



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 422 185 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(43) Date of publication:
26.05.2004 Bulletin 2004/22

(51) Int Cl.7: **B66B 11/02**

(21) Application number: **01958559.5**

(86) International application number:
PCT/JP2001/007366

(22) Date of filing: **28.08.2001**

(87) International publication number:
WO 2003/020629 (13.03.2003 Gazette 2003/11)

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**

(72) Inventor: **NISHIDA, Takao**
Mitsubishi Denki Kabushiki Kaisha
Chiyoda-ku, Tokyo 100-8310 (JP)

(71) Applicant: **MITSUBISHI DENKI KABUSHIKI
KAISHA**
Tokyo 100-8310 (JP)

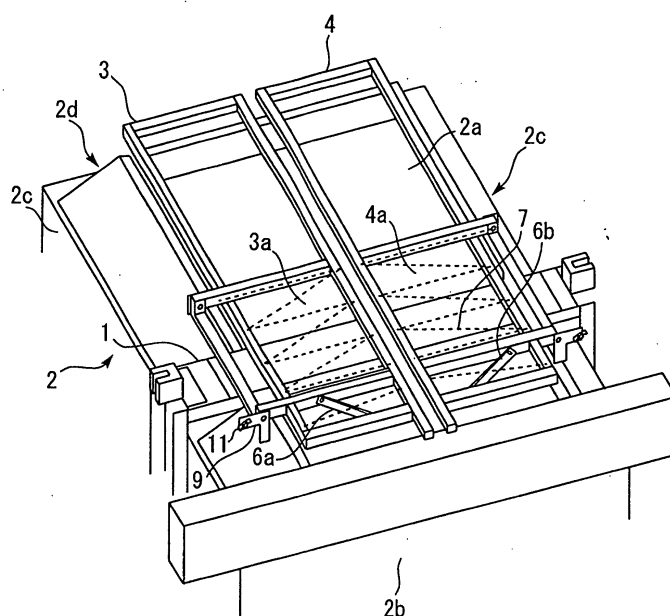
(74) Representative: **HOFFMANN - EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(54) **CAGE AND ELEVATOR**

(57) The invention has block members (7) for posing limitations on service technicians in performing operations while collapsible handrails (3, 4) to be provided on top (2a) of a passenger car (2) of an elevator system remain collapsed. By means of the members, the serv-

ice technicians can perform operation only after having assembled the collapsible handrails (3, 4) at the time of maintenance and inspection of the elevator system, thus readily ensuring safety for the service engineers at the time of maintenance and inspection of the elevator system.

Fig.1



EP 1 422 185 A1

Description

Field of the Invention

[0001] The invention relates to a passenger car and an elevator system, and more particularly, to a passenger car and an elevator system which have a collapsible handrail provided on top of the car to be used by service technicians in performing maintenance and inspection of the elevator system.

Background Art

[0002] There has hitherto been known a passenger car having a collapsible handrail (fence) which is provided on top of a car and is to be used for performing maintenance and inspection of an elevator system.

[0003] Specifically, for example, Japanese Patent Application Laid-Open No. 143125/2000 discloses a technique for installing a collapsible handrail on top of a passenger car of an elevator system having no machine room in which a machine, such as a hoisting machine, is installed in a hoistway.

[0004] Such a collapsible handrail is intended for minimizing a distance between the top of the passenger car and the ceiling of the hoistway when the passenger car has reached the highest position in the hoistway, thereby achieving space savings. Consequently, at the time of ordinary service of the elevator system, the handrail is housed on top of the passenger car in a collapsed manner.

[0005] When service technicians perform maintenance or inspection of an elevator system, a handrail is assembled so as to stand upright along an outer periphery of the passenger car. The thus-assembled handrail usually has a height of 700 to 1100 mm from the top of the car. The service technicians perform maintenance or inspection of hardware installed in a hoistway, such as a hoisting machine or a control panel, as well as maintenance or inspection of hardware installed on top of the car such as a guide device, within the assembled handrail without involvement of problems.

[0006] However, in order to prevent falling of service technicians, the foregoing related-art technique entails a necessity for reducing a clearance existing between the car and walls of the hoistway. If the clearance existing between the car and the walls of the hoistway cannot be reduced, partitions, such as steel plates, must be provided so as to extend across the entire height of the hoistway along a periphery of the car for reducing the clearance existing around the car. At this time, the clearance existing around the car assumes a value of, e.g., less than 300 mm.

[0007] The foregoing technique presents a second problem; that is, deteriorated ease of assembly of a collapsible handrail. For instance, the collapsible handrail is constituted of a plurality of split handrail components; e.g., side handrails to stand upright along both sides of

the car top and a rear handrail to stand upright along a rear portion of the car top. Each of the split handrail components, such as the side handrails and the rear handrail, is incapable of independently retaining an upright position; the handrail cannot stand upright unless all the components are engaged with each other.

[0008] The invention has been conceived to solve the drawback set forth and aims at facilitating assurance of service technicians at the time of maintenance and inspection of an elevator system and providing an elevator car and an elevator system which offer superior ease of assembly of a handrail.

Disclosure of the Invention

[0009] According to the invention, collapsible handrails to be mounted on top of a passenger car are provided with block members for posing limitations to service technicians in performing operation while the handrails remain collapsed. As a result, service technicians can perform operations only after collapsible handrails have been assembled at the time of maintenance or inspection of the elevator system, thereby preventing falling of the service technicians.

[0010] According to the invention, the block members of the improved passenger car are embodied as climbing block members for posing limitations to the service technicians in climbing up the car top from an elevator hall. As a result, service technicians can climb up the car top and perform predetermined operations only after collapsible handrails have been assembled at the time of maintenance or inspection of the elevator system, thereby preventing falling of the service technicians. Hence, the elevator car is useful as one which prevents falling of service technicians more easily than in a case in which components for reducing clearance existing around an elevator car are provided.

[0011] According to the invention, the climbing block members of the improved passenger car are embodied as wires extended across areas of the collapsed side handrails closer to an elevator hall. As a result, service technicians can climb up the car top and perform predetermined operations only after collapsible handrails have been assembled at the time of maintenance or inspection of the elevator system, thereby preventing falling of the service technicians. Hence, the elevator car is useful as one which prevents falling of service technicians more easily than in a case in which components for reducing clearance existing around an elevator car are provided.

[0012] According to the invention, the block members of the improved passenger car are embodied as movement block members for posing limitations to the service technicians in moving toward the rear section on the car top. As a result, service technicians can perform operations only after collapsible handrails have been assembled at the time of maintenance or inspection of the elevator system, thereby preventing falling of the service

technicians. Hence, the elevator car is useful as one which prevents falling of service technicians more easily than in a case in which components for reducing clearance existing around an elevator car are provided.

[0013] According to the invention, the movement block members of the improved passenger car are embodied as a wire whose one end is supported on a rear handrail, which is provided on one side handrail so as to be rotatable, and whose the other end is supported on another side of the side handrail. As a result, service technicians can perform operations only after collapsible handrails have been assembled at the time of maintenance or inspection of the elevator system, thereby preventing falling of the service technicians. Hence, the elevator car is useful as one which prevents falling of service technicians more easily than in a case in which components for reducing clearance existing around an elevator car are provided.

