provided through the fixation bracket 94. A fastening nut 108 is screwed on the bolt portion 105 passed through each of the through-holes 106 and 107. The other end of the horizontal member 96 and the block 100 are connected to the fixation bracket 94 by tightening the fastening nut 108.

[0065] Fig. 16 is a front view showing the support device 91 when the block 100 is displaced in such a direction as to widen the clearance between the pin 97 and the block 100 shown in Fig. 14. As shown in Fig. 16, when the clearance between the pin 97 and the block 100 is widened from L to (L+ΔL) through a positional adjustment of the block 100 with respect to the screw stock 102, the horizontal distance of the fixation bracket 94 with respect to the pin 97 remains almost unchanged, so the fixation bracket 94 is displaced upward. Further, the horizontal member 96 is turned upward as the fixation bracket 94 is displaced upward. Thus, the car floor 11 is displaced upward.

[0066] On the other hand, when the position of the block 100 with respect to the screw stock 102 is adjusted in such a direction that the block 100 approaches the pin 97, the clearance between the pin 97 and the block 100 becomes narrower than L. Accordingly, the fixation bracket 94 is displaced downward, so the horizontal member 96 is turned downward. Thus, the car floor 11 is displaced downward. Embodiment 5 of the present invention is identical to Embodiment 1 of the present invention in other constructional details.

[0067] Next, the procedure followed in making an adjustment to level the car floor 11 will be described. First of all, the fastening nut 108 is loosened. Then, while each of the positioning nuts 104 is turned, the position of the block 100 with respect to the screw stock 102 is adjusted to level the car floor 11. After that, when the car floor 11 is leveled, each of the positioning nuts 104 is tightened to hold the block 100 in position with respect to the screw stock 102. After that, the fastening nut 108 is tightened to fix the block 100 and the horizontal member 96 to the fixation bracket 94.

[0068] In the car for the elevator constructed as described above, the block 100 connected to the fixation bracket 94 is provided to the inclined member body 99, and the car floor 11 is adjusted to be leveled through a positional adjustment of the block 100 with respect to the inclined member body 99. Therefore, the car floor 11 can be easily adjusted to be leveled. Further, the car floor 11 can also be held in position with respect to the support device 91. Therefore, there is no need to separately provide a positioning device for holding the car floor 11 in position, so a structural simplification can be achieved.

Embodiment 6

[0069] Fig. 17 is a perspective view showing a car for an elevator according to Embodiment 6 of the present invention. Referring to Fig. 17, the pair of the diagonal members 17 and 19 is connected between the edges of the car floor 11 and the longitudinal frames 8 and 9, respectively. One of the diagonal members 17 is connected at one end thereof to one of the longitudinal frames 8, and at the other end thereof to one of the longitudinal edges of the car floor 11. Further, the other diagonal member 19 is connected at one end thereof to the other longitudinal frame 9, and at the other end thereof to the other longitudinal edge of the car floor 11.

[0070] The above-mentioned one of the diagonal members 17 is connected at the above-mentioned one end thereof to the upper portion of the longitudinal frame 8. The diagonal member 17 is connected at the other end thereof to that region of the above-mentioned one of the longitudinal edges which is closer to the support member 23 with respect to the longitudinal frame 8. Further, the other diagonal member 19 is connected at the above-mentioned one end thereof to the upper portion of the longitudinal frame 9. The other diagonal member 19 is connected at the other end thereof to that region of the other longitudinal edge which is closer to the support

member 23 with respect to the longitudinal frame 9.

[0071] Note that the car 2 is not provided with each of the longitudinal pillars 13 and 14, each of the depth-direction lateral members 15, each of the width-direction lateral members 16, each of the second diagonal members 18 and 20, which are illustrated in each of the foregoing embodiments of the present invention. Embodiment 6 of the present invention is identical to Embodiment 1 of the present invention in other constructional details.

[0072] In the car for the elevator constructed as described above as well, when a load concentrates on, for example, one of the second corner portions of the car floor 11 and hence the car floor 11 receives a biased load, a part of the biased load can be transmitted to the longitudinal frame 8 via a truss structure composed of the diagonal member 17 which is closer to the second corner portion receiving the biased load and the longitudinal edge of the car floor 11. Thus, the biased load can be dispersed, so the bending stress applied to each of the longitudinal frames 8 and 9 can be reduced.

[0073] Thus, the reinforcement of the car floor 11, the respective longitudinal frames 8 and 9, and the lower frame 6 can be avoided, so the cost of material and the weight of the car 2 can be prevented from increasing. Accordingly, the components such as the car guide rails 3, the main ropes, and the hoisting machine can be designed according to standard specifications, so the biased load received by the car floor 11 can be easily supported with a simple construction.

Embodiment 7

[0074] Fig. 18 is a perspective view showing a car for an elevator according to Embodiment 7 of the present invention. Referring to Fig. 18, the support device 81 for receiving a load of the car floor 11 is provided to the lower frame 6 at the intermediate portion thereof. The support device 81 is constructed in the same manner as the support device 81 of Embodiment 4 of the present invention. Embodiment 7 of the present invention is identical to Embodiment 6 of the present invention in other constructional details.

[0075] In this manner, a biased load received by the car floor 11 can be easily supported with a simple construction, and the cost of manufacturing and the weight of the car 2 can also be reduced.

Embodiment 8

[0076] Fig. 19 is a perspective view showing a car for an elevator according to Embodiment 8 of the present invention. Referring to Fig. 19, a support device 111 for receiving a load of the car floor 11 is provided to the lower frame 6 at the intermediate portion thereof. The support device 111 has a protrusion member 112 protruding downward from the lower frame 6, and a pair of support bodies 113 provided to the lower frame 6 and the protrusion member 112 while interposing the lower frame 6 therebetween.

[0077] Each of the support bodies 113 has an inclined member 114 connected between the protrusion member 112 and the car floor 11. The inclined member 114 is inclined with respect to the car floor 11. The inclined member 114 is connected at one end thereof to a lower end of the protrusion member 112, and at the other end thereof to a connection member 115 fixed to the lower surface of the car floor 11. Embodiment 8 of the present invention is identical to Embodiment 6 of the present invention in other constructional details.

[0078] In the car for the elevator constructed as described above as well, a part of a biased load of the car floor 11 can be transmitted to one of the longitudinal frames 8 and 9 via a truss structure composed of a corresponding one of the diagonal members 17 and 19 and a corresponding one of the longitudinal edges of the car floor 11. Therefore, the bending stress applied to each of the longitudinal frames 8 and 9 can be reduced.

[0079] Note that in the foregoing example, the car 2 illustrated in Embodiment 6 of the present invention is provided with the support device 111. However, the car 2 illustrated in Embodiment 1 of the present invention may be provided with the support device 111.

