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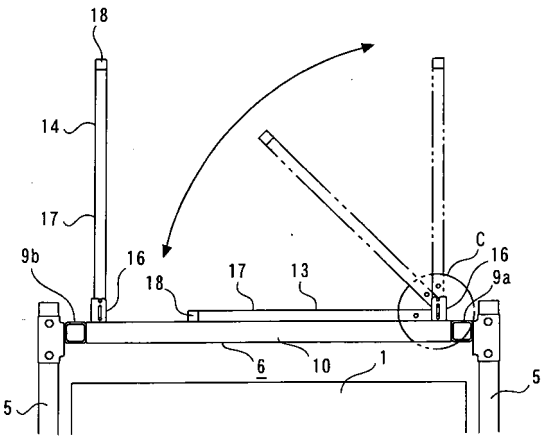
(54) CAR UPPER SIDE HANDRAIL DEVICE OF ELEVATOR

(57) There is provided a handrail device of an elevator car, in which work performed by the maintenance worker in a stooping posture to prevent the overturn of the handrail device is not needed, which makes the assembling work and storing work easy, and the handrail device can be configured at a low cost. For this purpose, in the lower end portion of a vertical pillar of the handrail device, an upper pin and a lower pin arranged above and below in the assembled state are provided, and also in a connecting portion for turnably connecting the lower end portion of the vertical pillar to the top portion of the car, a guide portion, which engages with one of the upper pin and the lower pin to guide the vertical pillar vertically through a predetermined distance, and a regulating portion, with which the other of the upper pin and the lower pin engages from the upside to regulate the turning of the vertical pillar in the assembled state of the handrail device, are provided.

Fig. 10



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Description

Technical Field

[0001] The present invention relates to a handrail device for an elevator car, which is erected in a top portion of the car when elevator maintenance work is performed, and is folded and stored in the top portion of the car when the handrail device is not needed.

Background Art

[0002] At the time of elevator maintenance work, a maintenance worker often performs work while getting on the top of a car moving up and down in an elevator shaft. For this purpose, a handrail device is installed in the top portion of the car to ensure safety at the time of maintenance work. As a conventional art of handrail device of an elevator car, a handrail device has been proposed in which the handrail devices arranged at both sides of the car are constructed so as to be foldable, by which a necessary space in the upper part of the elevator shaft is reduced (for example, refer to Patent Document 1).

Patent Document 1: Japanese Patent Laid-Open No. 2000-143125 (Figure 3)

Disclosure of the Invention

Problems to be Solved by the Invention

[0003] In the handrail device of an elevator car described in Patent Document 1, when the handrail device constructed so as to be foldable is assembled in the top portion of the car, the worker must handle stoppers, latch mechanisms, and the like for preventing the overturn of assembled handrail device in a stooping posture, which presents a problem of poor work efficiency. Also, the constructions of the stopper and latch mechanism are complicated, which leads to a high cost. Further, in the case where the telescopic handrail device is supported by pins or bolts, all of the vertical loads applied to the handrail device act on the pins etc. as a shearing force, so that strong and expensive pins etc. must be used inevitably.

[0004] The present invention has been made to solve the above problems, and accordingly an object thereof is to provide a handrail device of an elevator car, the assembling work and storing work of which are easy, and which can be configured at a low cost.

Means for Solving the Problems

[0005] A handrail device of an elevator car, which is erected in a top portion of the car when elevator maintenance work is performed, and is folded and stored in the top portion of the car when the handrail device is not needed, related to the present invention comprises a handrail device having handrails and vertical pillars for supporting the handrails, an upper pin and a lower pin which are provided in a lower end portion of the vertical pillar and are arranged above and below in an assembled state of the handrail device, and a connecting portion which is provided in the top portion of the car and to which the lower end portion of the vertical pillar is turnably connected, the connecting portion comprising a guide portion which engages with one of the upper pin and the lower pin to guide the vertical pillar vertically through a predetermined direction, and a regulating portion with which the other of the upper pin and the lower pin engages from the upside to regulate the turning of the vertical pillar in the assembled state of the handrail device.

Effect of the Invention

[0006] The present invention provides a handrail device of an elevator car, which is erected in a top portion of the car when elevator maintenance work is performed, and is folded and stored in the top portion of the car when the handrail device is not needed comprises a handrail device having handrails and vertical pillars for supporting the handrails, an upper pin and a lower pin which are provided in a lower end portion of the vertical pillar and are arranged above and below in an assembled state of the handrail device, and a connecting portion which is provided in the top portion of the car and to which the lower end portion of the vertical pillar is turnably connected, the connecting portion comprising a guide portion which engages with one of the upper pin and the lower pin to guide the vertical pillar vertically through a predetermined direction, and a regulating portion with which the other of the upper pin and the lower pin engages from the upside to regulate the turning of the vertical pillar in the assembled state of the handrail device. Therefore, the assembling work and storing work are easy, and the handrail device can be configured at a low cost.

Brief Description of the Drawings

[0007]

Figure 1 is a side view showing a construction of a handrail device of an elevator car in Embodiment 1 of the present invention.

Figure 2 is a plan view of the handrail device of an elevator car shown in Figure 1.

Figure 3 is a front view of the handrail device of an elevator car shown in Figure 1.

Figure 4 is a detailed view of portion A of the handrail device of an elevator car shown in Figure 1.

Figure 5 is a front view of the handrail device of an elevator car shown in Figure 4.

Figure 6 is a detailed view of portion B of the handrail device of an elevator car shown in Figure 1.

Figure 7 is a sectional view taken along the line X-X of the handrail device of an elevator car shown in Figure 6.

Figure 8 is a detailed view of an essential portion for illustrating a folding operation of the handrail device of an elevator car in Embodiment 1 of the present invention.
Figure 9 is a side view for illustrating a folding operation of the handrail device of an elevator car in Embodiment 1 of the present invention
Figure 10 is a front view for illustrating a folding operation of the handrail device of an elevator car in Embodiment 1 of the present invention.
Figure 11 is a detailed view of portion C of the handrail device of an elevator car shown in Figure 10.
Figure 12 is a front view for illustrating a folding operation of the handrail device of an elevator car in Embodiment 1 of the present invention.
Figure 13 is a plan view showing a construction of a handrail device of an elevator car in Embodiment 2 of the present invention.
Figure 14 is a sectional view taken along the line Y-Y of the handrail device of an elevator car shown in Figure 13.
Figure 15 is a front view showing a construction of a handrail device of an elevator car in Embodiment 2 of the present invention.
Figure 16 is a view for illustrating a construction of a handrail device of an elevator car in Embodiment 2 of the present invention.
Figure 17 is a side view for illustrating a folding operation of a handrail device of an elevator car in Embodiment 3 of the present invention.
Figure 18 is a detailed view of portion D of the handrail device of an elevator car shown in Figure 17.
Figure 19 is a front view of the handrail device of an elevator car shown in Figure 18.
Figure 20 is a side view for illustrating a folding operation of a handrail device of an elevator car in Embodiment 4 of the present invention.
Figure 21 is a side view for illustrating a folding operation of a handrail device of an elevator car in Embodiment 4 of the present invention.
Figure 22 is a side view of an essential portion of a handrail device of an elevator car in Embodiment 5 of the present invention.
Figure 23 is a front view of the handrail device of an elevator car shown in Figure 22.

Description of Symbols

[0008] 1 cab, 2 cushioning material, 3 car frame, 4 car lower frame, 5 car frame stile, 6 car upper frame, 7 car door driving device, 8 car door, 9a side beam, 9b side beam, 10 front beam, 11 rear beam, 12 handrail device, 13 right handrail, 14 left handrail, 15 rear handrail, 16 connecting portion, 17 vertical pillar, 17a through hole, 18 upper handrail, 19 lower handrail, 20 lower pin, 21 upper pin, 22 mounting fixture, 22a guide hole, 22b stopper groove, 23 vertical pillar, 24 upper handrail, 25 lower handrail, 26 turning device, 26a supporting member, 26b supporting member, 26c pin, 27 locking device, 27a mounting plate, 27b wing bolt, 27c locking device, 28 locking device, 29 right rear handrail, 30 left rear handrail, 31 raising member, 32 connecting portion, 33 lower pin, 34 mounting fixture, 34a guide hole, 35 float preventing means, 35a pin, 35b chain, 36 bolt

Best Mode for Carrying Out the Invention

[0009] To describe the present invention in more detail, the present invention will be explained with reference to the accompanying drawings. In the drawings, the same symbols are applied to the same or corresponding elements, and the duplicated explanation thereof is simplified or omitted appropriately.

Embodiment 1

[0010] Figure 1 is a side view showing a construction of a handrail device of an elevator car in Embodiment 1 of the present invention, Figure 2 is a plan view of the handrail device of an elevator car shown in Figure 1, and Figure 3 is a front view of the handrail device of an elevator car shown in Figure 1. Also, Figure 4 is a detailed view of portion A of the handrail device of an elevator car shown in Figure 1, Figure 5 is a front view of the handrail device of an elevator car shown in Figure 4, Figure 6 is a detailed view of portion B of the handrail device of an elevator car shown in Figure 1, and Figure 7 is a sectional view taken along the line X-X of the handrail device of an elevator car shown in Figure 6.

[0011] In Figures 1 to 7, reference numeral 1 denotes a cab into which the elevator users get in and out. This cab 1 is supported by a car frame 3 via a plurality of cushioning materials 2. The car frame 3 is formed by a car lower frame 4 which is arranged under the cab 1 to support the cab 1, car frame stiles 5 each having a substantially U-shaped transverse cross section, which are arranged on both sides of the cab 1 and the lower end portions of which are provided on the car lower frame 4, and a car upper frame 6 arranged above the top surface of the cab 1 to connect the upper end portions of the car frame stiles 5 to each other in the width direction of the car. Also, reference numeral 7 denotes a car door driving device which is provided on the car entrance side of the car upper frame 6 to drive a car door 8 for opening and closing the car entrance.

[0012] The car upper frame 6 is formed by side beams 9a and 9b consisting of right and left beams which are arranged in the car depth direction and the intermediate portions of which are fixed to the upper end portions of the car frame stiles 5, a front beam 10 which is provided between the front end portions of the side beams 9a and 9b to connect the front end portions of the side beams 9a and 9b to each other in the car width direction, and a rear beam 11 which is provided between the rear end portions of the side beams 9a and 9b to connect the rear end portions of the side beams 9a and 9b to each other

in the car width direction. The car upper frame 6 has a substantially quadrangular ring shape as a whole. Also, the side beams 9a and 9b, the front beam 10 and the rear beam 11 each are formed by a square pipe, and both end portions of the front beam 10 and the rear beam 11 are joined to the side beams 9a and 9b by welding.