[0014] According to the invention, the movement block members of the improved passenger car are embodied as a wire whose one end is supported on one side of the rear handrail rotating around the rear section and whose other end is supported on another side handrail. As a result, service technicians can perform operations only after collapsible handrails have been assembled at the time of maintenance or inspection of the elevator system, thereby preventing falling of the service technicians. Hence, the elevator car is useful as one which prevents falling of service technicians more easily than in a case in which components for reducing clearance existing around an elevator car are provided.

[0015] According to the invention, side handrails of collapsible handrails to be disposed on top of a passenger car have stopper members for limiting collapse of the side handrails in a collapsible direction when the handrails are raised. As a result, service technicians can independently raise the side handrails on the car top and retain the thus-raised handrails when performing maintenance and inspection of an elevator system, thus improving ease of assembly of handrails.

[0016] According to the invention, the stopper members of the thus-improved passenger car are provided on the side handrails in a rotatable manner and have indentations which engage shaft sections provided on mounts of the respective side handrails fixed to the car top. As a result, service technicians can independently raise the side handrails on the car top and retain the thus-raised handrails when performing maintenance and inspection of an elevator system, thus improving ease of assembly of handrails.

[0017] According to the invention, the handrails of the thus-improved passenger car further have block members which pose limitations on the service technicians in performing operation on the car top while the handrails remain collapsed. As a result, safety for service technicians can be readily assured at the time of maintenance and inspection of an elevator system, and the ease of assembly of the handrails is improved.

[0018] According to the invention, an elevator system has the thus-improved passenger car. As a result, safety for service technicians can be readily assured at the time of maintenance and inspection of an elevator system, and the ease of assembly of the handrails is improved.

Brief Description of the Drawings

[0019]

Fig. 1 is a schematic perspective view of a preferable first passenger car of the invention;

Fig. 2 is a schematic perspective view showing a state in which stopper members are provided on the passenger car shown in Fig. 1;

Fig. 3a is a fragmentary enlarged view showing processes for setting up stopper members on the passenger car shown in Fig. 2;

Fig. 3b is a fragmentary enlarged view showing completion of setup of the stopper members on the passenger car shown in Fig. 2;

Fig. 4 is a schematic perspective view showing a state in which side handrails are brought into stand-up positions on the passenger car shown in Fig. 1;

Fig. 5 is a schematic perspective view showing a state in which assembly of side handrails on the passenger car shown in Fig. 1 is completed;

Fig. 6 is a schematic perspective view showing a second preferable passenger car of the invention; and

Fig. 7 is a schematic perspective view showing a state in which assembly of side handrails on the passenger car shown in Fig. 6 is completed.

Best Modes for Implementing the Invention

[0020] In order to describe the invention in more detail, the invention will be described by reference to the accompanying drawings. Throughout the drawings, like or corresponding elements are assigned like reference numerals, and their overlapping explanations are simplified or omitted, as required.

[0021] By reference to Figs. 1 through 5, the construction and operation of a passenger car according to a first embodiment of the invention will now be described.

[0022] Fig. 1 is a schematic perspective view showing the passenger car of the first embodiment. In other words, Fig. 1 is a view partially showing only the top of the passenger car; that is, a state in which a collapsible handrail provided on the top of the car remains collapsed.

[0023] In the drawings, reference numeral 1 designates a car frame retaining a passenger car; 2 designates a passenger car which ascends and descends within a hoistway while passengers ride in the car; 2a designates a top of the passenger car 2 on which service technicians can climb from an elevator hall at the time

of maintenance or inspection; 2b designates the front section of the passenger car 2 corresponding to the elevator hall (or a door); 2c designates side sections of the passenger car 2; 2d designates a rear section of the passenger car 2 opposite the front section 2b; 3 designates a side handrail which is provided on the left side of the drawing and is to be brought into an upright position on the side section 2c; 4 designates a side handrail which is provided on the right side of the drawing and is to be brought into an upright position on the side section 2c; 6a, 6b designate stopper members (i.e., collapse prevention plates) for preventing falling of the side handrails 3, 4, which would otherwise be caused when the side handrails 3, 4 are brought into upright positions; 7 designates wires serving as climbing block members; 9 designates a mount fixed on the top 2a of the passenger car 2; and 11 designates shaft sections attached to the mount 9. In the drawings, a rear handrail to be brought into a standup position in the vicinity of a rear section 2d on the car top 2a is omitted from the drawing for simplification.

[0024] Here, the side handrails 3, 4 are rotatably fastened to the mount 9 in the vicinity of the side sections 2c on the car top 2a by way of, e.g., pin sections. When the service technicians are not required to perform operations; that is, at the time of normal service of the elevator system, the side handrails 3, 4 and the rear handrail are housed so as to cover the car top 2a in a collapsed manner.

[0025] The wires 7 are extended across opening areas (i.e., areas enclosed by the frames) of the side handrails 3, 4 closer to a front section 2b, so as to partition the opening areas into a plurality of small areas. Specifically, wires are extended across the portions of the collapsed side handrails 3, 4 close to an elevator hall, in a zigzag pattern so as to act as block members. The small areas partitioned by the wires 7 are arranged to assume, for example, the same size as feet of a person, so as to block footing for service technicians. The wires are members which are flexible to slack or to spread with regard to loads; for example, strings, ropes, wires, or chains. The wires are members which pose difficulty to service technicians in ensuring footing.

[0026] As has been described, in the passenger car of the first embodiment, the side handrails 3, 4 are provided with the wires 7 for preventing service technicians from climbing up the car from an elevator hall while the side handrails 3, 4 remain collapsed. Hence, service technicians can be hindered from performing operations while the side handrails 3, 4 remain collapsed.

[0027] By reference to Figs. 2, 3a, and 3b, procedures for bringing the collapsed side handrails 3, 4 into upright positions will now be described. Fig. 2 is a schematic perspective view showing a state in which the stopper members are rotated while the side handrails 3, 4 shown in Fig. 1 remain housed. Fig. 3a is a fragmentary enlarged view showing rotation of the stopper members shown in Fig. 2. Fig. 3b is a fragmentary enlarged view

showing a state in which setup of the stopper members is completed. Figs. 3a, 3b show the stopper member for the left side handrail 3; the stopper member for the right side handrail 4 is omitted for simplicity.

[0028] In Figs. 2, 3a, and 3b, reference numerals 6a, 6b designate stopper members for preventing falling of the side handrails 3, 4 in a collapsible direction when they are brought into standup positions; 9 designates a mount for rotatably supporting the side hand rail 3; 11 designates a shaft section provided on the mount 9; 16 designates an indentation formed in the stopper member 6a; 17 designates a rotational center of the stopper member 6a with regard to the side handrail 3; and 18 designates a rotational center of the side handrail 3 with respect to the mount 9.

[0029] The rotational center 18 of the side handrail 3 is formed from, e.g., a pin. The rotational center 17 of the stopper member 6a is formed from, for example, a wing screw having a shaft section for supporting the stopper member 6a, and a wing nut to mesh with the wing screw. After standup of the side handrail 3 has been completed, the rotational center 17 is fastened with the wing screw. The shaft section 11 of the mount 9 is constituted of, e.g., a shaft main body having a male screw portion provided at the tip end thereof and a wing nut to mesh with the shaft main body. After the indentation 16 of the stopper member 6a has engaged the shaft section 11, the shaft section 11 is fastened with the wing nut.

[0030] When service technicians are to perform maintenance and inspection of an elevator system on a passenger car having the foregoing construction, the passenger car 2 is moved such that the car top 2a of the passenger car 2 becomes substantially flush with an elevator hall at a predetermined floor. Subsequently, the service technicians rotate the stopper members 6a, 6b while raising the side handrails 3, 4 in the directions indicated by arrowheads in Fig. 2 from the elevator hall before climbing up the car top 2a, thus assembling the side handrails 3, 4.

