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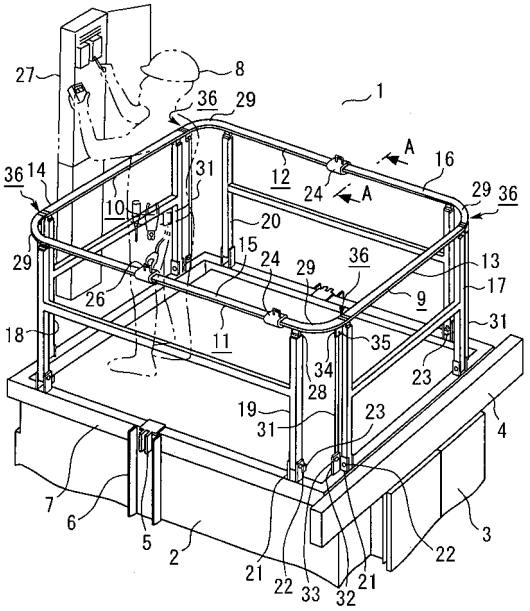
(54) **HANDRAIL DEVICE ON CAR OF ELEVATOR**

(57) There is provided a car handrail device of an elevator that can improve the work efficiency significantly without the need for refastening a safety hook when an elevator worker performs work while getting on the car. For this purpose, a handrail frame is erected in the top portion of the car so as to surround four directions, and a railing formed into endless is installed on the top portion of the handrail frame. Also, a guide having safety hook connecting means is installed on the railing, and is configured so as to be movable along the endless railing.

In the case where a worker performs work on the car, the worker connects his safety hook to the safety hook connecting means after moving on the car to ensure his security. And then, he performs the maintenance and the like of equipment in the shaft.

FIG. 1



EP 2 138 440 A1

Description

Technical Field

[0001] The present invention relates to a car handrail device that is used at the time of elevator maintenance and the like and ensures the security of a worker on a car.

Background Art

[0002] At the time of elevator maintenance and the like, an elevator worker often performs work while getting on the top of a car which ascends and descends in a shaft. For this reason, a car handrail device is provided in a top portion of the car so as to ensure the security of the worker who performs work on the car.

[0003] As a related art of such a car handrail device, there have been disclosed a car handrail device which is configured that the handrail divided into several parts can be foldable in a top portion of a car and a plurality of detectors are set, whereby the folded state of the handrail can be detected easily (for example, refer to Patent Document 1).

[0004]

Patent Document 1: Japanese Patent Laid-Open No. 2002-284469

Disclosure of the Invention

Problems to be Solved by the Invention

[0005] In the case where the elevator worker performs work while getting on the car, in the conventional techniques, the worker connects a safety hook fixed to his belt or the like to a part of the frame of a car handrail device and ensured his security. Incidentally, even when the car handrail device described in Patent Document 1 is provided in an elevator, the same method can be adopted.

[0006] However, in the case where the safety hook is connected to the frame of the car handrail device, a work area (range of movement) is limited within a predetermined scope. For this reason, the worker is required to refasten the safety hook when he has to move extensively on the car, and this has posed the problem that the work efficiency decreases remarkably.

[0007] The present invention has been made to solve problems as described above and the object of the invention is to provide a car handrail device of an elevator that can improve the work efficiency significantly without the need for refastening a safety hook when an elevator worker performs work while getting on the car.

Means for Solving the Problems

[0008] A car handrail device of an elevator of the present invention is a car handrail device provided in a top portion of a car that ascends and descends within an elevator shaft, which comprises a handrail frame erected in the top portion of the car so as to surround four directions, a railing which is installed on a top portion of the handrail frame consecutively, and is formed into endless so as to surround four directions, a guide which is installed on the railing, and is movable along the endless railing, and safety hook connecting means which is installed on the guide and to which a worker on the car can connect a safety hook.

[0009] A car handrail device of an elevator of the present invention is a car handrail device provided in a top portion of a car that ascends and descends within an elevator shaft, which comprises a plurality of handrail frames which are tiltably installed in the top portion of the car so as to surround four directions while erected, a plurality of railings which are installed on a top portion of each of the handrail frames, and are formed into endless as a whole so as to surround four directions when the handrail frames are erected, a guide which is installed on the railing, and is movable along the endless railings when the handrail frames are erected, and safety hook connecting means which is installed on the guide and to which a worker on the car can connect a safety hook.

Effect of the Invention

[0010] According to the present invention, when an elevator worker performs work while getting on the car, it becomes possible to improve the work efficiency significantly without the need for refastening a safety hook.

Brief of Description of the Drawings

[0011]

Figure 1 is a perspective view of a car handrail device of an elevator in a first embodiment according to the present invention;
Figure 2 is a view taken in the direction of the arrows along the line A-A shown in Figure 1;
Figure 3 is a view taken in the direction of the arrow B of Figure 2;
Figure 4 is a side view of a car handrail device of an elevator in the first embodiment according to the present invention;
Figure 5 is a longitudinal sectional view showing the configuration of the guide drop preventing means in the assembled state;
Figure 6 is a longitudinal sectional view for explaining the function of the guide drop preventing means;
Figure 7 is a diagram showing only the side handrail shown in Figure 6;
Figure 8 is a view taken in the direction of the arrow E shown in Figure 7;
Figure 9 is an exploded perspective view for explaining the function of the guide drop preventing means;
Figure 10 is a perspective view for explaining a fold-

ing operation of the car handrail device of an elevator in the first embodiment according to the present invention;

Figure 11 is a side view of the car handrail device of an elevator shown in Figure 10;

Figure 12 is a perspective view showing the stored state of the car handrail device of an elevator in the first embodiment according to the present invention;

Figure 13 is a side view of the car handrail device of an elevator shown in Figure 12;

Figure 14 is a front view showing the guide in a second embodiment according to the present invention;

Figure 15 is a side view showing the guide in the second embodiment according to the present invention; and

Figure 16 is a plan view showing the guide in the second embodiment according to the present invention.

Description of symbols

[0012] 1 shaft, 2 cab, 3 car door, 4 door operator, 5 guide shoe, 6 vertical frame, 7 top frame, 8 worker, 9 front handrail, 10 rear handrail, 11 side handrail, 12 side handrail, 13-16 railing, 17-20 handrail frame, 17a clearance hole, 21 supporting plate, 22 pin, 23 safety switch, 24 guide, 25 sliding member, 26 safety hook ring, 27 equipment in a shaft, 28 connecting portion, 29 curved portion, 30 pin, 31 link, 32 supporting plate, 33 pin, 34 supporting plate, 34a clearance hole, 34b clearance hole, 35 pin, 36 guide drop preventing means, 37 dividing plate, 37a spring hooking hole, 37b through hole, 38 dividing plate, 38a through holes, 39 stepped bolt, 40 spring, 41 spring guide, 42 attachment plate, 43 base plate, 43a screw hole, 44 wing bolt, 44a threaded portion at the leading end, 44b spring retainer, 45 spring, 46 guide roller

Best Mode for Carrying Out the Invention

[0013] The present invention will be described in more detail in accordance with the accompanying drawings. Incidentally, in each of the drawings, like numerals refer to like or similar parts and overlaps of description of these parts are appropriately simplified or omitted.

