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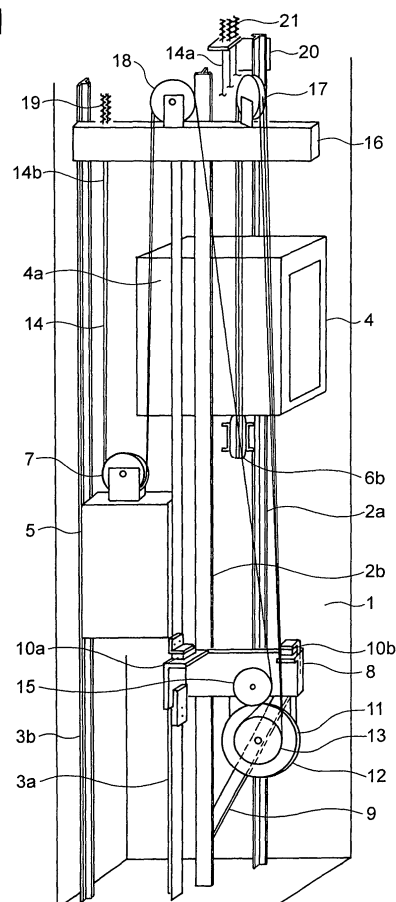
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(54) **ELEVATOR APPARATUS**

(57) In an elevator apparatus, a drive machine for raising and lowering a car and a counterweight is arranged in a hoistway. The drive machine has a drive sheave. Main ropes for suspending the car and the counterweight are wound around the drive sheave. Further, the drive machine is arranged such that the rotation axis of the drive sheave becomes horizontal. An idle pulley, around which the main ropes are wound, is provided in the vicinity of the drive machine. By winding the main ropes around the idle pulley, the arc of contact of the main ropes on the drive sheave is increased.

FIG. 1



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Description

Technical Field

[0001] The present invention relates to an elevator apparatus in which a drive machine for raising and lowering a car is arranged in a hoistway.

Background Art

[0002] A conventional elevator apparatus in which a hoisting machine is arranged at a lower portion of a hoistway is disclosed in, for example, JP 2001-192191 A. A main rope for suspending a car and a counterweight is wound around a drive sheave of the hoisting machine. The main rope extends vertically upwards from the drive sheave, with the arc of contact of the main rope on the drive sheave being approximately 180 degrees.

[0003] In the conventional elevator apparatus, however, it is often the case that a sufficient traction force is not obtained because the arc of contact of the main rope on the drive sheave is approximately 180 degrees. In such a case, it is necessary to use a drive sheave having a large diameter, with the result that the hoisting machine increases in size and the layout becomes somewhat restricted. Further, it is also necessary to provide a rope groove of the drive sheave with an undercut groove allowing a large penetration amount of the main rope, causing an increase in cost and a reduction in the life of the main rope.

Disclosure of the Invention

[0004] The present invention has been made with a view to solving the above problems, and therefore it is an object of the invention to provide an elevator apparatus capable of achieving reduced size of a drive machine and extended life of a main rope.

[0005] To this end, according to one aspect of the present invention, there is provided an elevator apparatus comprising: a drive machine arranged in a hoistway and having a drive sheave; a main rope wound around the drive sheave; and a car and a counterweight that are suspended in the hoistway by the main rope and are raised and lowered by a drive force of the drive machine, wherein: the drive machine is arranged such that a rotation axis of the drive sheave is horizontal; an idle pulley around which the main rope is wound is provided in a vicinity of the drive machine; and an arc of contact of the main rope on the drive sheave is increased by the main rope being wound around the idle pulley.

Brief Description of the Drawings

[0006]

Fig. 1 is a perspective view showing an elevator apparatus according to Embodiment 1 of the present

invention;

Fig. 2 is a plan view showing a main portion of the elevator apparatus shown in Fig. 1;

Fig. 3 is a sectional view showing rope grooves of a drive sheave shown in Fig. 1;

Fig. 4 is a perspective view showing an elevator apparatus according to Embodiment 2 of the present invention;

Fig. 5 is a plan view showing a main portion of the elevator apparatus shown in Fig. 4;

Fig. 6 is a perspective view showing an elevator apparatus according to Embodiment 3 of the present invention;

Fig. 7 is a plan view showing a main portion of the elevator apparatus shown in Fig. 6;

Fig. 8 is a perspective view showing an elevator apparatus according to Embodiment 4 of the present invention;

Fig. 9 is a perspective view showing an elevator apparatus according to Embodiment 5 of the present invention;

Fig. 10 is a plan view showing a main portion of the elevator apparatus shown in Fig. 9;

Fig. 11 is a perspective view showing an elevator apparatus according to Embodiment 6 of the present invention; and

Fig. 12 is a plan view showing a main portion of the elevator apparatus shown in Fig. 11.

30 Best Mode for carrying out the Invention

[0007] Hereinbelow, preferred embodiments of the present invention will be described with reference to the drawings.

35 Embodiment 1

[0008] Fig. 1 is a perspective view showing an elevator apparatus (machine room-less elevator apparatus) according to Embodiment 1 of the present invention, and Fig. 2 is a plan view showing a main portion of the elevator apparatus of Fig. 1.

[0009] Referring to the figures, a pair of car guide rails 2a and 2b and a pair of counterweight guide rails 3a and 3b are disposed in a hoistway 1. A car 4 is raised and lowered in the hoistway 1 while being guided by the car guide rails 2a and 2b. A counterweight 5 is raised and lowered in the hoistway 1 while being guided by the counterweight guide rails 3a and 3b.