[0031] More specifically, as shown in Fig. 3a, the stopper member 6a is rotated from the position designated by broken lines to another position designated by a solid line while the side handrail 3 is raised in the direction indicated by the arrowhead in the drawing. Subsequently, as shown in Fig. 3b, the indentation 16 of the stopper member 6a is engaged with the shaft section 11 of the mount 9 in association with the side handrail 3 being raised to a position substantially perpendicular to the car top 2a.

[0032] As has been described, in connection with the passenger car of the first embodiment, when the side handrails 3, 4 are raised, the stopper members 6a, 6b are engaged with the mount 9. As a result, the side handrails 3, 4 independently retain standup positions, thereby preventing falling of the side handrails in a collapsible direction, thus improving the ease of assembly of the handrails.

[0033] Procedures for raising the rear handrail will now be described by reference to Figs. 4 and 5. Fig. 4 is a schematic perspective view showing a state in which raising of the side handrails 3, 4 is completed as a result of the stopper members 6a, 6b being engaged. Fig. 5 is a schematic perspective view showing a state in which assembly of all the handrails is completed as a result of raising of the rear handrail.

[0034] As shown in Figs. 4 and 5, reference numeral 5 designates a rear handrail which is to be raised in the vicinity of a rear section 2d on the car top 2a; 8 designates a wire serving as movement block member; 10 designates a hinge section provided on the side handrail 3 that rotatably supports the rear handrail 5; and 12 designates a fastening member which fastens the rear handrail 5 and the side handrail 4 together when they are engaged with each other.

[0035] Here, the rear handrail 5 is provided on the side handrail 3 so as to be rotatable by way of the hinge section 10. When the handrails are housed, the rear handrail 5 is collapsed on the car top 2a so as to overlap the side handrail 3.

[0036] The rear handrail 5 and the side handrail 4 are formed so as to engage each other when the rear handrail 5 is rotated so as to stand along the rear section 2d. Specifically, an indentation 4b to mesh with the shaft section is formed in an engagement section of the side handrail 4. A fastening member 12 having a shaft section to mesh with the indentation 4b is provided on an engagement section of the rear handrail 5. The fastening member 12 further has a wing nut. After the side handrail 4 and the rear handrail 5 have finished engaging each other, the wing nut fastens the handrails together.

[0037] One end of the wire 8 is supported in the vicinity of an area on the rear handrail 5 where the handrail 5 and the side handrail 4 engage each other, and the other end of the same is supported in the vicinity of an area on the side handrail 4 where the handrail 4 and the handrail 5 engage each other. Specifically, one end of the wire 8 is supported on the portion of the collapsed rear handrail 5 closer to the front section 2b, and the other end of the wire 8 is supported on the portion of the side handrail 4 closer to the rear section 2d. Here, the wire 8 is a slacking or spreading member which does not hinder rotation of the rear handrail 5; e.g., a string, a cable, a wire, or a chain. The wire 8 is a member which prevents service technicians from moving toward the rear section 2d before rotation of the rear handrail 5.

[0038] As shown in Fig. 4, in relation to the passenger car having the foregoing construction, before the rear handrail 5 is raised along the rear section 2d, the wire 8 is extended so as to block the car top 2a substantially diagonally. As a result, when the service technicians who have raised the side handrails 3, 4 along the side sections 2c have climbed up the car top 2a, limitations are imposed on the service technicians in moving toward the rear section 2d of the car top 2a without as-

sembling the rear handrail 5.

[0039] As shown in Fig. 5, the service technicians rotate the rear handrail 5 in the direction of the arrow, thereby causing the rear handrail 5 to engage the side handrail 4. At this time, the wire 8 droops in the vicinity of an area where the rear handrail 5 and the side handrail 4 are engaged with each other. As a result of raising of the rear handrail 5, assembly of all the collapsible handrails is completed.

[0040] As has been described, in relation to the passenger car of the first embodiment, when the side handrails 3, 4 have been raised, the wire 8 is flexibly provided between the rear handrail 5 and the side handrail 4, wherein the rear handrail 5 is provided rotatably on the side handrail 3 by way of the hinge 10. Thus, service technicians can be prevented from performing operations while the rear handrail 5 remains collapsed, which could otherwise occur at the time of maintenance or inspection of the elevator system.

[0041] In relation to the passenger car of the first embodiment, procedures for housing collapsible handrails after the service technicians have completed maintenance and inspection are the reverse of the procedures shown in Figs. 1 through 5.

[0042] Although not shown, the passenger car of the first embodiment is suspended at one end of a pull cable, and a counterweight is suspended at the other end of the pull cable. By means of driving action of the hoisting machine around which the pull cable is passed, the passenger car and the counterweight ascend and descend in opposite directions within a hoistway formed in a building.

[0043] By reference to Figs. 6 and 7, the construction and operation of a passenger car according to a second embodiment of the invention will be described. Fig. 6 is a schematic perspective view of the passenger car of the second embodiment, showing the passenger car after the side handrails 3, 4 have been raised. Fig. 7 is a schematic perspective view showing the passenger car when assembly of the handrails has been completed as a result of raising of the rear hand rail 5.

[0044] The passenger car of the second embodiment differs from that of the first embodiment in that the rear handrail 5 is provided so as to be rotatable around the vicinity of the rear section 2d of the car top 2a; whereas in the first embodiment the rear handrail 5 is provided so as to be rotatable with respect to the side handrail 3, in the second embodiment, the rear handrail 5 is rotatable around the rear section 2d independently of the side handrail 5.

[0045] As shown in Figs. 6 and 7, reference numerals 3, 4 designate side handrails which are to be independently raised along the respective side sections 2c; 8a, 8b designate wires serving as movement block members; 12 designates a fastening member which fastens the side handrails 3, 4 together after the side handrails 3, 4 have been engaged with each other by raising the rear handrail 5; and 20 designates a support plate fix-

edly provided on the car top 2a.

[0046] Here, the rear handrail 5 comes into contact with an interior surface of a support plate 20 bent into the shape of \sqcap and is supported so as to be rotatable with respect to the support plate 20 by means of pin sections provided so as to penetrate through the support plate 20.

[0047] One end of the wire 8a is supported in the vicinity of an area on an upper edge of the rear handrail 5 closer to the side handrail 3, and the other end of the wire 8a is supported in the vicinity of an area on an upper edge of the side handrail 4 where the side handrail 4 engages the rear handrail 5. Specifically, one end of the wire 8a is supported on a portion of the rear handrail 5, the portion being closer to the front section 2b when the rear handrail 5 is in a collapsed state, as well as to the left side section 2c, and the other end of the wire 8a is supported on a portion of the side handrail 4 closer to the rear section 2d.

[0048] Similarly, one end of the wire 8b is supported in the vicinity of an area on an upper edge of the rear handrail 5 closer to the side handrail 4, and the other end of the wire 8b is supported in the vicinity of an area on an upper edge of the side handrail 3 where the side handrail 3 engages the rear handrail 5.

[0049] The wires 8a, 8b are flexible members which do not hinder rotation of the rear handrail 5; e.g., a string, a cable, a wire, or a chain. The wires are members for inhibiting service technicians from moving toward the rear section 2d before raising the rear handrail 5.

