(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 810 910 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
10.12.2014 Bulletin 2014/50

(21) Application number: **12867097.3**

(22) Date of filing: **31.01.2012**

(51) Int Cl.:
B66B 11/02 *(2006.01)*

(86) International application number:
PCT/JP2012/052121

(87) International publication number:
WO 2013/114566 (08.08.2013 Gazette 2013/32)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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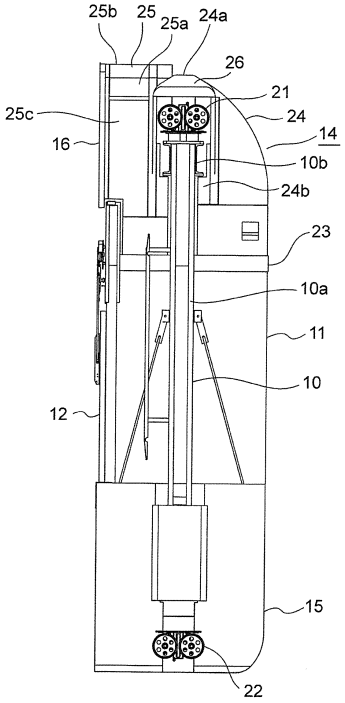
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(54) ELEVATOR DEVICE

(57) In an elevator apparatus, an upper portion wind-rectifying cover is disposed on an upper portion of a car. A rectangular wind-rectifying plate is disposed above a front surface of a cage. An upper portion wind-rectifying cover includes: a wind-rectifying cover main body; and a wind-rectifying cover linking portion that is disposed between the wind-rectifying cover main body and the wind-rectifying plate. An external shape of the wind-rectifying cover main body is a streamlined shape that widens gradually downward from an upper end. The wind-rectifying cover linking portion includes a semi-tubular portion in which a cross section parallel to the front surface of the cage is constant in a depth direction of the cage.

FIG. 2



EP 2 810 910 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator apparatus in which a wind-rectifying cover for suppressing noise that arises when a car travels at high speed is mounted onto the car.

BACKGROUND ART

[0002] In conventional elevator apparatuses, streamlined enclosing bodies are disposed above and below a car. Each of the enclosing bodies has: a semi-circular plate-shaped apron cover; three curved covers; and a pair of streamlining covers that cover a pair of roller guiding apparatuses (see Patent Literature 1, for example).

CITATION LIST

PATENT LITERATURE

[Patent Literature 1]

[0003] Japanese Patent Laid-Open No. HEI 6-329372 (Gazette)

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0004] In conventional elevator apparatuses such as that described above, it is necessary to manufacture curved covers that have different sizes depending on depth dimensions of the car, increasing costs. More effective noise reduction is also being required as the traveling speed of cars increases further.

[0005] The present invention aims to solve the above problems and an object of the present invention is to provide an elevator apparatus that can reduce noise during traveling more effectively by a simple configuration.

MEANS FOR SOLVING THE PROBLEM

[0006] In order to achieve the above object, according to one aspect of the present invention, there is provided an elevator apparatus including: a car that is raised and lowered inside a hoistway, the car including: a car frame; and a cage that is supported by the car frame; an upper portion wind-rectifying cover that is disposed on an upper portion of the car; and a rectangular wind-rectifying plate that is disposed on the car above a front surface of the cage so as to suppress inflow of air into a gap between the front surface of the cage and a hoistway wall when the car is traveling upward, wherein: the upper portion wind-rectifying cover includes: a wind-rectifying cover main body; and a wind-rectifying cover linking portion that is disposed between the cover main body and the wind-rectifying plate; an external shape of the wind-rectifying cover main body is a streamlined shape that widens gradually downward from an upper end; and the wind-rectifying cover linking portion includes a semi-tubular portion in which a cross section parallel to the front surface of the cage is constant in a depth direction of the cage.

[0007] According to another aspect of the present invention, there is provided an elevator apparatus including: a car that is raised and lowered inside a hoistway, the car including: a car frame; and a cage that is supported by the car frame; a suspending body that is connected to an upper portion of the car frame so as to suspend the car inside the hoistway; a pair of car guiding apparatuses that are mounted onto the car frame so as to engage with a pair of car guide rails that are disposed inside the hoistway; and an upper portion wind-rectifying cover that is disposed on an upper portion of the car, on which a suspending body insertion aperture through which the suspending body passes is disposed, wherein: a pair of left and right opening portions are disposed on the upper portion wind-rectifying cover; the opening portions are positioned in a vicinity of the car frame below the car guiding apparatuses; airflow pathways are formed inside the upper portion wind-rectifying cover such that air that enters through the suspending body insertion apertures when the car is traveling upward is discharged through the opening portions; the upper portion wind-rectifying cover is supported by the car frame so as to be spaced apart from an upper end portion of the cage; and a blocking member that blocks a gap between the cage and the upper portion wind-rectifying cover while allowing vertical displacement of the cage relative to the car frame is disposed between the upper end portion of the cage and a lower end portion of the upper portion wind-rectifying cover.

EFFECTS OF THE INVENTION

[0008] According to an elevator apparatus according to the present invention, noise during traveling can be reduced more effectively by a simple configuration.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Figure 1 is a schematic configuration diagram that shows an elevator apparatus according to Embodiment 1 of the present invention;
Figure 2 is a side elevation that shows a car from Figure 1 enlarged;
Figure 3 is a rear elevation that shows the car from Figure 2;
Figure 4 is a front elevation that shows the car from Figure 2;
Figure 5 is a plan that shows the car from Figure 2;
Figure 6 is a bottom plan that shows the car from

Figure 2;
Figure 7 is a side elevation that shows an upper portion wind-rectifying cover from Figure 2;
Figure 8 is a rear elevation that shows the upper portion wind-rectifying cover from Figure 7;
Figure 9 is a plan that shows the upper portion wind-rectifying cover from Figure 7;
Figure 10 is a side elevation in which airflow pathways that are formed in the upper portion wind-rectifying cover during ascent of the car from Figure 2 are represented by arrows;
Figure 11 is a cross section that is taken along Line XI - XI in Figure 10;
Figure 12 is a plan that shows a state in which the upper portion wind-rectifying cover from Figure 11 is removed;
Figure 13 is a side elevation that shows part of an elevator apparatus according to Embodiment 2 of the present invention; and
Figure 14 is a side elevation that shows part of an elevator apparatus according to Embodiment 3 of the present invention.

DESCRIPTION OF EMBODIMENTS

[0010] Preferred embodiments of the present invention will now be explained with reference to the drawings.

Embodiment 1

[0011] Figure 1 is a schematic configuration diagram that shows an elevator apparatus according to Embodiment 1 of the present invention. In the figure, a machine room 2 is disposed in an upper portion of a hoistway 1. A hoisting machine (a driving apparatus) 3, a deflecting sheave 4, and an elevator controlling apparatus (a controlling board) 5 are installed in the machine room 2. The hoisting machine 3 has: a driving sheave 6; a hoisting machine motor that rotates the driving sheave 6; and a hoisting machine brake (an electromagnetic brake) that brakes rotation of the driving sheave 6.