First Embodiment

[0014] Figure 1 is a perspective view of a car handrail device of an elevator in a first embodiment of the present invention. In Figure 1, reference numeral 1 denotes an elevator shaft; 2 denotes an elevator cab; 3 denotes a car door for opening and closing an entrance of the cab 2; 4 denotes a door operator for driving the car door 3; 5 denotes a guide shoe. Reference numeral 6 denotes a vertical frame of a car frame that supports the cab 2 and is arranged at each side of the cab 2. 7 denotes a top frame of the car frame that has a rectangular ring shape and is arranged horizontally above the cab 2 so as to surround the circumference of a top surface of the cab 2.

[0015] The car handrail device that ensures the security of a worker 8 on the car is supported by the top frame 7. This car handrail device is formed by a front handrail 9 arranged on the front side (hall side) of the car, a rear handrail 10 arranged on the rear side (far side of the shaft 1) of the car, and side handrails 11 and 12 arranged on each side of the car. Each of the handrails 9 to 12 is erected on a top surface of the top frame 7 so as to surround four directions, whereby the handrails form the work area for worker 8 inside thereof and prevent the worker 8 from falling.

[0016] Each of the handrails 9 to 12 includes a railing installed on the uppermost portion of the handrail and a handrail frame which supports this railing. Incidentally, the railing 13 and the handrail frame 17 of the front handrail 9 have the same configuration as that of the railing 14 and the handrail frame 18 of the rear handrail 10 facing to the front handrail 9. The railing 15 and the handrail frame 19 of the side handrail 11 have the same configuration as that of the railing 16 and the handrail frame 20 of the side handrail 12 facing to the side handrail 11.

[0017] Also, the car handrail device is constructed so as to be foldable in the top portion of the car for space-saving designs in the upper part of the shaft 1. Figure 1 shows a state in which the car handrail device is assembled completely and erected in the top portion of the car at the time of elevator maintenance and the like (hereinafter referred to as an "assembled state"). A supporting plate 21 and a pin 22 are the members for constituting the car handrail device so as to be foldable, and turnably fixing a lower end portion of each of the handrail frames 17 through 20 to the top frame 7. That is, the handrail frames 17 to 20 are brought down completely inside of the car, with the pin 22 serving as the center, from the state shown in Figure 1, whereby the car handrail device is folded and stored on the top frame 7 (hereinafter, referred to as a "stored state"). Incidentally, 23 denotes a safety switch which detects whether the car handrail device is in a predetermined stored state on the basis of the tilted position of the handrail frames 19 and 20, and switches an elevator operation to a maintenance operation automatically when the car handrail device is not in the predetermined stored state.

[0018] Each of the railings 13 to 16 of the handrails 9 to 12 has a plate shape. And the railings 13 to 16 in the assembled state have a rectangular ring shape as a whole that has predetermined roundness in each corner portion, by which the railings are arranged endlessly so as to surround four directions.

[0019] Also, a guide 24 which is movable along the endless railings 13 to 16 in the assembled state is installed on the railings 13 to 16. Figure 2 is a view taken in the direction of the arrows along the line A-A shown in Figure 1, Figure 3 is a view taken in the direction of the

arrow B shown in Figure 2. Figure 2 and 3 show the construction of the guide 24. The guide 24 includes a sliding member 25 formed of high-polymer material, and a safety hook ring 26 (safety hook connecting means). The sliding member 25 is provided so as to move the guide 24 smoothly on the railings 13 to 16, and is installed on a facing surface facing to the railings 13 to 16. Also, the safety hook ring 26 is intended for being connected with a safety hook fastened to the belt or the like of the worker 8. As also shown in Figure 1, at the time of elevator maintenance and the like, the elevator worker 8 connects his safety hook to the safety hook ring 26 to ensure his security after moving onto the car. Then, the maintenance work and the like of the equipment in a shaft 27 are performed.

[0020] The guide 24 has a predetermined high strength for preventing the railings 13 to 16 from coming off even in the worst case where the worker 8 falls from the top of the car. For example, the guide 24 has a rectangular tubular shape having, in a part thereof, a slit of a predetermined width, and is arranged so as to wrap around the flat railings 13 to 16. Also, the guide 24 is arranged so that the slit is positioned downward thereof so as not to contact with the connecting portion 28 between the railings 13 to 16 and the handrail frames 17 to 20 when the guide moves on the railings 13 to 16.

[0021] That is to say, since the guide 24 has the above-described configuration, the guide 24, in the assembled state in which the railings 13 to 16 are formed into endless, is able to move smoothly between the adjacent railings (for example, between the railing 15 and the railing 13) without making contact with each of connection portions 28. Also, in the assembled state, since the predetermined roundness is formed in the corner portion of the railings 13 to 16 which have a rectangular ring shape as a whole, the guide 24 can moves smoothly on the corner portion. Therefore, the guide 24 has the configuration so as to be able to go around bi-directionally along the railings 13 to 16 above the cab 2, by which the guide can easily follow the movement of worker 8 who is connected to the guide by the safety hook on the car.

[0022] A curved portion 29 (corresponding to the corner portion) for causing the guide 24 to move smoothly is formed at each end portion of the railing 15 of the side handrail 11 and the railing 16 of the side handrail 12. This curved portion 29 is curved inward of the car with a predetermined curvature so that the curved portion is connected to end portions of railings 13 and 14 in the assembled state. Therefore, the height of the car handrail device in the stored state may become increased, whereby the space-saving designs in the upper part of the shaft 1 cannot be achieved if, for example, the side handrail 11 is tilted inward under the situation in which the railing 15 is firmly fixed to the handrail frame 19.

[0023] For this reason, the car handrail device has a predetermined configuration so as to be able to be stored in the state in which the railings 15 and 16 retain horizontal attitude. For example, a pin 30 arranged parallel to the pin 22 is provided on the connecting portion 28 of the side handrail 11, whereby the railing 15 and the handrail frame 19 are turnably connected on the axis of a lengthwise direction of the railing 15. And a link 31 is connected between the curved portions 29 of the railing 15 and the top frame 7, whereby causing the top surface of the railing 15 to be constantly retained horizontal attitude even when the handrail frame 19 is tilted. Incidentally, 32 and 33 denote a supporting plate and a pin that are intended for turnably fixing a lower end portion of the link 31 to the top frame 7. 34 and 35 denote a supporting plate and a pin that are intended for turnably fixing a upper end portion of the link 31 to the curved portion 29 of the railing 15. The side handrail 12 has the same configuration as that of the side handrail 11.

[0024] On the other hand, the car handrail device is stored on the car by tilting the handrails 9 to 12 inward, respectively. For this reason, the railings 13 to 16 which are formed into endless as a whole in the assembled state are arranged separately each other in the stored state. Guide drop preventing means 36 is intended for preventing the guide 24 from coming off the end portions of the railings 13 to 16 when the car handrail device is brought into a disassembled state, and is provided on both end portions of the railings 13 to 16, respectively. Hereinafter, the specific configuration of the guide drop preventing means 36 will be explained while taking an exemplary one that is provided between the adjacent end portions of the railing 15 of side handrail 11 and the railing 13 of the front handrail 9.