[0010] The counterweight 5 is arranged such that it is opposed to a side surface 4a of the car 4 when the counterweight 5 is located at the same height as the car 4 (counterweight side drop type).

[0011] A pair of car suspension sheaves 6a and 6b are mounted below the car 4. A counterweight suspension sheave 7 is mounted above the counterweight 5.

[0012] A support member (mounting beam) 8 is fixed to the rear surface of the counterweight guide rail 3a. A

reinforcing diagonal member 9 is provided between the support member 8 and the counterweight guide rail 3a.

[0013] Vibration isolating members 10a and 10b are provided between the counterweight guide rail 3a, the diagonal member 9, and the support member 8. That is, the support member 8 is fixed to the counterweight guide rail 3a through the vibration isolating members 10a and 10b. For example, elastic members such as rubber plates can be used as the vibration members 10a and 10b.

[0014] A drive machine (hoisting machine) 11 for raising and lowering the car 4 and the counterweight 5 is mounted onto the underside of the support member 8. The drive machine 11 has a drive machine main body 12 including a motor and a brake, and a drive sheave 13 that is rotated by the drive machine main body 12.

[0015] The drive machine 11 used is a thin hoisting machine whose axial dimension is smaller than the outside diameter dimension (the dimension in the direction at a right angle to the axial direction) of the drive sheave 13 or the drive machine main body 10.

[0016] Further, the drive machine 11 is arranged at a position which is higher than the floor level of the car 4 when the car 4 stops at the lowest stop floor and which is lower than the ceiling of the car 4 when the car 4 stops at the highest stop floor. Specifically, in Embodiment 1, the drive machine 11 is arranged such that it is opposed to the side surface 4a of the car 4 when the car 4 stops at the lowest stop floor. Further, the drive machine 11 is arranged such that the rotation axis of the drive sheave 13 becomes horizontal and parallel (or substantially parallel) to the width direction of the car 4.

[0017] Furthermore, as seen in the vertical projection plane, the drive machine 11 is arranged between the side surface 4a of the car 4 and a hoistway wall 1a so as to be in parallel to the hoistway wall 1a and the side surface 4a. Further, the drive machine main body 12 is arranged on the car 4 side, and the drive sheave 13 is arranged on the hoistway wall 1a side.

[0018] Further, as seen in the vertical projection plane, the drive machine 11 is arranged such that a part thereof protrudes toward the car 4 side beyond to the rear surface of the car guide rail 2b which is located on the same side as the drive machine 11 with respect to the car 4.

[0019] Wound around the drive sheave 13 are a plurality of main ropes 14 (only one of which is shown in Fig. 2) for suspending the car 4 and the counterweight 5.

[0020] Provided near the drive machine 11 is an idle pulley 15 around which the main ropes 14 are wound. Specifically, the idle pulley 15 is mounted to a side surface of the support member 8 which is opposed to the hoistway wall 1a, the support member 8 being common to the idle pulley 15 and the drive machine 11. By winding the main ropes 14 around the idle pulley 15, the arc of contact of the main ropes 14 on the drive sheave 13 is increased to 230 to 280 degrees.

[0021] The rotation axis of the idle pulley 15 is parallel to the rotation axis of the drive sheave 13. Further, the diameter of the idle pulley 15 is smaller than the diameter

of the drive sheave 13. Furthermore, the idle pulley 15 is arranged so as to overlap the drive sheave 13 as seen in the vertical projection plane.

[0022] An upper support beam 16 is arranged at an upper portion (top portion) of the hoistway 1. The upper support beam 16 is fixed to the car guide rail 2b and the counterweight guide rails 3a and 3b.

[0023] A car side return pulley 17 and a counterweight side return pulley 18 are mounted on top of the upper support beam 16. The car side return pulley 17 is arranged so as to diagonally cross the drive machine main body 12 as seen in the vertical projection plane. That is, the car side return pulley 17 partially overlaps the drive machine 11 as seen in the vertical projection plane. Further, as seen in the vertical projection plane, the counterweight side return pulley 18 is arranged between the counterweight suspension sheave 7 and the drive sheave 13.

[0024] Further, the upper support beam 16 is provided with a counterweight side rope securing portion 19. A rope securing beam 20 is fixed to the upper end portion of the car guide rail 3a. The rope securing beam 20 is provided with a car side rope securing portion 21.

[0025] Each main rope 14 has a first end portion 14a connected to the car side rope securing portion 21, and a second end portion 14b connected to the counterweight side rope securing portion 19. Further, the main ropes 14 are wound around the car suspension sheaves 6a and 6b, the car side return pulley 17, the drive sheave 13, the idle pulley 15, the counterweight side return pulley 18, and the counterweight suspension sheave 7 in the stated order from the first end portion 14a side.

[0026] The car 4 and the counterweight 5 are suspended in the hoistway 1 by the main ropes 14 according to a 2:1 roping system.

[0027] It should be noted that the support member 8, the upper support beam 16, and the rope securing beam 20 are omitted in Fig. 2.

[0028] In the elevator apparatus as described above, the arc of contact of the main ropes 14 on the drive sheave 13 is increased by means of the idle pulley 15, whereby the traction force can be increased while suppressing an increase in the size of the drive sheave 13. As a result, the drive machine 11 can be miniaturized, making it possible to achieve a reduction in cost and an increase in the freedom of layout.

[0029] Further, a large traction force can be secured, whereby, as shown in Fig. 3, the width of undercut grooves 13b provided at the bottom of rope grooves 13a of the drive sheave 13 can be reduced. Further, it is also possible to omit the undercut grooves 13b if the traction force obtained is sufficient in strength. Accordingly, the contact surface area between the bottom surface of the rope grooves 13a and the main ropes 14 can be increased, thereby lessening the contact pressure between the main ropes 14 and the drive sheave 13 to be within a permissible value range. This enables extended life of the main ropes 14.

