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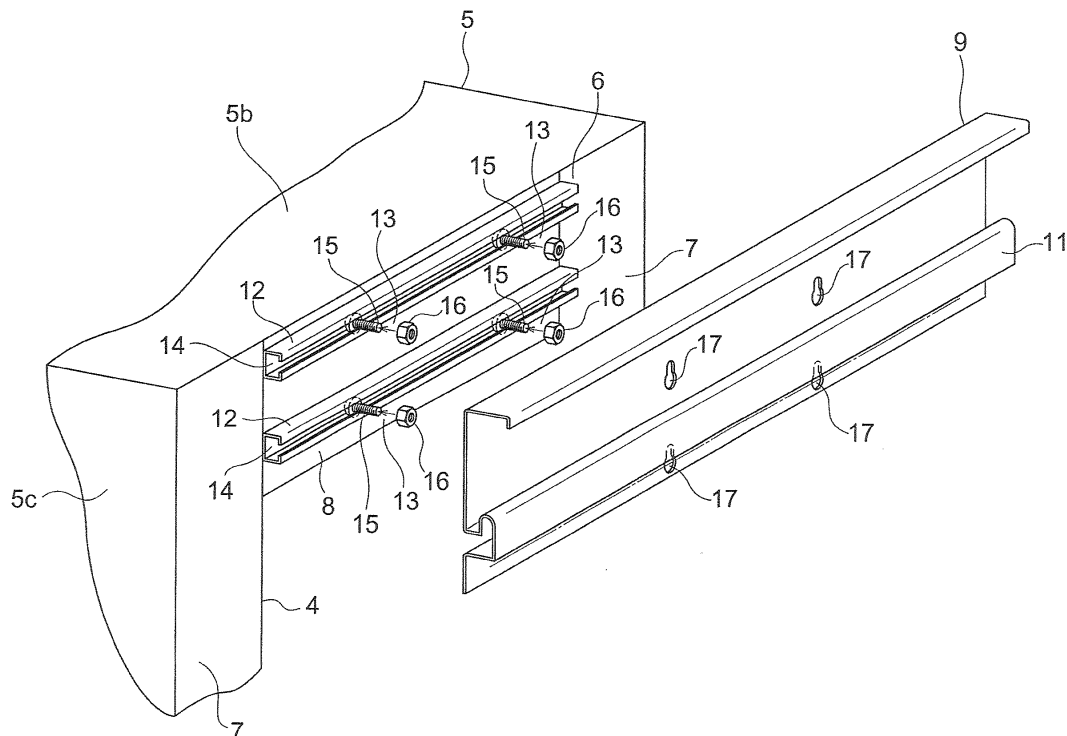
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(54) **ELEVATOR CAR COMPARTMENT AND ELEVATOR CAR**

(57) An elevator cage includes: a cage main body on which a car doorway is disposed; a supporting rail that is fixed to the cage main body; and a fixing apparatus that is disposed displaceably on the supporting rail. The

supporting rail is disposed above a car doorway so as to be parallel to a direction of frontage of the car doorway. The fixing apparatus is configured so as to fix to the supporting rail a door apparatus that opens and closes the car doorway.

FIG. 3



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Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator cage and an elevator car in which a door apparatus that opens and closes a car doorway is disposed.

BACKGROUND ART

[0002] Conventionally, elevator cars are known in which a door apparatus is mounted by means of a mounting arm to a car frame that supports a cage. Disposed on the door apparatus are: a plurality of jack bolts for adjusting a position of the door apparatus relative to the mounting arm; and nuts and bolts for fixing the door apparatus to the mounting arm. In conventional elevator cars, a position of the door apparatus relative to a car doorway that is disposed on the cage is adjusted by the position of the door apparatus relative to the mounting arm being adjusted by manipulating the respective jack bolts (see Patent Literature 1).

CITATION LIST

PATENT LITERATURE

[Patent Literature 1]

[0003] Japanese Utility Model Laid-Open No. SHO 54-175141 (Gazette)

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0004] However, because the door apparatus is separated from the car frame in conventional elevator cars, the burden on the mounting arm, which supports the weight of the door apparatus, is increased, necessitating enlargement of the mounting arm. Overall weight of the car is thereby increased.

[0005] Because the plurality of jack bolts are disposed on the door apparatus in order to adjust the position of the door apparatus, the number of parts is large, increasing costs. In addition, because each of the respective jack bolts must be manipulated while adjusting the position of the door apparatus, door apparatus installation work is time-consuming.

[0006] The present invention aims to solve the above problems and an object of the present invention is to provide an elevator cage and an elevator car that enable weight reductions, that can achieve cost reductions, and that can facilitate door apparatus installation work.