Claims

1. A car for an elevator, comprising:

a car frame having a lower frame extending horizontally, an upper frame disposed above the lower frame, and a pair of longitudinal frames extending vertically to joint ends of the lower frame to ends of the upper frame, respectively;
a car floor disposed between the longitudinal frames and laid on the lower frame;
a pair of longitudinal pillars disposed so as to interpose therebetween a plane including the longitudinal frames, having lower ends fixed to edges of the car floor, respectively, and extending vertically;
a plurality of lateral members fixed between upper ends of the longitudinal frames and upper ends of the longitudinal pillars, respectively;
a support device having a pair of support bodies provided to the lower frame at an intermediate portion thereof while interposing the lower frame therebetween and disposed along an intersectional direction intersecting with a length direction of the lower frame, for receiving a load of the car floor;
a first diagonal member disposed at least either between one of the longitudinal frames and one of the longitudinal pillars or between the other longitudinal frame and the other longitudinal pillar, and connected at one end thereof to a corresponding one of the longitudinal frames and

at the other end thereof to a corresponding one of the edges of the car floor; and
a second diagonal member disposed at least either between the one of the longitudinal frames and the one of the longitudinal pillars or between the other longitudinal frame and the other longitudinal pillar, and connected at one end thereof to a corresponding one of the longitudinal frames and at the other end thereof to a corresponding one of the lateral members.

2. A car for an elevator, comprising:

a car frame having a lower frame extending horizontally, an upper frame disposed above the lower frame, and a pair of longitudinal frames extending vertically to joint ends of the lower frame to ends of the upper frame, respectively;
a car floor disposed between the longitudinal frames and laid on the lower frame;
a pair of support devices having a pair of support bodies provided to the lower frame at an intermediate portion thereof while interposing the lower frame therebetween and disposed along an intersectional direction intersecting with a length direction of the lower frame, for receiving a load of the car floor; and
a diagonal member connected at one end thereof to one of the longitudinal frames and at the other end thereof to a region of an edge of the car floor which is closer to a corresponding one of the support bodies with respect to the one of the longitudinal frames.

3. A car for an elevator according to Claim 1 or 2, wherein the support bodies are fixed to the lower frame by a plurality of screws disposed vertically apart from one another.

4. A car for an elevator according to Claim 1 or 2, wherein:

the lower frame is provided with a protrusion member protruding downward from the lower frame; and
the support bodies each have an inclined member inclined with respect to the car floor and connected between the protrusion member and the car floor.

5. A car for an elevator according to Claim 1 or 2, wherein:

the lower frame is provided with a protrusion member protruding downward from the lower frame; and
the support bodies each have a horizontal member extending from the lower frame in the intersectional direction, and an inclined member inclined with respect to the horizontal member and connected between the protrusion member and the horizontal member.

6. A car for an elevator according to Claim 1 or 2, wherein each of the support bodies and the car floor are provided therebetween with a car floor leveling adjustment device for making an adjustment to level the car floor.

7. A car for an elevator according to Claim 6, wherein:

the car floor leveling adjustment device has an adjusting bolt on which the car floor is laid; and
the car floor is adjusted to be leveled through a positional adjustment of the adjusting bolt with respect to each of the support bodies in a vertical direction.

8. A car for an elevator according to Claim 6, wherein:

the car floor leveling adjustment device has a car floor fixation member fixed to the car floor, an adjusting bolt mounted on each of the support bodies, and a nut screwed on the adjusting bolt;
the adjusting bolt is provided with a cylinder portion decentered with respect to an axis of the adjusting bolt;
the car floor fixationmember is provided with a fitting portion into which the cylinder portion is fitted; and
the car floor is adjusted to be leveled through adjustment of an angle of the cylinder portion fitted into the fitting portion.

9. A car for an elevator according to Claim 6, wherein:

the car floor leveling adjustment device has a car floor fixation member fixed to the car floor, a bolt mounted on each of the support members, and an adjusting nut screwed on the bolt;
the adjusting nut is provided with a cylinder portion decentered with respect to an axis of a screw hole of the adjusting nut;
the car floor fixation member is provided with a fittingportion into which the cylinder portion is fitted; and
the car floor is adjusted to be leveled through adjustment of an angle of the cylinder portion fitted into the fitting portion.

10. A car for an elevator according to Claim 4 or 5, wherein:

the car floor has a connection member fixed to a lower surface thereof;
the inclined member has an inclined member

body, and a block provided to the inclined member body to be connected to the connection member; and
the car floor is adjusted to be leveled through a positional adjustment of the block with respect to the inclined member body.

FIG. 1

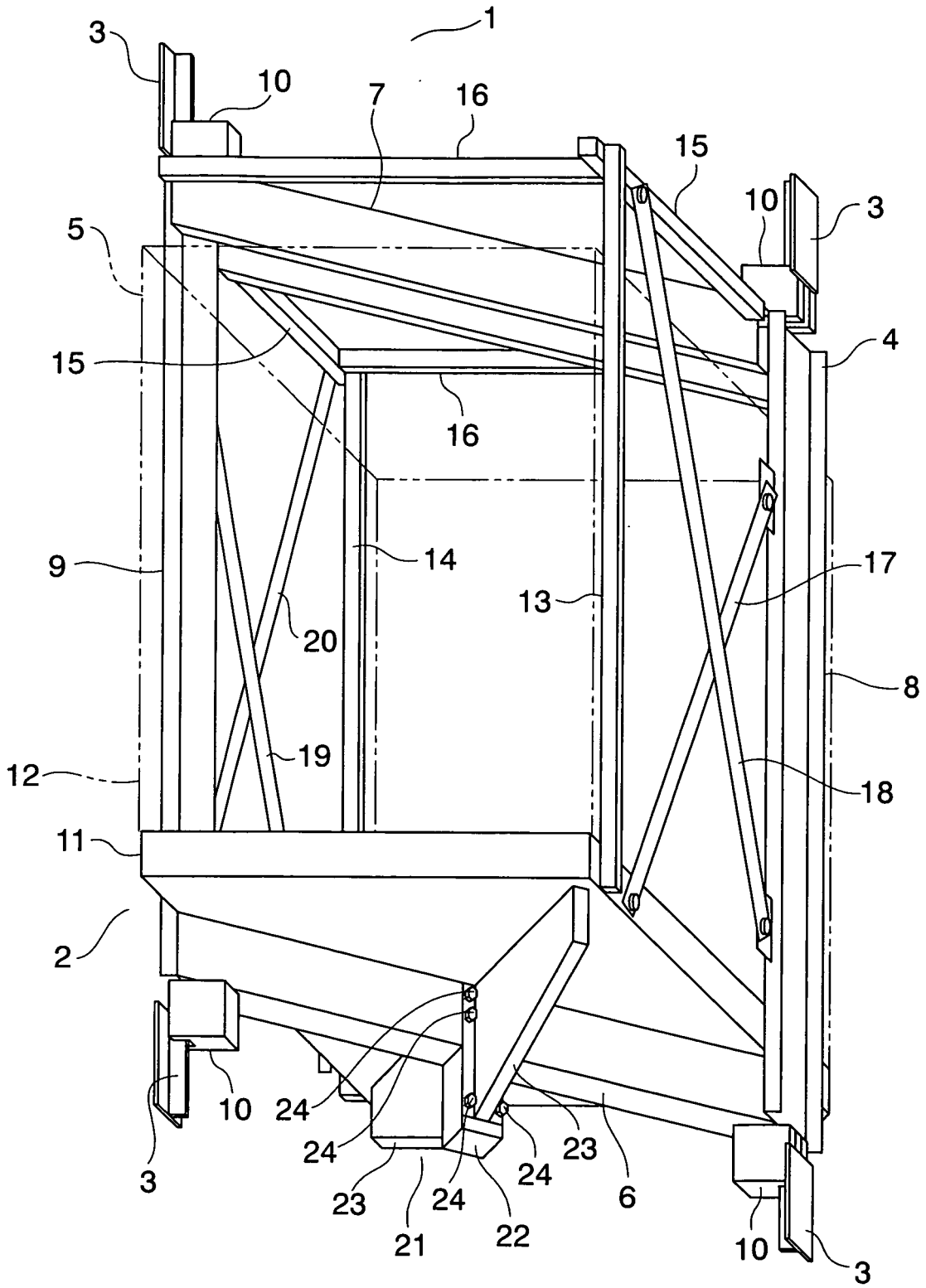
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FIG. 2