[0030] Further, the arc of contact of the main ropes 14 on the drive sheave 13 is set to 230 to 280 degrees by means of the idle pulley 15, whereby an optimum traction force can be obtained.

[0031] Furthermore, the drive machine 11 is arranged at a position higher than the floor level of the car 4 when the car 4 stops at the lowest stop floor. Accordingly, even in the event that the pit (bottom portion) of the hoistway 1 should be flooded, the drive machine 11 is prevented from being exposed to water.

[0032] Further, the drive machine 11 and the idle pulley 15 are supported by the common support member 8, whereby the number of parts can be reduced to achieve simplified construction and also the positional adjustment (centering) of the idle pulley 15 with respect to the drive sheave 13 can be facilitated. Further, the increased arc of contact enables the tension of the main ropes 14 acting on the drive sheave 13 and the idle pulley 15 to be absorbed within the support member 8, thereby making it possible to prevent a load from being placed on the counterweight guide rail 3a.

[0033] Furthermore, the drive machine 11 is mounted onto the underside of the support member 8 and the idle pulley 15 is mounted onto the side surface of the support member 8, whereby the drive machine 11 and the idle pulley 15 can be arranged efficiently in a compact manner.

[0034] Furthermore, the support member 8 is fixed to the counterweight guide rail 3a through the vibration isolating members 10a and 10b, whereby it is possible to prevent the vibration of the drive machine 11 or the idle pulley 15 from being transmitted to the building or the car 4 through the guide rail 3a.

[0035] Further, the idle pulley 15 serves only to change the path of the main ropes 14, so the arc of contact of the main ropes 14 on the idle pulley 15 may be set small. The diameter of the idle pulley 15 may be thus smaller than the diameter of the drive sheave 13, making it possible to suppress an increase in cost due to the provision of the idle pulley 15.

[0036] It should be noted that the idle pulley and the drive machine may be mounted separately to different support members.

[0037] While in the above-described example the idle pulley 15 is arranged between the drive sheave 13 and the counterweight side return pulley 18, the idle pulley 15 may be arranged between the drive sheave 13 and the car side return pulley 17. Further, two idle pulleys may be provided so that one return pulley is arranged both between the drive sheave and the car side return pulley, and between the drive sheave and the counterweight side return pulley.

[0038] Further, while in the above-described example the drivemachine 11 is arranged at a position higher than the floor level of the car 4 when the car 4 stops at the lowest stop floor, the drive machine 11 may be arranged at a position higher than the floor level of the first floor or reference floor (main entry floor).

Embodiment 2

[0039] Next, Fig. 4 is a perspective view showing an elevator apparatus according to Embodiment 2 of the present invention, and Fig. 5 is a plan view showing a main portion of the elevator apparatus of Fig. 4.

[0040] Referring to the figures, the counterweight 5 is arranged such that it is opposed to a rear surface 4b of the car 4 when the counterweight 5 is located at the same height as the car 4 (counterweight rear drop type). The drive machine 11 is arranged by the side of the counterweight 5 as seen in the vertical projection plane. That is, as seen in the vertical projection plane, more than half the portion of the drive machine 11 is arranged between the rear surface 4b of the car 4 and the hoistway wall 1b so as to be in parallel to the hoistway wall 1b and the rear surface 4b.

[0041] Further, the drive machine 11 is arranged such that the rotation axis of the drive sheave 13 becomes parallel to the depth direction of the car 4.

[0042] The support member 8 is fixed to the car guide rail 2b and the counterweight guide rail 3b. The idle pulley 15 is mounted to the side surface of the support member 8 which is opposed to the hoistway wall 1b.

[0043] The upper support beam 16 is fixed to the upper end portions of the car guide rail 2b and counterweight guide rail 3a. The support member 8 and the upper support beam 16 each have a substantially L-shaped configuration.

[0044] The car side return pulley 17 is mounted below the upper support beam 16. Further, the car side return pulley 17 is arranged such that its rotation axis becomes parallel (or substantially parallel) to the width direction of the car 4. Furthermore, the car side return pulley 17 crosses the drive machine 11 at a substantially right angle as seen in the vertical projection plane. Otherwise, Embodiment 2 is of the same construction as Embodiment 1.

[0045] With this construction as well, it is possible to achieve a reduction in the size of the drive machine 11 and an increase in the freedom of layout. Further, the life of the main ropes 14 can be extended.

Embodiment 3

[0046] Next, Fig. 6 is a perspective view showing an elevator apparatus according to Embodiment 3 of the present invention, and Fig. 7 is a plan view showing a main portion of the elevator apparatus of Fig. 6. In Embodiment 3, as seen in the vertical projection plane, while the counterweight 5 is opposed to the rear surface 4b of the car 4, the drive machine 11 is opposed to the side surface 4a of the car 4.

[0047] As seen in the vertical projection plane, the drive machine 11 is arranged between the side surface 4a of the car 4 and the drive machine main body 12 so as to be parallel (or substantially parallel) to the side surface 4a. Further, the drive sheave 13 is arranged on the car 4 side, and the drive machine main body 12 is ar-

ranged on the hoistway wall 1a side.

[0048] Further, the drive machine 11 is arranged between the car guide rail 2b and the counterweight guide rail 3b. Furthermore, a part of the drive machine 11 is arranged so as to protrude beyond the rear surface of the car guide rail 2b, which is located on the same side as the drive machine 11 with respect to the car 4, toward the car 4.