MEANS FOR SOLVING THE PROBLEM

[0007] In order to achieve the above object, according

to one aspect of the present invention, there is provided an elevator cage characterized in including: a cage main body on which a car doorway is disposed; a supporting rail that is disposed above the car doorway so as to be parallel to a direction of frontage of the car doorway, and that is fixed to the cage main body; and a fixing apparatus that is disposed displaceably on the supporting rail, and that fixes to the supporting rail a door apparatus that opens and closes the car doorway.

[0008] According to another aspect of the present invention, there is provided an elevator car characterized in including: a cage including: a cage main body on which a car doorway is disposed; a supporting rail that is disposed above the car doorway so as to be parallel to a direction of frontage of the car doorway, and that is fixed to the cage main body; and a fixing apparatus that is disposed displaceably on the supporting rail; and a door apparatus including: a hanger case on which is disposed a penetrating aperture into which the fixing apparatus is inserted, and that is fixed to the supporting rail by the fixing apparatus in a state in which the fixing apparatus is passed through the penetrating aperture; and a car door that is supported by the hanger case, and that opens and closes the car doorway.

EFFECTS OF THE INVENTION

[0009] In an elevator cage according to the present invention, because the supporting rail is fixed to the cage main body, and the fixing apparatus that fixes the door apparatus to the supporting rail is disposed displaceably on the supporting rail, the door apparatus can be mounted by means of the supporting rail onto the cage main body, which is closer to the door apparatus, instead of onto a car frame that is further away from the door apparatus. The burden on the supporting rail that supports the weight of the door apparatus can thereby be reduced, enabling weight reductions to be achieved in the cage. Because the supporting rail can be fixed directly onto the cage main body, errors in the position of the door apparatus relative to the car doorway can be reduced significantly in both the depth direction and the height direction of the cage. Thus, it is no longer necessary to dispose jack bolts, etc., enabling the number of parts to be reduced, and enabling cost reductions. In addition, because the fixing apparatus is displaceable relative to the supporting rail, the position of the door apparatus relative to the cage main body can be easily adjusted in the direction of frontage of the car doorway. Consequently, adjustment of the position of the door apparatus is facilitated, enabling the installation work on the door apparatus to be facilitated.

[0010] In an elevator car of this kind, because the supporting rail is fixed to the cage main body, and the fixing apparatus that fixes the hanger case of the door apparatus to the supporting rail is disposed displaceably on the supporting rail, the burden on the supporting rail that supports the weight of the door apparatus can be re-

duced, enabling weight reductions to be achieved in the car. Because the supporting rail can be fixed directly onto the cage main body, it is no longer necessary to dispose jack bolts, etc., enabling the number of parts to be reduced, and enabling cost reductions. In addition, because the fixing apparatus is displaceable relative to the supporting rail, adjustment of the position of the door apparatus is facilitated, enabling the installation work of the door apparatus to be facilitated. Because the penetrating aperture into which the fixing apparatus is inserted is disposed on the hanger case, the fixing apparatus is less likely to dislodge from the hanger case when the position of the hanger case is adjusted, enabling the operation of adjusting the position of the hanger case to be further facilitated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

Figure 1 is a front elevation that shows an elevator car according to Embodiment 1 of the present invention;

Figure 2 is a cross section that is taken along line II - II in Figure 1; and

Figure 3 is an exploded perspective that shows an upper portion of a car from Figure 1.

DESCRIPTION OF EMBODIMENTS

[0012] A preferred embodiment of the present invention will now be explained with reference to the drawings.

Embodiment 1

[0013] Figure 1 is a front elevation that shows an elevator car according to Embodiment 1 of the present invention. In the figure, a car 1 that moves through a hoistway has: a cage 2; a door apparatus 3 that is disposed on the cage 2; and a car frame (not shown) that supports the cage 2 so as to surround the cage 2.

[0014] The cage 2 has: a cage main body 5 on which a car doorway 4 is disposed; and a mounting apparatus 6 that is disposed on the cage main body 5 to mount the door apparatus 3 onto the cage main body 5.

[0015] The cage main body 5 has: a car floor 5a; a car ceiling 5b that is positioned above the car floor 5a; a pair of car side surface walls 5c that face each other in a width direction of the cage 2; and a car front surface wall 5d and a car back surface wall that face each other in a depth direction of the cage main body 5. The car doorway 4 is disposed on the car front surface wall 5d. Consequently, a direction of frontage (a width direction) of the car doorway 4 is oriented in the width direction of the cage 2. The car front surface wall 5d has: a pair of wing wall portions 7 that are positioned on left and right sides of the car doorway 4; and an upper wall portion 8 that is positioned above the car doorway 4.

[0016] The mounting apparatus 6 is disposed on the upper wall portion 8. Consequently, the mounting apparatus 6 is disposed above the car doorway 4. The door apparatus 3 is supported on the cage main body 5 by means of the mounting apparatus 6.