[0012] A suspending body 7 is wound around the driving sheave 6 and the deflecting sheave 4. A plurality of ropes or a plurality of belts are used as the suspending body 7. A car 8 is connected to a first end portion of the suspending body 7. A counterweight 9 is connected to a second end portion of the suspending body 7.

[0013] The car 8 and the counterweight 9 are suspended inside the hoistway 1 by the suspending body 7 so as to be raised and lowered inside the hoistway 1 by the hoisting machine 3. The elevator controlling apparatus 5 controls operation of the car 8 by controlling the hoisting machine 3.

[0014] A pair of car guide rails (not shown) that guide raising and lowering of the car 8 and a pair of counterweight guide rails (not shown) that guide raising and lowering of the counterweight 9 are installed inside the hoistway 1. The car guide rails are disposed on both left and right sides of the car 8.

[0015] The car 8 has: a car frame 10 to which the suspending body 7 is connected; and a cage 11 that is supported by the car frame 10. A car doorway is disposed on a front surface of the cage 11. The car doorway is opened and closed by a pair of car doors 12.

[0016] Pairs of landing doors 13 that open and close landing doorways are respectively disposed on landings of a plurality of floors. The landing doors 13 are operated so as to open and close interdependently with the car doors 12 by engaging with the car doors 12 when the car 8 is at a floor.

[0017] An upper portion wind-rectifying cover 14 is disposed on an upper portion of the car 8. A lower portion wind-rectifying cover 15 is disposed on a lower portion of the car 8. The wind-rectifying covers 14 and 15 suppress noise that arises when the car 8 travels at high speed.

[0018] A rectangular (oblong) wind-rectifying plate 16 is disposed above the front surface of the cage 11. The wind-rectifying plate 16 suppresses inflow of air into a gap between the front surface of the cage 11 and the hoistway wall 1 a when the car 8 is traveling upward. Noise that is generated by traveling airflow colliding with the car doors 12 is thereby suppressed.

[0019] In the elevator apparatus according to Embodiment 1, the maximum speed of the car 8 when traveling upward is an ultrahigh speed (greater than or equal to 1,000 m/min, for example). Furthermore, the maximum speed of the car 8 when traveling downward is lower than a maximum speed when traveling upward (600 m/min, for example). Because of this, the shape of the upper portion wind-rectifying cover 14 and the shape of the lower portion wind-rectifying cover 15 is asymmetrical vertically.

[0020] Figure 2 is a side elevation that shows the car 8 from Figure 1 enlarged, Figure 3 is a rear elevation that shows the car 8 from Figure 2, Figure 4 is a front elevation that shows the car 8 from Figure 2, Figure 5 is a plan that shows the car 8 from Figure 2, Figure 6 is a bottom plan that shows the car 8 from Figure 2, Figure 7 is a side elevation that shows the upper portion wind-rectifying cover 14 from Figure 2, Figure 8 is a rear elevation that shows the upper portion wind-rectifying cover 14 from Figure 7, and Figure 9 is a plan that shows the upper portion wind-rectifying cover 14 from Figure 7.

[0021] The car frame 10 has: a pair of left and right vertical frames 10a; and a horizontal upper beam 10b that is fixed between upper end portions of the vertical frames 10a. A pair of upper portion roller guiding apparatuses (car guiding apparatuses) 21 that engage with the car guide rails are mounted onto upper end portions of the car frame 10. A pair of lower portion roller guiding apparatuses (car guiding apparatuses) 22 that engage with the car guide rails are mounted onto lower end portions of the car frame 10.

[0022] The roller guiding apparatuses 21 and 22 each have three guiding rollers that are rolled along the car

guide rails. A plurality of actuators that drive the guiding rollers so as to reduce vibration of the car 8 (active roller guiding systems) are mounted onto each of the roller guiding apparatuses 21 and 22.

[0023] An upper portion wind-rectifying cover 14 is supported by the car frame 10 so as to be spaced apart from an upper end portion of the cage 11. A strip-shaped rubber sheet 23 that functions as a flexible blocking member is disposed between the upper end portion of the cage 11 and a lower end portion of the upper portion wind-rectifying cover 14. The rubber sheet 23 blocks a gap between the cage 11 and the upper portion wind-rectifying cover 14.

[0024] The cage 11 displaces vertically relative to the car frame 10 due to load fluctuations on the car 8 (approximately 10 mm, for example). Clearance between the upper end portion of the cage 11 and the lower end portion of the upper portion wind-rectifying cover 14 is at a minimum when the car 8 is in an unloaded state, being approximately 50 mm, for example. A width dimension (a vertical dimension) of the rubber sheet 23 is set to a dimension that is sufficiently larger than the clearance between the upper end portion of the cage 11 and the lower end portion of the upper portion wind-rectifying cover 14 (greater than or equal to 100 mm, for example).

[0025] The rubber sheet 23 is fixed to the upper end portion of the cage 11 and the lower end portion of the upper portion wind-rectifying cover 14 such that a predetermined amount of play arises when the car 8 is in the unloaded state. The rubber sheet 23 thereby absorbs the vertical displacement of the cage 11 relative to the car frame 10. The thickness of the rubber sheet 23 is approximately 2 mm, for example.

[0026] The upper portion wind-rectifying cover 14 has: a wind-rectifying cover main body 24; a wind-rectifying cover linking portion 25; and a pair of guiding apparatus covers 26. The wind-rectifying cover main body 24 covers a space above the cage 11 rearward from a vicinity of the upper beam 10b. The wind-rectifying cover linking portion 25 is disposed between the wind-rectifying cover main body 24 and the wind-rectifying plate 16 so as to cover the space above the cage 11 further forward than the upper beam 10b. The guiding apparatus covers 26 are mounted onto the wind-rectifying cover main body 24 so as to cover the upper portion roller guiding apparatuses 21.

[0027] The external shape of the wind-rectifying cover main body 24 is a streamlined dome shape that widens gradually downward from an upper end. An upper end portion of the wind-rectifying cover main body 24 is positioned almost directly above an intermediate portion of the upper beam 10b. A lower end portion of a back surface of the wind-rectifying cover main body 24 faces an upper end portion of a back surface of the cage 11. Lower end portions of two side surfaces of the wind-rectifying cover main body 24 face upper end portions of two side surfaces of the cage 11.

[0028] The wind-rectifying cover linking portion 25 has a semi-tubular portion 25a. The external shape of the semi-tubular portion 25a is a shape in which a rectangular tube is cut in half axially (a gate shape), and the cross-sectional shape of the semi-tubular portion 25a is a reverse U shape. The cross section of the semi-tubular portion 25a parallel to the front surface of the cage 11 is constant in a depth direction of the cage 11.