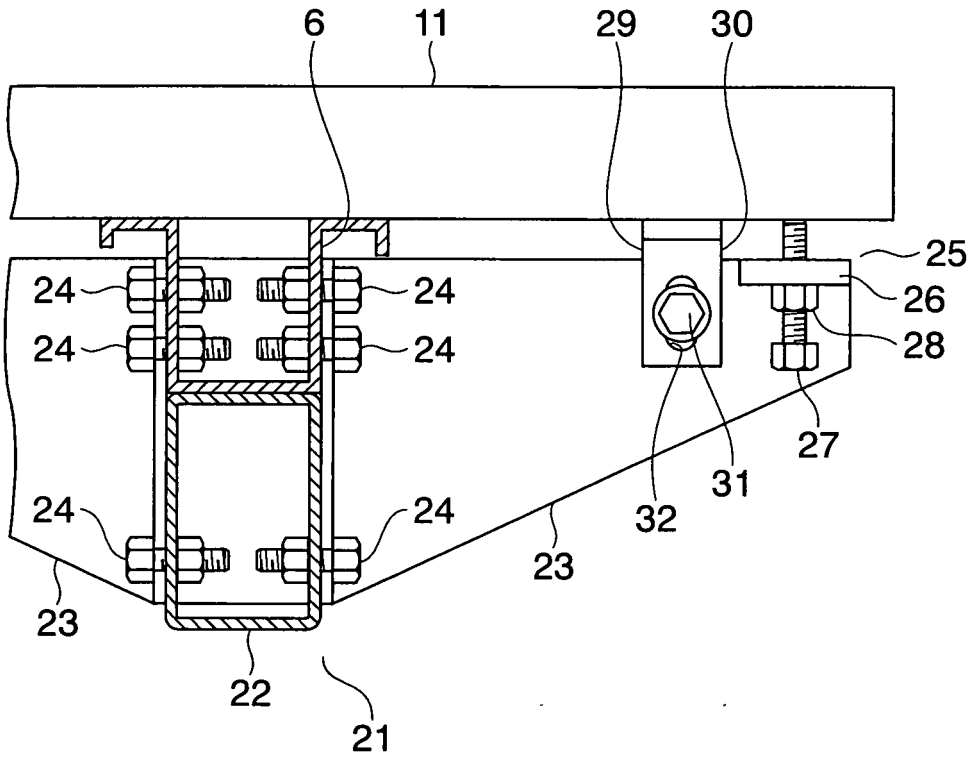

FIG. 3

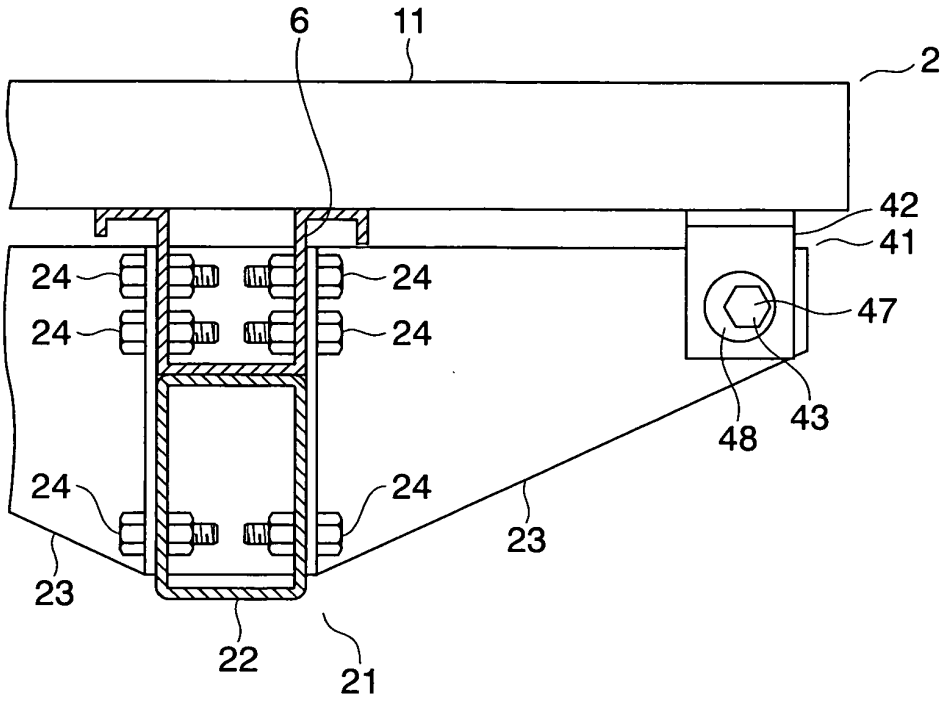
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FIG. 4