[0049] The upper support beam 16 is fixed to the upper end portions of the car guide rail 2b and counterweight guide rail 3a and 3b. The car side return pulley 17 is mounted below the upper support beam 16. Further, as seen in the vertical projection plane, the car side return pulley 17 is arranged between the side surface 4a of the car 4 and the drive machine main body 12 so as to be parallel or substantially parallel to the side surface 4a.

[0050] The counterweight side return pulley 18 is mounted below the upper support beam 16. Further, as seen in the vertical projection plane, the counterweight side return pulley 18 is arranged outside the region of the car 4 so as not to overlap the car 4.

[0051] With this construction as well, it is possible to achieve a reduction in the size of the drive machine 11 and an increase in the freedom of layout. Further, the life of the main ropes 14 can be extended.

[0052] Further, the drive machine 11 and the counterweight 5 are arranged such that they are opposed to different surfaces of the car 4. Accordingly, the width dimension of the counterweight 5 can be enlarged to achieve a reduction in thickness dimension, and the drive machine 11 can be arranged in the space between the car guide rail 2b and the counterweight guide rail 3b, whereby the space within the hoistway 1 can be utilized more efficiently to achieve a reduction in the planar dimension of the hoistway 1.

Embodiment 4

[0053] Next, Fig. 8 is a perspective view showing an elevator apparatus according to Embodiment 4 of the present invention. In Embodiment 4, the support member 8, to which the drive machine 11 and the idle pulley 15 are mounted, is arranged in an upper portion of the hoistway 1. Further, the car side return pulley 17 and the counterweight side return pulley 18 are mounted on top of the support member 8. That is, the support member 8 also serves as the upper support beam.

[0054] The drive machine 11 is arranged at a position which is higher than the floor level, but lower than the ceiling, of the car 4 when the car 4 stops at the highest stop floor. That is, when the car 4 stops at the highest stop floor, the drive machine 11 is opposed to the side surface 4a of the car 4.

[0055] The drive machine main body 12 is arranged on the car 4 side, and the drive sheave 13 is arranged on the hoistway wall 1a side. The idle pulley 15 is mounted to the side surface of the support member 8 opposed to the hoistway wall 1a.

[0056] The counterweight side rope securing portion 19 is provided to a rope securing beam 22 fixed to the upper end portion of the car guide rail 3a. Otherwise, Embodiment 4 is of the same construction as Embodiment 3.

[0057] With this construction, the car return pulley 17, the counterweight side return pulley 18, the drive machine 11, and the idle pulley 15 are mounted to the common support member 8, whereby the positional adjustment (centering) can be easily performed on the car return pulley 17, the counterweight side return pulley 18, the drive sheave 13, and the idle pulley 15. Further, the number of parts can be reduced.

Embodiment 5

[0058] Fig. 9 is a perspective view showing an elevator apparatus according to Embodiment 5 of the present invention, and Fig. 10 is a plan view showing a main portion of the elevator apparatus of Fig. 9. Referring to the figures, the counterweight 5 is arranged such that it is opposed to the side surface 4a of the car 4 when the counterweight 5 is located at the same height as the car 4.

[0059] The support member 8, to which the drive machine 11 and the idle pulley 15 are mounted, is arranged at the top portion of the hoistway 1. Further, the support member 8 is fixed to the upper end portions of the car guide rail 2b and counterweight guide rails 3a and 3b through vibration isolating members (not shown).

[0060] The drive machine 11 is mounted on top of the support member 8. Further, the drive machine 11 partially overlaps the car 4 as seen in the vertical projection plane. Specifically, as seen in the vertical projection plane, a part of the drive machine main body 12 overlaps the car 4, and the drive sheave 13 is arranged outside the region of the car 4.

[0061] Further, each of the drive machine 11 and the support member 8 is arranged at a height where it does not interfere with the car 4 even when the car 4 is lifted up as the counterweight 5 moves to the lowermost travel position in the hoistway 1.

[0062] The main ropes 14 extend downward from the drive sheave 13 and the idle pulley 15. That is, the main ropes 14 extend from the drive sheave 13 and the idle pulley 15 to the car suspension sheave 6b and the counterweight suspension sheave 7 without the intermediation of the idle pulley.

[0063] With this construction as well, it is possible to achieve a reduction in the size of the drive machine 11 and an increase in the freedom of layout. Further, the life of the main ropes 14 can be extended.

[0064] Further, the return pulley is omitted, whereby the number of parts can be reduced to achieve a reduction in cost.

[0065] It should be noted that the orientation of the drive machine 11 may be reversed from that of Fig. 10 so that, as seen in the vertical projection plane, the drive machine 11 is arranged between the side surface 4a of

the car 4 and the hoistway wall 1a.

Embodiment 6

[0066] Next, Fig. 11 is a perspective view showing an elevator apparatus according to Embodiment 6 of the present invention, and Fig. 12 is a plan view showing a main portion of the elevator apparatus of Fig. 11.

[0067] Referring to the figures, the counterweight 5 is arranged such that it is opposed to the rear surface 4a of the car 4 when the counterweight 5 is located at the same height as the car 4.

[0068] The support member 8 is arranged at the top portion of the hoistway 1. The support member 8 is fixed to the upper end portions of the car guide rail 2b and counterweight guide rails 3a and 3b through vibration isolating members (not shown).

[0069] The drive machine 11 is disposed on top of the support member 8. Further, the drive machine 11 is arranged so as to partially overlap the car 4 as seen in the vertical projection plane. The idle pulley 15 is mounted in the casing of the drive machine main body 12.