[0029] The semi-tubular portion 25a has: a flat, horizontal upper surface portion 25b; and a pair of flat side surface portions 25c that are positioned opposite each other. The upper surface portion 25b extends from an upper end portion of the wind-rectifying plate 16 toward the wind-rectifying cover main body 24. The side surface portions 25c extend from two left and right end portions of the wind-rectifying plate 16 toward the wind-rectifying cover main body 24.

[0030] A continuing portion 25d is disposed at a boundary of the semi-tubular portion 25a with the wind-rectifying plate 16 (Figure 7). The cross-sectional shape of the continuing portion 25d is a circular arc shape that is tangential to both the back surface of the wind-rectifying plate 16 and the upper surface of the upper surface portion 25b.

[0031] The upper surface portion 25b is positioned higher than the upper end portion of the wind-rectifying cover main body 24. The wind-rectifying plate 16, the wind-rectifying cover main body 24, and the wind-rectifying cover linking portion 25 are each configured by joining aluminum sheets to a steel frame.

[0032] The external shapes of the guiding apparatus covers 26 are streamlined shapes that widen gradually downward from an upper end. Edges of the guiding apparatus covers 26 are aligned with edges of the wind-rectifying cover main body 24. Each of the guiding apparatus covers 26 is molded integrally using a carbon-fiber-reinforced polymer (CFRP).

[0033] A suspending body insertion aperture 24a through which the suspending body 7 passes is disposed on the upper end portion of the wind-rectifying cover main body 24. A pair of left and right opening portions 24b are disposed on the wind-rectifying cover main body 24. The opening portions 24b are positioned in a vicinity of the vertical frames 10a below the upper portion roller guiding apparatuses 21.

[0034] The space above the cage 11 is covered by the upper portion wind-rectifying cover 14, the wind-rectifying plate 16, and the rubber sheet 23 except for the suspending body insertion aperture 24a and the opening portions 24b. Airflow pathways in which air that enters through the suspending body insertion aperture 24a when the car 8 is traveling upward is discharged through the left and right opening portions 24b are thereby formed inside the upper portion wind-rectifying cover 14.

[0035] Figure 10 is a side elevation in which airflow pathways that are formed in the upper portion wind-rectifying cover during ascent of the car 8 from Figure 2 are represented by arrows, Figure 11 is a cross section that is taken along Line XI - XI in Figure 10, and Figure 12 is

a plan that shows a state in which the upper portion wind-rectifying cover 14 from Figure 11 is removed.

[0036] Equipment is installed inside the upper portion wind-rectifying cover 14 so as to be distributed between two levels in the space above the cage 11 and the space above the upper beam 10b. An air conditioner 31 is installed above the cage 11.

[0037] An air pressure controlling fan 33 and a switching valve 34 are installed above the upper beam 10b. The blower 33 and the switching valve 34 are connected by a plurality of connecting ducts 35. The blowing direction of the blower 33 is constant, and air pressure inside the cage 11 is adjusted by switching the air flow using the switching valve 34.

[0038] Heat that is generated by the equipment inside the upper portion wind-rectifying cover 14 is discharged outside the upper portion wind-rectifying cover 14 by the air flowing along the airflow pathways that are shown in Figures 10 and 11. The car-side rope fastener portion 36 to which the suspending body 7 is connected is disposed on the upper beam 10b.

[0039] In an elevator apparatus of this kind, changes in the depth dimension of the car 8 can be easily accommodated by changing dimensions of the semi-tubular portion 25a in the same direction. By disposing the wind-rectifying cover linking portion 25, which has the semi-tubular portion 25a, between the wind-rectifying plate and the wind-rectifying cover main body 24, inflow of air into a gap between the front surface of the cage 11 and the hoistway wall 1 a can be suppressed more effectively. Because of that, noise during traveling can be reduced more effectively by a simple configuration.

[0040] Because the continuing portion 25d is disposed at the boundary of the semi-tubular portion 25a with the wind-rectifying plate 16, the flow of air near the back surface of the wind-rectifying plate 16 is smoothed, suppressing inflow of air into the gap between the front surface of the cage 11 and the hoistway wall 1a more effectively, and enabling noise during traveling to be reduced more effectively.

[0041] In addition, by making the shape of the semi-tubular portion 25a a rectangular shape that has an upper surface portion 25b and side surface portions 25c, inflow of air into the gap between the front surface of the cage 11 and the hoistway wall 1 a is suppressed more effectively, enabling noise during traveling to be reduced more effectively.

[0042] Furthermore, because airflow pathways are formed inside the upper portion wind-rectifying cover 14 such that air that enters through the suspending body insertion aperture 24a is discharged through the left and right opening portions 24b, the flow of air during traveling is smoothed, enabling noise during traveling to be reduced more effectively.

[0043] Because the guiding apparatus covers 26 that cover the upper portion roller guiding apparatuses 21 are disposed on the upper portion wind-rectifying cover 14, and the edges of the guiding apparatus covers 26 are aligned with the edges of the wind-rectifying cover main body 24, traveling wind turbulence due to the upper portion roller guiding apparatuses 21 is suppressed effectively, enabling noise during traveling to be reduced more effectively.

[0044] In addition, because the gap between the upper portion wind-rectifying cover 14 and the upper end portion of the cage 11 is blocked by the flexible rubber sheet 23, displacement of the upper portion wind-rectifying cover 14 relative to the cage 11 is allowed while generation of noise due the traveling airflow leaking from somewhere other than the predetermined airflow pathways is suppressed, enabling noise during traveling to be reduced more effectively. Heat that is generated by the equipment inside the upper portion wind-rectifying cover 14 can also be discharged efficiently.

[0045] Moreover, in the above example, a rubber sheet 23 is shown as the blocking member, but the blocking member may be constituted by other materials.

Embodiment 2

[0046] Next, Figure 13 is a side elevation that shows part of an elevator apparatus according to Embodiment 2 of the present invention. A mounting bracket 41 is fixed onto an upper portion of a cage 11. A blocking member 42 that blocks a gap between the cage 11 and an upper portion wind-rectifying cover 14 is mounted onto the mounting bracket 41 so as to be in contact with an inner surface of a lower end portion of the upper portion wind-rectifying cover 14.

[0047] The blocking member 42 is made of rubber, or sponge, for example. The upper portion wind-rectifying cover 14 is slid on the blocking member 42 by vertical displacement of the cage 11 relative to a car frame 10. The rest of the configuration is similar or identical to that of Embodiment 1.

[0048] In an elevator apparatus of this kind, by ensuring a margin of overlap between the blocking member 42 that is disposed on the upper portion of the cage 11 and the upper portion wind-rectifying cover 14, sealability between the cage 11 and the upper portion wind-rectifying cover 14 can be ensured while allowing vertical displacement of the cage 11.

Embodiment 3

[0049] Next, Figure 14 is a side elevation that shows part of an elevator apparatus according to Embodiment 3 of the present invention. In this example, a blocking member 43 is fixed horizontally onto an upper portion of a mounting bracket 41, and an end portion of the blocking member 43 contacts an inner surface of a lower end portion of an upper portion wind-rectifying cover 14. The rest of the configuration is similar or identical to that of Embodiment 2.