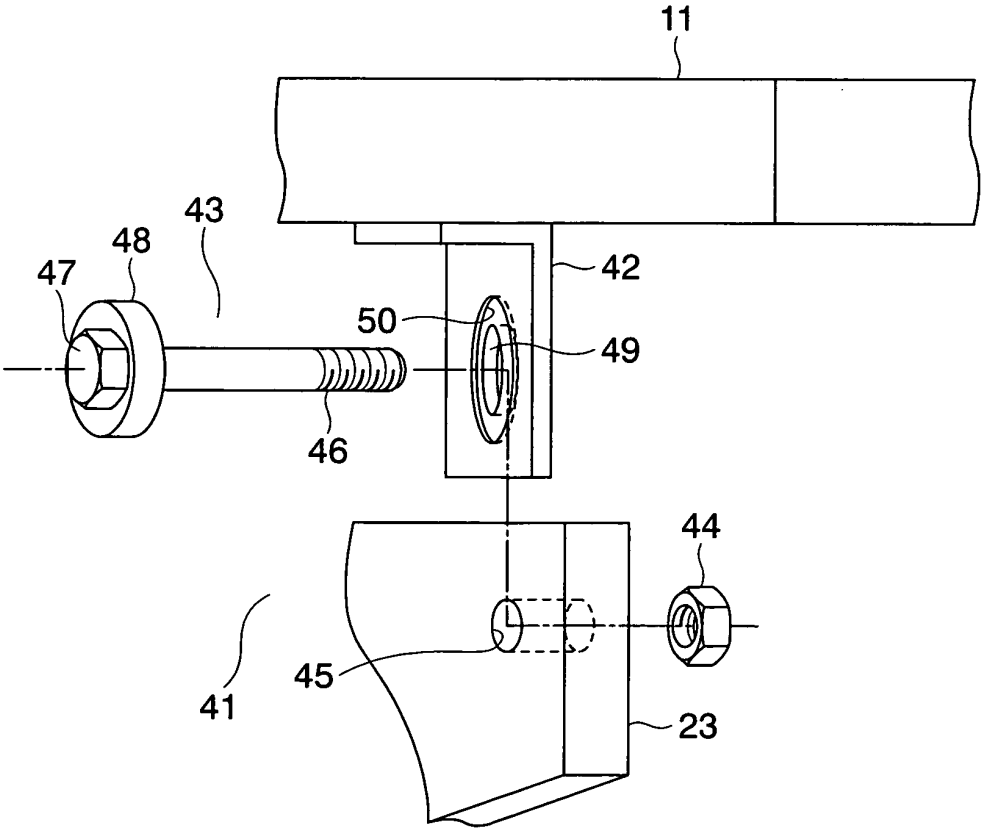
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FIG. 5

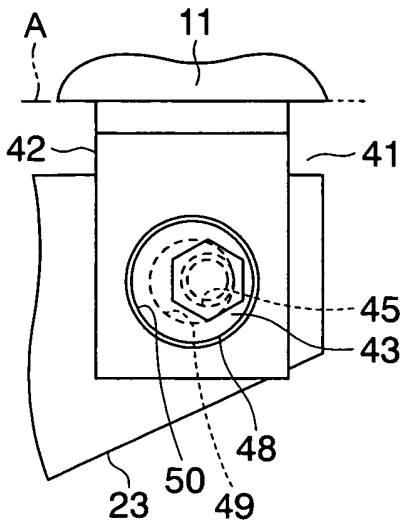

FIG. 6

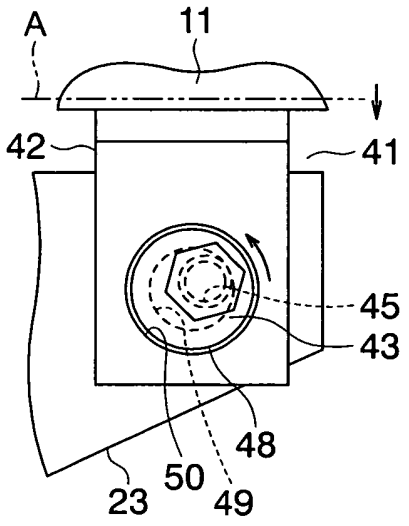

FIG. 7

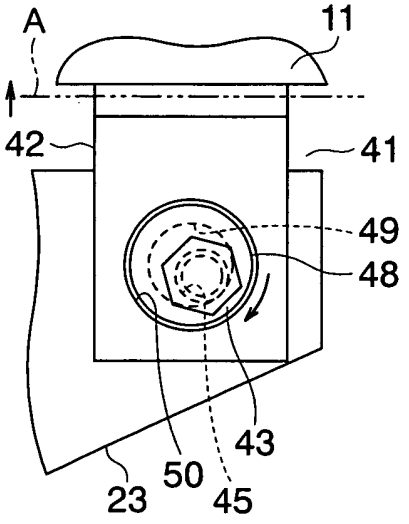

FIG. 8

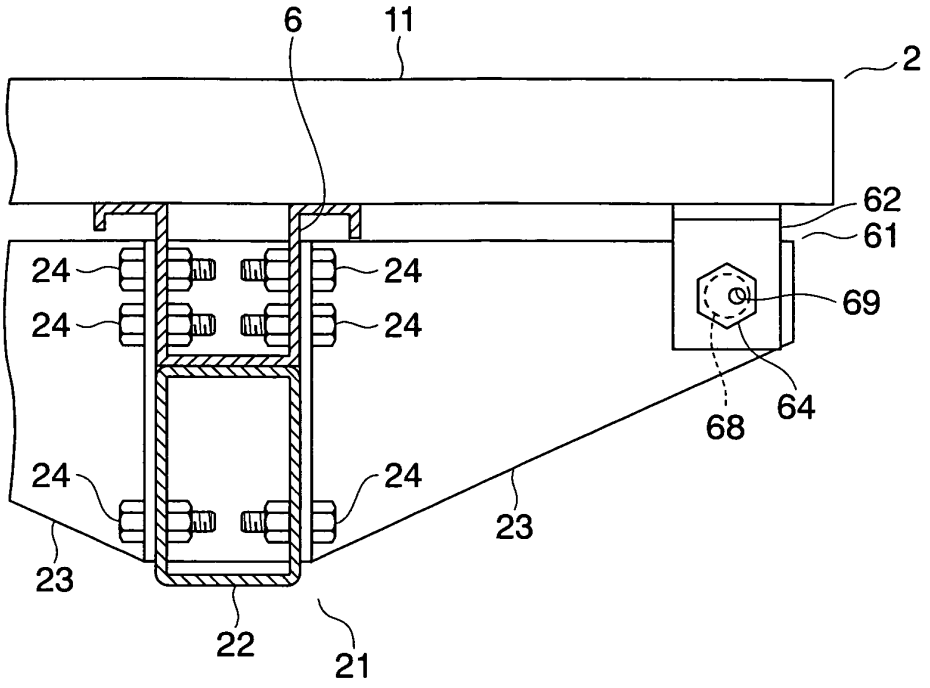
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FIG. 9