[0025] Figure 4 is a side view of a car handrail device of an elevator in the first embodiment of the present invention; Figure 5 is a longitudinal sectional view showing the configuration of the guide drop preventing means in the assembled state; Figure 6 is a longitudinal sectional view for explaining the function of the guide drop preventing means; Figure 7 is a diagram showing only the side handrail shown in Figure 6; Figure 8 is a view taken in the direction of the arrow E shown in Figure 7; and Figure 9 is an exploded perspective view for explaining the function of the guide drop preventing means. Incidentally, Figure 5 shows a portion A shown in Figure 4. Figure 8 is a view taken in the direction of the arrows along the line D-D shown in Figure 6.

[0026] In Figures 4 to 9, the railing 15 of the side handrail 11 and the railing 13 of the front handrail 9 are provided with dividing plates 37 and 38 on their end portions that are adjacent to each other in the assembling state of the handrail device. The dividing plates 37 and 38 have a T-shape, respectively, and each of the top portions thereof has the same shape as the rail portions of the railing 15 and 13, that is, a tabular shape. Accordingly, in the assembled state shown in Figure 5, the top portions of the dividing plates 37 and 38 are arranged linearly to the rail portions of the railings 15 and 13 so as to contact the adjacent railings 15 and 13. Therefore, the guide 24 can move freely between the railing 15 and 13.

[0027] On the other hand, in a case where the car

handrail device is not in the assembled state, that is, when the handrail frames 19 and 17 are tilted, the top portions of the dividing plates 37 and 38 are arranged at a remove from each rail portion of the corresponding railings 15 and 13, as shown in Figures 6 to 8. Namely, the dividing plates 37 and 38 prevent the guide 24 from coming off the end portions of the railings 15 and 13 by stopping the guide 24 from sliding.

[0028] 39 denotes a stepped bolt for turnably fixing the dividing plate 37 to one end surface of the railing 15; 40 denotes a spring which constantly presses the dividing plate 37 against one side with the axis of the stepped bolt 39 as a center; 41 denotes a spring guide for setting the pressure direction of the spring 40; 42 denotes an attachment plate for attaching the spring 40 in the predetermined position. 43 denotes a base plate provided on the supporting plate 34. The stepped bolt 39 and the attachment plate 42 are fixed to the base plate 43 via a clearance hole 34a of the supporting plate 34. As shown in Figures 4 to 9, the lower portion of the dividing plate 37 is constantly pressed toward one side by the spring 40 one end portion of which is inserted into a spring hooking hole 37a, whereby the dividing plate 37 turns around the stepped bolt 39 and a top portion thereof is arranged at a remove from the rail portion of the railing 15. Incidentally, the dividing plate 38 also prevents the guide 24 from coming off (dropping from) the railing 13 by the same configuration as described above.

[0029] Also, an axis portion of a wing bolt 44 is inserted into through holes 37b and 38a formed on lower end portions of the dividing plates 37 and 38, whereby the dividing plates 37 and 38 are held in a state in which the top portions thereof are arranged linearly to the rail portions of the railings 15 and 13 so as to bring the railings 15 and 13 into a continuity form. 43a denotes a screw hole that is formed on the base plate 43 so as to be fixed with a threaded portion at the leading end 44a of the wing bolt 44; 34b denotes a clearance hole that is formed on the supporting plate 34 for the leading end portion of the wing bolt 44; 45 and 44b denote a spring and a spring retainer for constantly pressing the wing bolt 44 to the direction of removing from the through holes 37b and 38a; 17a denotes a clearance hole for actuating the wing bolt 44. Incidentally, holding means is formed by the wing bolt 44, the through holes 37b and 38a, and the screw hole 43a etc. Although the configuration described above is for the guide drop preventing means 36 provided between end portions of the railings 15 and 13, other guide drop preventing means 36 also have same configuration.

[0030] Next, a description will be given of the operation that occurs when the car handrail device having the above-described configuration is folded from the position shown in Figure 1. Figure 10 is a perspective view for explaining a folding operation of the car handrail device of an elevator in the first embodiment of the present invention; Figure 11 is a side view of the car handrail device of an elevator shown in Figure 10; Figure 12 is a perspective view showing the stored state of the car handrail device of an elevator in the first embodiment of the present invention; Figure 13 is a side view of the car handrail device of an elevator shown in Figure 12.

[0031] In the assembled state of the car handrail device shown in Figure 1, as noted above, the railings 13 to 16 are formed in continuity, and each of the guide drop preventing means 36 is in the state shown in Figure 5. In a case where the car handrail device is stored from this state, the worker 8 puts the guide drop preventing means 36 into being functional by performing a predetermined work (shown in Figure 6) at first. Namely, the worker 8 looses the wing bolt 44 from the position shown in Figure 5, then removes the axis portion of the wing bolt from the lower end portions of the dividing plates 37 and 38. As a result, the dividing plate 37 becomes inclined with respect to the railing 15 and the dividing plate 38 becomes inclined with respect to the railing 13 due to the pressing force of spring 40, thereby the dropping of the guide 24 is caused to be prevented.

[0032] After all of the guide drop preventing means 36 become functional, the worker 8 tilts the front handrail 9 and the rear handrail 10 to the inside of the car and puts them into the horizontal state above the cave 2. Next, as shown in Figures 10 and 11, the worker 8 tilts the side handrails 11 and 12 to the inside of the car and puts the car handrail device into the stored state. Incidentally, even when the handrail frames 19 and 20 of the side handrails 11 and 12 are tilted to the inside of the car, the railings 15 and 16 are kept in a horizontal attitude constantly by the action of the link 31. Therefore, the height of the car handrail device can be kept low also in the stored state shown in Figures 12 and 13.

[0033] Further, by reversing the procedure described above, the car handrail device can be assembled. In this instance, for example, after erecting the handrail frames 19 and 17 on the top frame 7, the worker 8 sets the dividing plates 37 and 38 so that the top portions thereof are arranged linearly to the rail portions of the railings 15 and 13, then inserts the wing bolt 44 into the through holes 38a and 37b and screws it. And after erecting the handrails 9 to 12 and arranging all the dividing plates so as to be linearly to the rail portions of the railings 13 to 16, the worker 8 connects his safety hook to the safety hook ring 26 of the guide 24 and begins work.

[0034] According to the first embodiment of the present invention, when the elevator worker 8 performs work on the top of the car, it becomes possible to significantly improve the work efficiency without the need for refastening the safety hook. Therefore, this car handrail device can be especially effective means for a machine roomless elevator that has various devices within the shaft 1. In addition, the forgetting to connect the safety hook can be prevented at the same time, which occurs after the worker removes the safety hook during an operation.

[0035] Also, even in the case where each of the surrounding handrails 9 to 12 is configured so as to be able to tilt so that the car handrail device can be foldable, the dropping of the guide 24 can surely be prevented by the

guide drop preventing means 36 provided on the end portions of the railings 13 to 16. Further, since the railings 15 and 16 having the curved portion 29 can be stored in a horizontal attitude, the height of the car handrail device in the stored state can be minimized, and the space-saving designs of the upper space of the shaft 1 can also be achieved.

Second Embodiment

[0036] Figure 14 is a front view showing the guide in a second embodiment of the present invention; Figure 15 is a side view of the guide; and Figure 16 is a plan view of the guide. In Figures 14 to 16, the guide 24 includes a guide roller 46 for moving smoothly on the railings 13 to 16 and a safety hook ring 26. Namely, when the guide 24 moves along the railings 13 to 16, the guide roller 46 turnably provided inside thereof rolls on both side portions of railings 13 to 16, whereby the smooth movement can be achieved.