[0070] Provided on top of the support member 8 is a deflector sheave 23 for introducing the main ropes 14 from the idle pulley 15 to the counterweight suspension sheave 7. The deflector sheave 23 is arranged directly above the counterweight 5 so as to partially overlap the counterweight 5 as seen in the vertical projection plane.

[0071] The support member 8 is provided with a plurality of main rope passage holes 8a and 8b through which the main ropes 14 are passed.

[0072] With this construction as well, it is possible to achieve a reduction in the size of the drive machine 11 and an increase in the freedom of layout. Further, the life of the main ropes 14 can be extended.

[0073] Further, the return pulley is omitted, whereby the number of parts can be reduced to achieve a reduction in cost.

[0074] Furthermore, the deflector sheave 23 is used, whereby an improvement can be achieved in terms of the freedom of layout of the counterweight 5.

[0075] While in the above-described example the vibration isolating members are provided between the support member and the guide rails, the vibration isolating members may be provided between the drive machine or idle pulley and the support member.

[0076] Further, instead of fixing the support member, the upper support beam, the rope securing beam, and the like to the guide rail, they may be fixed directly or indirectly to a building.

Claims

1. An elevator apparatus comprising:

a drive machine arranged in a hoistway and having a drive sheave;

a main rope wound around the drive sheave; and a car and a counterweight that are suspended in the hoistway by the main rope and are raised and lowered by a drive force of the drive machine,

wherein:

the drive machine is arranged such that a rotation axis of the drive sheave is horizontal;

an idle pulley around which the main rope is wound is provided in a vicinity of the drive machine; and

an arc of contact of the main rope on the drive sheave is increased by the main rope being wound around the idle pulley.

2. An elevator apparatus according to Claim 1, wherein the arc of contact of the main rope on the drive sheave is within a range of 230 to 280 degrees.

3. An elevator apparatus according to Claim 1, wherein the drive machine is arranged at a position which is higher than a floor level of the car when the car stops at a lowest stop floor and which is lower than a ceiling of the car when the car stops at a highest stop floor.

4. An elevator apparatus according to Claim 1, wherein the drive machine is arranged at a top portion of the hoistway.

5. An elevator apparatus according to Claim 1, wherein a plurality of guide rails for guiding the car and the counterweight are disposed in the hoistway, and wherein at least one of the drive machine and the idle pulley is supported by a support member that is mounted to at least part of the guide rails.

6. An elevator apparatus according to Claim 1, wherein the drive machine and the idle pulley are mounted to a common support member fixed in the hoistway.

7. An elevator apparatus according to Claim 6, wherein the support member is fixed in the hoistway through a vibration isolating member.

8. An elevator apparatus according to Claim 6, wherein the drive machine is mounted to an underside of the support member, and wherein the idle pulley is mounted to a side surface of the support member.

9. An elevator apparatus according to Claim 1, wherein the idle pulley is mounted in a casing of the drive machine.

10. An elevator apparatus according to Claim 1, wherein the idle pulley has a diameter that is smaller than a diameter of the drive sheave.