[0017] The door apparatus 3 has: a hanger case 9 that is mounted onto the mounting apparatus 6; and a pair of car doors 10 that are supported by the hanger case 9 to open and close the car doorway 4.

[0018] A door rail 11 that is parallel to the direction of frontage of the car doorway 4 is disposed on the hanger case 9. A longitudinal dimension of the door rail 11 is longer than a frontage dimension of the car doorway 4.

[0019] The car doors 10 are hooked onto the shared door rail 11. The car doors 10 are movable in the direction of frontage of the car doorway 4 while being guided by the door rail 11. The car doors 10 are moved in opposite directions to each other in the direction of frontage of the car doorway 4 by a driving force from a door driving apparatus (not shown) that is disposed in the hanger case 9. The car doorway 4 is opened and closed by the car doors 10 being moved in the direction of frontage of the car doorway 4.

[0020] Figure 2 is a cross section that is taken along line II - II in Figure 1. Figure 3 is an exploded perspective that shows an upper portion of the car 1 from Figure 1. In the figures, the mounting apparatus 6 has: a plurality of (in this example, two) supporting rails 12 that are disposed parallel to each other; and a plurality of (in this example, four) fixing apparatuses 13 that are disposed displaceably on the supporting rails 12 to fix the hanger case 9 of the door apparatus 3 to the respective supporting rails 12.

[0021] The respective supporting rails 12 are fixed to the upper wall portion 8 directly by bolts, or welding, for example. The respective supporting rails 12 are disposed so as to be oriented in the direction of frontage of the car doorway 4. Specifically, the respective supporting rails 12 are disposed above the car doorway 4 so as to be oriented in the direction of frontage of the car doorway 4, and are fixed to the cage main body 5. In this example, as shown in Figure 3, a longitudinal dimension of the supporting rails 12 is oriented in the frontage dimension of the car doorway 4. In this example, as shown in Figure 2, the upper wall portion 8 is fixed to the car ceiling 5b by bolts 31.

[0022] As shown in Figure 2, the supporting rails 12 have: a flat rail base portion 12a that contacts the upper wall portion 8; a pair of rail facing portions 12b that are disposed on two edge portions of the rail base portion 12a, and that face each other in a width direction of the supporting rails 12; and a pair of rail protruding portions 12c that protrude toward each other from end portions of the respective rail facing portions 12b. Consequently, a cross-sectional shape of the supporting rails 12 is made approximately C-shaped by the rail base portion 12a, the respective rail facing portions 12b, and the respective rail protruding portions 12c. Holding grooves 14 that are

formed by the rail base portions 12a, the respective rail facing portions 12b, and the respective rail protruding portions 12c are thereby disposed on the supporting rails 12. The holding grooves 14 extend in the longitudinal direction of the supporting rails 12.

[0023] As shown in Figure 3, a predetermined number of fixing apparatuses 13 are respectively disposed on each of the supporting rails 12. In this example, two fixing apparatuses 13 are disposed on each of the supporting rails 12. The fixing apparatuses 13 have: a fastening bolt 15 that is fitted into the holding groove 14; and a fastening nut 16 that is screwed onto the fastening bolt 15.

[0024] The fastening bolt 15 is displaceable along the supporting rails 12 while being held by the supporting rails 12. As shown in Figure 2, the fastening bolts 15 are square base bolts that have: a head portion 15a that is disposed inside the holding groove 14; a rotation arresting portion 15b that has a rectangular cross sectional shape that is fixed to the head portion 15a, and fits into an opening portion of the holding groove 14 (i.e., a space between the respective rail protruding portions 12c); and a screw-threaded portion 15c that protrudes outside the holding groove 14 from the rotation arresting portion 15b. The fastening bolts 15 are displaceable along the supporting rails 12 by the rotation arresting portion 15b being guided by the respective rail protruding portions 12c.

[0025] As shown in Figure 3, a plurality of (in this example, four) keyhole apertures 17 into which the screw-threaded portions 15c of the respective fastening bolts 15 are inserted are disposed on the hanger case 9. The keyhole apertures 17 function as penetrating apertures that pass through the hanger case 9. The keyhole apertures 17 are disposed so as to be aligned with the spacing between each of the supporting rails 12, and are disposed so as to be spaced apart from each other in the longitudinal direction of the door rail 11. In addition, the keyhole apertures 17 have: a large diameter portion; and a small diameter portion that protrudes outward from the large diameter portion. In this example, the keyhole apertures 17 are formed on the hanger case 9 such that the small diameter portion protrudes upward from the large diameter portion. The diameter of the large diameter portion of the keyhole apertures 17 is a diameter that allows both the screw-threaded portions 15c and the fastening nuts 16 to pass through. The diameter of the small diameter portion of the keyhole apertures 17 is a diameter that allows only the screw-threaded portions 15c to pass through, but not the fastening nuts 16.