[0013] Next, the construction of a handrail device 12 provided in the top portion of the car to ensure the safety of elevator maintenance workers is explained. This handrail device 12 is formed so as to be foldable to achieve space saving in the upper part of an elevator shaft. Figures 1 to 7 show a state in which the handrail device 12 has been assembled and erected in the top portion of the car when elevator maintenance is performed (hereinafter referred to as an "assembled state"). In the assembled state, the handrail device 12 is formed by a right handrail 13 and a left handrail 14 arranged on the right side and the left side of the top portion of the car, respectively, when being viewed from the elevator hall side, and a rear handrail 15 arranged on the rear side of the top portion of the car. Reference numeral 16 denotes connecting portions which are provided in both end portions of the front beam 10 and both end portions of the rear beam 11 of the car upper frame 6 to connect the lower end portions of the right handrail 13 and the left handrail 14 so as to be turnable within a predetermined angle.

[0014] The right handrail 13 and a left handrail 14 each include two vertical pillars 17 arranged on the front side and the rear side of the car, an upper handrail 18 joined to the upper end portions of both the vertical pillars 17 by welding to connect the upper end portions of the vertical pillars 17 to each other in the car depth direction, and a lower handrail 19 arranged in the car depth direction so as to be substantially parallel with the upper handrail 18 by being joined by welding to intermediate portions of both the vertical pillars 17. The upper handrail 18, the lower handrail 19, and the vertical pillars 17 for supporting the upper handrail 18 and the lower handrail 19 each are formed by a square pipe.

[0015] Also, in the lower end portion of each of the vertical pillars 17, there are provided a lower pin 20 and an upper pin 21 which are arranged above and below in the assembled state of the handrail device 12. The lower pin 20 and the upper pin 21 are arranged in the car depth direction so as to be parallel with each other, and are provided so that both end portions thereof protrude through a predetermined distance from the front side surface and the rear side surface of the vertical pillar 17. The connecting portion 16 for turnably connecting the lower end portion of the vertical pillar 17 to the front beam 10 and the rear beam 11 is provided with a guide portion, which engages with one of the lower pin 20 and the upper pin 21 to guide the vertical pillar 17 to the above through a predetermined distance, and a regulating portion, with which the other of the lower pin 20 and the upper pin 21 is engaged from the above to regulate the turning of the vertical pillar 17 in the assembled state of the handrail device 12.

[0016] The connecting portions 16 in Embodiment 1 consist of mounting fixtures 22 which each have a substantially U-shaped transverse cross section, and is erected on the upper surfaces of the end portions of the front beam 10 and the rear beam 11 so that the open end of the U-shaped portion faces to the car center portion in the plan view. In each of parallel plates of the mounting fixture 22 facing to each other with a predetermined clearance being provided, a guide hole 22a (guide portion) consisting of an elongated hole having a lengthwise direction in the vertical direction and a stopper groove 22b (regulating portion) consisting of a substantially U-shaped groove that is open to the above are formed.

[0017] Also, in the U-shaped portion of the mounting fixture 22, in other words, between the parallel plates, the lower end portion of the vertical pillar 17 is arranged. In the guide holes 22a of the mounting fixture 22, the lower pin 20 is arranged penetratingly with a play, and in the stopper grooves 22b, the upper pin 21 is arranged. In the assembled state of the handrail device 12, the vertical pillars 17 are directly mounted on the front beam 10 so that vertical loads acting on the handrail device 12 and the weight of the handrail device 12 are supported by the front beam 10 and the rear beam 11. That is to say, a small gap is formed between the lower pin 20 and the lower edge of the guide hole 22a and between the upper pin 21 and the lower edge of the stopper groove 22b, so that the above-mentioned vertical loads do not act on the lower pin 20 and the upper pin 21.

[0018] On the other hand, the rear handrail 15 is formed by joining four square pipes to each other by welding into a quadrangular ring shape, and includes vertical pillars 23 on both sides, an upper handrail 24 that connects the upper end portions of both the vertical pillars 23, and a lower handrail 25 that connects the lower end portions of both the vertical pillars 23. The rear handrail 15 is connected so that the vertical pillar 23 on the left side is freely turned with respect to the vertical pillar 17 on the rear side of the left handrail 14 by turning devices 26 (not shown in Figures 1 to 7), and the vertical pillar 23 on the right side is locked to the vertical pillar 17 on the rear side of the right handrail 13 by locking devices 27. The distance between the upper handrail 24 and the lower handrail 25 of the rear handrail 15 is shorter than the distance between the upper handrail 18 and the lower handrail 19 of the left handrail 14 supported by the turning devices 26, and the rear handrail 15 is arranged within the height between the upper handrail 18 and the lower handrail 19 of the left handrail 14.

[0019] Also, as shown in Figures 6 and 7, the locking device 27 is made up of a substantially L-shaped mounting plate 27a provided on the vertical pillar 17 on the rear side of the right handrail 13 and a wing bolt 27b screwed in the vertical pillar 23 on the right side of the rear handrail 15. The wing bolt 27b is tightened to hold the mounting plate 27a by using the side surface of the vertical pillar 23 of the rear handrail 15 and the wing bolt 27b, by which the vertical frame 23 on the right side of the rear handrail

15 is fixed to the vertical pillar 17 on the rear side of the right handrail 13.

[0020] Next, explanation is given of the operation and configuration at the time when the handrail device 12 is folded and stored in the top portion of the car when the elevator maintenance work is finished and hence the handrail device 12 becomes unnecessary. Figure 8 is a detailed view of an essential portion for illustrating a folding operation of the handrail device of an elevator car in Embodiment 1 of the present invention, Figure 9 is a side view for illustrating a folding operation of the handrail device of an elevator car in Embodiment 1 of the present invention, Figures 10 and 12 are front views for illustrating a folding operation of the handrail device of an elevator car in Embodiment 1 of the present invention, and Figure 11 is a detailed view of portion C of the handrail device of an elevator car shown in Figure 10.

[0021] The elevator maintenance worker first loosens the wing bolts 27b of the locking devices 27, thereby removing the vertical pillar 23 on the right side of the rear handrail 15 from the vertical pillar 17 on the rear side of the right handrail 13, and turns the rear handrail 15 around the turning devices 26 to move the rear handrail 15 to the left handrail 14 side. At this time, since the configuration is such that the distance between the upper handrail 24 and the lower handrail 25 of the rear handrail 15 is shorter than the distance between the upper handrail 18 and the lower handrail 19 of the left handrail 14, by turning the rear handrail 15 to a position at which the rear handrail 15 is substantially parallel with the left handrail 14, the rear handrail 15 can be arranged within a space formed by the vertical pillars 17 on both sides of the left handrail 14, the upper handrail 18, and the lower handrail 19. That is to say, the rear handrail 15 is configured so as to be stored within the thickness of the left handrail 14.

[0022] Figure 8 shows an essential portion in the state in which the rear handrail 15 is arranged within the thickness of the left handrail 14. In Figure 8, in the turning device 26, a substantially U-shaped supporting member 26a provided on the vertical pillar 17 on the rear side of the left handrail 14 and a substantially U-shaped supporting member 26b provided on the vertical pillar 23 on the left side of the rear handrail 15 are pivotally provided by a pin 26c having an axis in the vertical direction. The configuration is made such that when the rear handrail 15 is arranged within the thickness of the left handrail 14, the supporting members 26a and 26b and pins 26c are also arranged within the thickness of the left handrail 14 like the rear handrail 15. A locking device denoted by the reference numeral of 28 is used for fixing the rear handrail 15 to the left handrail 14 to prevent the rear handrail 15 from moving when the rear handrail 15 is arranged within the thickness of the left handrail 14.

[0023] Next, the maintenance worker raises the right handrail 13 and the left handrail 14 through a predetermined distance, and then folds the handrails 13 and 14 to the central side of the car. The right handrail 13 is placed on the car upper frame 6, and the left handrail 14 is placed on the right handrail 13 having been placed on the car upper frame 6. Figure 11 shows a configuration of the lower part of the vertical pillar 17 and the connecting portion 16 at the time when the right handrail 13 and the left handrail 14 are stored in the top portion of the car. In this storing work, the maintenance worker first raises the right handrail 13 upward, and thereby moves the vertical pillars 17 on the front side and the rear side upward. At this time, the lower pin 20 is guided by the guide hole 22a formed in the mounting fixture 22, by which the lower end portion of the vertical pillar 17 is moved upward along the lengthwise direction of the guide hole 22a. Both end portions of the lower pin 20 project to the outside of the mounting fixture 22 via the guide hole 22a. Therefore, in the state in which the lower pin 20 is installed, the vertical pillar 17 cannot be removed completely from the connecting portion 16.

[0024] Also, by raising the right handrail 13 upward, the upper pin 21 provided above the lower pin 20 is also moved together with the lower pin 20. The upper pin 21 moves from the opening end of the stopper groove 22b to a position above the mounting fixture 22, by which the upper pin 21 is disengaged from the stopper groove 22b. In this state, the vertical frame 17 can be turned around the lower pin 20. Therefore, the maintenance worker raises the right handrail 13 to a height at which the upper pin 21 does not interfere with the mounting fixture 22 when the vertical frame 17 is turned, and thereafter brings down the right handrail 13 to the central side of the car to place it on the car upper frame 6.

[0025] Next, the maintenance worker brings down the left handrail 14 to the central side of the car by the same procedure as described above, and places the left handrail 14 on the right handrail 13 having been folded on the car upper frame 6. At this time, the left handrail 14 is arranged horizontally on the right handrail 13. That is to say, the vertical length of the guide hole 22a formed in the mounting fixture 22 is set so as to match the position of the lower pin 20 moving upward by the thickness of the right handrail 13 when the left handrail 14 is placed horizontally on the right handrail 13. Figure 12 shows a state in which the right handrail 13 and the left handrail 14 are placed on the car upper frame 6 and the handrail device 12 is folded completely (hereinafter, referred to as a "stored state").

[0026] Also, when the elevator maintenance work is performed, the maintenance worker assembles the handrail device 12 in the top portion of the car by reversing the procedure for the storage. Specifically, the maintenance worker first raises the left handrail 14 placed in the top portion of the car so as to turn it around the lower pin 20. Then, after making the left handrail 14 in an upright state, the maintenance worker lowers the left handrail 14 slowly and erects it on the car upper frame 6 so that the upper pin 21 provided in the lower end portion of the vertical pillar 17 is arranged in the stopper groove 22b of the connecting portion 16. Also, the maintenance worker

erects the right handrail 13 on the car upper frame 6 by the same procedure as described above.

[0027] Next, the maintenance worker loosens the wing bolt of the locking device 28, thereby making the rear handrail 15 in a turnable state, and turns the rear handrail 15 around the turning devices 26 and moves it to the right handrail 13 side. By fastening the wing bolts 27b of the locking devices 27, the vertical pillar 23 on the right side of the rear handrail 15 is fixed to the vertical pillar 17 on the rear side of the right handrail 13.

[0028] According to Embodiment 1 of the present invention, when the right handrail 13 or the left handrail 14 is assembled, merely by engaging the upper pin 21 provided in the lower end portion of the vertical pillar 17 with the stopper groove 22b of the mounting fixture 22, an effect of preventing the handrail device 12 from overturning can be achieved, so that the conventional stoppers, latch mechanisms, and the like which are provided only for preventing the overturn of the assembled handrail device 12, are unnecessary. Therefore, work that is performed by the maintenance worker in a stooping posture to prevent the overturn of the handrail device 12 is not needed, which improves the work efficiency, and thereby the assembling time and storing time can be shortened. Also, since the conventional stoppers, latch mechanisms, and the like need not be provided, the construction can be simplified, and hence the handrail device 12 can be provided at a low cost.