[0050] Using a blocking member 43 of this kind, by ensuring a margin of overlap between the blocking mem-

ber 43 and the upper portion wind-rectifying cover 14, sealability between the cage 11 and the upper portion wind-rectifying cover 14 can also be ensured while allowing vertical displacement of the cage 11.

[0051] Moreover, in Embodiments 2 and 3, the blocking member 42 or 43 is fixed to the cage 11, but may instead be fixed to the wind-rectifying cover 14.

[0052] In the above examples, roller guiding apparatuses 21 and 22 of a type that has actuators are used, but may instead have no actuators.

[0053] In addition, the car guiding apparatuses may instead be of a type that has sliding guide shoes.

[0054] Furthermore, the type of elevator apparatus to which the present invention is applied is not limited to the type in Figure 1. The present invention can also be applied to machine-roomless elevators, multi-car elevators, or double-deck elevators, for example. However, the present invention is particularly effective in elevator apparatuses in which a car travels at high speed.

Claims

1. An elevator apparatus comprising:

a car that is raised and lowered inside a hoistway, the car including:

a car frame; and
a cage that is supported by the car frame;

an upper portion wind-rectifying cover that is disposed on an upper portion of the car; and
a rectangular wind-rectifying plate that is disposed on the car above a front surface of the cage so as to suppress inflow of air into a gap between the front surface of the cage and a hoistway wall when the car is traveling upward, wherein:

the upper portion wind-rectifying cover includes:

a wind-rectifying cover main body; and
a wind-rectifying cover linking portion that is disposed between the wind-rectifying cover main body and the wind-rectifying plate;

an external shape of the wind-rectifying cover main body is a streamlined shape that widens gradually downward from an upper end; and
the wind-rectifying cover linking portion includes a semi-tubular portion in which a cross section parallel to the front surface of the cage is constant in a depth direction of the cage.

2. The elevator apparatus according to Claim 1, wherein a continuing portion that has a circular arc-shaped cross section is disposed at a boundary of the semi-tubular portion with the wind-rectifying plate.

3. The elevator apparatus according to Claim 1, wherein the semi-tubular portion includes:

a flat, horizontal upper surface portion that extends from an upper end portion of the wind-rectifying plate towards the wind-rectifying cover main body; and
a pair of flat side surface portions that extend from two left and right end portions of the wind-rectifying plate toward the wind-rectifying cover main body so as to be opposite each other.

4. The elevator apparatus according to Claim 1, further comprising:

a suspending body that is connected to an upper portion of the car frame so as to suspend the car inside the hoistway; and
a pair of car guiding apparatuses that are mounted onto the car frame so as to engage with a pair of car guide rails that are installed inside the hoistway,
wherein:

a suspending body insertion aperture through which the suspending body passes is disposed on an upper portion of the wind-rectifying cover main body;
a pair of left and right opening portions are disposed on the upper portion wind-rectifying cover;
the opening portions are positioned in a vicinity of the car frame below the car guiding apparatuses; and
airflow pathways are formed inside the upper portion wind-rectifying cover such that air that enters through the suspending body insertion apertures when the car is traveling upward is discharged through the opening portions.

5. The elevator apparatus according to Claim 4, wherein:

the upper portion wind-rectifying cover further includes a pair of guiding apparatus covers that are mounted onto the wind-rectifying cover main body so as to cover the car guiding apparatuses;
an external shape of the guiding apparatus covers is a streamlined shape that widens gradually downward from an upper end; and
edges of the guiding apparatus covers are aligned with edges of the wind-rectifying cover

main body.

6. The elevator apparatus according to Claim 1, wherein:

the upper portion wind-rectifying cover is supported by the car frame so as to be spaced apart from an upper end portion of the cage; and
a blocking member that blocks a gap between the cage and the upper portion wind-rectifying cover while allowing vertical displacement of the cage relative to the car frame is disposed between the upper end portion of the cage and a lower end portion of the upper portion wind-rectifying cover.

7. An elevator apparatus comprising:

a car that is raised and lowered inside a hoistway, the car including:

a car frame; and
a cage that is supported by the car frame;

a suspending body that is connected to an upper portion of the car frame so as to suspend the car inside the hoistway;
a pair of car guiding apparatuses that are mounted onto the car frame so as to engage with a pair of car guide rails that are disposed inside the hoistway; and
an upper portion wind-rectifying cover that is disposed on an upper portion of the car, on which a suspending body insertion aperture through which the suspending body passes is disposed, wherein:

a pair of left and right opening portions are disposed on the upper portion wind-rectifying cover;
the opening portions are positioned in a vicinity of the car frame below the car guiding apparatuses;
airflow pathways are formed inside the upper portion wind-rectifying cover such that air that enters through the suspending body insertion apertures when the car is traveling upward is discharged through the opening portions;
the upper portion wind-rectifying cover is supported by the car frame so as to be spaced apart from an upper end portion of the cage; and
a blocking member that blocks a gap between the cage and the upper portion wind-rectifying cover while allowing vertical displacement of the cage relative to the car frame is disposed between the upper end portion of the cage and a lower end portion of the upper portion wind-rectifying cover.

8. The elevator apparatus according to either of Claims 6 or 7, wherein the blocking member is a flexible sheet that is deformed by the vertical displacement of the cage relative to the car frame.

9. The elevator apparatus according to either of Claims 6 or 7, wherein:

the blocking member is fixed to either one of the cage and the upper portion wind-rectifying cover; and
the other of the cage and the upper portion wind-rectifying cover is slid relative to the blocking member by the vertical displacement of the cage relative to the car frame.