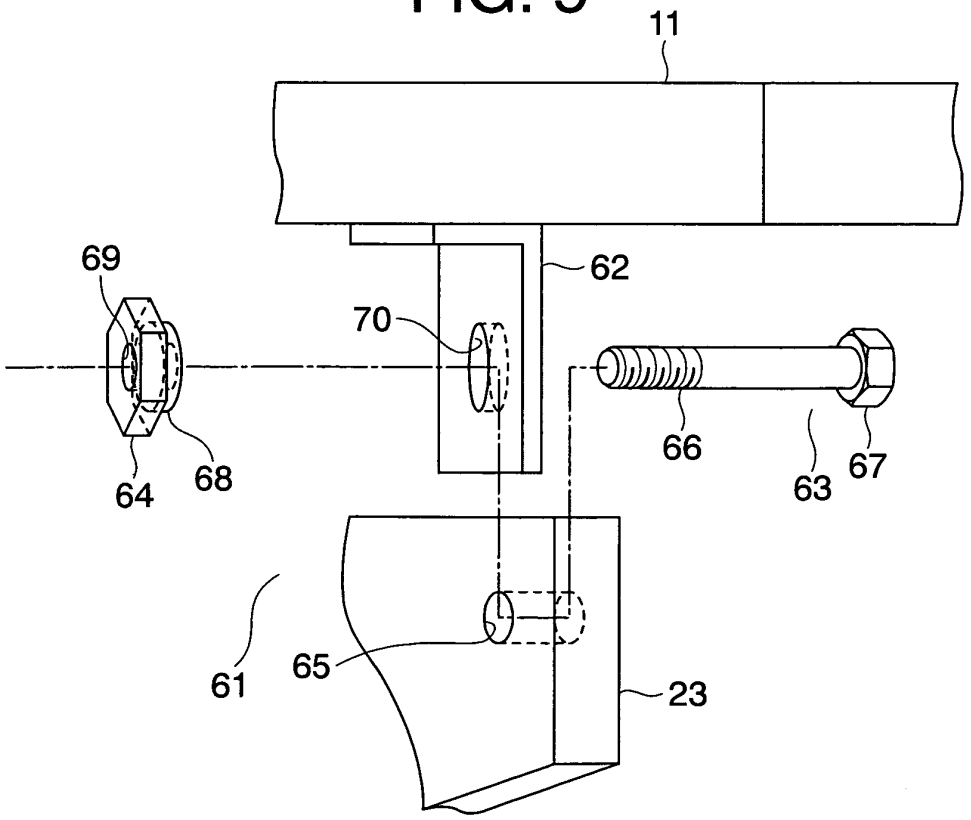
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FIG. 10

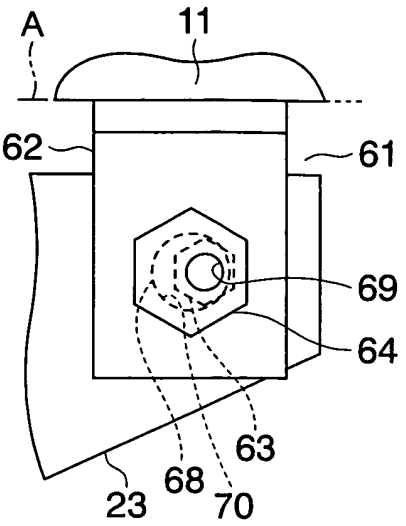

FIG. 11

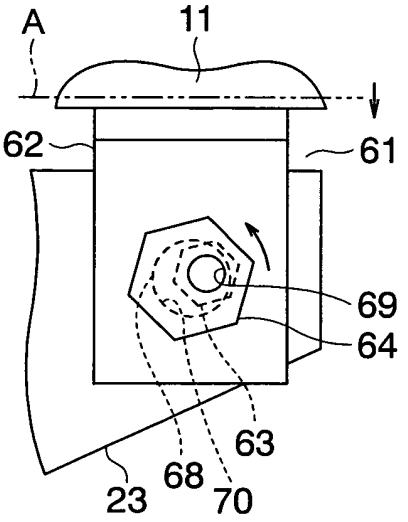

FIG. 12

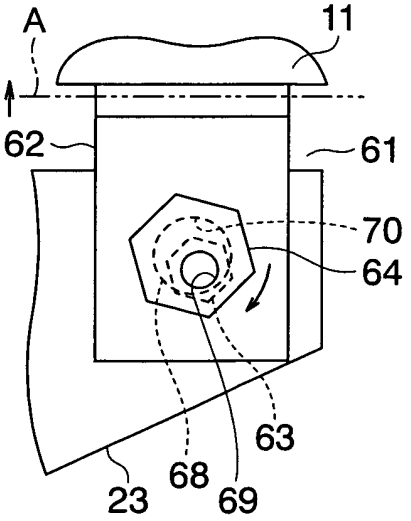

FIG. 13

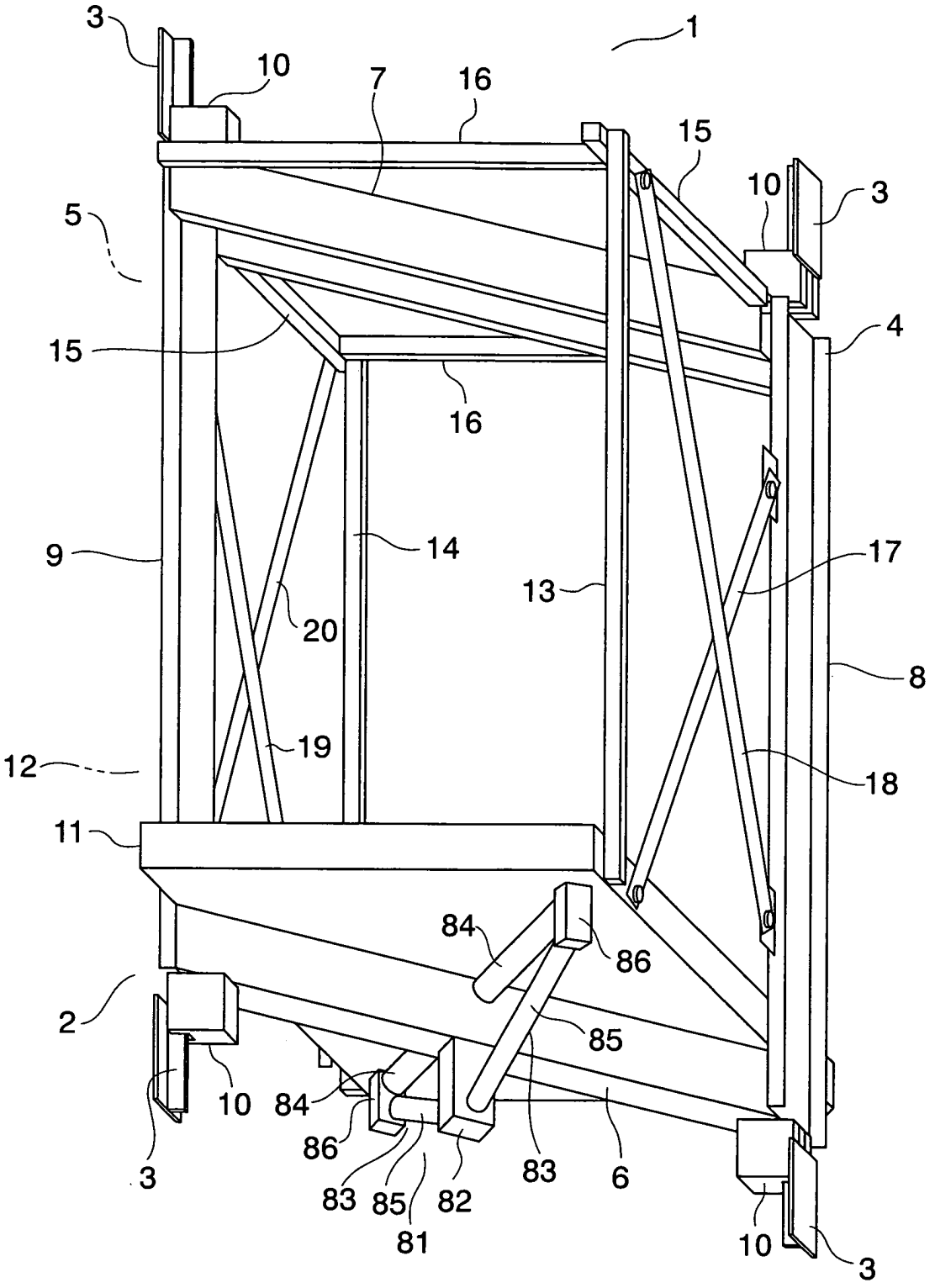
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FIG. 14