[0029] Also, since the handrail device 12 is stored by being placed on the car upper frame 6 provided at a position separating upward a predetermined distance from the top surface of the cab 1, there is no fear that elevator equipment installed on the top surface of the cab 1 is damaged, and also a phenomenon that the vibrations of a fan etc. installed on the top surface of the cab 1 transmit to the handrail device 12 to generate noise can be prevented.

[0030] Further, since the rear handrail 15 of the stored handrail device 12 is arranged within the thickness of the left handrail 14, the total thickness of the handrail device 12 placed on the car upper frame 6 can be kept to only the sum of the thickness of the right handrail 13 and the thickness of the left handrail 14. It is a matter of course that even if the rear handrail 15 cannot be arranged within the thickness of the left handrail 14, the same effect as described above can be achieved if the rear handrail 15 can be arranged within the thicknesses of the right handrail 13 and the left handrail 14 in the stored state of the handrail device 12.

Embodiment 2

[0031] Figure 13 is a plan view showing a construction of a handrail device of an elevator car in Embodiment 2 of the present invention, and Figure 14 is a sectional view taken along the line Y-Y of the handrail device of an elevator car shown in Figure 13. In Figures 13 and 14, the rear handrail 15 of the handrail device 12 is made up of a right rear handrail 29 provided on the vertical pillar 17 on the rear side of the right handrail 13 so as to be turnable via turning devices (not shown) and a left rear handrail 30 provided on the vertical pillar 17 on the rear side of the left handrail 14 so as to be turnable via the turning devices 26. Both of the right rear handrail 29 and the left rear handrail 30 each are formed by joining square pipes to each other into a quadrangular ring shape by welding, and in the assembled state of the handrail device 12, the adjacent vertical pillars are connected to each other by locking devices 27c. When the handrail device 12 is stored, the right rear handrail 29 and the left rear handrail 30 each are turned around the turning devices 26 etc., and are stored within the thickness of the right handrail 13 and the thickness of the left handrail 14, respectively.

[0032] By dividedly constructing the handrail 15 as described above, the turning ranges of the right rear handrail 29 and the left rear handrail 30 can be kept narrow, so that the work efficiency at the time of assembling and at the time of storing can be improved. Also, even in the case where the width of the rear handrail 15 is wider than the width of the right handrail 13 or the left handrail 14, namely, the width of the car is wide, the same effect as described above can be achieved.

[0033] Figure 15 is a front view showing a construction of a handrail device of an elevator car in Embodiment 2 of the present invention, and Figure 16 is a view for illustrating a construction of a handrail device of an elevator car in Embodiment 2 of the present invention, showing the construction of the handrail device 12 in the case where the width of the car is wide. In Figure 15, a substantially Z-shaped raising member 31 is provided on the upper surface in the left end portion of the car upper frame 6. In the stored state of the handrail device 12, the vertical pillar 17 of the left handrail 14 is placed horizontally on the raising member 31 and the right handrail 13. That is to say, the raising member 31 has a height same as the thickness of the right handrail 13, and is arranged at a position under the vertical pillar 17 of the left handrail 14 in the stored state.

[0034] If the raising member 31 is not provided in the case where the width of the car is wide, as shown in Figure 16, the left handrail 14 is inclined undesirably in the stored state of the handrail device 12. Therefore, by providing the above-described construction, the handrail device 12 in the stored state is arranged horizontally on the car upper frame 6, and thus the thickness thereof can be kept to only the sum of the thickness of the right handrail 13 and the thickness of the left handrail 14, so that interference with equipment on the top surface of the cab 1 can be prevented. Also, since the left handrail 14 can be kept horizontal, the car is stable even when moving up and down, and also there is no fear that vibrations and noise such as chattering noise are generated. As for the others, the same configuration and effect as those of Embodiment 1 are achieved.

Embodiment 3

[0035] Figure 17 is a side view for illustrating a folding operation of a handrail device of an elevator car in Embodiment 3 of the present invention, and Figure 18 is a detailed view of portion D of the handrail device of an elevator car shown in Figure 17, and Figure 19 is a front view of the handrail device of an elevator car shown in Figure 18. In Figures 17 to 19, the front sides of the right handrail 13 and the left handrail 14, namely, the elevator boarding side has the same construction as that of Embodiment 1 and Embodiment 2. Specifically, the mounting fixtures 22 provided on the car upper frame 6 and the lower pins 20 and the upper pins 21 provided in the lower end portions of the vertical pillars 17 are provided.

[0036] On the other hand, on the rear sides of the right handrail 13 and the left handrail 14, namely, on the side opposite to the elevator boarding side, connecting portions 32 erected in the end portions of the rear beam 11 of the car upper frame 6 and lower pins 33 provided in the lower end portions of the vertical pillars 17 are provided. The connecting portions 32 consist of mounting fixtures 34 which each have a substantially U-shaped transverse cross section, and is arranged so that the open end of the U-shaped portion faces to the car center portion in the plan view. In each of parallel plates of the mounting fixture 34 facing to each other with a predetermined clearance being provided, a guide hole 34a consisting of an elongated hole having a lengthwise direction in the vertical direction is formed. Also, the lower pin 33 has the same construction as that of the lower pin 20 in Embodiment 1 and Embodiment 2. Specifically, the lower pin 33 is provided so that the lengthwise direction thereof is arranged in the depth direction of car, and both end portions project through a predetermined distance from the front side surface and the rear side surface of the vertical frame 17. That is to say, on the side opposite to the elevator boarding side, an element corresponding to the upper pin 21 and the stopper groove 22b in Embodiment 1 and Embodiment 2 is not provided.

[0037] By providing the upper pin 21 and the stopper groove 22b formed in the mounting fixture 22 on the elevator boarding side only, the assembling work and storing work for the handrail device 12 performed by the elevator maintenance worker can be lightened. Specifically, in the case where the handrail device 12 is stored, when raising the right handrail 13 and the left handrail 14 and folding them to the central side of car, the maintenance worker can make the right handrail 13 and the left handrail 14 in a foldable state merely by raising the vertical pillar 17 on the elevator boarding side as shown in Figure 17. Therefore, the storing work can be carried out with a force about a half of the weight of the right handrail 13. Also, in the case where the handrail device 12 is assembled, the work for engaging the upper pin 21 in the stopper groove 22b has only to be performed on the elevator boarding side only. Even in the case where the interior of the elevator shaft is dark and the side opposite to the elevator boarding side far from the maintenance worker is difficult to see, there is no fear of decreased work efficiency. As for the others, the same configuration and effect as those of Embodiment 1 or Embodiment 2 are achieved.

Embodiment 4

[0038] Figures 20 and 21 are side views for illustrating a folding operation of a handrail device of an elevator car in Embodiment 4 of the present invention. In Figures 20 and 21, the cab 1 of the elevator is formed with car entrances (not shown) on both of the front side and the rear side. The car door 8 for opening and closing the car entrance and the car door driving device 7 for driving the car door 8 are also provided on the front side and the rear side of the car upper frame 6. That is to say, the elevator shown in Figures 20 and 21 is a two-entrance elevator in which two entrances are formed in the straight line direction of the cab 1.

[0039] The right handrail 13, the left handrail 14, and the rear handrail 15 of the handrail device 12 are provided so as to be detachable from the top part of the car, and are configured so as to be capable of being installed in the opposite orientation in the front and rear direction with respect to the car. Specifically, the configuration is such that the lower pin 20 is detachably provided in the vertical pillar 17, and by removing the lower pin 20, the handrail device 12 can be pulled out of the mounting fixture 22. The vertical pillar 17 and the mounting fixture 22 are arranged so that even if the orientation of the handrail device 12 is changed through 180 degrees, the vertical pillar 17 can be installed in the mounting fixture 22. All of the mounting fixtures 22 provided on the front beam 10 and the rear beam 11 of the car upper frame 6 are formed with the stopper groove 22b. On the other hand, all of the vertical pillars 17 are provided detachably with the lower pin 20 in the lower end portion thereof. Also, only in the lower end portions of the vertical pillars 17 on the elevator boarding side, namely, on the side on which the turning devices 26 and the locking devices 27 for supporting the rear handrail 15 are not attached, the upper pin 21 is detachably provided.

[0040] By providing such a construction, the arrangement of the handrail device 12 can be set freely so as to match the direction of boarding the car from each floor, so that the present invention can be applied easily to the two-entrance elevator. Also, even in the case where the boarding direction is different, the common handrail device 12 can be used. Therefore, the components of the handrail device 12 can be made common, and therefore the number of component types can be decreased, and the cost can be reduced. As for the others, the same configuration and effect as those of any of Embodiments 1 to 3 are achieved.

Embodiment 5

[0041] Figure 22 is a side view of an essential portion of a handrail device of an elevator car in Embodiment 5 of the present invention, and Figure 23 is a front view of the handrail device of an elevator car shown in Figure 22, these figures corresponding to Figures 4 and 5 in Embodiment 5. In Figures 22 and 23, in the lower end portion of the vertical pillar 17, a through hole 17a having the axial direction in the same direction as the lengthwise directions of the lower pin 20 and the upper pin 21 is provided. This through hole 17a is formed so as to be arranged in the upper parts of the guide holes 22a in the mounting fixture 22 in the assembled state of the handrail device 12.

[0042] Also, reference numeral 35 denotes a float preventing means for preventing the vertical pillar 17 of the handrail device 12 in the assembled state from moving in the vertical direction. This float preventing means 35 includes a pin 35a having a predetermined length and a chain 35b one end portion of which is connected to the pin 35a. The other end portion of the chain 35b is fixed to the side beam 9a with a bolt 36. In the assembled state of the handrail device 12, the pin 35 is inserted through the through holes 17a formed in the upper part of the guide holes 22a formed in the mounting fixture 22 and in the lower end portion of the vertical pillar 17.

[0043] By providing such a construction, even if a force is applied upward to the handrail device 12 when the elevator maintenance work is performed, the float of the handrail device 12 can surely be prevented because the pin 35a of the float preventing means 35 does not move upward from the upper edge of the guide hole 22a. As for the others, the same configuration and effect as those of any of Embodiments 1 to 4 are achieved.

Industrial Applicability

[0044] As described above, according to the handrail device of an elevator car in accordance with the present invention, merely by engaging the upper pins provided in the lower end portions of the vertical pillars of the right handrail and the left handrail with the stopper grooves provided on the car upper frame from the upside, the overturn of the handrail device in the assembled state can be prevented. Therefore, the assembling work and storing work performed by the maintenance worker on the top of the car is made easy. Also, the construction of the handrail device can be simplified, and hence the handrail device can be configured at a low cost.