[0026] When the screw-threaded portions 15c of the fastening bolts 15 are passed through the small diameter portion of the keyhole slots 17, inner circumferential portions of the keyhole slots 17 are engaged with the fastening bolts 15 in the direction of frontage of the car doorway 4. The hanger case 9 is fixed to the supporting rails 12 by being fastened together with the rail protruding portions 12c between the head portions 15a of the fastening bolts 15 and the fastening nuts 16 when the screw-threaded portions 15c of the fastening bolts 15 are

passed through the small diameter portion of the keyhole slots 17. In other words, the hanger case 9 is fixed to the supporting rails 12 by the fastening nuts 16 being fastened onto the fastening bolts 15 so as to be held between the head portions 15a of the fastening bolts 15 and the fastening nuts 16.

[0027] As shown in Figure 2, each of the car doors 10 has: a door panel 18; and a door hanger 19 that is disposed on an upper portion of the door panel 18, and that is hooked onto the door rail 11. The door hangers 19 have: a hanger plate 20 that is fixed to an upper portion of the door panel 18 by bolts (not shown); a plurality of hanger rollers 21 that are disposed on the hanger plate 20, and that are disposed on top of the door rail 11 so as to be spaced apart from each other in the longitudinal direction of the door rail 11; and a plurality of upthrust rollers 22 that are disposed on the hanger plate 20, and that are disposed below the door rail 11 so as to align with positions of each of the hanger rollers 21. When the respective car doors 10 are moved in the direction of frontage of the car doorway 4, the respective hanger rollers 21 are rolled along the door rail 11.

[0028] The position of the door panel 18 on the hanger plate 20 is adjustable in both the depth direction and the width direction of the cage 2 by loosening the bolts that fix the hanger plate 20 to the door panel 18. Consequently, respective fine adjustments of a dimension of the gap between the upper wall portion 8 and the door panel 18 (a gap dimension), a dimension between the door panel 18 and the center line of the car doorway 4 when the car doorway 4 is closed (a JJ dimension), etc., are performed by adjusting the position of the door panel 18 relative to the hanger plate 20.

[0029] Next, procedures when assembling the car 1 will be explained. The cage 2 is shipped from a factory with the respective fixing apparatuses 13 mounted to the supporting rails 12 in advance. Specifically, when the cage 2 is shipped from the factory, the respective fixing apparatuses 13 are mounted onto the supporting rails 12 such that the fastening nuts 16 are screwed onto the fastening bolts 15 that are fitted into the holding grooves 14. At this point, the respective fixing apparatuses 13 are mounted onto the supporting rails 12 so as to be aligned with the positions of the keyhole slots 17 on the hanger case 9.

[0030] The door apparatus 3 is shipped from the factory so as to be detached from the cage 2. When the door apparatus 3 is shipped from the factory, the car doors 10 are detached from the hanger case 9.

[0031] At an elevator installation site, the hanger case 9 is mounted to the cage 2, and then the car 1 is completed by mounting the car doors 10 onto the hanger case 9.

[0032] Specifically, when the car 1 is assembled, the fastening nuts 16 are first loosened to form a gap between the fastening nuts 16 and the supporting rails 12 into which the hanger case 9 fits.

[0033] Next, the fastening nuts 16 are passed through

the large diameter portion of the keyhole apertures 17, and the hanger case 9 is pressed against the supporting rails 12. Next, the hanger case 9 is moved downward while being pressed against the supporting rails 12 to move the small diameter portions of the keyhole apertures 17 to the positions of the screw-threaded portions 15c of the fastening bolts 15. The screw-threaded portions 15c of the fastening bolts 15 are thereby fitted into the small diameter portions of the keyhole apertures 17.

[0034] Next, the hanger case 9 is moved in the longitudinal direction of the supporting rails 12 together with the respective fixing apparatuses 13 to adjust the position of the hanger case 9 relative to the cage main body 5 in the direction of frontage of the car doorway 4. Next, the fastening nuts 16 are tightened to fix the hanger case 9 to the supporting rails 12. The hanger case 9 is thereby mounted onto the cage 2.

[0035] Next, the car doors 10 are mounted onto the hanger case 9 by hanging the car doors 10 on the door rail 11. Next, the bolts that fix the hanger plate 20 to the door panel 18 are loosened and fine adjustments of the gap dimension and the JJ dimension are performed while moving the door panel 18 relative to the hanger plate 20. Next, the door panel 18 is fixed to the hanger plate 20 again by tightening the bolts. Next, the door apparatus 3 is mounted onto the cage 2 by mounting attachments to the hanger case 9 to complete the door apparatus 3. The car 1 is thereby assembled.