[0037] According to the second embodiment of the present invention, the guide 24 moves smoothly on the railings 13 to 16. Therefore, the burden on the worker 8 can be reduced, and the work efficiency can be more improved.

Industrial Applicability

[0038] As described above, according to the car handrail device of the present invention, when an elevator worker performs work while getting on the car, it becomes possible to improve the work efficiency significantly without the need for refastening a safety hook. Therefore, the car handrail device according to the present invention can be applied to an elevator in general that has a car handrail device on the car, regardless of an elevator type and the like.

Claims

1. A car handrail device of an elevator provided in a top portion of a car that ascends and descends within an elevator shaft, comprising:

   a handrail frame erected in the top portion of the car so as to surround four directions;
   a railing which is installed on the top portion of the handrail frame consecutively, and is formed into endless so as to surround four directions;
   a guide which is installed on the railing, and is movable along the endless railing; and
   safety hook connecting means which is installed on the guide and to which a worker on the car can connect a safety hook.

2. A car handrail device of an elevator provided in a top portion of a car that ascends and descends within an elevator shaft, comprising:

   a plurality of handrail frames which are tiltably installed in the top portion of the car so as to surround four directions when erected;
   a plurality of railings which are installed on the top portion of each of the handrail frames, and are formed into endless as a whole so as to surround four directions when the handrail frames are erected;
   a guide which is installed on the railing, and is movable along the endless railings when the handrail frames are erected; and
   safety hook connecting means which is installed on the guide and to which a worker on the car can connect a safety hook.

3. The car handrail device of an elevator according to claim 2, wherein the car handrail device comprises guide drop preventing means which is arranged on each end portion of each of the railings, respectively, and prevents the guide from coming off the railing when the handrail frames are tilted.

4. The car handrail device of an elevator according to claim 3, wherein
   the guide drop preventing means has one part that has the same shape as that of a rail portion of the railing;
   the one part becomes arranged linearly to the rail portion of the railing and connects the adjacent railings when the handrail frames are erected; and
   the one part becomes arranged at a remove from the rail portion of the railing and prevents the guide from coming off the railing when the handrail frames are tilted.

5. The car handrail device of an elevator according to claim 4, wherein the guide drop preventing means comprises:

   a dividing plate which is turnably provided on each end portion of each of the railings and one part of which has the same shape as that of the rail portion of the railing;
   a spring which is provided corresponding to each of the dividing plates, and constantly presses the corresponding dividing plate against one side, thereby causing the one part of the dividing plate to be arranged at a remove from the rail portion of the corresponding railing; and
   holding means which holds the one part of the dividing plate in the state in which the one part of the dividing plate is arranged linearly to the rail portion of the corresponding railing when the handrail frames are erected.

6. The car handrail device of an elevator according to

claim 2, wherein
the railings are formed into a rectangular ring shape as a whole that has predetermined roundness in each corner portion when the handrail frames are erected, and
the railing having the corner portion is held so that the top surface thereof constantly keeps horizontal attitude when the handrail frames are tilted.

7. The car handrail device of an elevator according to claim 2, wherein the car handrail device comprises a safety switch which detects whether the car handrail device is in a predetermined stored state, and automatically switches the elevator operation to a maintenance operation automatically when the car handrail device is not in the predetermined stored state.

8. The car handrail device of an elevator according to any one of claims 1 to 7, wherein the guide has a sliding member formed of high-polymer material on a facing surface facing to the railing.

9. The car handrail device of an elevator according to any one of claims 1 to 7, wherein the guide has guide rollers which roll on both side portions of the railing.