[0050] In relation to the passenger car of the foregoing construction, procedures required for raising the collapsed side handrails 2, 4 along the side sections 2c at the time of start of operations are the same as those described in connection with the first embodiment. As shown in Fig. 6, before the rear handrail 5 is raised along the rear section 2d, the wires 8a, 8b are extended so as to block a predetermined area on the car top 2a in a cross-shaped pattern. As a result, when service technicians who have raised the side handrails 3, 4 along the side sections 2c climb up the car top 2a from an elevator hall, limitations are imposed on the service technicians in moving toward the rear section 2d of the car top 2a without assembly of the rear handrail 5.

[0051] As shown in Fig. 7, the service technicians rotate the rear handrail 5 in the direction indicated by the arrowhead, thereby causing the rear handrail 5 to engage the side handrails 3, 4. At this time, the wires 8a, 8b become close to the rear handrail 5 and droop. In this way, assembly of all the collapsible handrails is completed as a result of raising of the rear handrail 5.

[0052] As has been described, in the passenger car of the second embodiment, the side handrails 3, 4 are provided with the wires 7 for limiting climbing up of service technicians from an elevator hall while the side handrails 3, 4 remain collapsed, as in the case of the first embodiment. Hence, the service technicians can be prevented from performing operations while the side

handrails 3, 4 remain collapsed.

[0053] When the side handrails 3, 4 are raised, the wire 8b is flexibly provided between the side handrail 3 and the rear handrail 5, and the wire 8a is flexibly provided between the side handrail 4 and the rear handrail 5. Service technicians can be prevented from performing operations at the time of maintenance and inspection of an elevator system while the rear handrail 5 remains collapsed.

[0054] In the second embodiment, the two wires 8a, 8b are provided as movement block members. Even when only any one of the two wires 8a, 8b is provided, the wire sufficiently acts as a movement block member.

[0055] It is obvious that the invention is not limited to the above-described embodiments and is susceptible to modifications other than those suggested in the embodiments, as required, within the technical scope of the invention. The number, positions, and geometries of the constituent members are not limited to those mentioned in the embodiments. The preferred number, positions, and geometries may be determined in carrying out the invention. Throughout the drawings, like constituent elements are assigned like constituent reference numerals.

Industrial Applicability

[0056] As has been described, in a passenger car of the invention, collapsible handrails provided on a car top are equipped with block members for posing limitations on service technicians while the handrails remain collapsed. As a result, service technicians can perform operations only after collapsible handrails have been assembled at the time of maintenance or inspection of the elevator system, thereby preventing falling of the service technicians. Hence, the elevator car is useful as one which prevents falling of service technicians more easily than in a case in which components for reducing clearance existing around an elevator car are provided.

[0057] In a passenger car of the invention, the block members of the passenger car are embodied as climbing block members for posing limitations to the service technicians in climbing up the car top from an elevator hall. As a result, service technicians can climb up the car top and perform predetermined operations only after collapsible handrails have been assembled at the time of maintenance or inspection of the elevator system, thereby preventing falling of the service technicians. Hence, the elevator car is useful as one which prevents falling of service technicians more easily than in a case in which components for reducing clearance existing around an elevator car are provided.

[0058] In a passenger car of the invention, the climbing block members of the improved passenger car are embodied as wires extended across areas of the collapsed side handrails closer to an elevator hall. As a result, service technicians can climb up the car top and perform predetermined operations only after collapsible

handrails have been assembled at the time of maintenance or inspection of the elevator system, thereby preventing falling of the service technicians. Hence, the elevator car is useful as one which prevents falling of service technicians more easily than in a case in which components for reducing clearance existing around an elevator car are provided.

[0059] In a passenger car of, the block members of the improved passenger car are embodied as movement block members for posing limitations to the service technicians in moving toward the rear section on the car top. As a result, service technicians can perform operations only after collapsible handrails have been assembled at the time of maintenance or inspection of the elevator system, thereby preventing falling of the service technicians. Hence, the elevator car is useful as one which prevents falling of service technicians more easily than in a case in which components for reducing clearance existing around an elevator car are provided.

[0060] In a passenger car of the invention, the movement block members of the improved passenger car are embodied as a wire whose one end is supported on a rear handrail, which is provided on one side handrail so as to be rotatable, and whose the other end is supported on another side of the side handrail. As a result, service technicians can perform operations only after collapsible handrails have been assembled at the time of maintenance or inspection of the elevator system, thereby preventing falling of the service technicians. Hence, the elevator car is useful as one which prevents falling of service technicians more easily than in a case in which components for reducing clearance existing around an elevator car are provided.

[0061] In a passenger car of the invention, the movement block members of the improved passenger car are embodied as a wire whose one end is supported on one side of the rear handrail rotating around the rear section and whose other end is supported on another side handrail. As a result, service technicians can perform operations only after collapsible handrails have been assembled at the time of maintenance or inspection of the elevator system, thereby preventing falling of the service technicians. Hence, the elevator car is useful as one which prevents falling of service technicians more easily than in a case in which components for reducing clearance existing around an elevator car are provided.

[0062] In a passenger car of the invention, side handrails of collapsible handrails to be disposed on top of a passenger car have stopper members for limiting collapse of the side handrails in a collapsible direction when the handrails are raised. As a result, service technicians can independently raise the side handrails on the car top and retain the thus-raised handrails when performing maintenance and inspection of an elevator system. Hence, the elevator car is useful as one which improves ease of assembly of handrails.

[0063] In a passenger car of the invention, the stopper members of the thus-improved passenger car are pro-

vided on the side handrails in a rotatable manner and have indentations which engage shaft sections provided on mounts of the respective side handrails fixed to the car top. As a result, service technicians can independently raise the side handrails on the car top and retain the thus-raised handrails when performing maintenance and inspection of an elevator system. Hence, the elevator car is useful as one which improves ease of assembly of handrails.

[0064] In a passenger car of, the handrails of the thus-improved passenger car further have block members which pose limitations on the service technicians in performing operation on the car top while the handrails remain collapsed. As a result, safety for service technicians can be readily assured at the time of maintenance and inspection of an elevator system, and the ease of assembly of the handrails is improved.

[0065] In an elevator system of the invention, an elevator system has the thus-improved passenger car. As a result, safety for service technicians can be readily assured at the time of maintenance and inspection of an elevator system, and the ease of assembly of the handrails is improved.

Claims

1. A passenger car comprising collapsible handrails provided on top of a passenger car up which service technicians can climb from an elevator hall at the time of maintenance or inspection of an elevator system, wherein
the collapsible handrails each have a block member for inhibiting the service technicians from performing operations on the car top while the handrails remain collapsed.
2. The passenger car according to claim 1, wherein the collapsible handrails comprise side handrails which are raised independently along both sides of the car top when a portion of the elevator car opposing the elevator hall is taken as a front section; and
the block member is a climbing block member which poses limitations on the service technicians in climbing up the car top from the elevator hall while the side handrails remain collapsed.
3. The passenger car according to claim 2, wherein the climbing block member is a wire which is extended so as to partition opening areas of the side handrails closer to the elevator hall into a plurality of small areas.
4. The passenger car according to any one of claims 1 through 3, wherein the collapsible handrails comprise a rear handrail which is raised upright along a rear section of the car top while a portion of the car

top is taken as a front section; and

the block member is a movement block member which poses limitations on the service technicians in moving across the car top toward the rear section while the rear handrail remains collapsed.

while the handrails remain collapsed.