[0036] In an elevator cage 2 of this kind, because the supporting rails 12 are fixed to the cage main body 5, and the fixing apparatuses 13 that fix the door apparatus 3 to the supporting rails 12 are disposed displaceably on the supporting rails 12, the door apparatus 3 can be mounted by means of the supporting rails 12 onto the cage main body 5, which is closer to the door apparatus 3, instead of onto a car frame that is further away from the door apparatus 3. The burden on the supporting rails 12 that support the weight of the door apparatus 3 can thereby be reduced, enabling weight reductions to be achieved in the cage 2. Because the supporting rails 12 can be fixed directly onto the cage main body 5, errors in the position of the door apparatus 3 relative to the car doorway 4 can be reduced significantly in both the depth direction and the height direction of the cage 2. Thus, it is no longer necessary to dispose jack bolts, etc., for adjusting the position of the door apparatus 3 in both the depth direction and the height direction of the cage 2, enabling the number of parts to be reduced, and enabling cost reductions. In addition, because the fixing apparatuses 13 are displaceable relative to the supporting rails 12, the position of the door apparatus 3 relative to the cage main body 5 can be easily adjusted in the direction of frontage of the car doorway 4. Consequently, adjustment of the position of the door apparatus 3 is facilitated, enabling the installation work of the door apparatus 3 to be facilitated.

[0037] Because the fixing apparatuses 13 have: fastening bolts 15 that are displaceable along the supporting

rails 12 while being held by the supporting rails 12; and fastening nuts 16 that are screwed onto the fastening bolts 15, and the door apparatus 3 is fixed to the supporting rails 12 by fastening the fastening nuts 16 onto the fastening bolts 15, the door apparatus 3 can be fixed to the supporting rails 12 using a simple configuration, enabling the door apparatus 3 to be fixed easily onto the supporting rails 12.

[0038] In an elevator car 1 of this kind, because the supporting rails 12 are fixed to the cage main body 5, and the fixing apparatuses 13 that fix the hanger case 9 of the door apparatus 3 to the supporting rails 12 are disposed displaceably on the supporting rails 12, as described above, the burden on the supporting rails 12 that support the weight of the door apparatus 3 can be reduced, enabling weight reductions to be achieved in the car 1. Because the supporting rails 12 can be fixed directly onto the cage main body 5, it is no longer necessary to dispose jack bolts, etc., for adjusting the position of the door apparatus 3 in both the depth direction and the height direction of the cage 2, enabling the number of parts to be reduced, and enabling cost reductions. In addition, because the fixing apparatuses 13 are displaceable relative to the supporting rails 12, adjustment of the position of the door apparatus 3 is facilitated, enabling the installation work of the door apparatus 3 to be facilitated. Because the keyhole apertures (penetrating apertures) 17 into which the fastening bolts 15 are inserted are disposed on the hanger case 9, the fastening bolts 15 are less likely to dislodge from the hanger case 9 when the position of the hanger case 9 is adjusted, enabling the operation of adjusting the position of the hanger case 9 to be further facilitated.

[0039] Because the penetrating apertures that are disposed on the hanger case 9 are keyhole apertures 17, even if the fastening nuts 16 are screwed onto the fastening bolts 15, the fastening bolts 15 can still be fitted into the small diameter portions of the keyhole apertures 17 by passing the fastening nuts 16 through the large diameter portion of the keyhole apertures 17. Thus, the hanger case 9 can be fixed to the supporting rails 12 without removing the fastening nuts 16 from the fastening bolts 15, enabling the installation work on the door apparatus 3 to be further facilitated.

[0040] Moreover, in the above example, the fixing apparatuses 13 have fastening bolts 15 and fastening nuts 16, but the configuration is not limited thereto provided that the fixing apparatuses 13 are disposed displaceably on the supporting rails 12, and the door apparatus 3 is fixed to the supporting rails 12. Fixing apparatuses may also have hooks that are disposed displaceably on the supporting rails 12, and pins that fix the positions of the hooks on the supporting rails 12, for example. In that case, pin passage apertures through which the pins are passed are disposed on the hooks. The positions of the hooks in the supporting rails 12 are fixed by the pins that are passed through the pin passage apertures being inserted into positioning apertures that are disposed at pre-

determined positions on the supporting rails 12. In addition, the hanger case 9 is fixed to the supporting rails 12 so as to be fitted into the hooks by the positions of the hooks being fixed on the supporting rails 12.

[0041] In the above example, the penetrating apertures that are disposed on the hanger case 9 are keyhole apertures 17, but are not limited thereto. Round apertures or slots may also be disposed on the hanger case 9 as the penetrating apertures, for example. In that case, the fastening nuts 16 must be removed from the fastening bolts 15 temporarily, and then the fastening bolts 15 passed through the penetrating apertures on the hanger case 9. If slots function as the penetrating apertures, then the slots may also be disposed vertically, and one end only of the upper end portion and the lower end portion of the slots may be left open. The fastening bolts 15 can thereby be inserted into the slots through the open portions of the slots with the fastening nuts 16 still screwed onto the fastening bolts 15.