FIG. 1

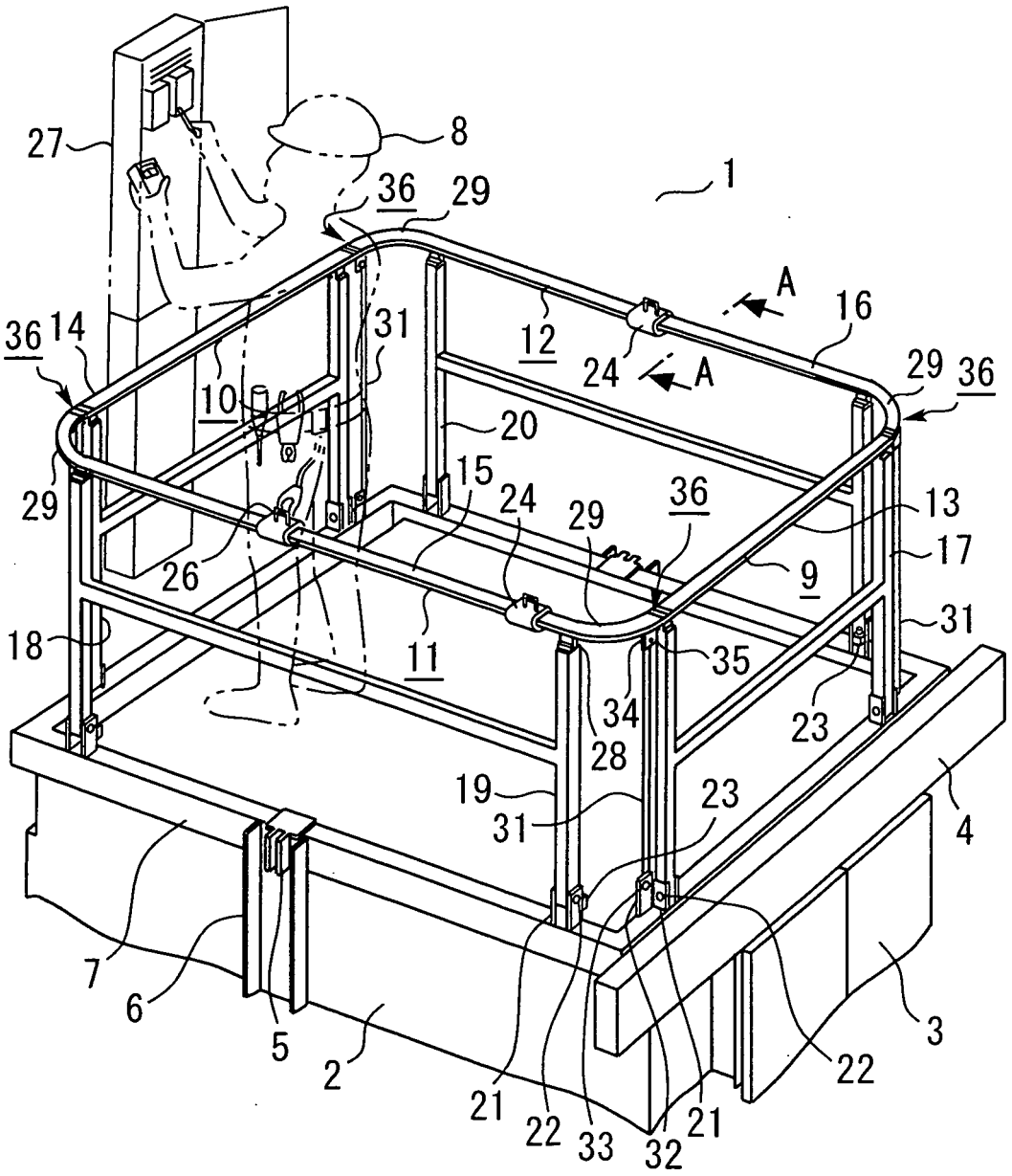

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FIG. 2

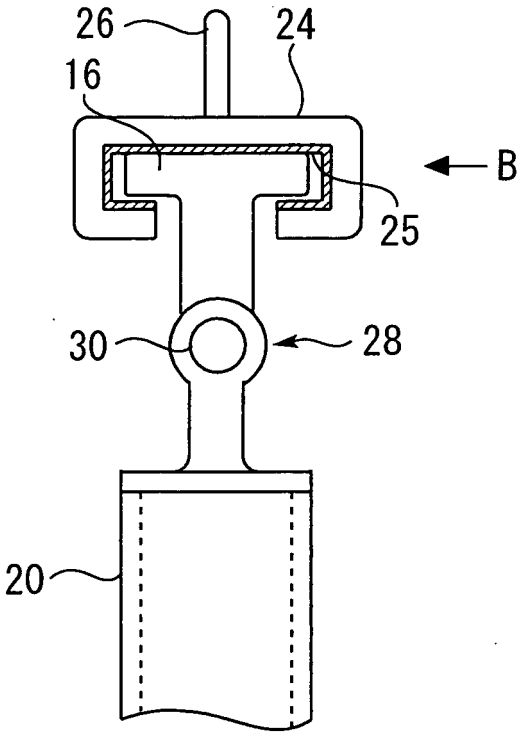

FIG. 3

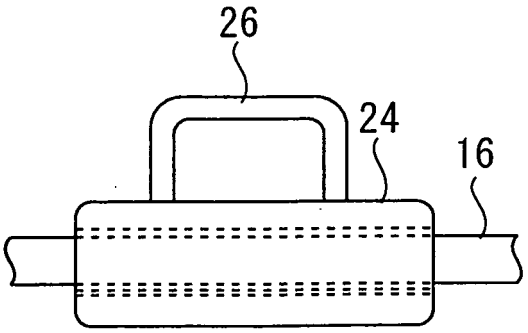

FIG. 4

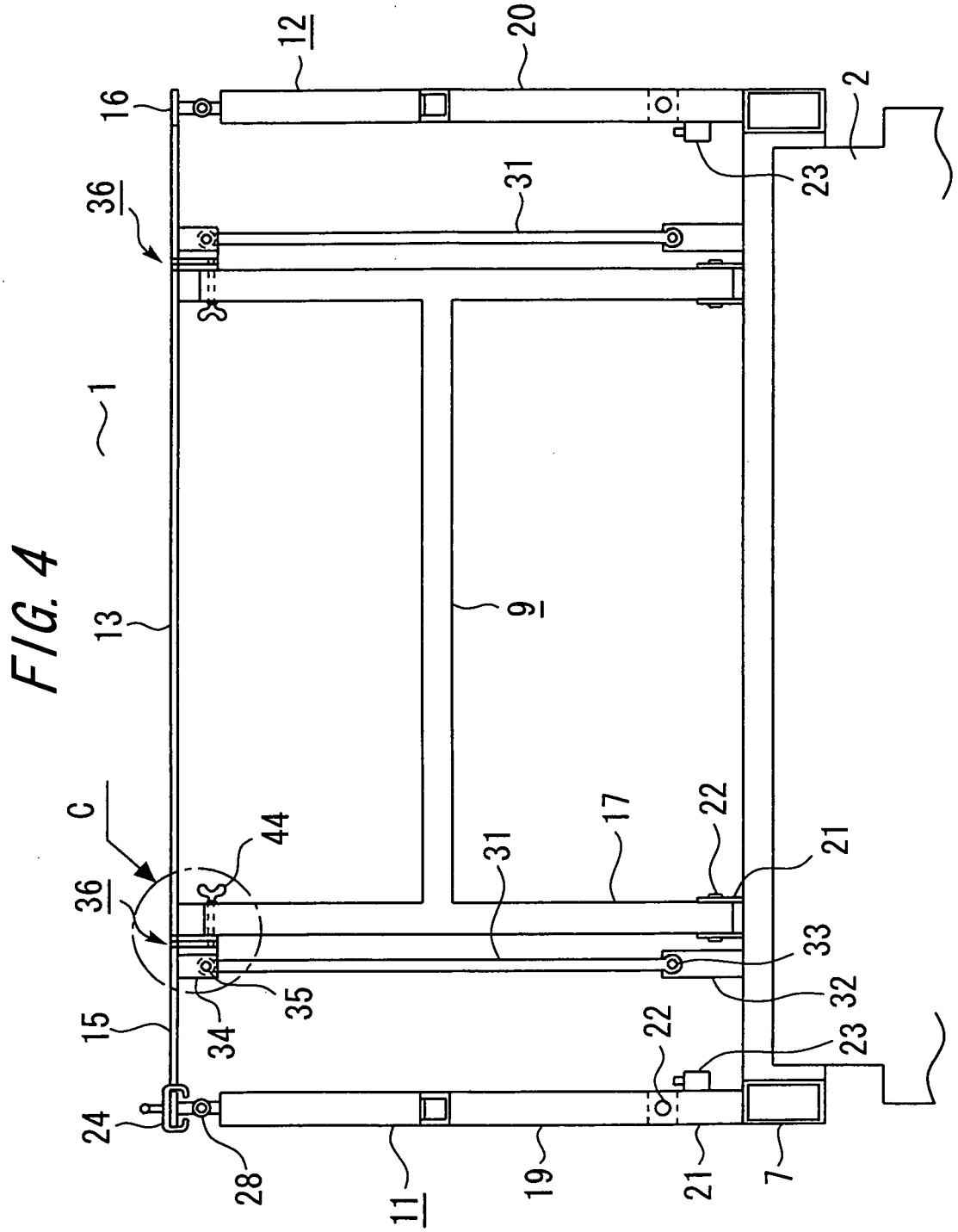

FIG. 5

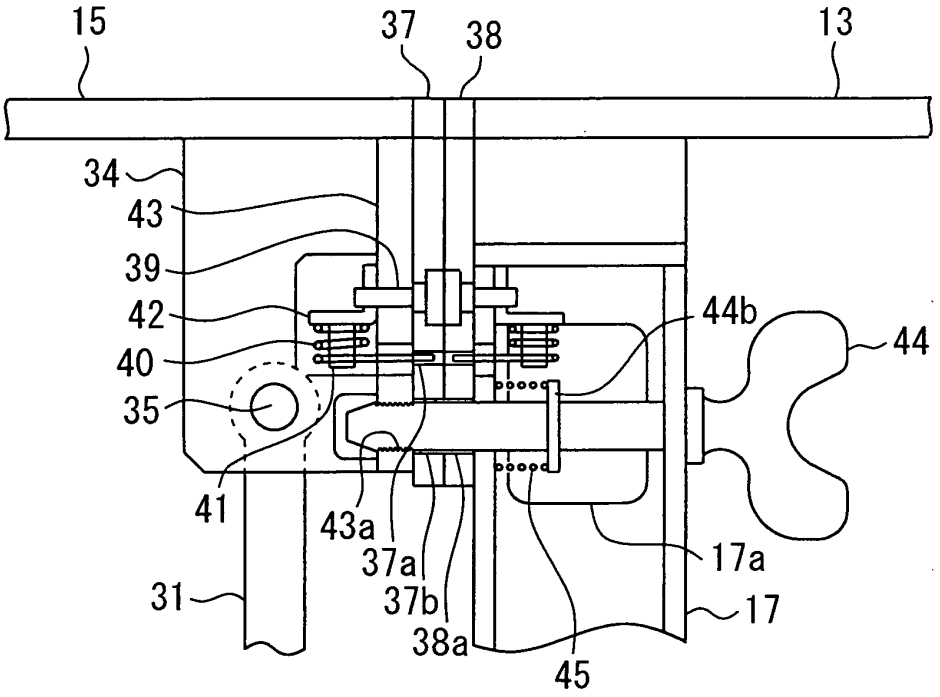
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FIG. 6