10. An elevator system having the passenger car defined in any one of claims 1 through 9.

5. The passenger car according to claim 4, wherein the rear handrail is provided on any one of the side handrails, which are provided upright along both side sections of the car top in a rotatable manner, and is formed so as to be able to engage another handrail after the rear handrail has rotated; and
the movement block member is a flexible wire whose one end is supported in the vicinity of an area of the rear handrail where the rear handrail engages the other side handrail and whose other end is supported in the vicinity of an area where the other side handrail engages the rear handrail.
6. The passenger car according to claim 4, wherein the rear handrail is formed so as to be rotatable around the rear section and engage side handrails which are raised upright along both side sections of the car top after the rear handrail has been rotated; and
the movement block member is a flexible wire whose one end is supported in the vicinity of an area on an upper edge of the rear handrail close to one of the side handrails and whose other end is supported in the vicinity of an area on an upper edge of the other side handrail where the other side handrail engages the rear handrail.
7. A passenger car comprising collapsible handrails provided on top of a passenger car up which service technicians can climb from an elevator hall at the time of maintenance or inspection of an elevator system, wherein
the collapsible handrails comprise side handrails which are raised independently along both sides of the car top when a portion of the elevator car opposing the elevator hall is taken as a front section; and
the side handrails have stopper members for limiting collapse of the side handrails in a collapsible direction when the handrails are raised.
8. The passenger car according to claim 7, wherein the stopper members are provided on the side handrails in a rotatable manner and have indentations which engage shaft sections provided on mounts of the respective side handrails fixed to the car top.
9. The passenger car according to claim 8, wherein the collapsible handrails further comprise block members which pose limitations on the service technicians in performing operation on the car top