Claims

1. A handrail device of an elevator car, which is erected in a top portion of the car when elevator maintenance work is performed, and is folded and stored in the top portion of the car when the handrail device is not needed, comprising:

   a handrail device having handrails and vertical pillars for supporting the handrails;
   an upper pin and a lower pin which are provided in a lower end portion of the vertical pillar and are arranged above and below in an assembled state of the handrail device; and
   a connecting portion which is provided in the top portion of the car and to which the lower end portion of the vertical pillar is turnably connected, the connecting portion comprising:

      a guide portion which engages with one of the upper pin and the lower pin to guide the vertical pillar vertically through a predetermined direction; and
      a regulating portion with which the other of the upper pin and the lower pin engages from the upside to regulate the turning of the vertical pillar in the assembled state of the handrail device.

2. The handrail device of an elevator car according to claim 1, **characterized in that** the connecting portion is provided with parallel plates erected with a predetermined clearance being provided therebetween so that the lower end portion of the vertical pillar of the handrail device is arranged between the parallel plates, and the parallel plates each are formed with a guide portion consisting of an elongated hole, which has a lengthwise direction in the vertical direction and in which one of the upper pin and the lower pin is arranged penetratingly with a play, and a regulating portion consisting of a groove, which is open to the above.

3. The handrail device of an elevator car according to claim 1 or 2, **characterized in that** the handrail device comprises a right handrail and a left handrail arranged on the right side and the left side, respectively, of the top portion of the car, and a rear handrail which is turnably provided on at least one of the right handrail and the left handrail and is arranged on the rear side of the top portion of the car; and in a stored state of the handrail device, one of the right handrail and the left handrail is placed on the other thereof, and the rear handrail is stored within thicknesses of the right handrail and the left handrail.

4. The handrail device of an elevator car according to any one of claims 1 to 3, **characterized in that** the connecting portion is provided on a car upper frame arranged above the top surface of a cab, and in the assembled state of the handrail device, the vertical pillar is placed on the car upper frame so that vertical loads applied to the handrail device is supported by the car upper frame.

5. The handrail device of an elevator car according to claim 4, **characterized in that** the handrail device in a stored state is arranged horizontally on the car upper frame.

6. The handrail device of an elevator car according to any one of claims 1 to 5, **characterized in that** the other of the upper pin and the lower pin for regulating the turning of the vertical pillar in the assembled state of the handrail device is provided only on the vertical pillar arranged on a boarding side.

7. The handrail device of an elevator car according to any one of claims 1 to 6, **characterized in that** the handrail device is provided so as to be detachable from the top portion of the car, and can be installed in an opposite orientation in the front and rear direction with respect to the car.

8. The handrail device of an elevator car according to any one of claims 1 to 7, **characterized in that** a float preventing means is provided to regulate a vertical movement of the vertical pillar of the handrail device in the assembled state.

Fig. 1

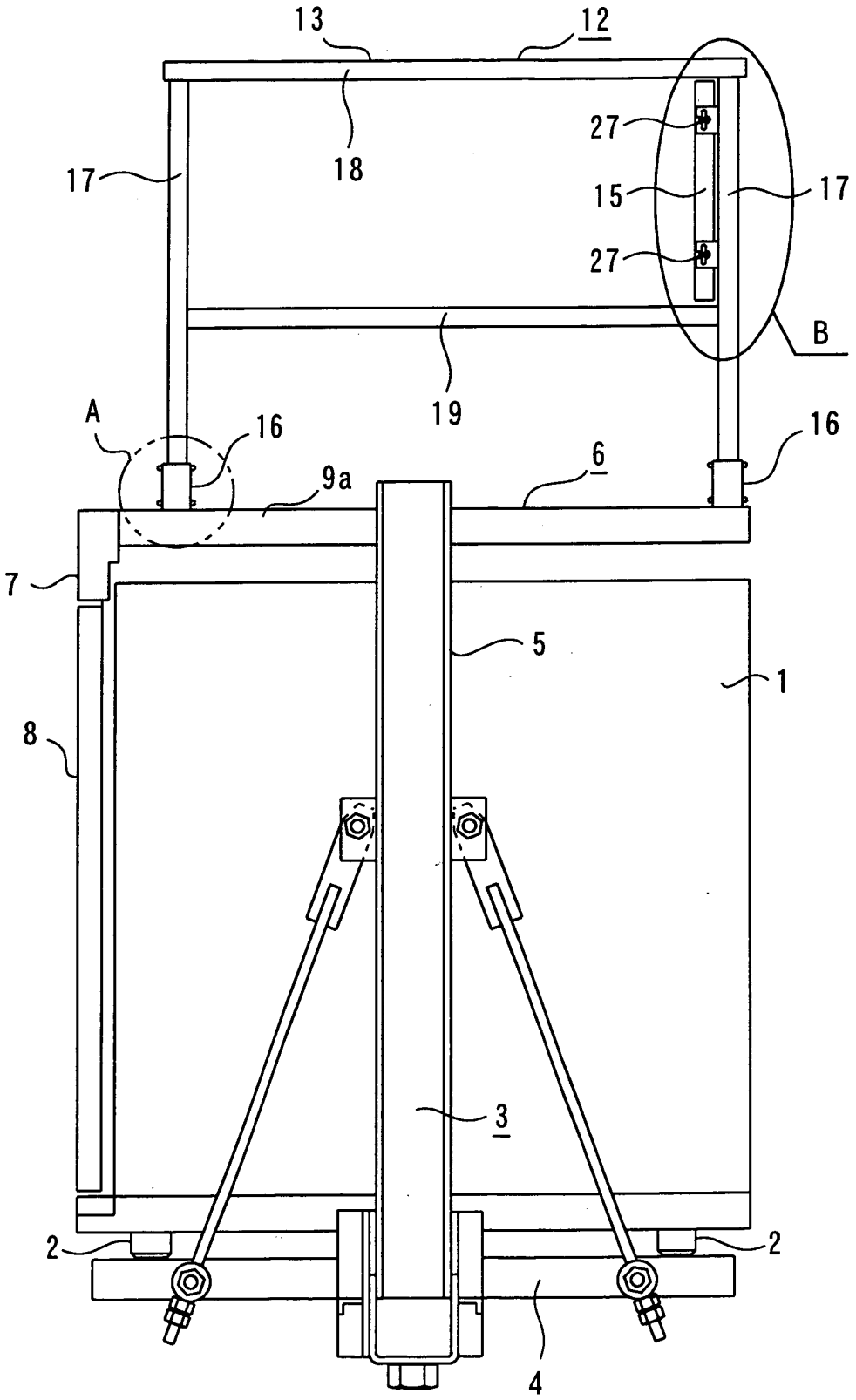

Fig. 2

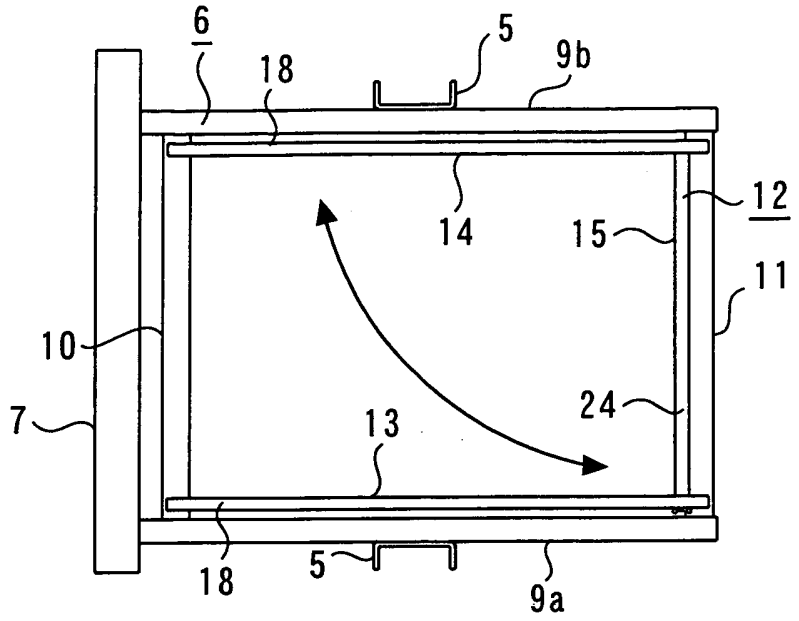
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Fig. 3

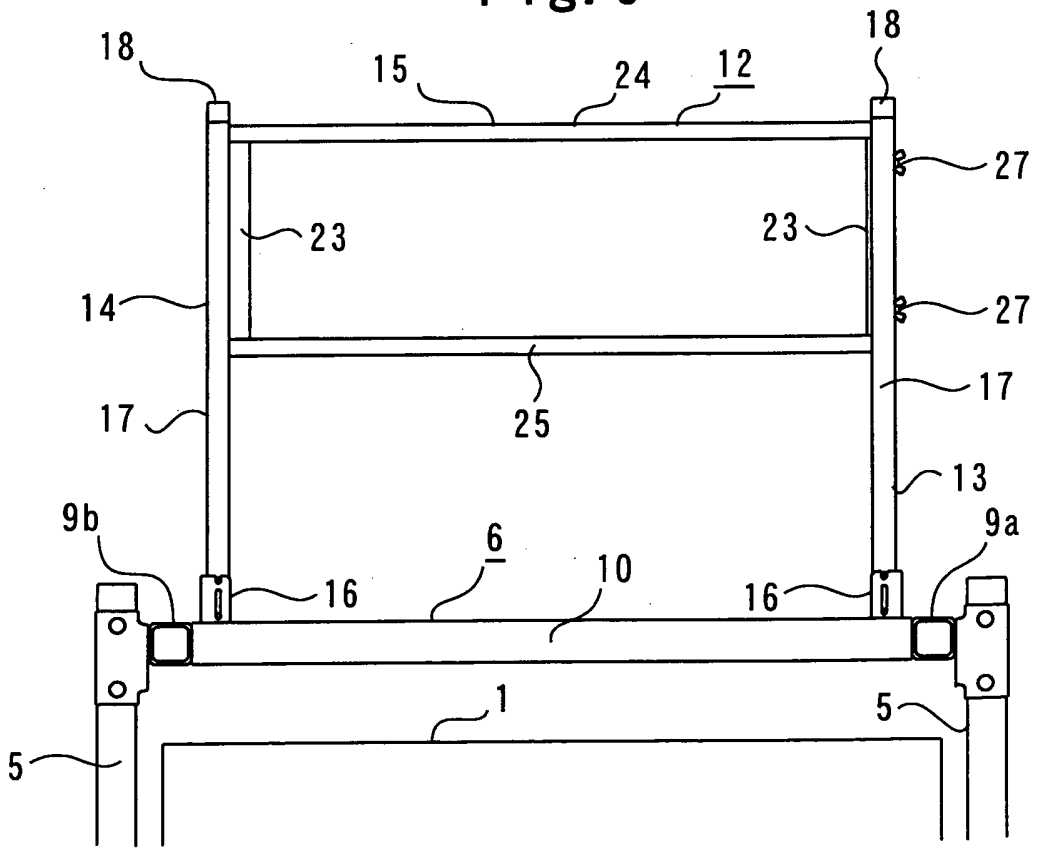
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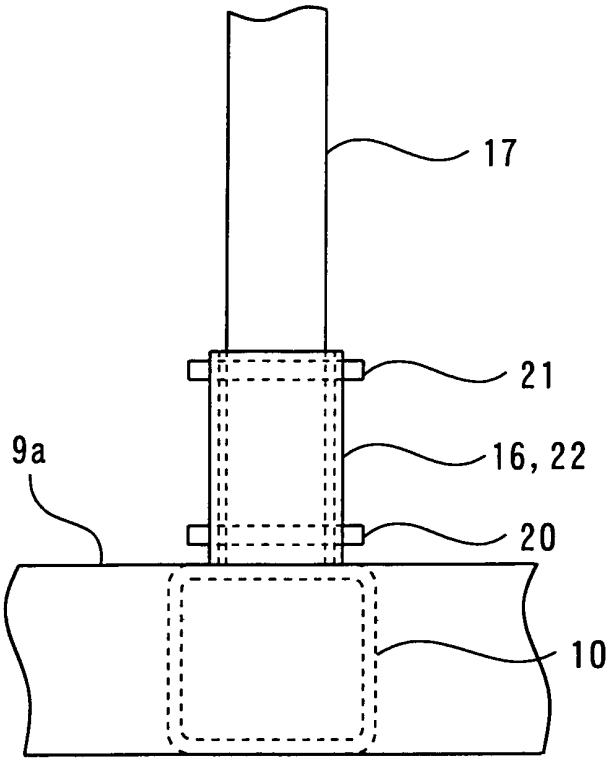
Fig. 4