EXPLANATION OF NUMBERING

[0042] 1 CAR, 2 CAGE, 3 DOOR APPARATUS, 4 CAR DOORWAY, 5 CAGE MAIN BODY, 9 HANGER CASE, 10 CAR DOOR, 12 SUPPORTING RAILS, 13 FIXING APPARATUSES, 15 FASTENING BOLTS, 16 FASTENING NUTS, 17 KEYHOLE APERTURES (PENETRATING APERTURES).

Claims

1. An elevator cage **characterized in** comprising:

a cage main body on which a car doorway is disposed;
a supporting rail that is disposed above the car doorway so as to be parallel to a direction of frontage of the car doorway, and that is fixed to the cage main body; and
a fixing apparatus that is disposed displaceably on the supporting rail, and that fixes to the supporting rail a door apparatus that opens and closes the car doorway.

2. An elevator cage according to Claim 1, **characterized in that**:

the fixing apparatus comprises:

a fastening bolt that is displaceable along the supporting rail while being held by the supporting rail; and
a fastening nut that is screwed onto the fastening bolt; and

the door apparatus is fixed to the supporting rail by fastening the fastening nut onto the fastening

bolt.

3. An elevator car **characterized in** comprising:

a cage comprising:

a cage main body on which a car doorway is disposed;
a supporting rail that is disposed above the car doorway so as to be parallel to a direction of frontage of the car doorway, and that is fixed to the cage main body; and
a fixing apparatus that is disposed displaceably on the supporting rail; and

a door apparatus comprising:

a hanger case on which is disposed a penetrating aperture into which the fixing apparatus is inserted, and that is fixed to the supporting rail by the fixing apparatus in a state in which the fixing apparatus is passed through the penetrating aperture; and
a car door that is supported by the hanger case, and that opens and closes the car doorway.

4. An elevator car according to Claim 3, **characterized in that**:

the fixing apparatus comprises:

a fastening bolt that is displaceable along the supporting rail while being held by the supporting rail; and
a fastening nut that is screwed onto the fastening bolt;

the penetrating aperture is a keyhole aperture; and
the hanger case is fixed to the supporting rail by being fastened between a head portion of the fastening bolt that is passed through the keyhole aperture and the fastening nut.