Fig. 1

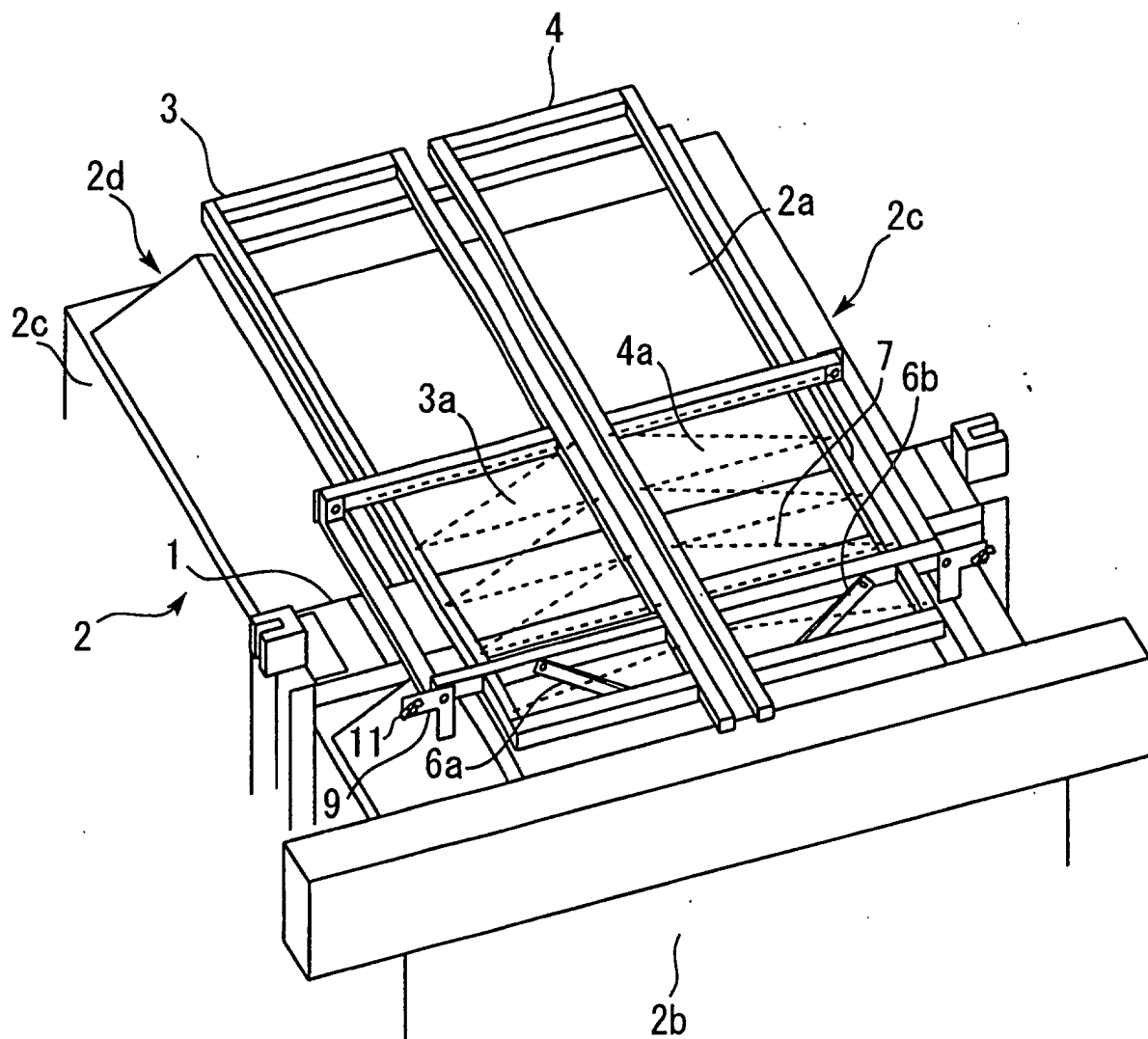


Fig. 2

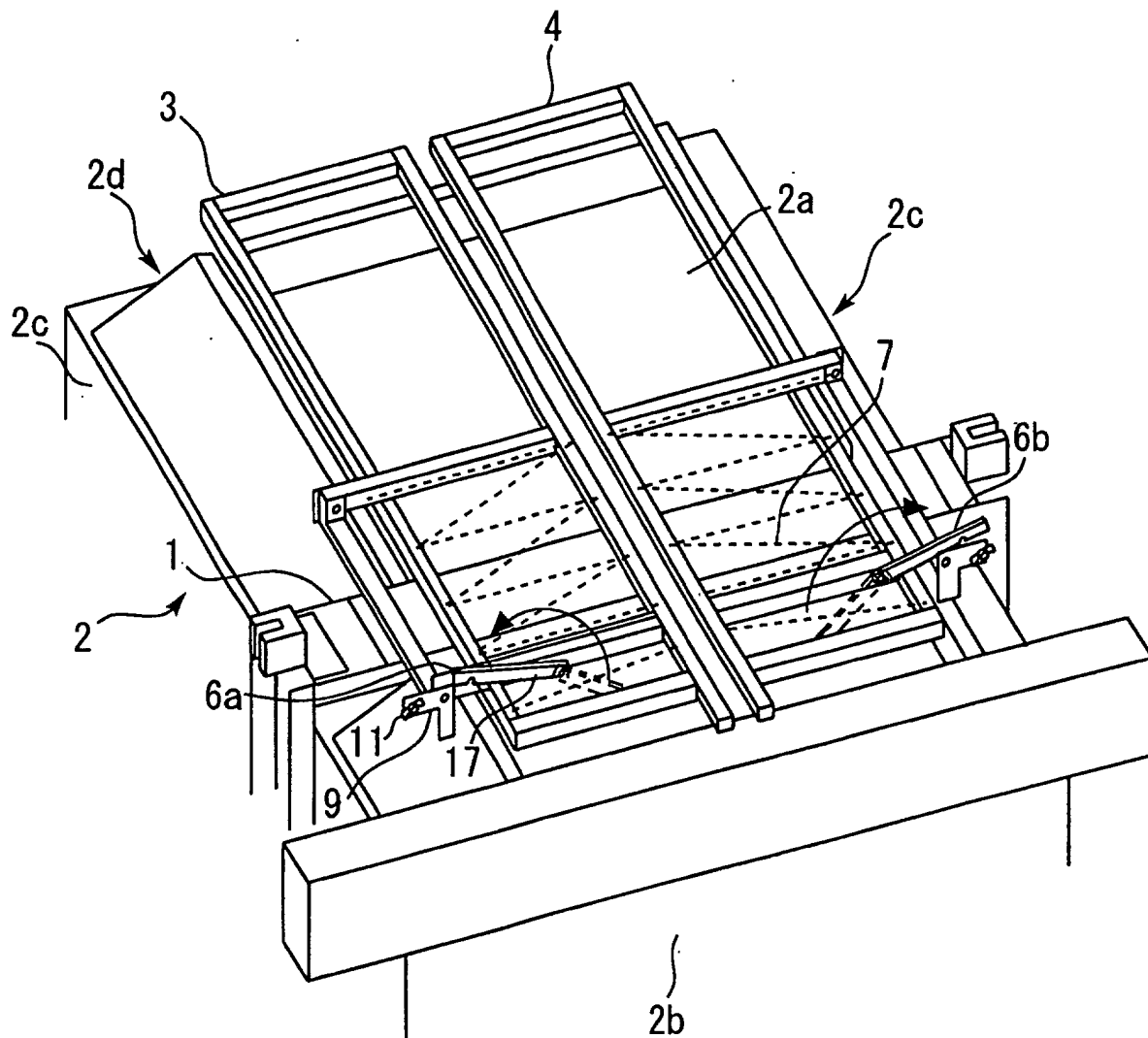


Fig. 3a

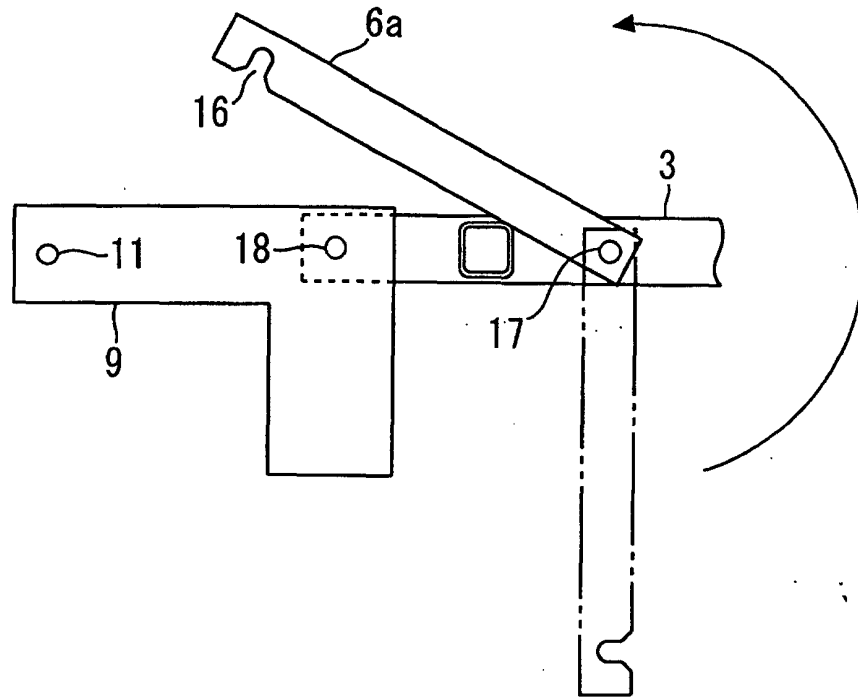


Fig. 3b

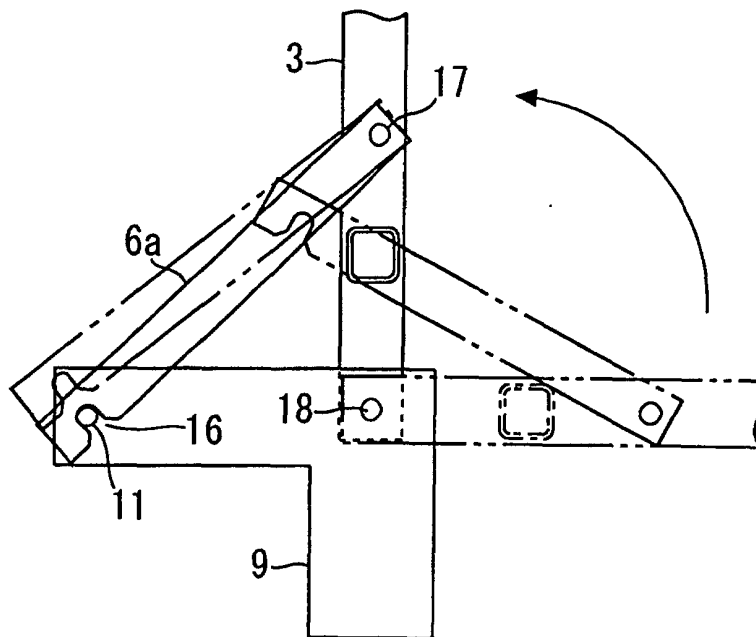


Fig. 4

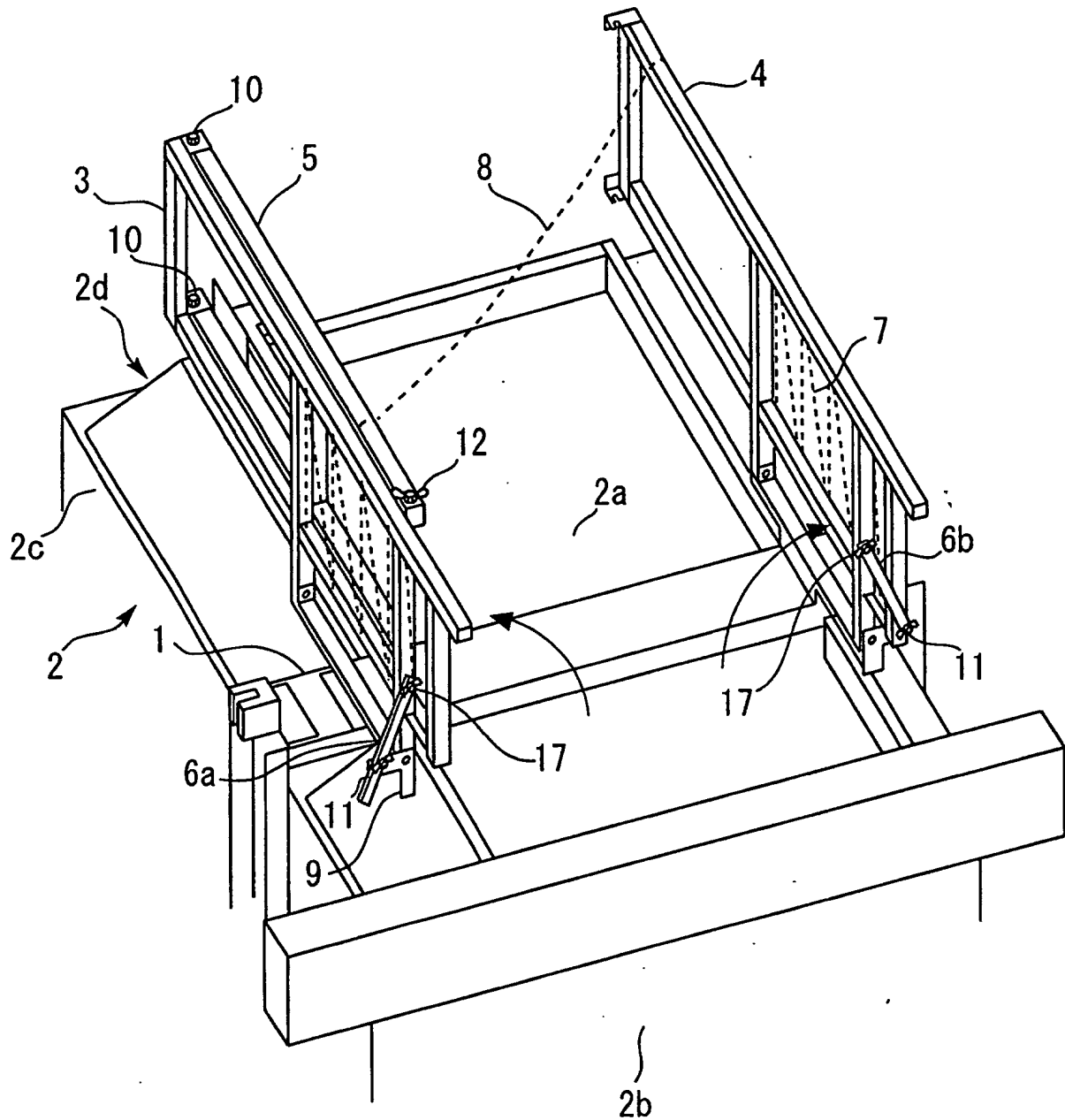


Fig. 5

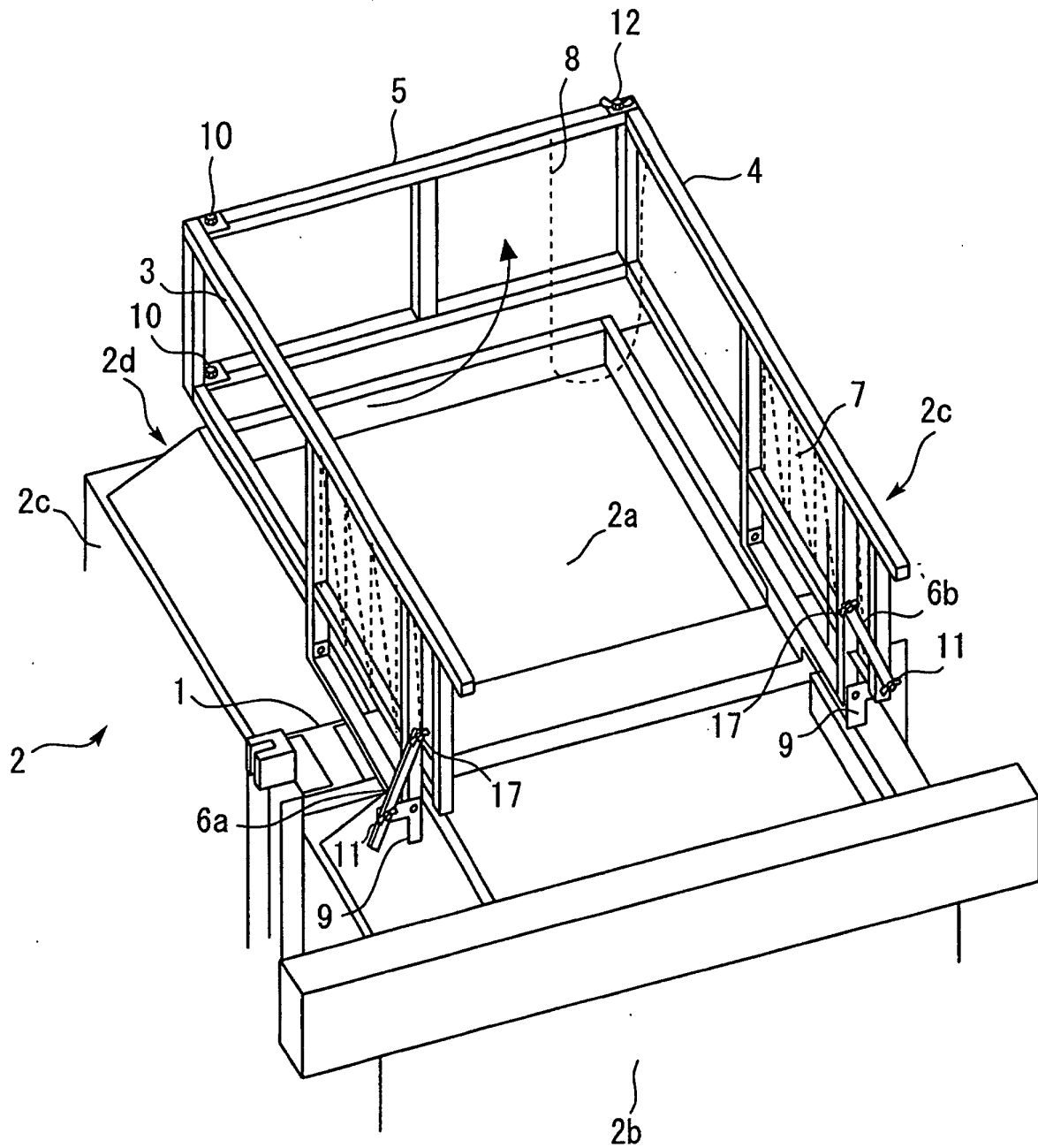


Fig. 6

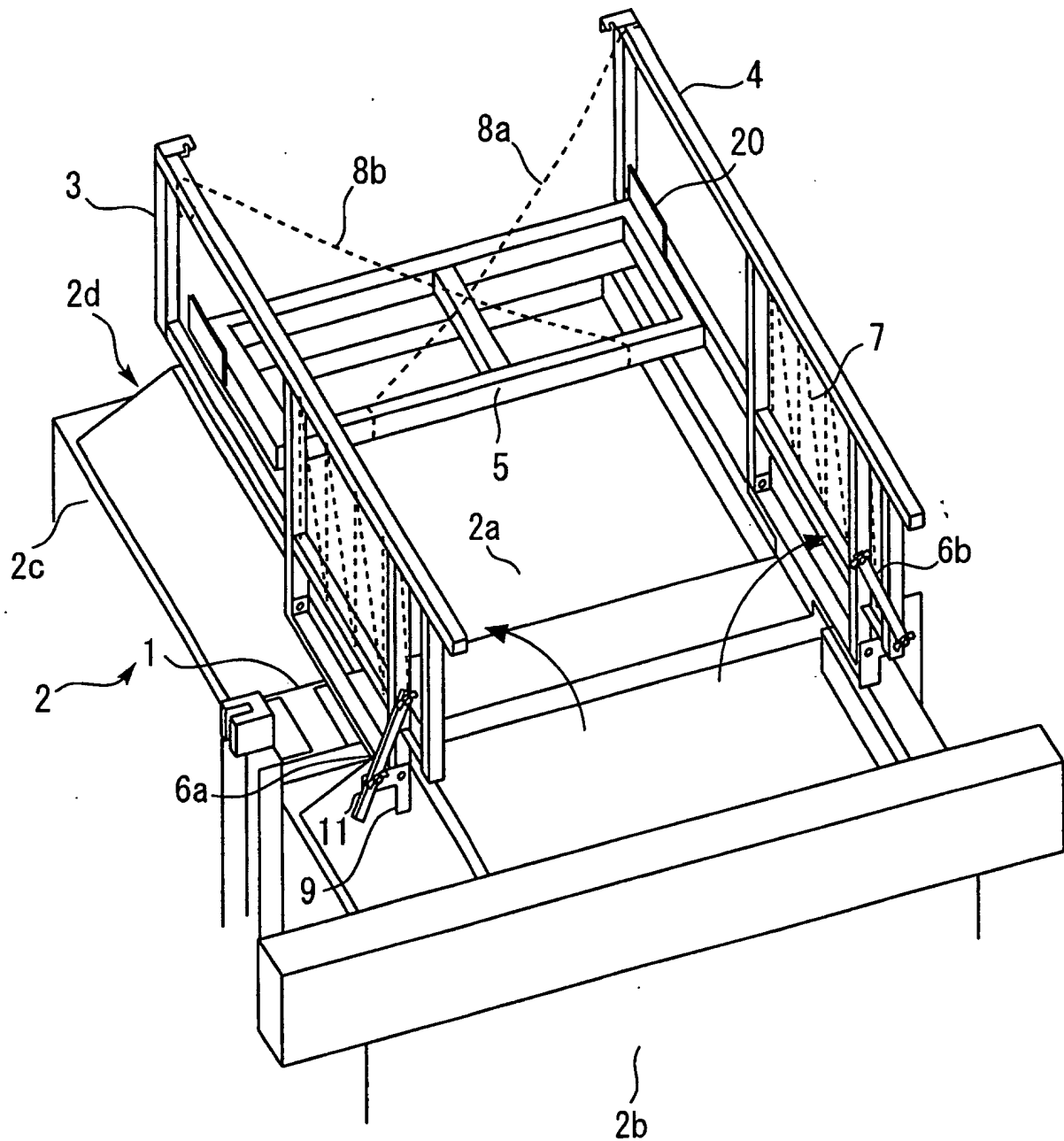
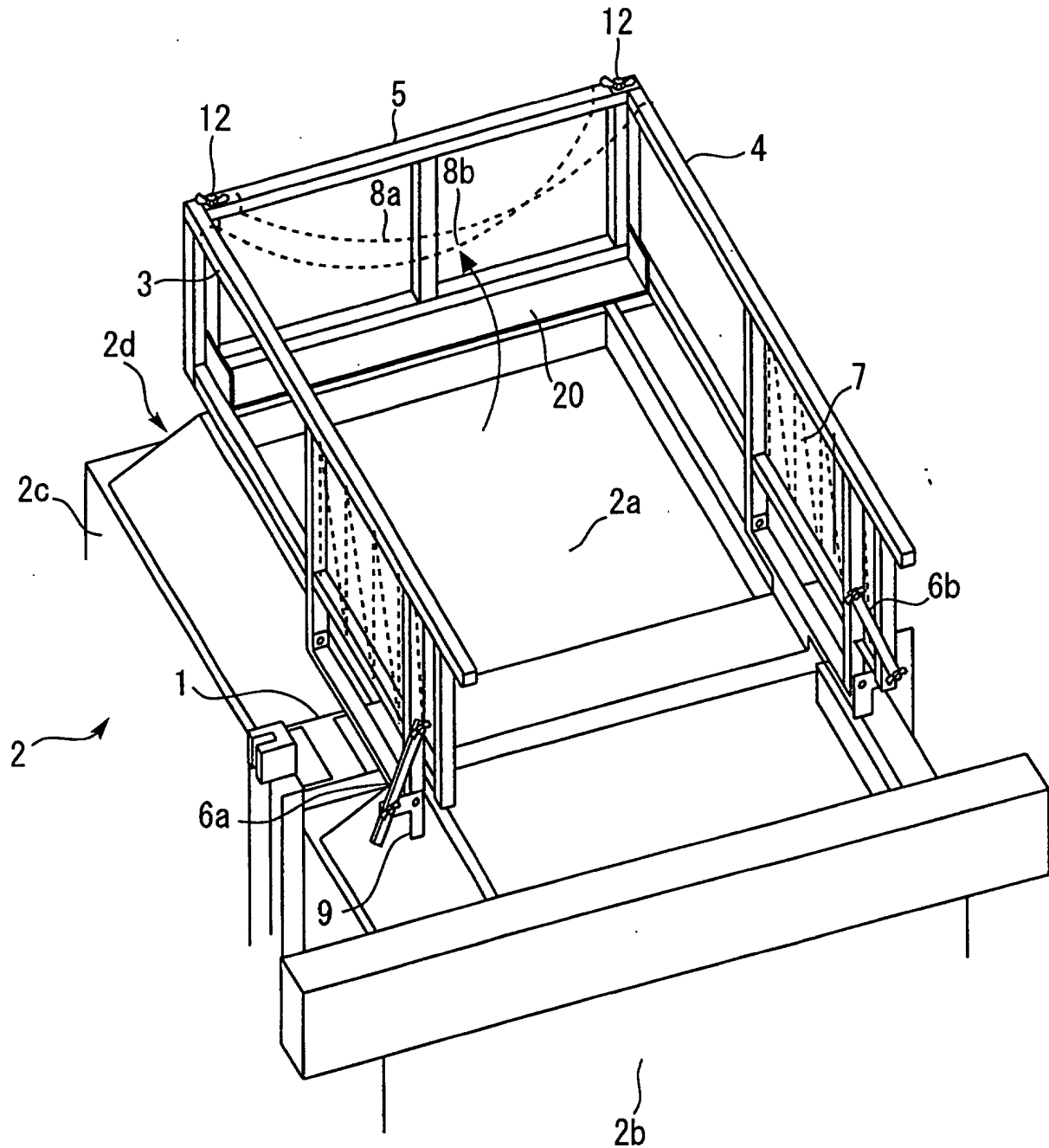


Fig. 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/07366

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. ⁷ B66B11/02 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) Int.Cl. ⁷ B66B5/00-B66B11/08 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 1996-2002 Kokai Jitsuyo Shinan Koho 1971-2002 Toroku Jitsuyo Shinan Koho 1994-2002 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.
X A	JP 2000-143125 A (Toshiba Corp.), 23 May, 2000 (23.05.00), & CN 1246437 A	1-2, 7-10 3-6
X A	JP 6-49577 Y2 (Hitachi Building System Eng. & Service Co., Ltd.), 14 December, 1994 (14.12.94), & JP 1-85368 U	1-2, 4, 7, 9-10 3, 5-6, 8
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 88153/1987 (Laid-open No. 197261/1988) (Mitsubishi Electric Corp.), 19 December, 1988 (19.12.88), (Family: none)	1-10
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "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		"I" 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 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "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 23 May, 2002 (23.05.02)		Date of mailing of the international search report 11 June, 2002 (11.06.02)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/07366

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2-291377 A (Mitsubishi Electric Corp.), 03 December, 1990 (03.12.90), (Family: none)	1-10

Form PCT/ISA/210 (continuation of second sheet) (July 1998)