FIG. 1

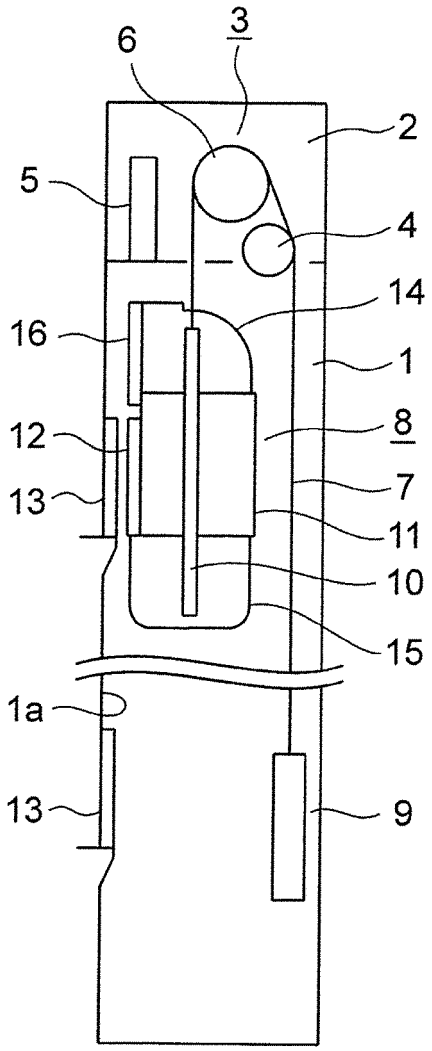


FIG. 2

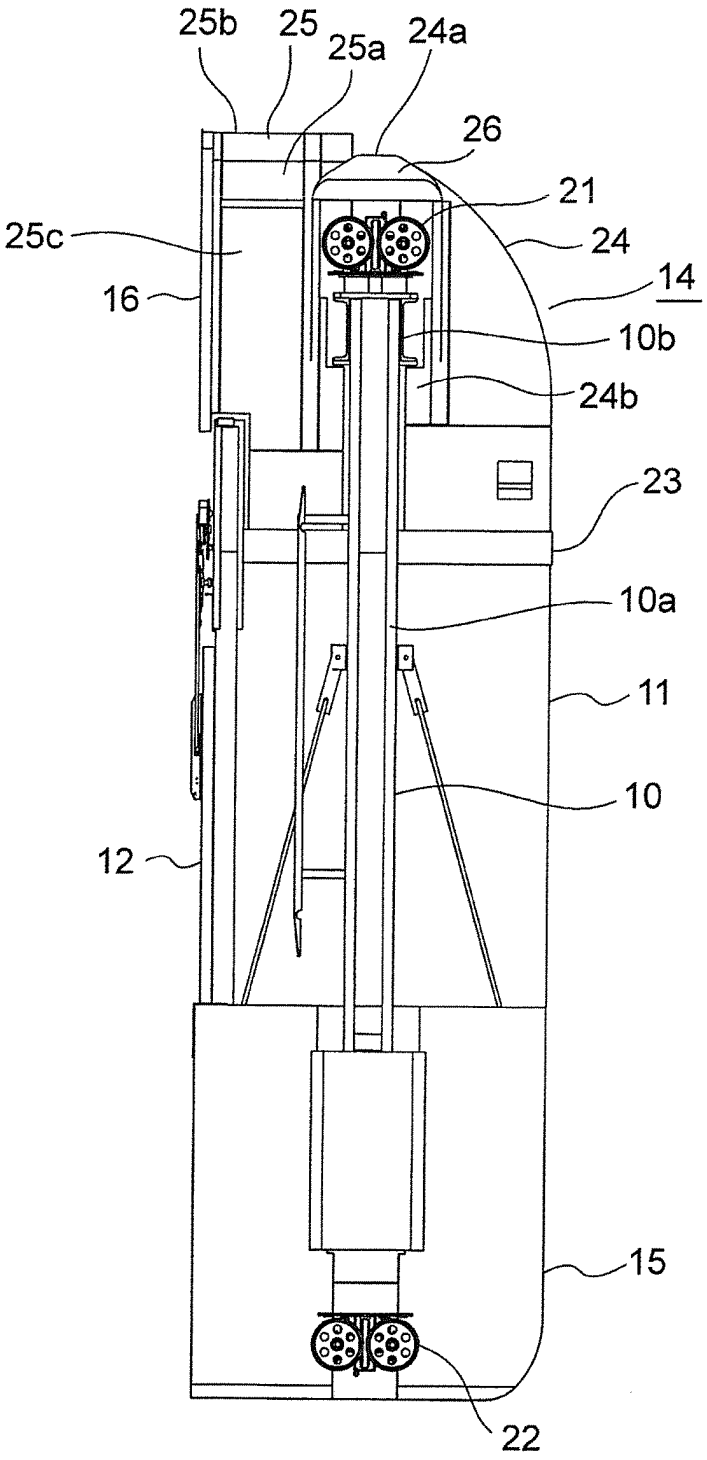


FIG. 3

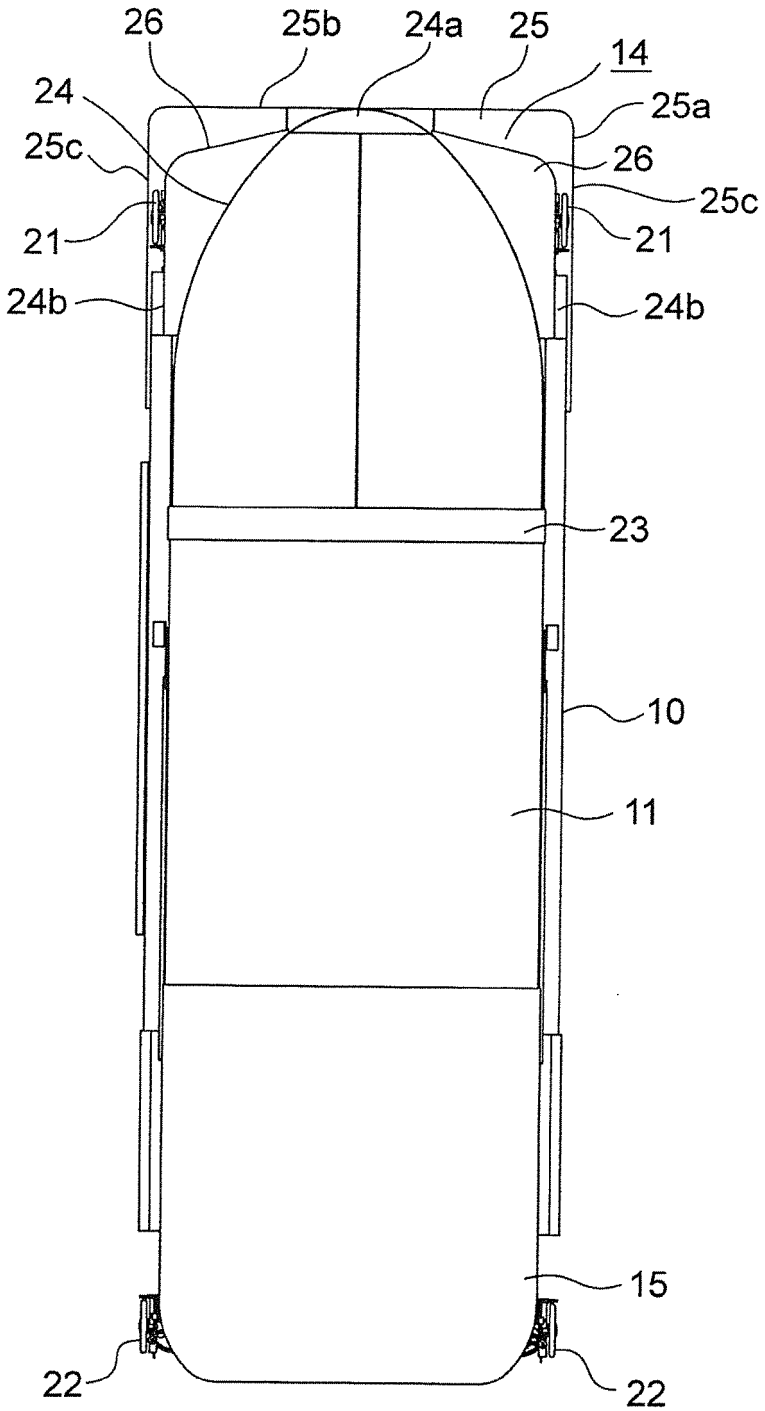


FIG. 4

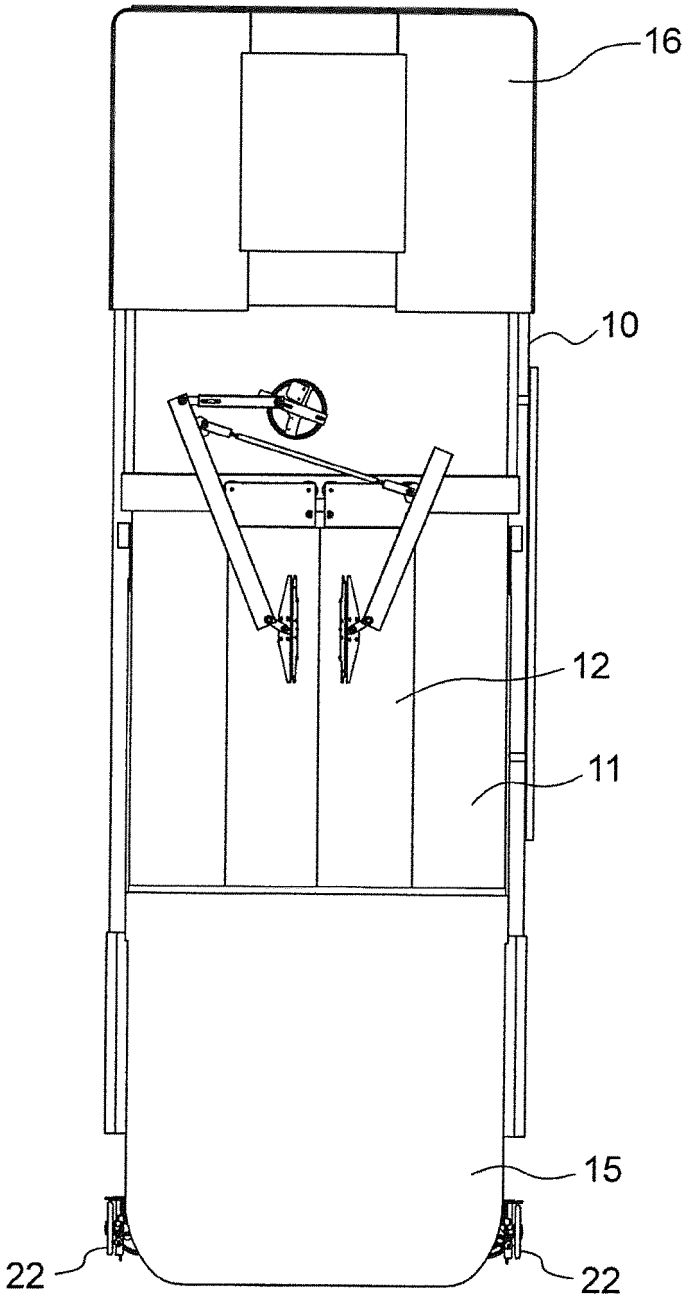


FIG. 5

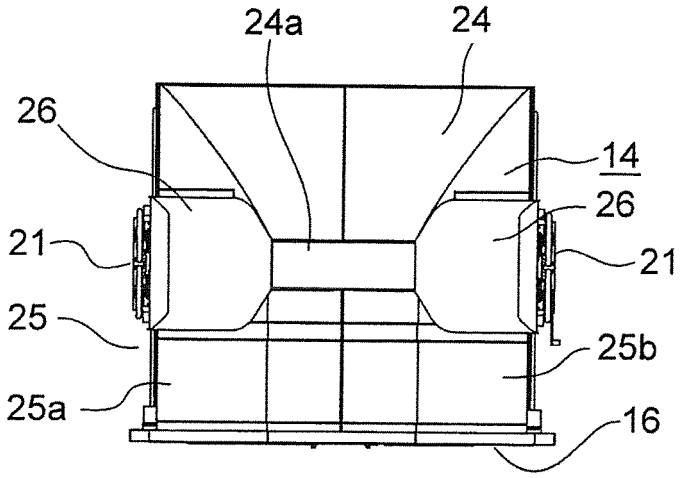


FIG. 6

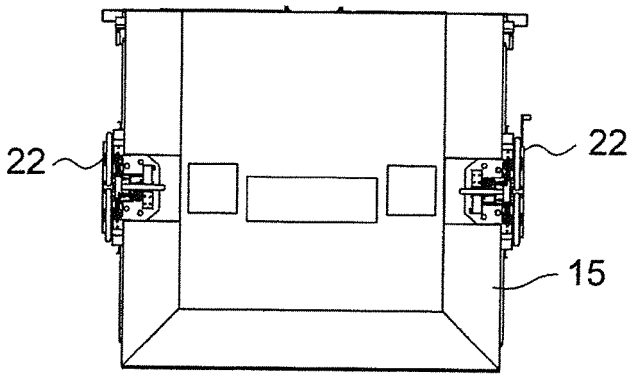


FIG. 7

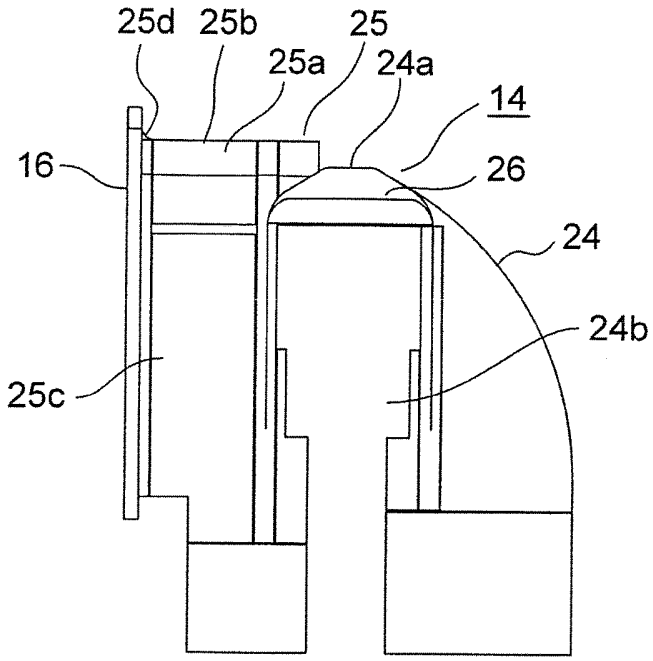

25d
25b
25
25a
24a
14
16
26
24
24b
25c

FIG. 8

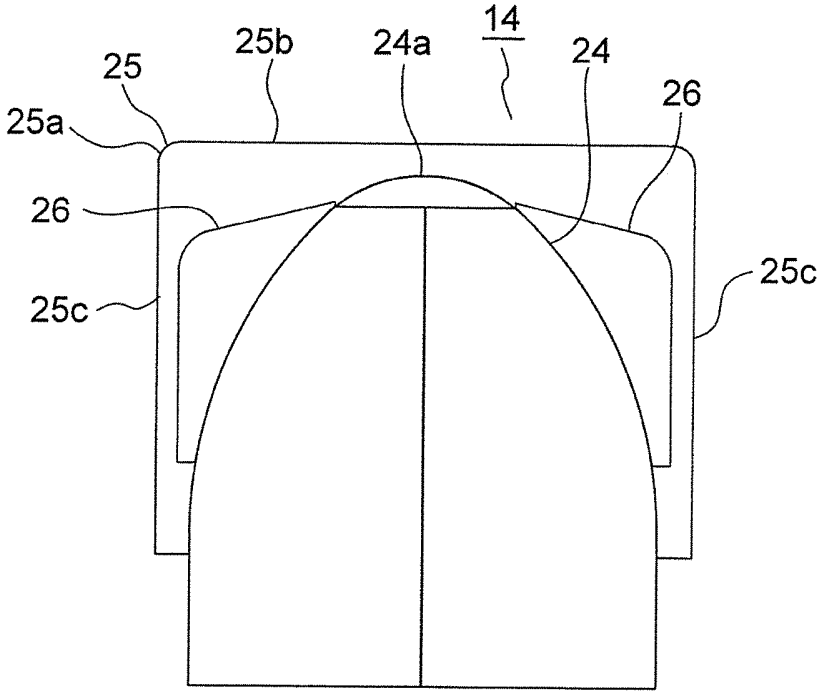

14
25b
24a
24
25
26
25a
26
25c
25c

FIG. 9