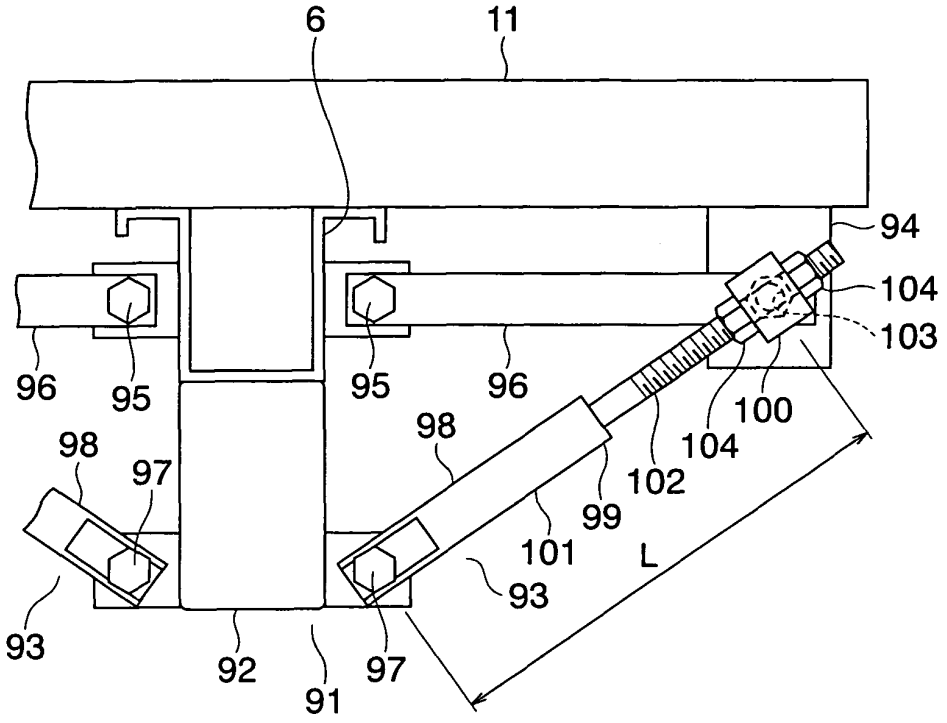
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FIG. 15

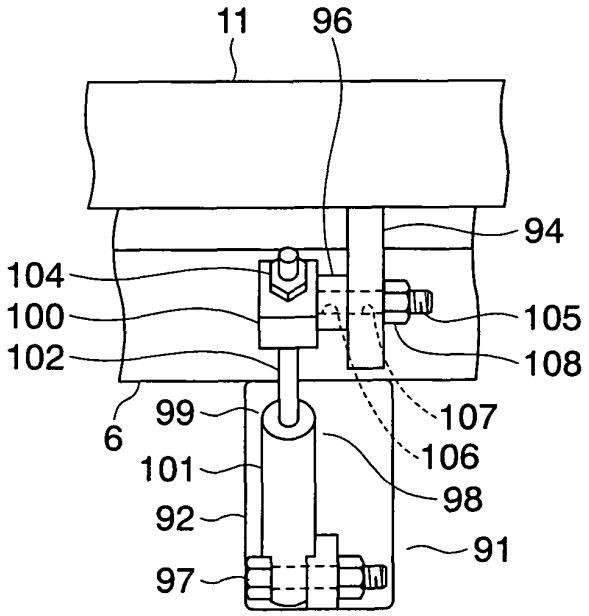
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FIG. 16