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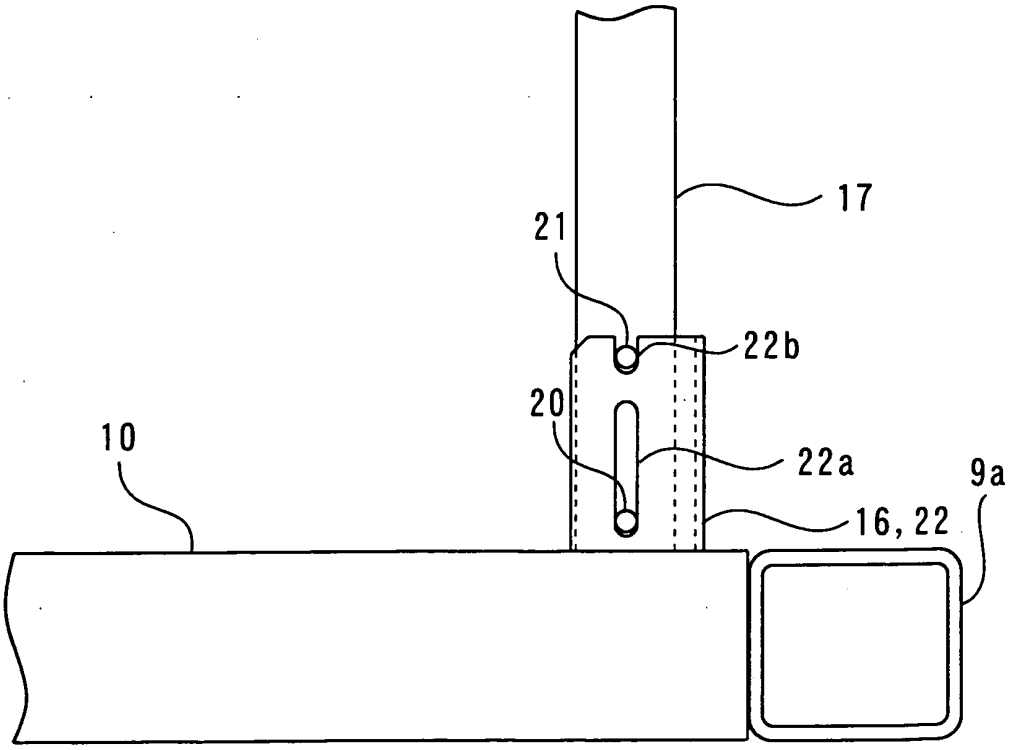

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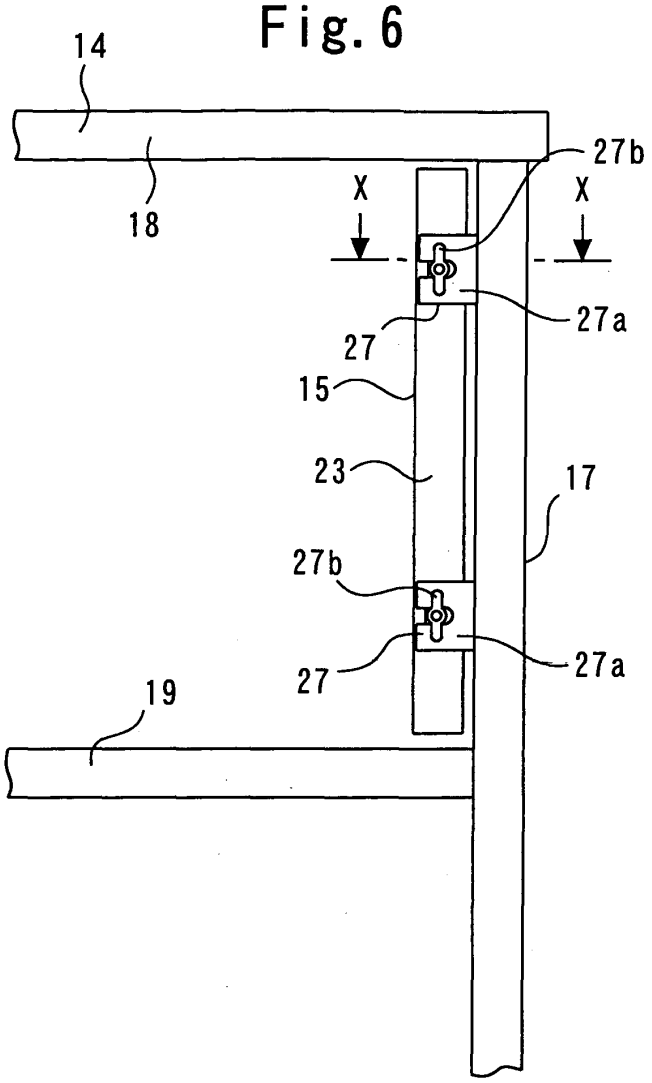

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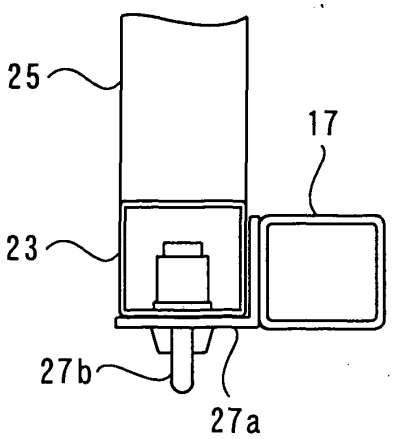

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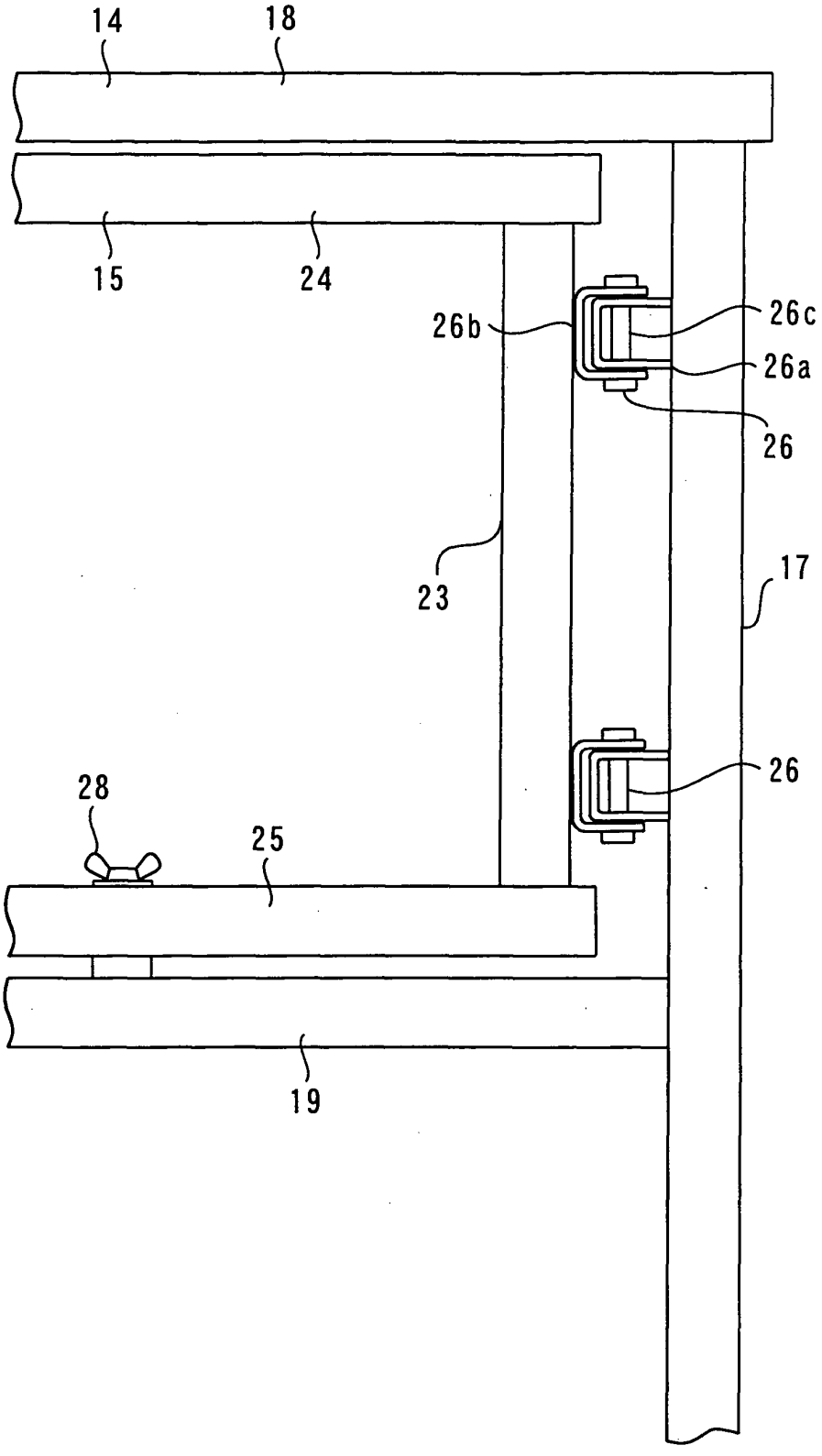