FIG. 1

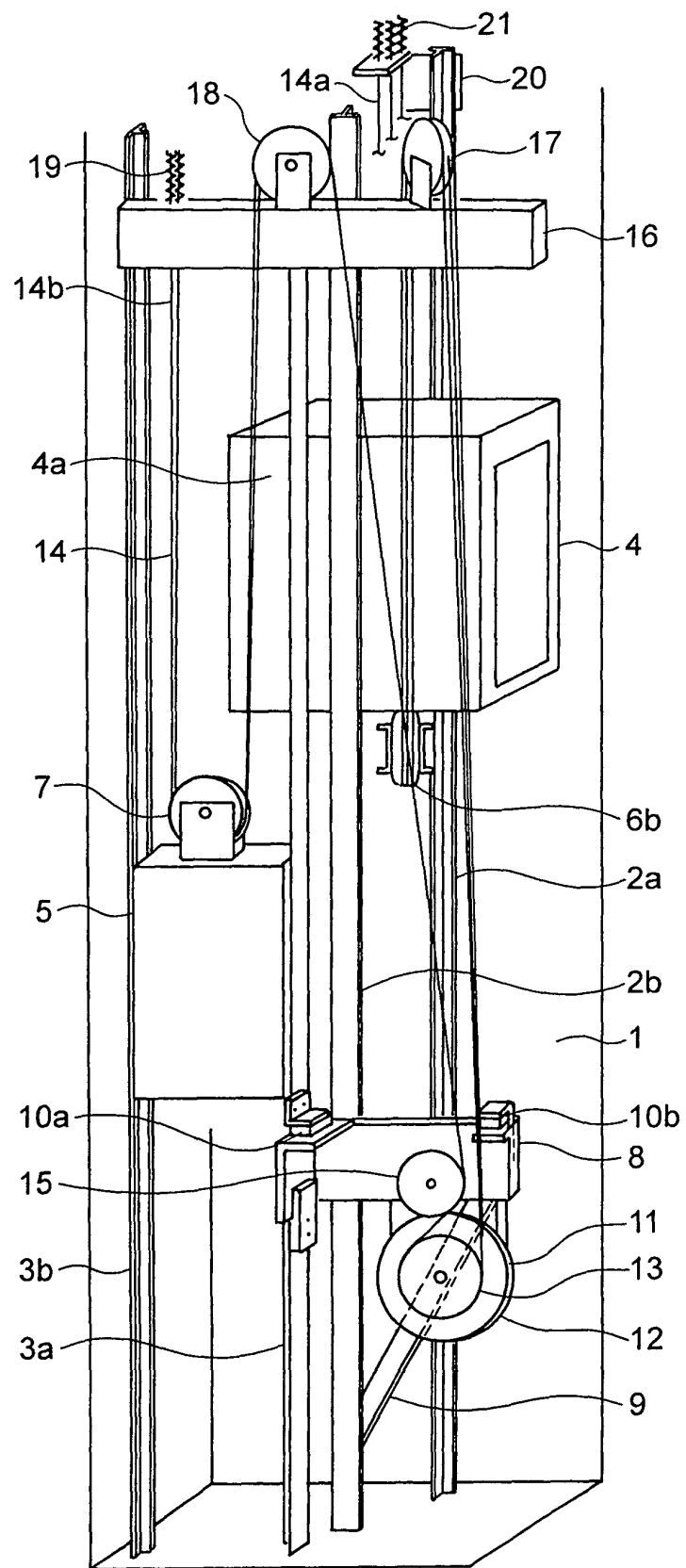


FIG. 2

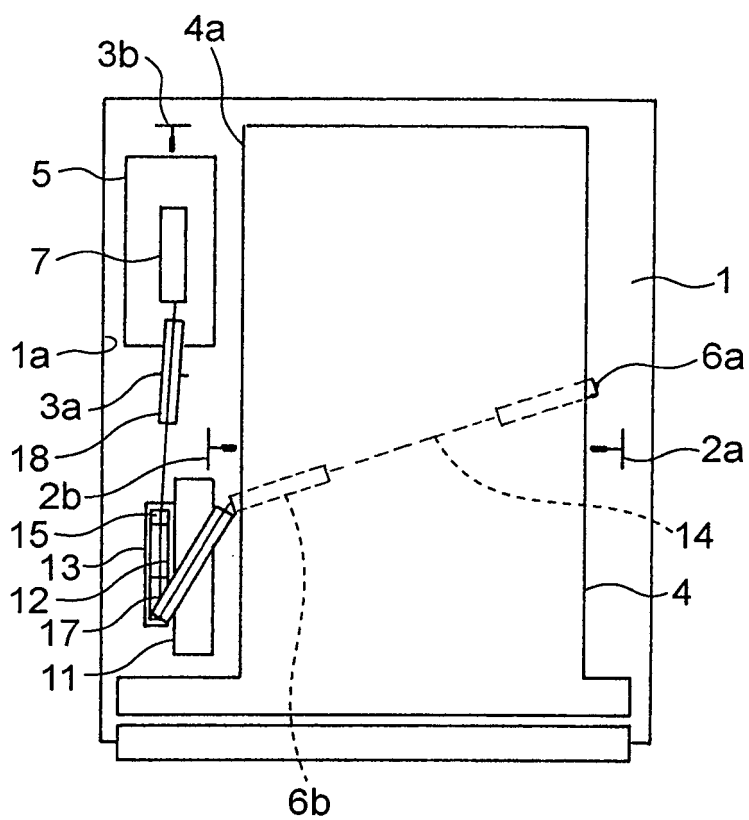


FIG. 3

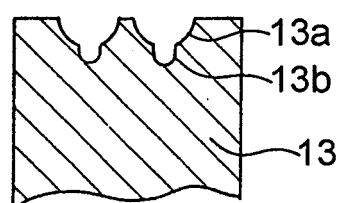