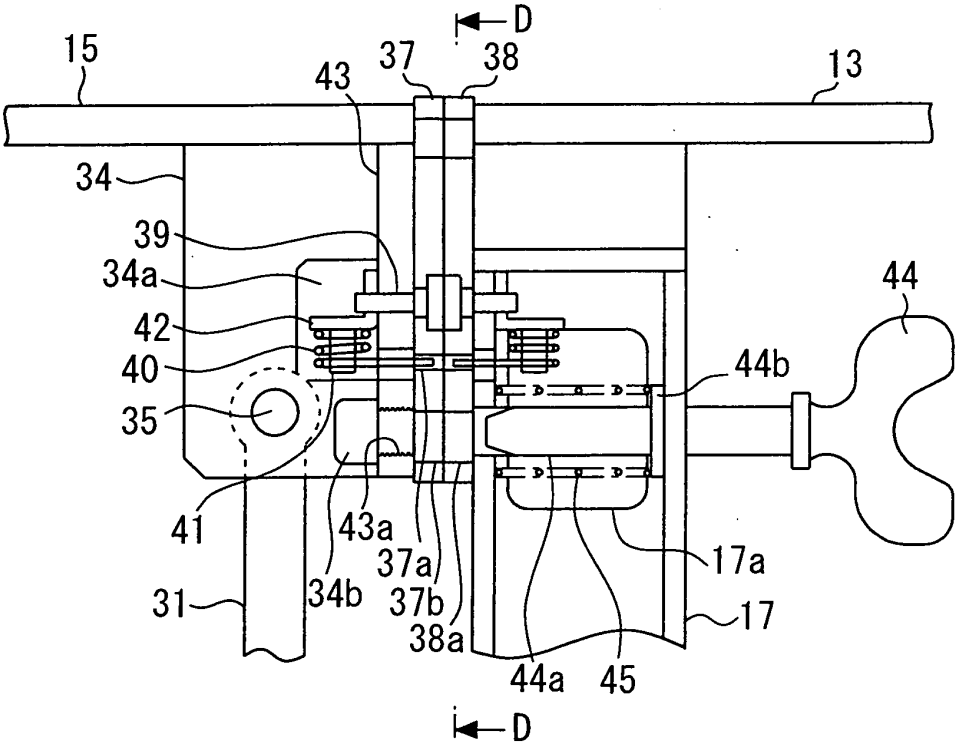
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FIG. 7

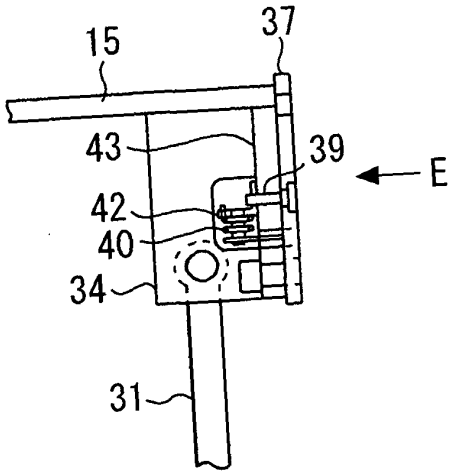

FIG. 8

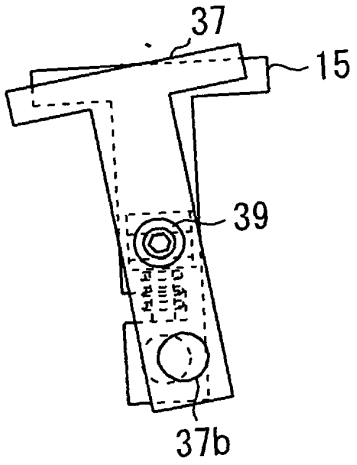

FIG. 9

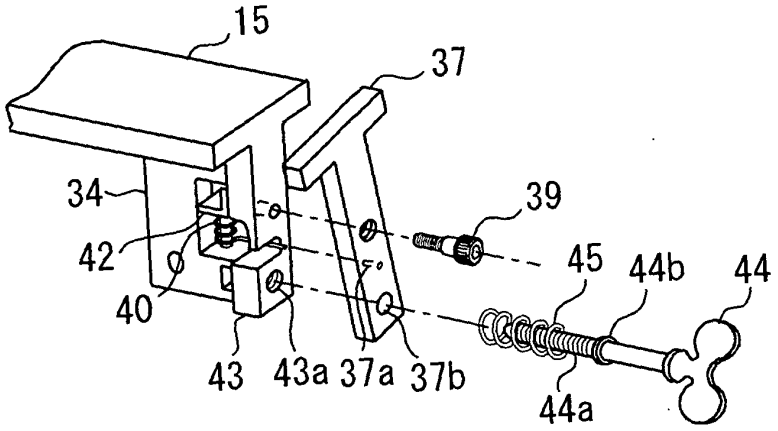

FIG. 10

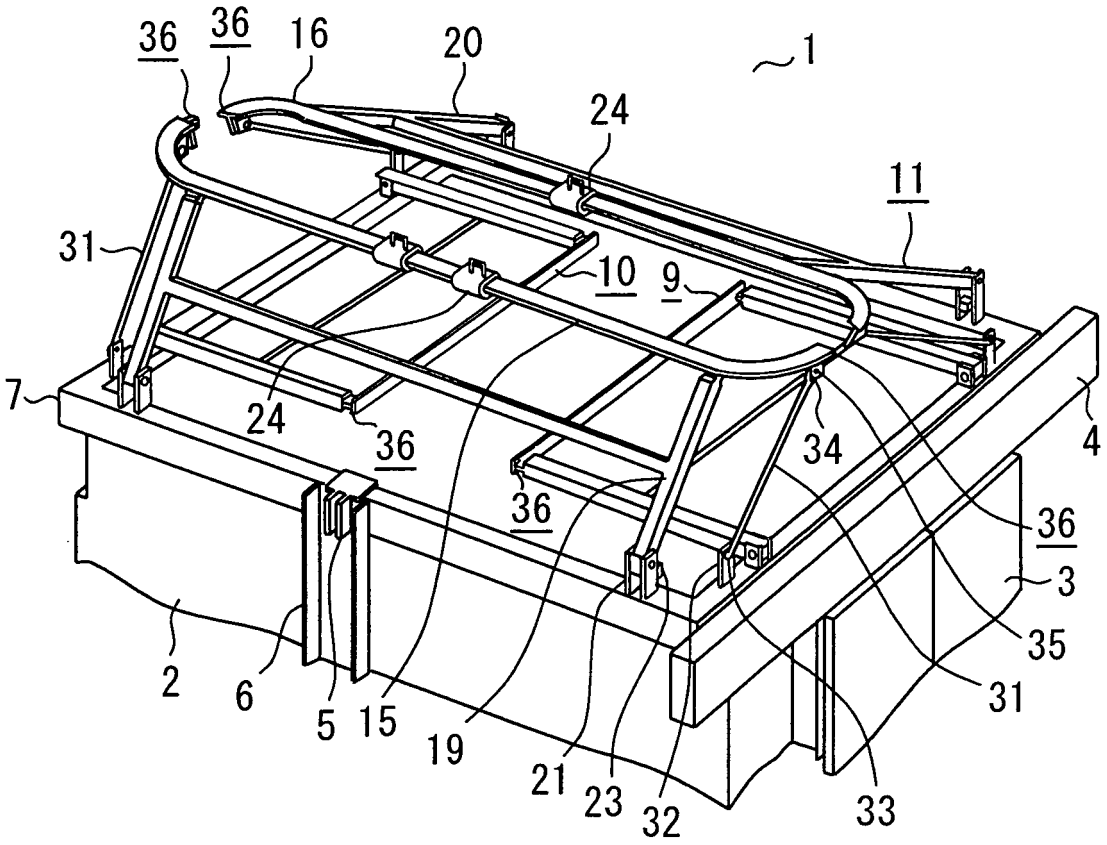
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FIG. 11