FIG. 1

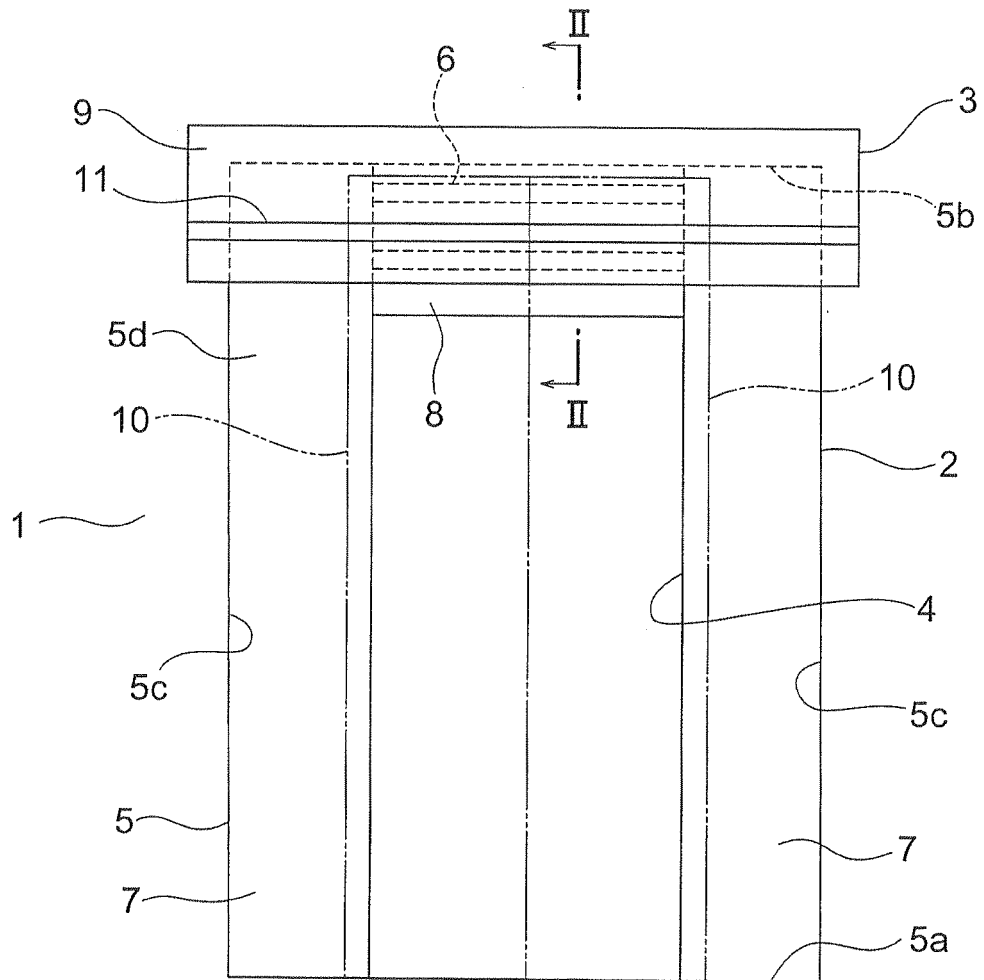


FIG. 2

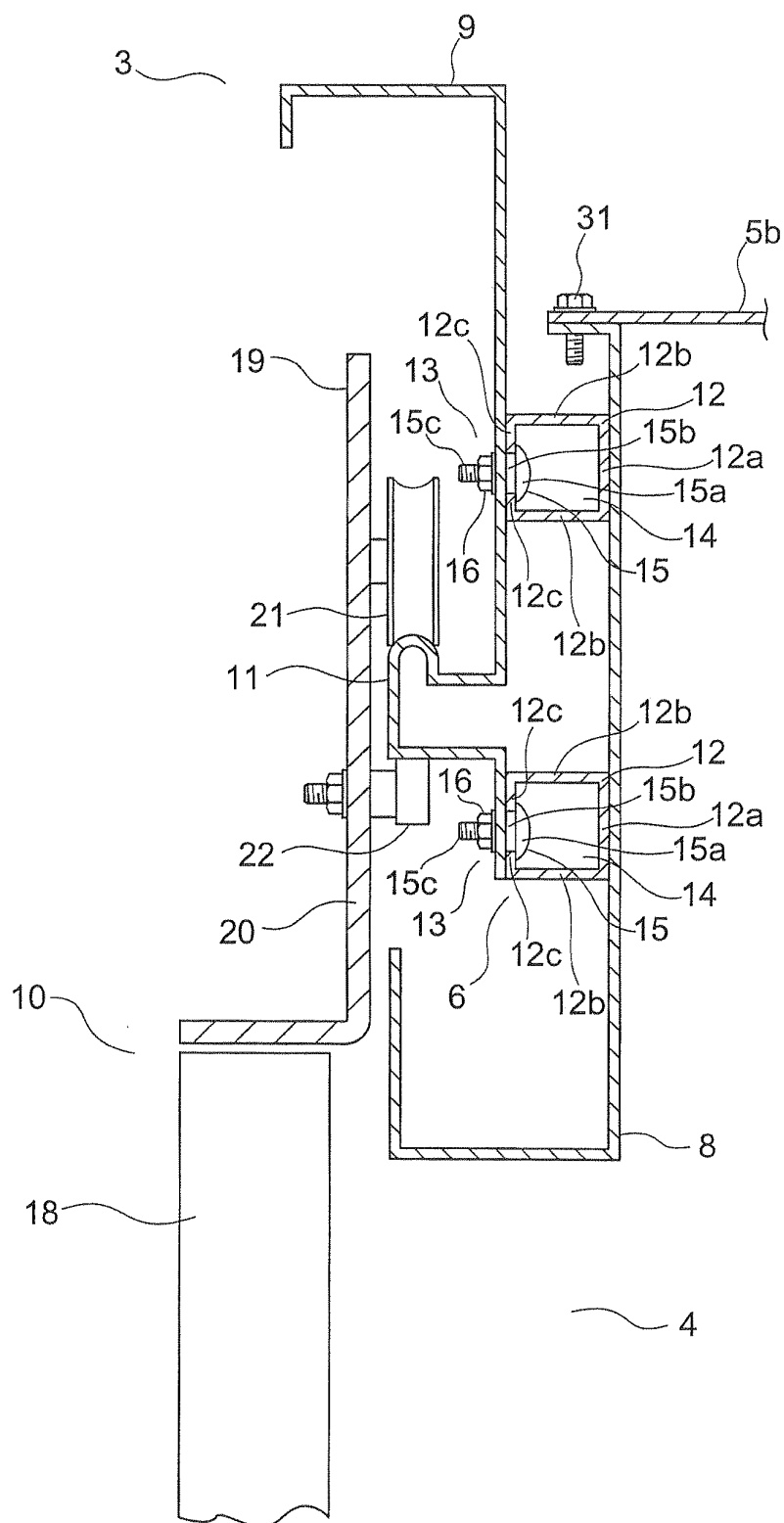
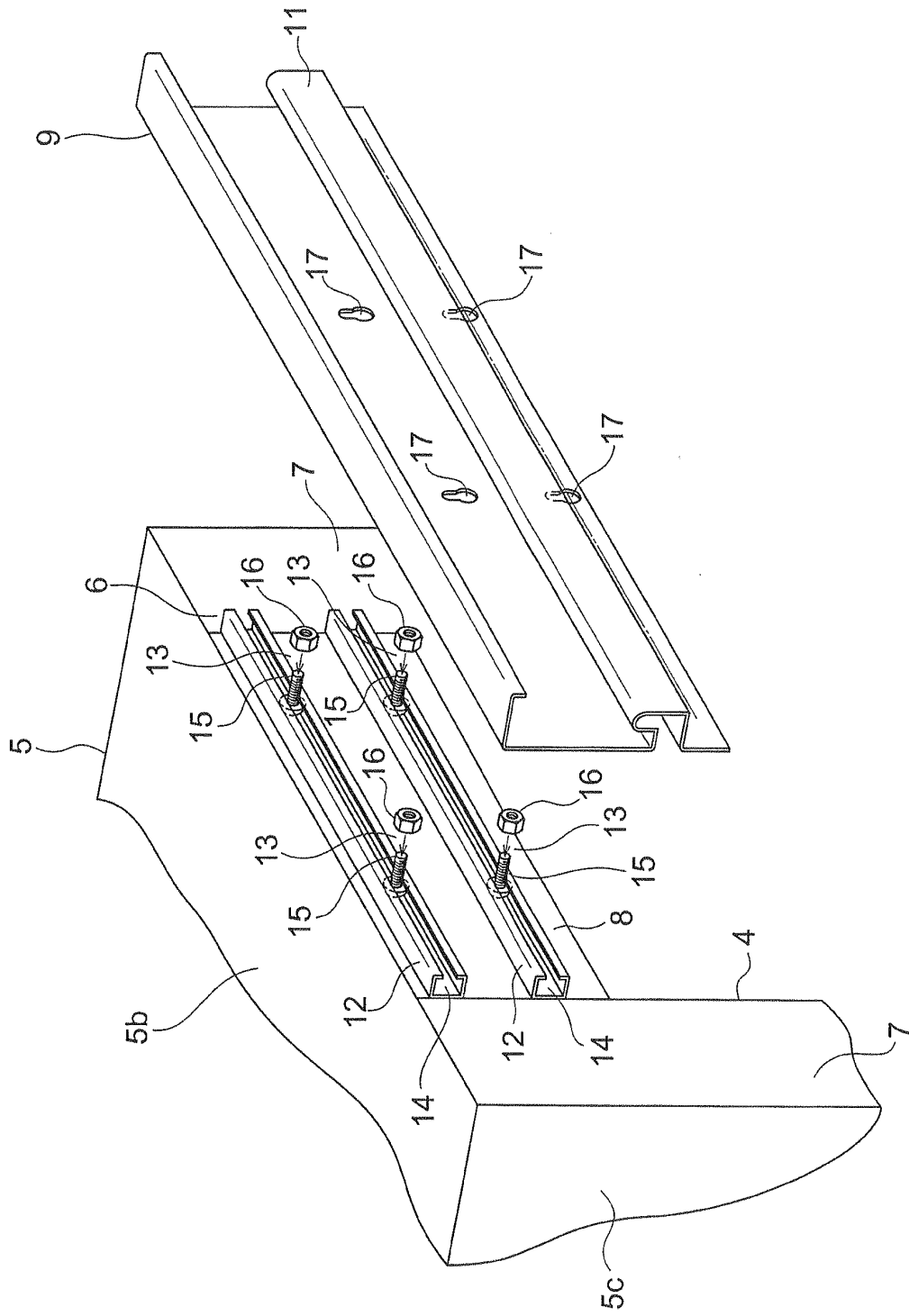