FIG. 4

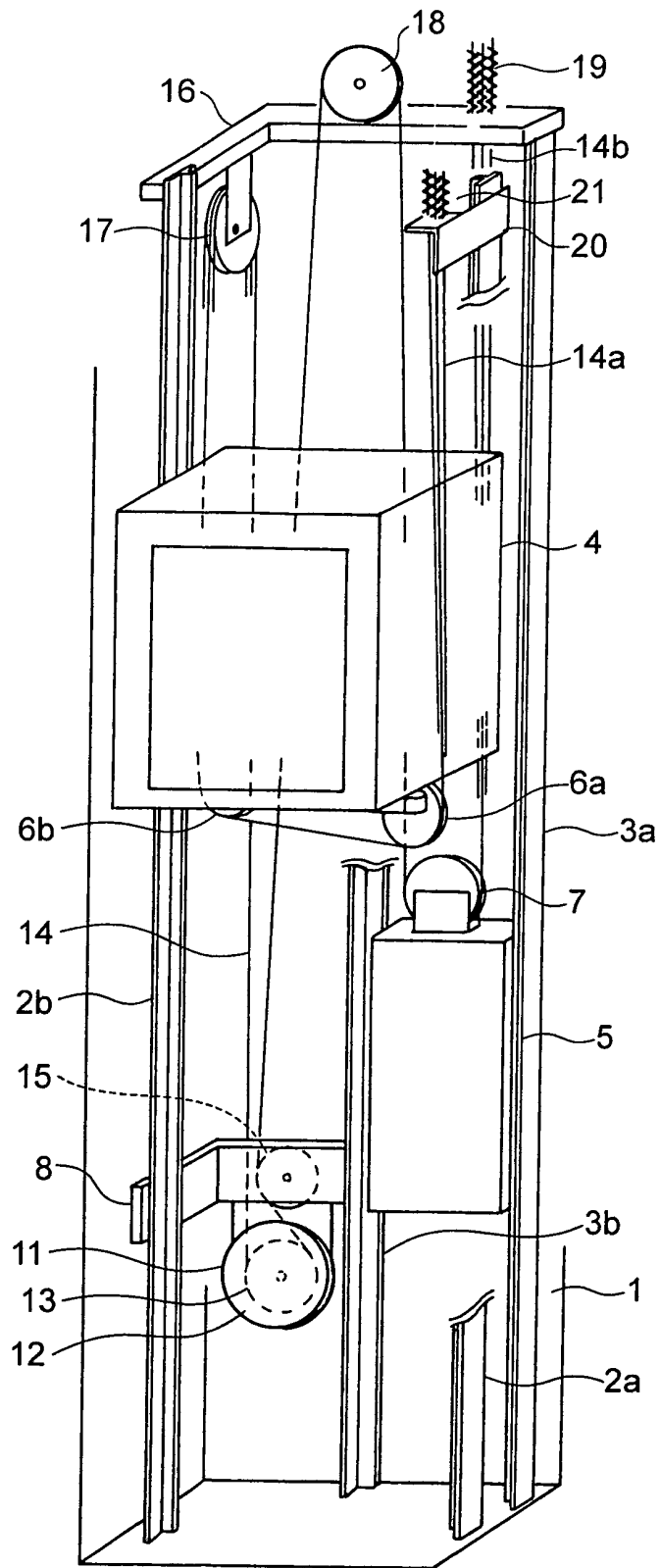


FIG. 5

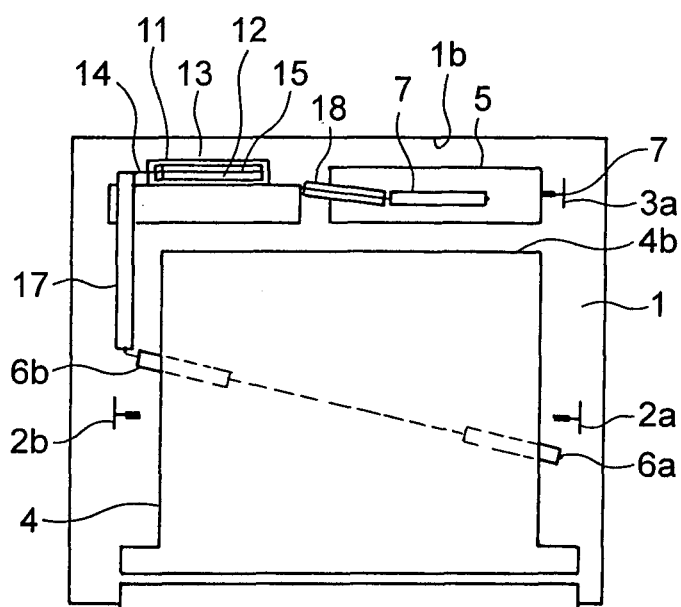


FIG. 6