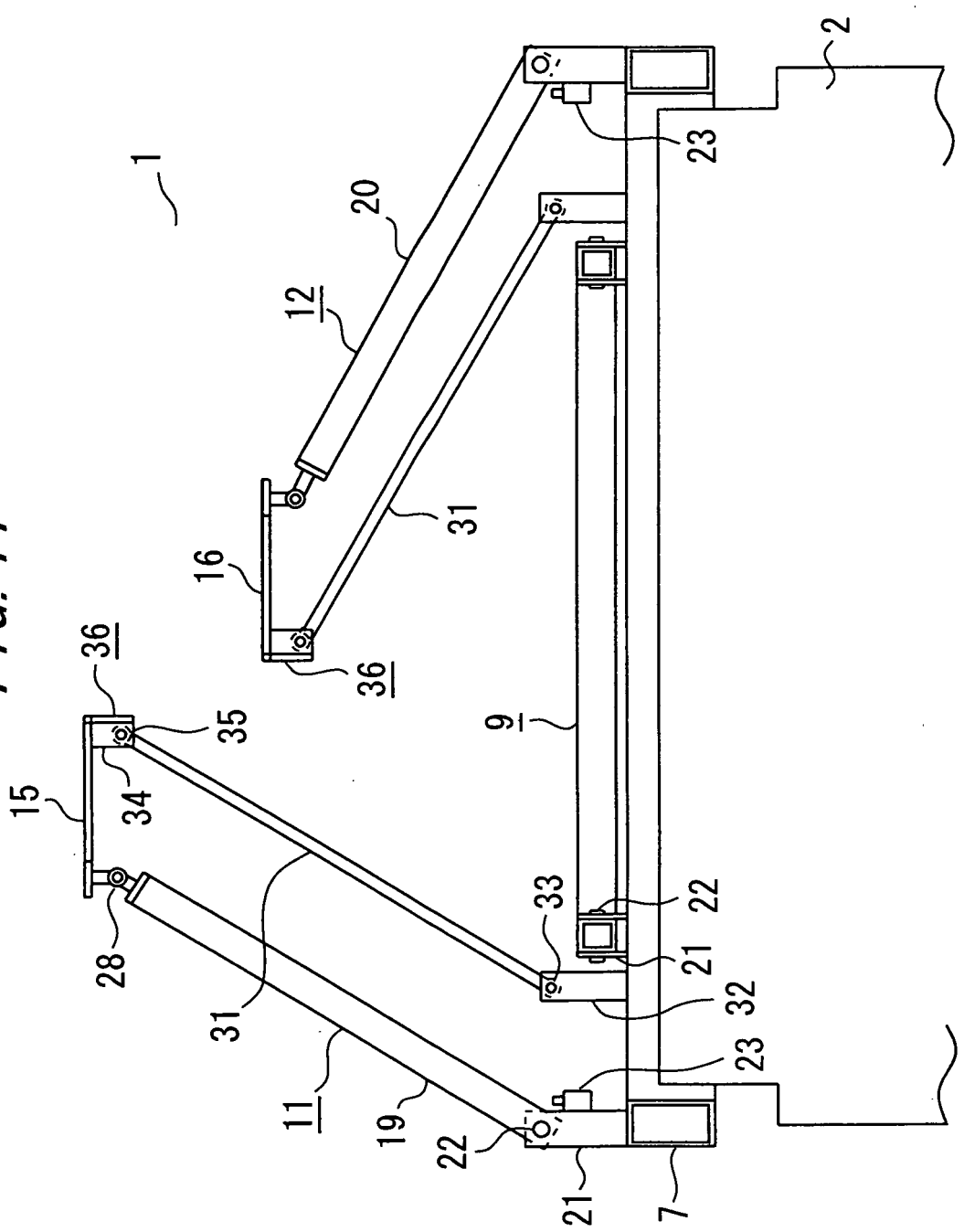


FIG. 12

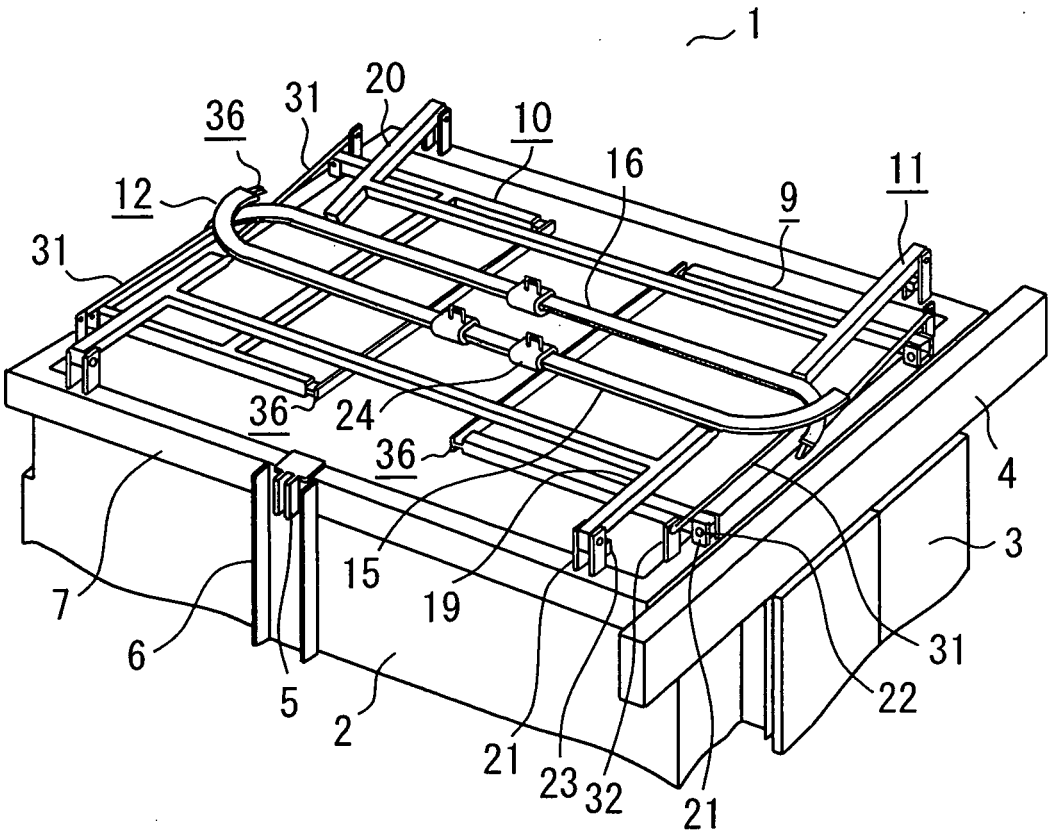


FIG. 13

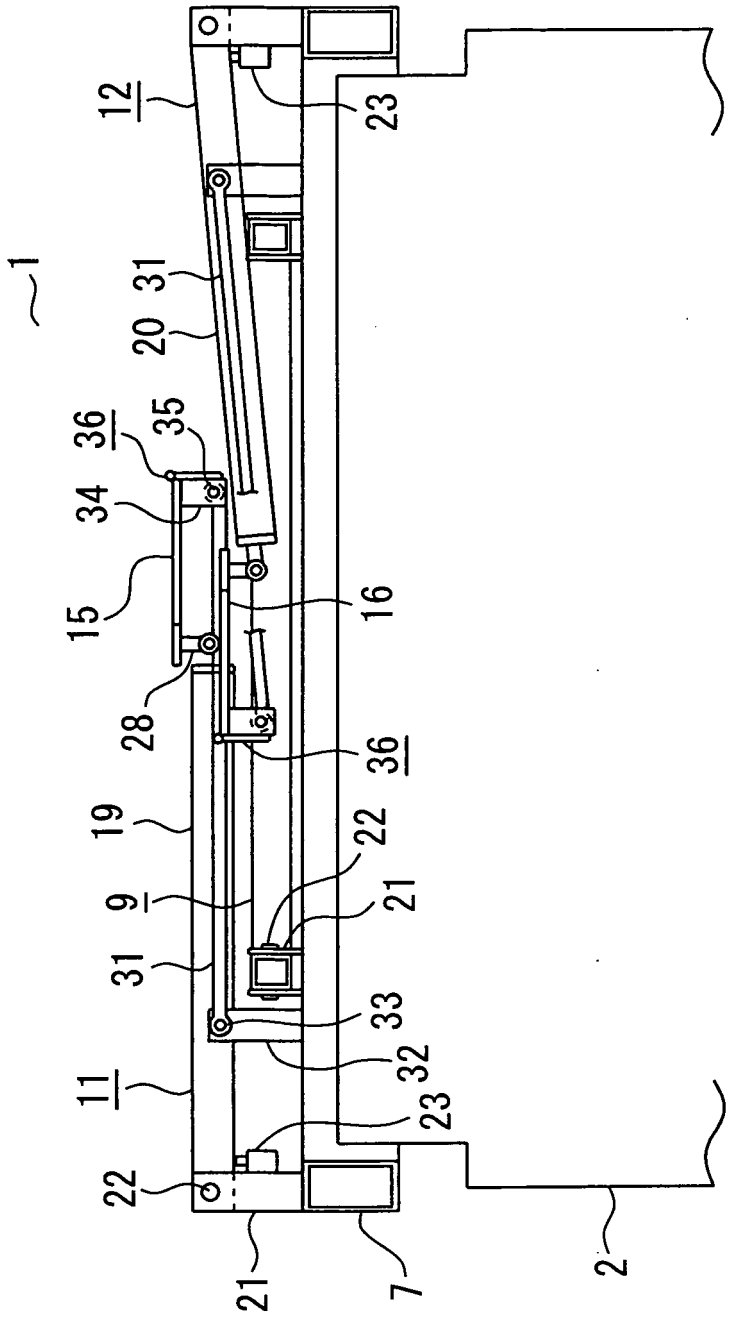


FIG. 14

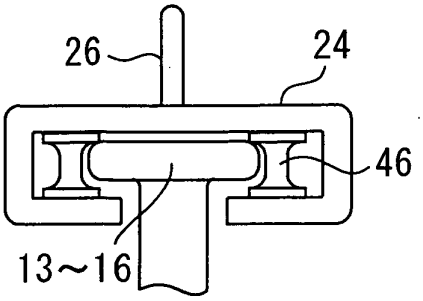


FIG. 15

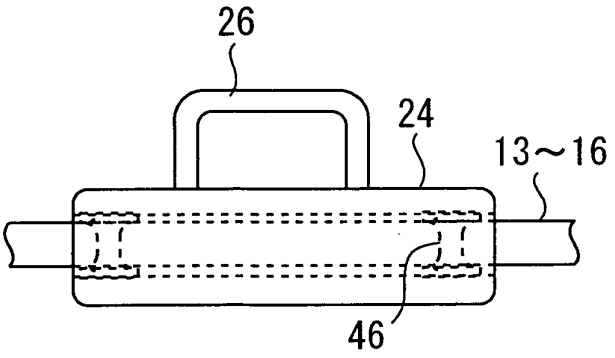
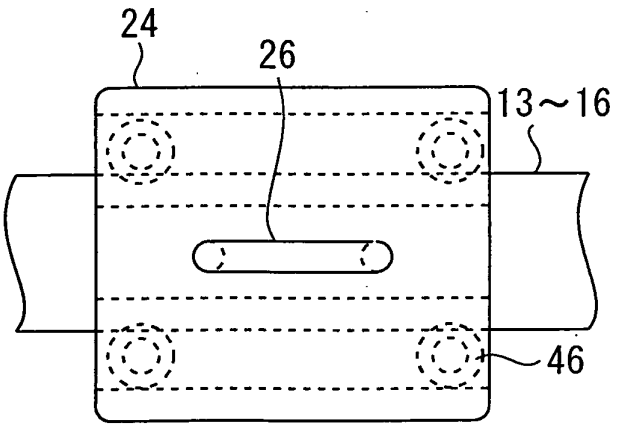


FIG. 16



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/059090

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 08-099782 A (Mitsubishi Electric Building Techno-Service Co., Ltd.), 16 April, 1996 (16.04.96), (Family: none)	1-3,7-9 4-6
Y A	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 056895/1992(Laid-open No. 073079/1994) (Seirei Industry Co., Ltd.), 11 October, 1994 (11.10.94), (Family: none)	1-3,7-9 4-6

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

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Date of the actual completion of the international search	Date of mailing of the international search report
25 December, 2007 (25.12.07)	15 January, 2008 (15.01.08)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/059090

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 112467/1987(Laid-open No. 019457/1989) (Sumitomo Electric Industries, Ltd.), 31 January, 1989 (31.01.89), (Family: none)	1-3,7-9 4-6
Y A	JP 2002-284469 A (Mitsubishi Electric Corp.), 03 October, 2002 (03.10.02), (Family: none)	2-3,7 4-6
Y A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 009305/1982(Laid-open No. 112342/1983) (Asahi Kinzoku Seiko Kabushiki Kaisha), 01 August, 1983 (01.08.83), (Family: none)	3 4-6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2002284469 A **[0004]**