FIG. 3



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/067360

A. CLASSIFICATION OF SUBJECT MATTER

B66B13/30 (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)

B66B13/30

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	1996-2010
Kokai Jitsuyo Shinan Koho	1971-2010	Toroku Jitsuyo Shinan Koho	1994-2010

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.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 49469/1982 (Laid-open No. 151183/1983) (Mitsubishi Electric Corp.), 11 October 1983 (11.10.1983), page 1, line 20 to page 3, line 2; fig. 2 (Family: none)	1-4
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 119435/1980 (Laid-open No. 42070/1982) (Godo Denki Kabushiki Kaisha), 06 March 1982 (06.03.1982), page 3, line 12 to page 4, line 2; fig. 2 to 3 (Family: none)	1-4

☒ 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
24 December, 2010 (24.12.10)Date of mailing of the international search report
11 January, 2011 (11.01.11)Name and mailing address of the ISA/
Japanese Patent Office

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/067360

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 58701/1976 (Laid-open No. 150172/1977) (Haruo SASAHARA), 14 November 1977 (14.11.1977), page 3, line 4 to page 4, line 1; fig. 3 (Family: none)	3
A	JP 2007-137613 A (Mitsubishi Electric Corp.), 07 June 2007 (07.06.2007), paragraph [0026]; fig. 14 (Family: none)	4

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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