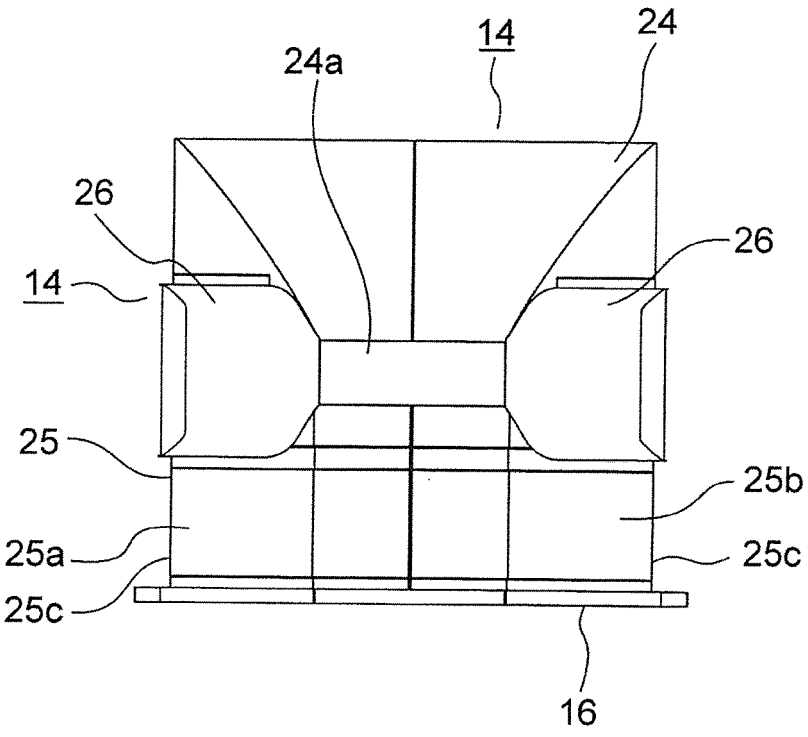


FIG. 10

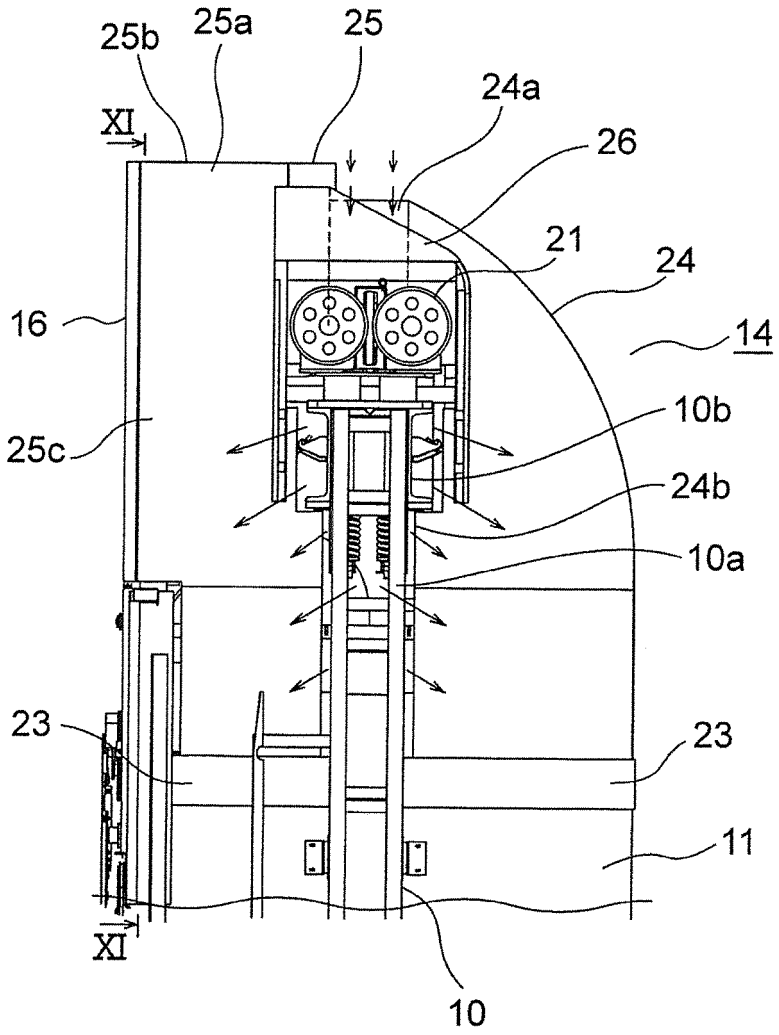


FIG. 11

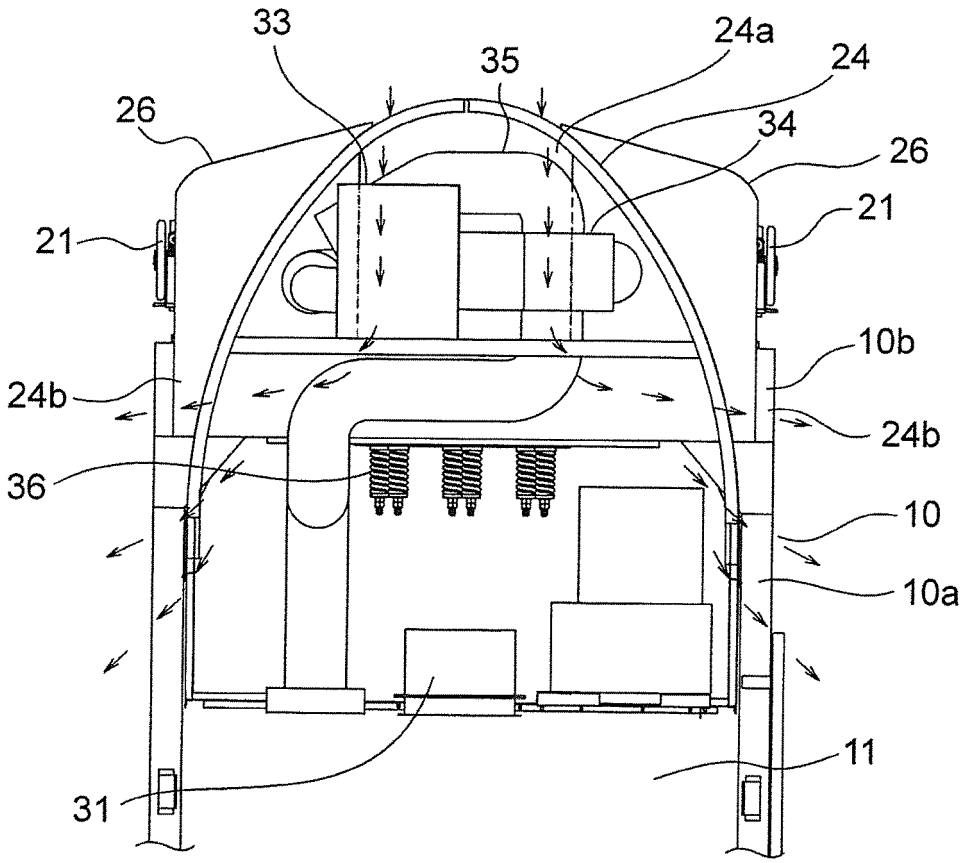


FIG. 12

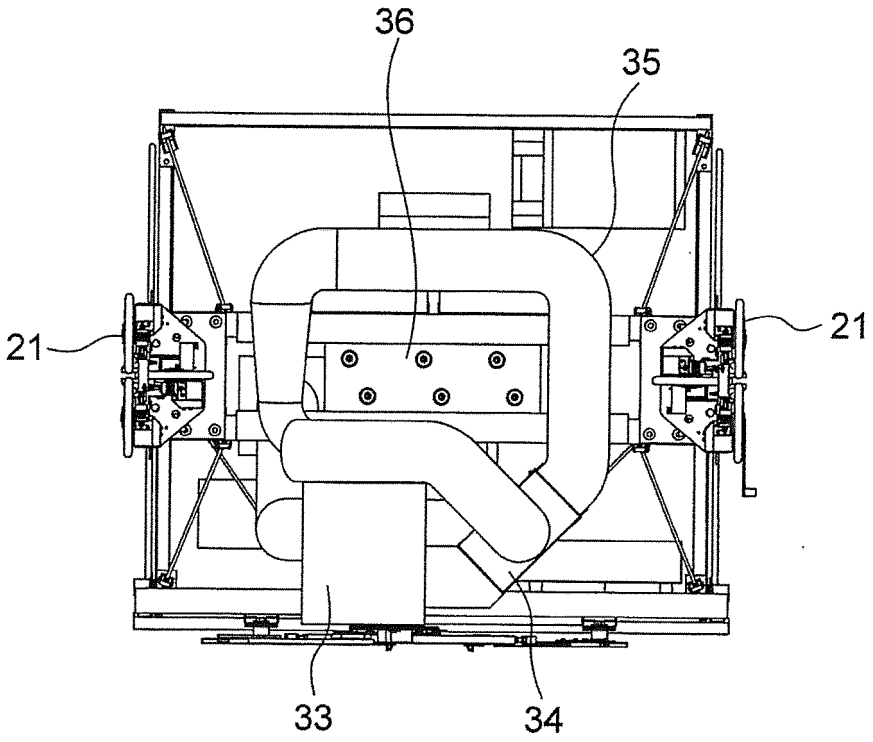


FIG. 13

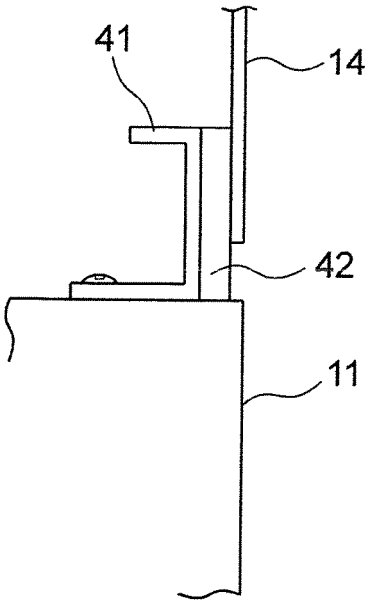
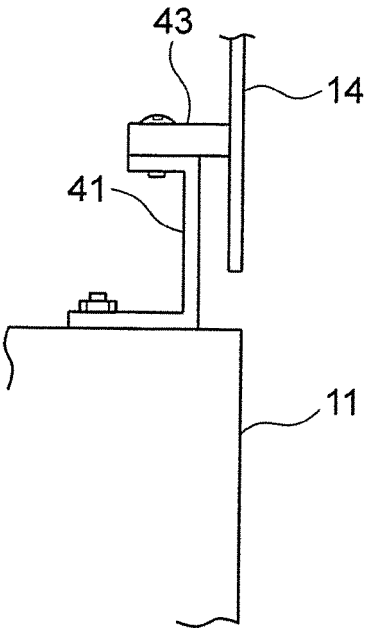


FIG. 14



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/052121

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 1996-2012
Kokai Jitsuyo Shinan Koho 1971-2012 Toroku Jitsuyo Shinan Koho 1994-2012

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 6-329372 A (Hitachi, Ltd.), 29 November 1994 (29.11.1994), paragraphs [0020] to [0038]; fig. 1 to 2 & GB 2280662 A	1-9
Y	JP 2004-338908 A (Toshiba Elevator and Building Systems Corp.), 02 December 2004 (02.12.2004), paragraphs [0018] to [0038]; fig. 2 to 6 (Family: none)	1-9
Y	JP 2001-19321 A (Mitsubishi Electric Corp.), 23 January 2001 (23.01.2001), paragraphs [0016] to [0029]; fig. 1 to 3 (Family: none)	4-5,7-9

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

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"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	Date of mailing of the international search report
06 April, 2012 (06.04.12)	17 April, 2012 (17.04.12)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/052121

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 166375/1980(Laid-open No. 89567/1982) (Fujitec Co., Ltd.), 02 June 1982 (02.06.1982), claims; fig. 2 (Family: none)	6-9

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP HEI6329372 B **[0003]**