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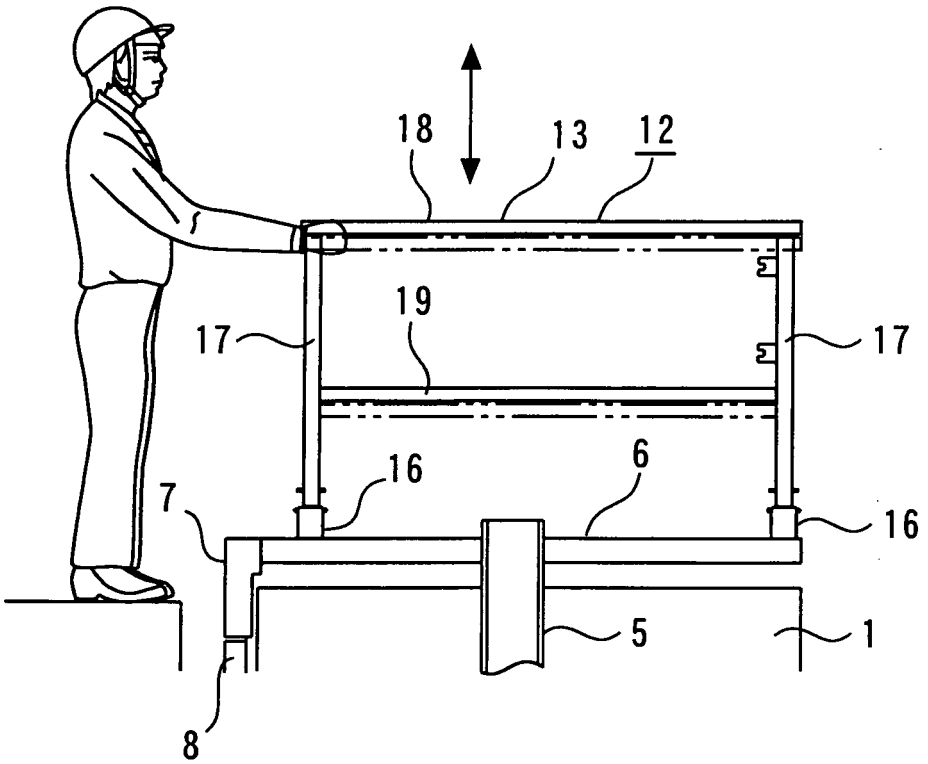

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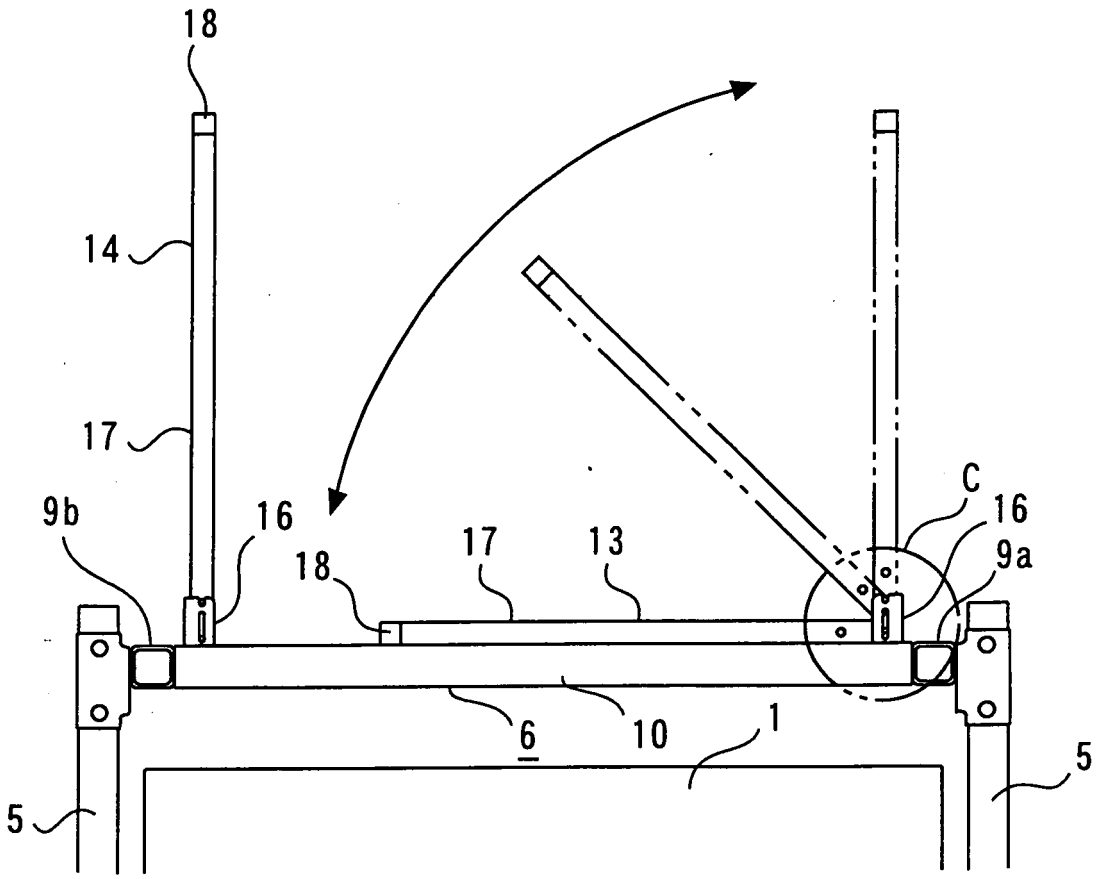

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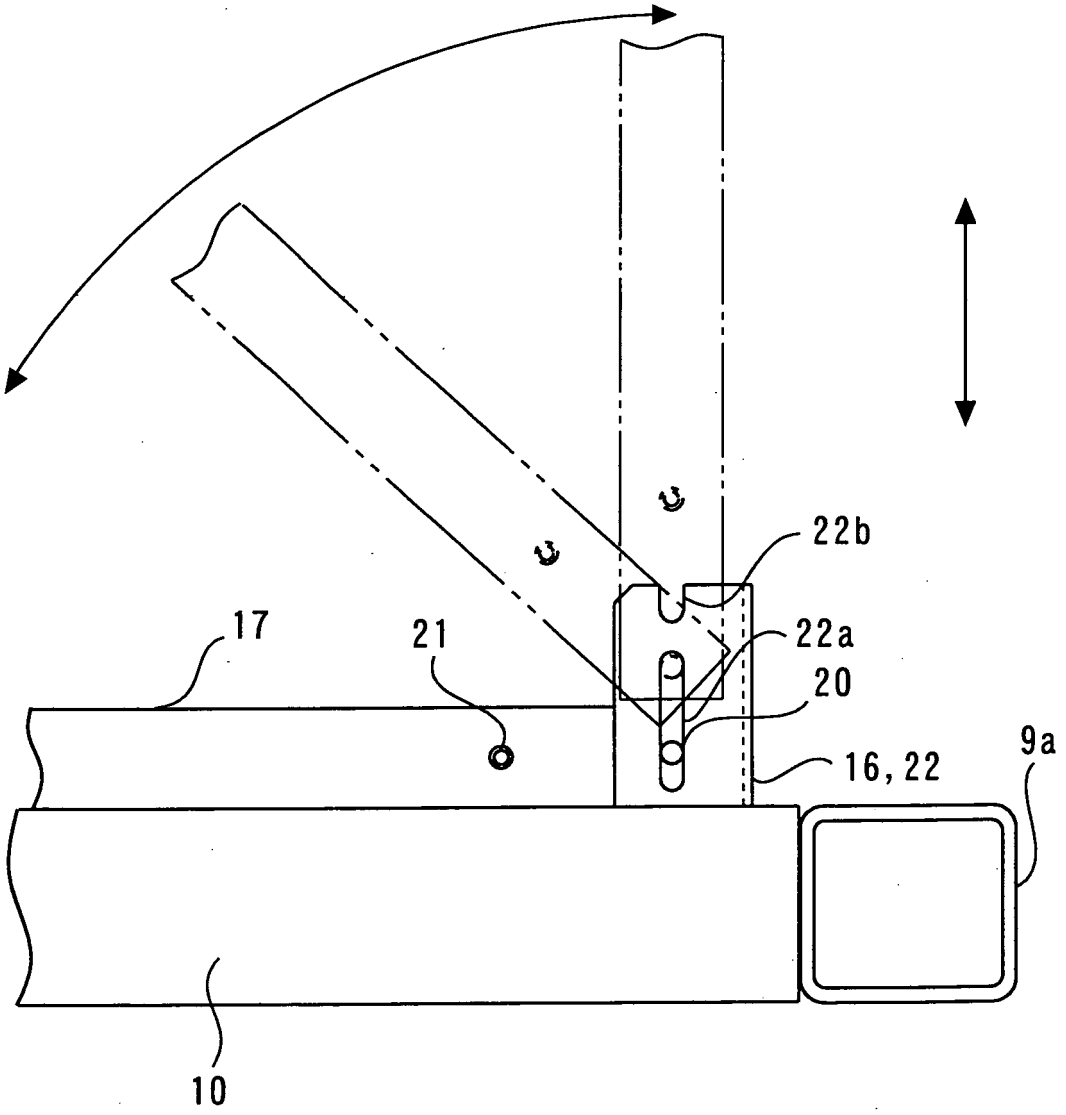

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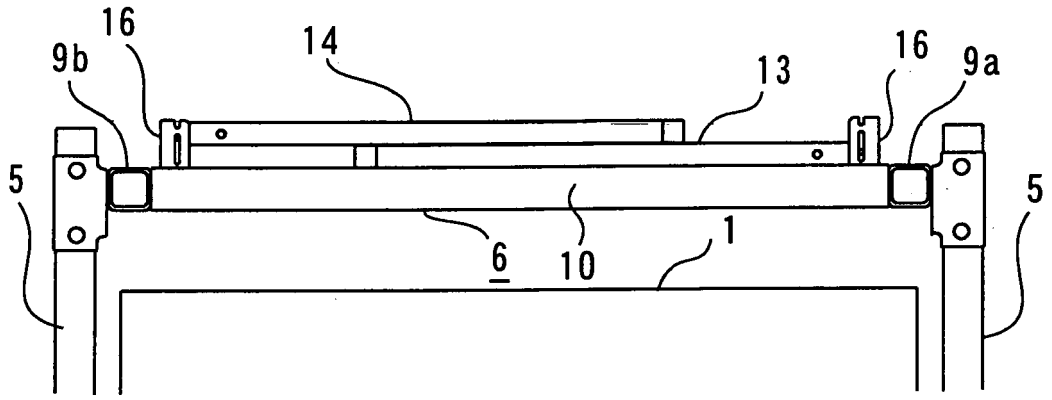