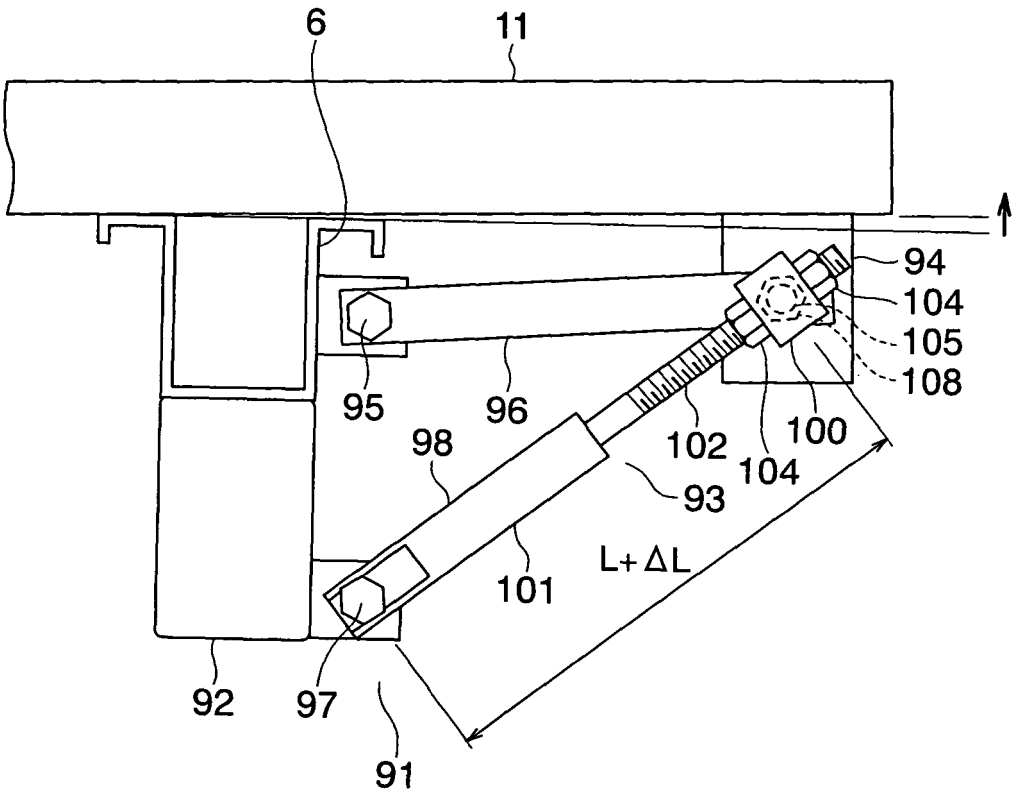


FIG. 17

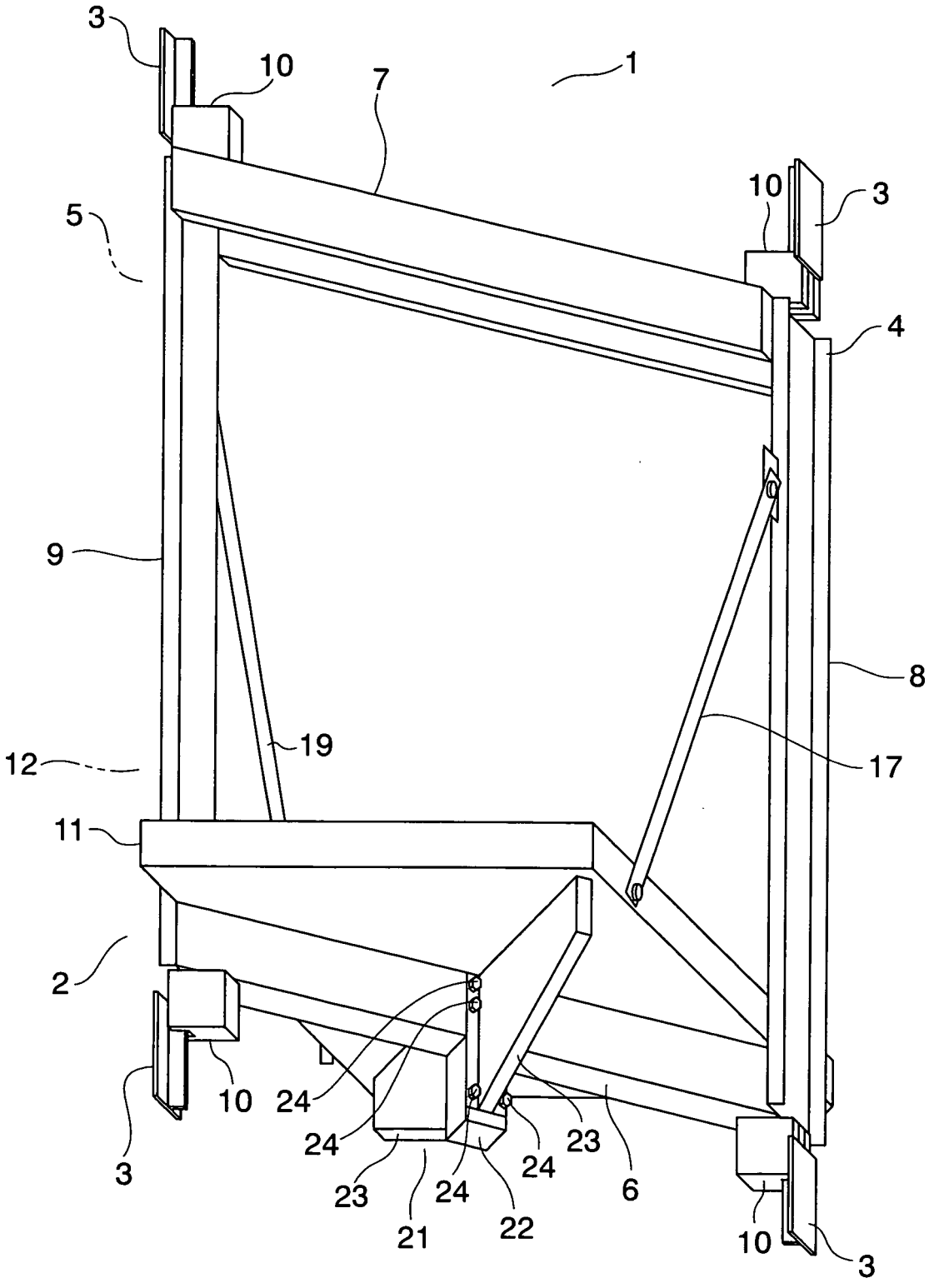


FIG. 18

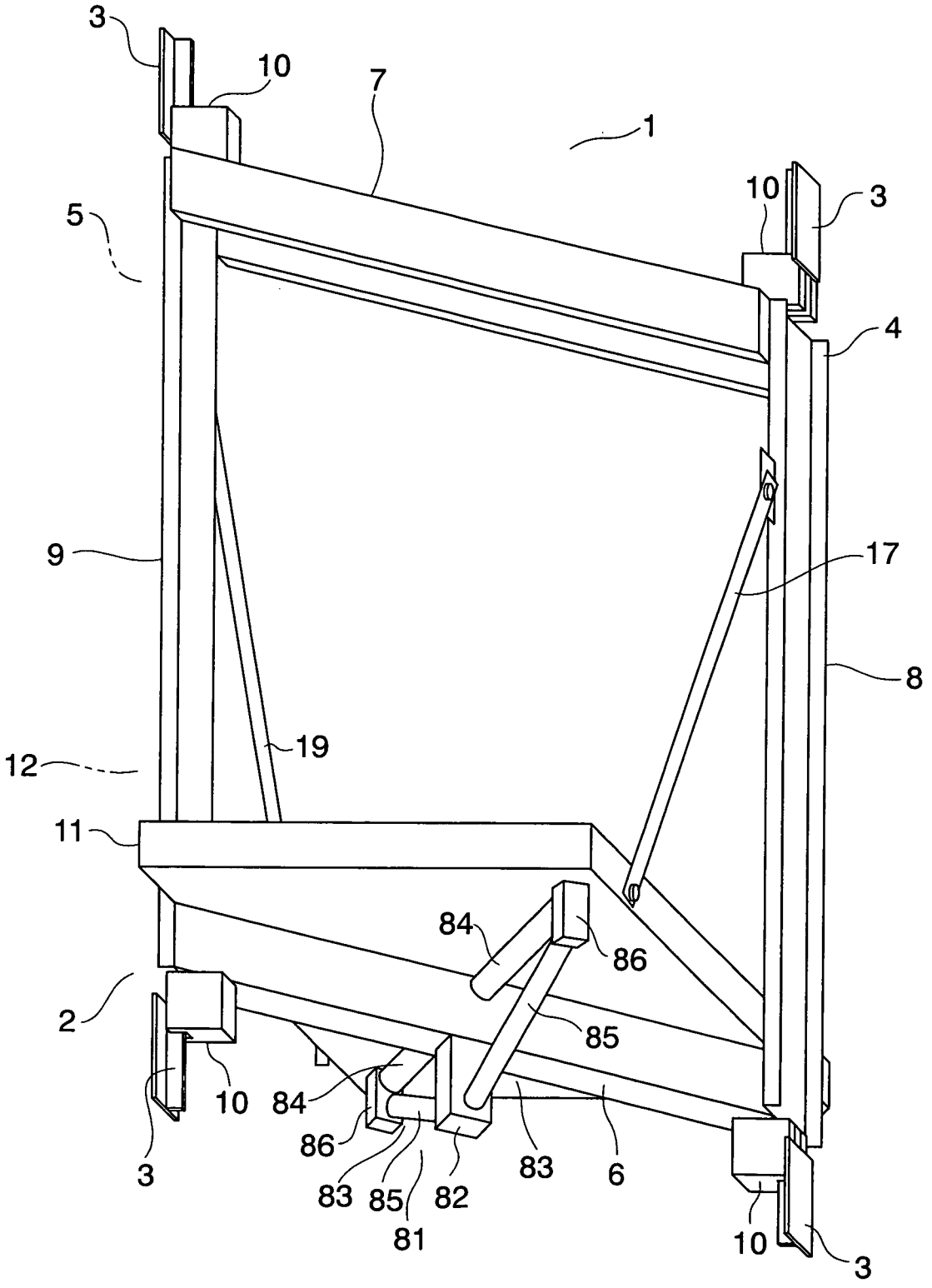
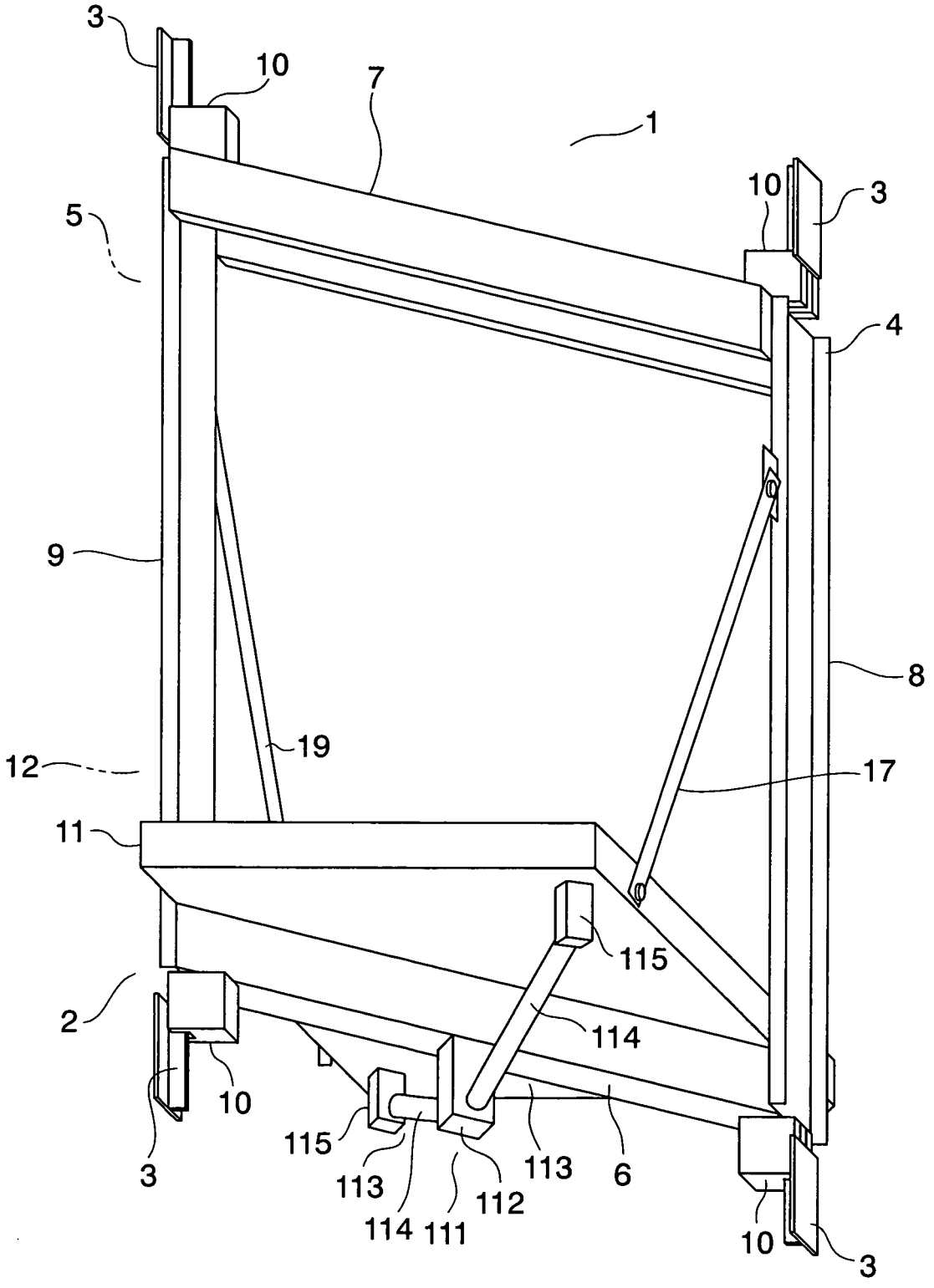


FIG. 19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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/022554

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

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B66B11/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2006
Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006

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 A	JP 2004-359368 A (Hitachi, Ltd.), 24 December, 2004 (24.12.04), Par. Nos. [0015] to [0020]; Figs. 1 to 4 (Family: none)	2-10 1
Y A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 151980/1983(Laid-open No. 061265/1985) (Toshiba Corp.), 27 April, 1985 (27.04.85), Description, page 1, line 14 to page 2, line 17; Fig. 1 (Family: none)	2-10 1

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

* Special categories of cited documents:
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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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
04 September, 2006 (04.09.06)	12 September, 2006 (12.09.06)
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/JP2005/022554

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 59-118685 A (Tokyo Shibaura Electric Co., Ltd.), 09 July, 1984 (09.07.84), Claims 1 to 2; page 3, upper right column, lines 5 to 8; Fig. 3 (Family: none)	4-5,10
Y	JP 50-114752 A (Hitachi, Ltd.), 08 September, 1975 (08.09.75), Claim 1; page 2, upper left column, line 2 to upper right column, line 2; Fig. 2 (Family: none)	6-9
Y	JP 54-040451 A (Tokyo Shibaura Electric Co., Ltd.), 29 March, 1979 (29.03.79), Page 2, upper right column, line 4 to lower right column, line 18; Figs. 6 to 8 (Family: none)	10

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2000191255 A **[0003]**