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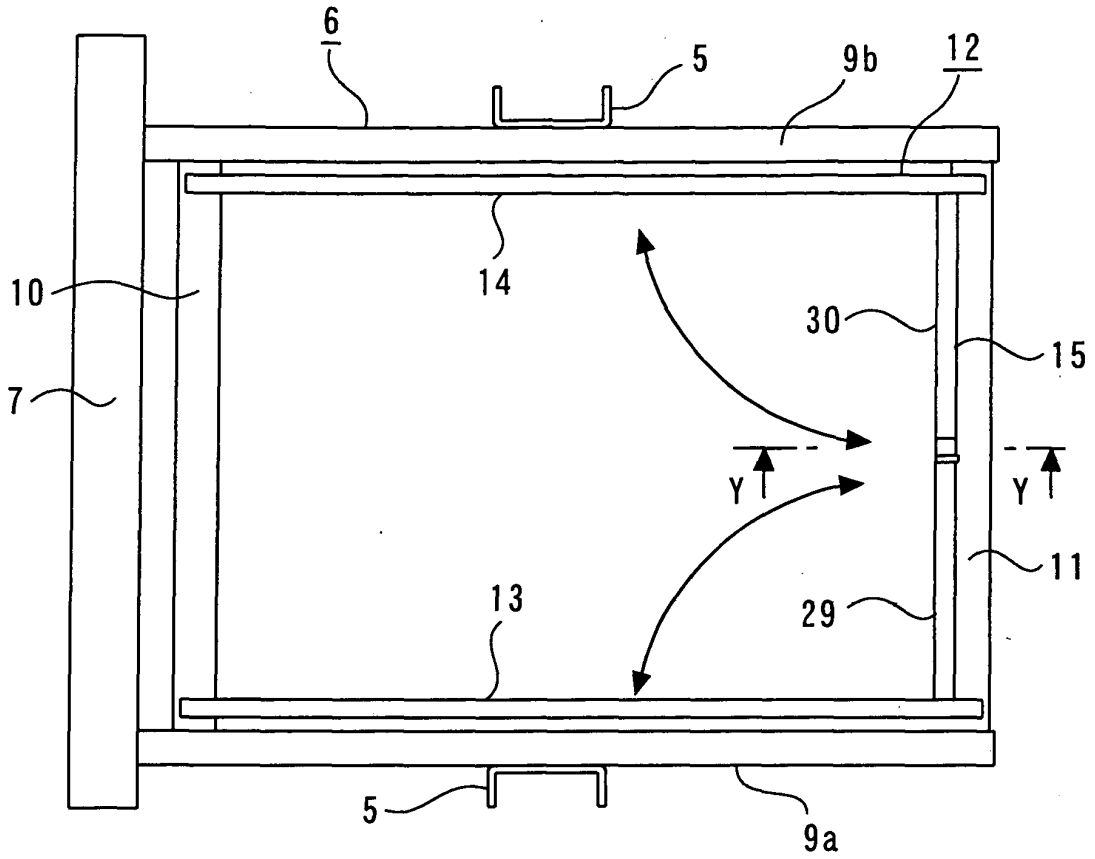

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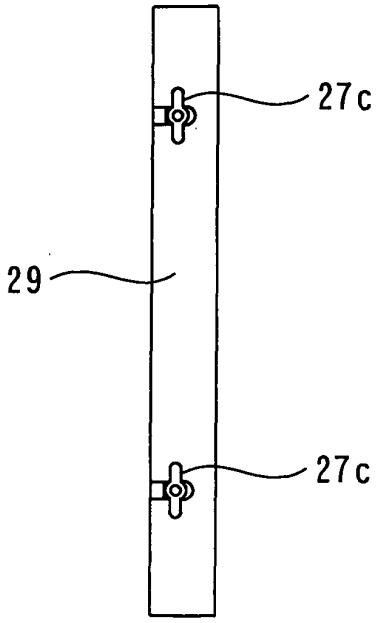

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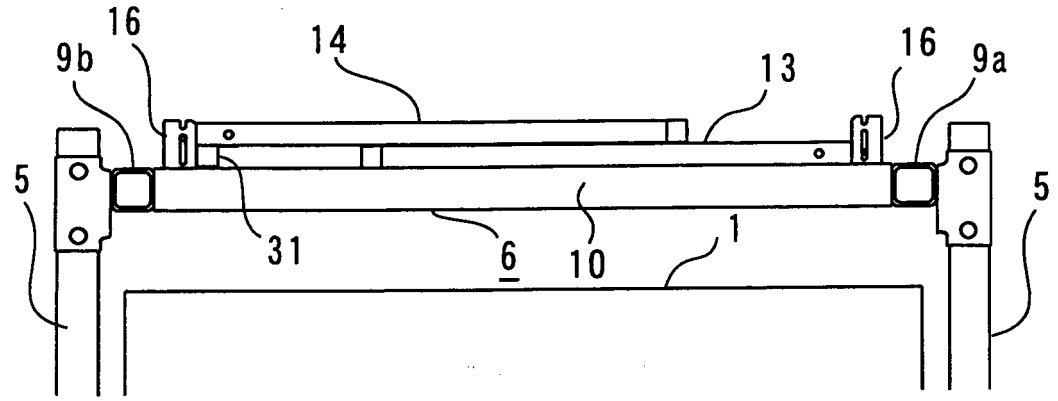

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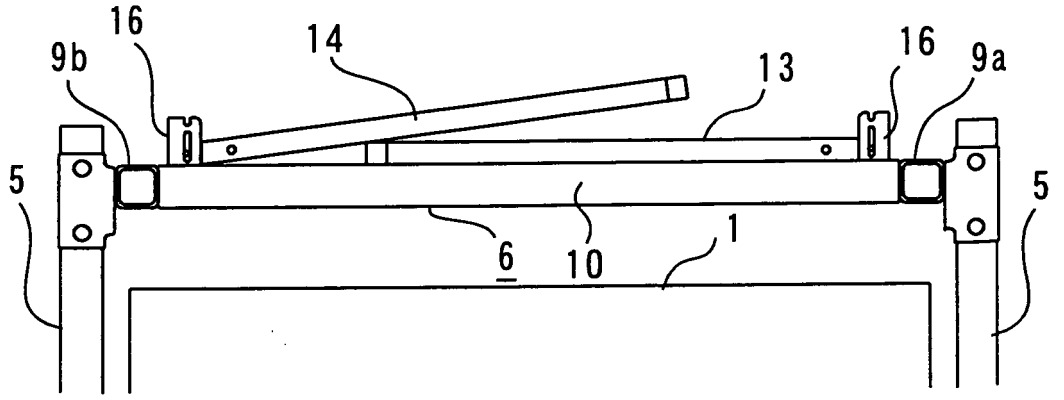

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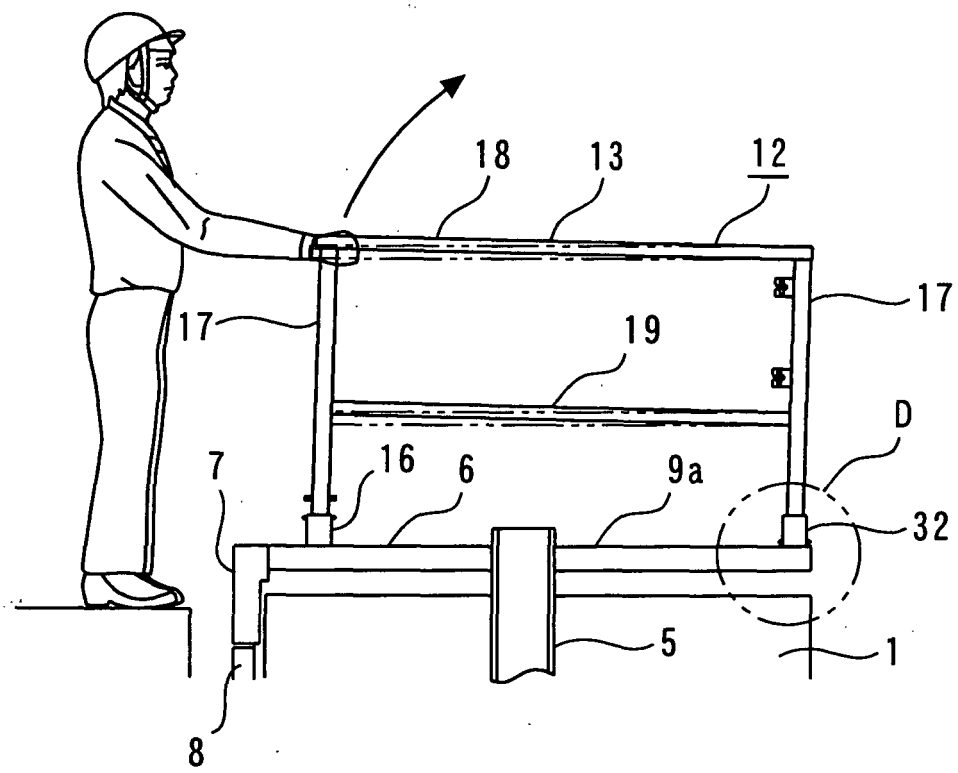

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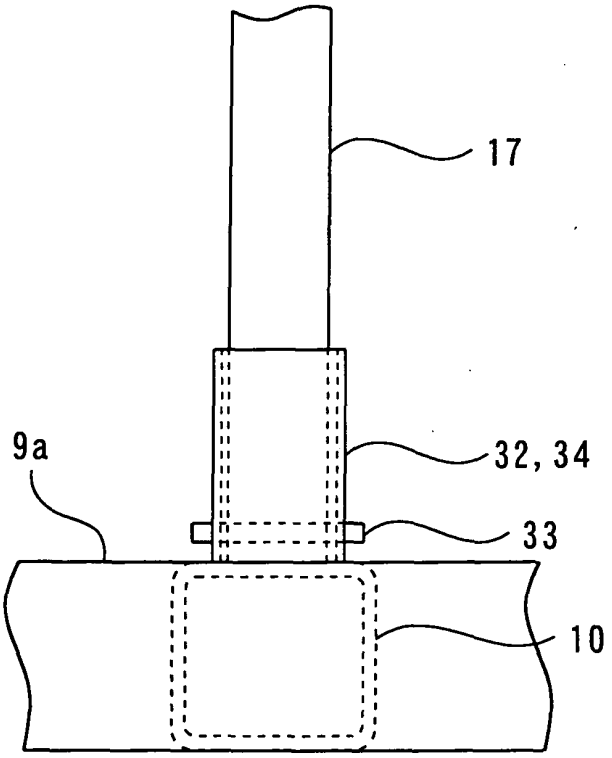
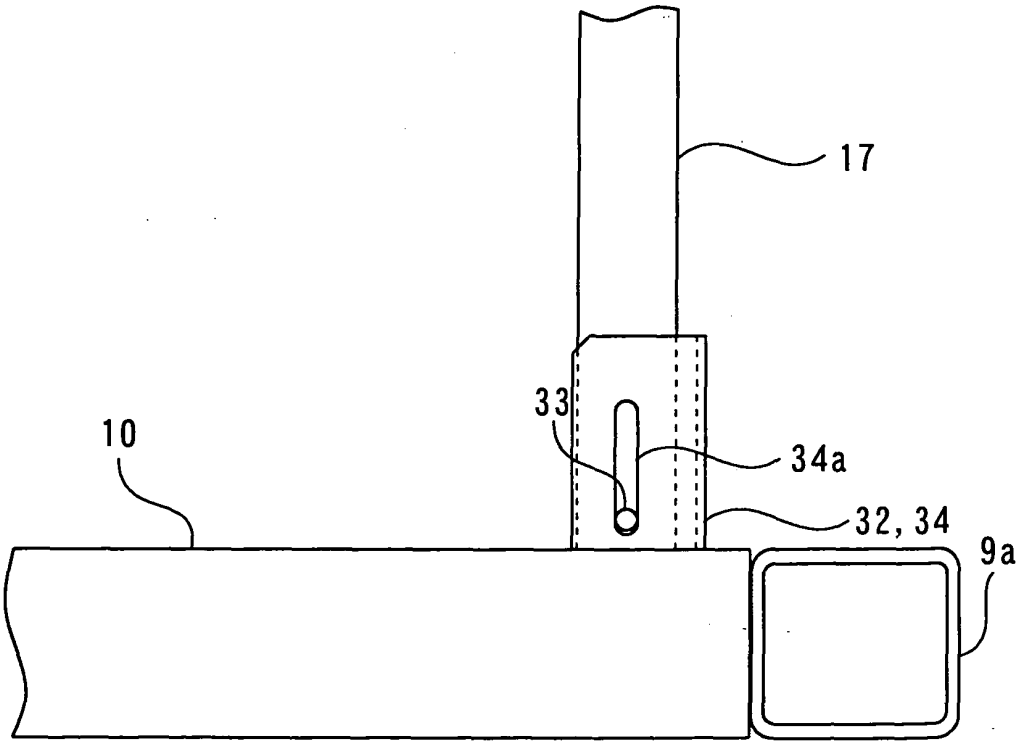


Fig. 19



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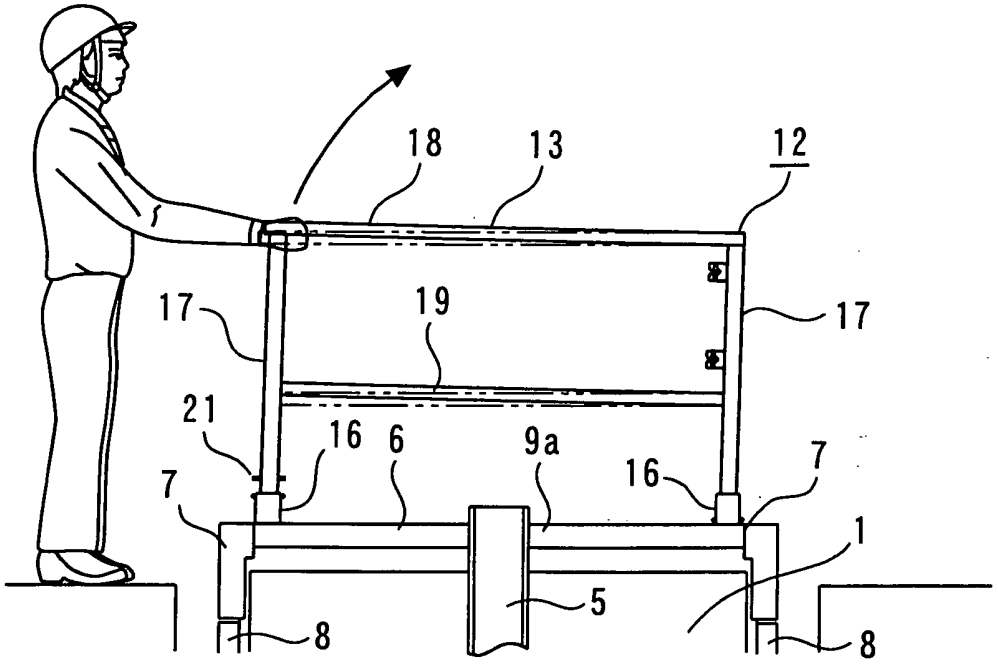
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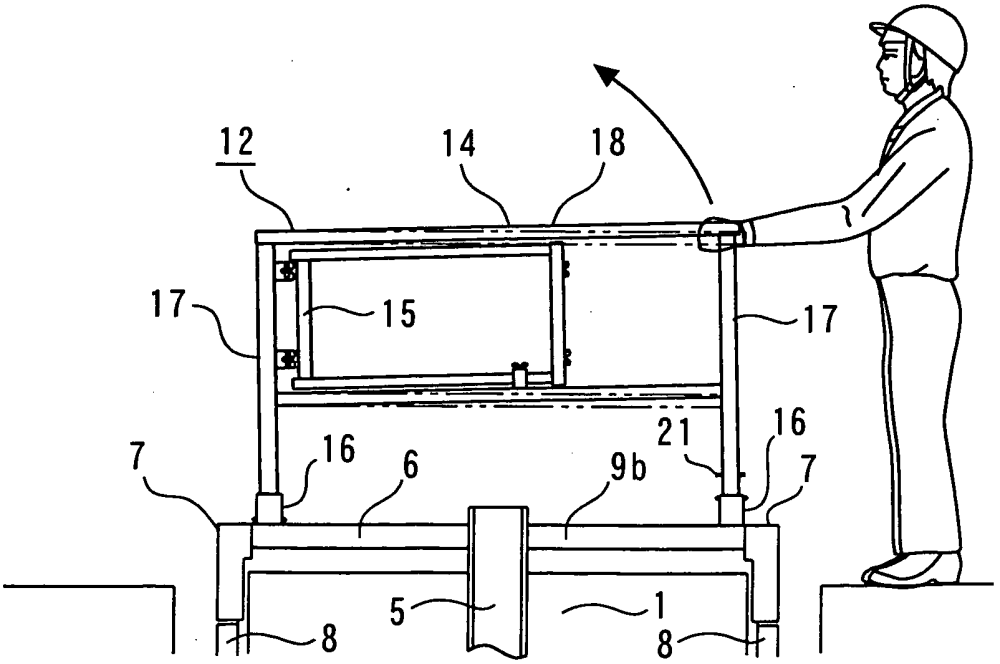
Fig. 21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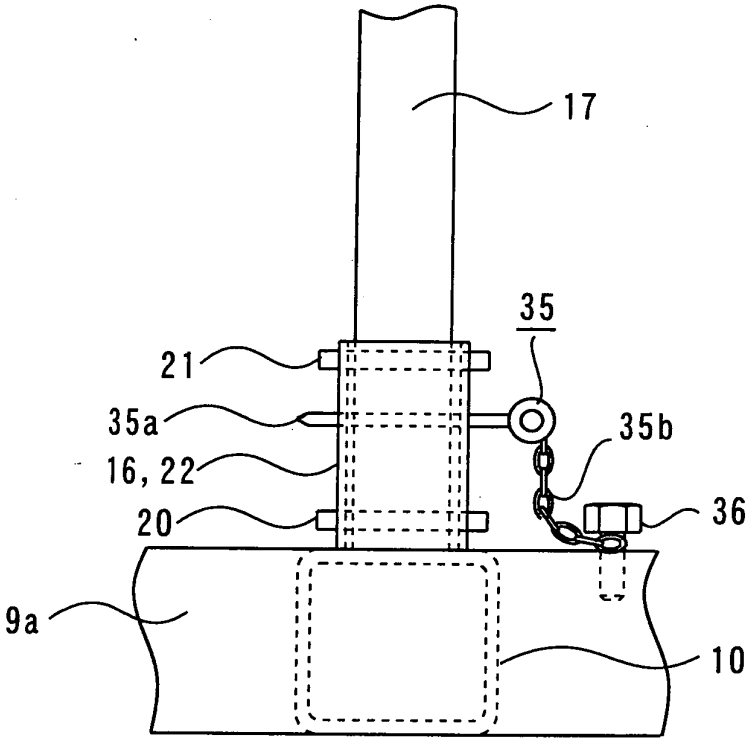
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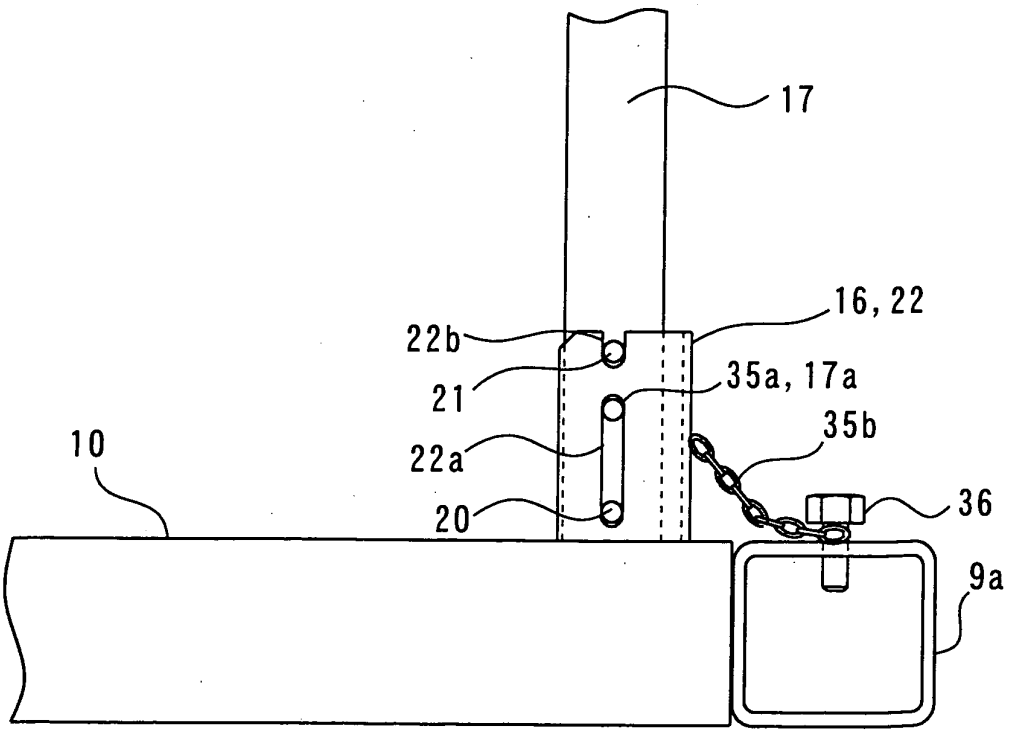
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/017133

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

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(2006.01)

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	JP 2005-132547 A (Hitachi Building Systems Co., Ltd.), 26 May, 2005 (26.05.05), (Family: none)	1-8
Y	JP 37-29874 Y1 (Noboru OYA), 07 November, 1962 (07.11.62), (Family: none)	1-8
Y	WO 03/093157 A1 (Mitsubishi Electric Corp.), 13 November, 2003 (13.11.03), & CN 1525937 A & EP 1500623 A1	4-6

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

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"O" document referring to an oral disclosure, use, exhibition or other means
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search 14 June, 2006 (14.06.06)	Date of mailing of the international search report 20 June, 2006 (20.06.06)
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

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