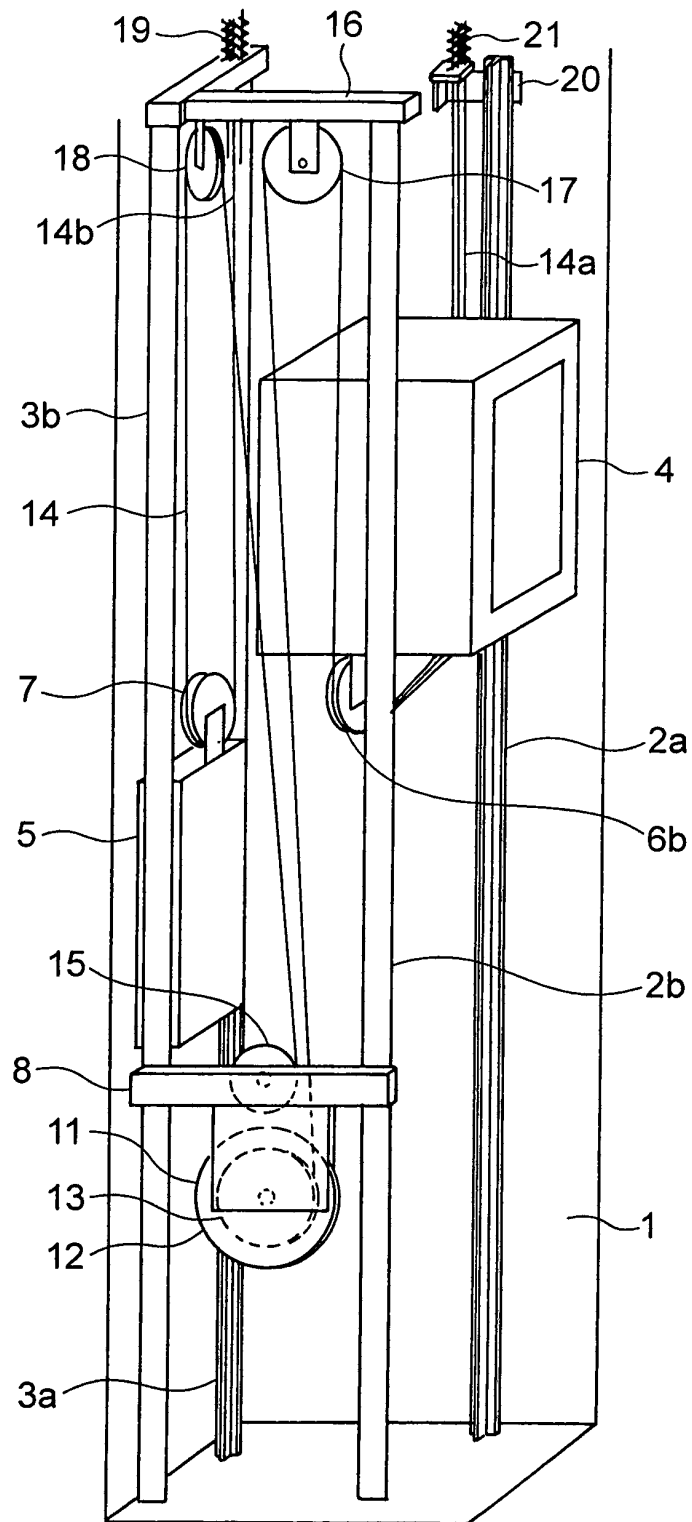


FIG. 7

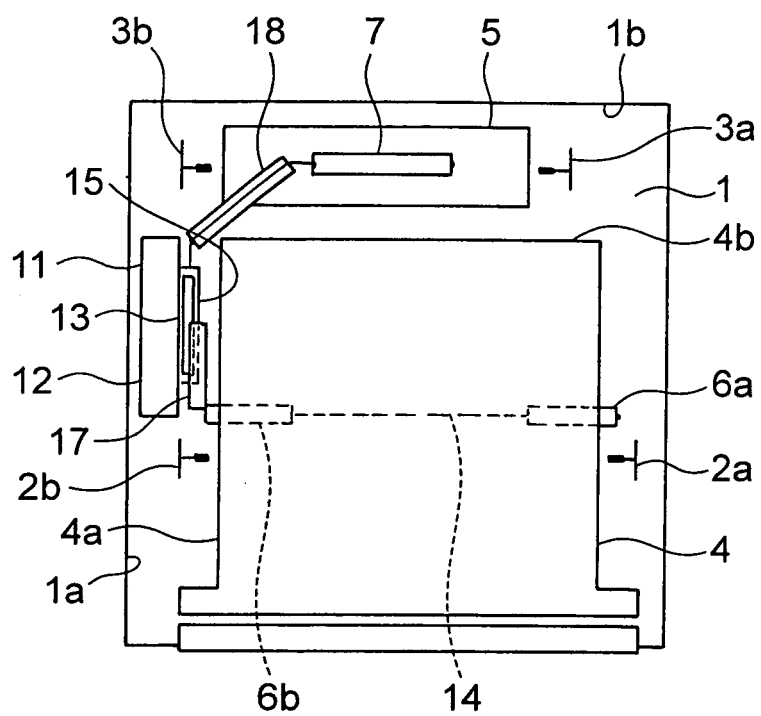


FIG. 8

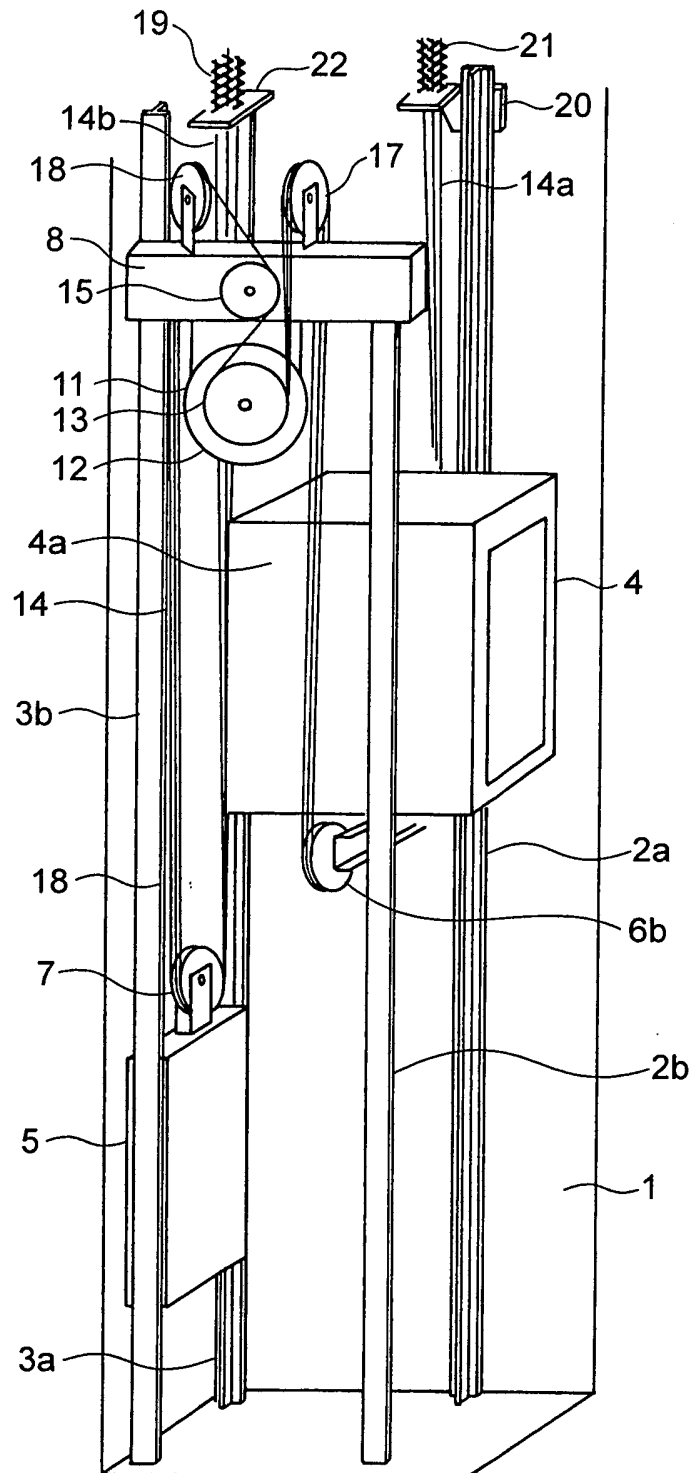


FIG. 9

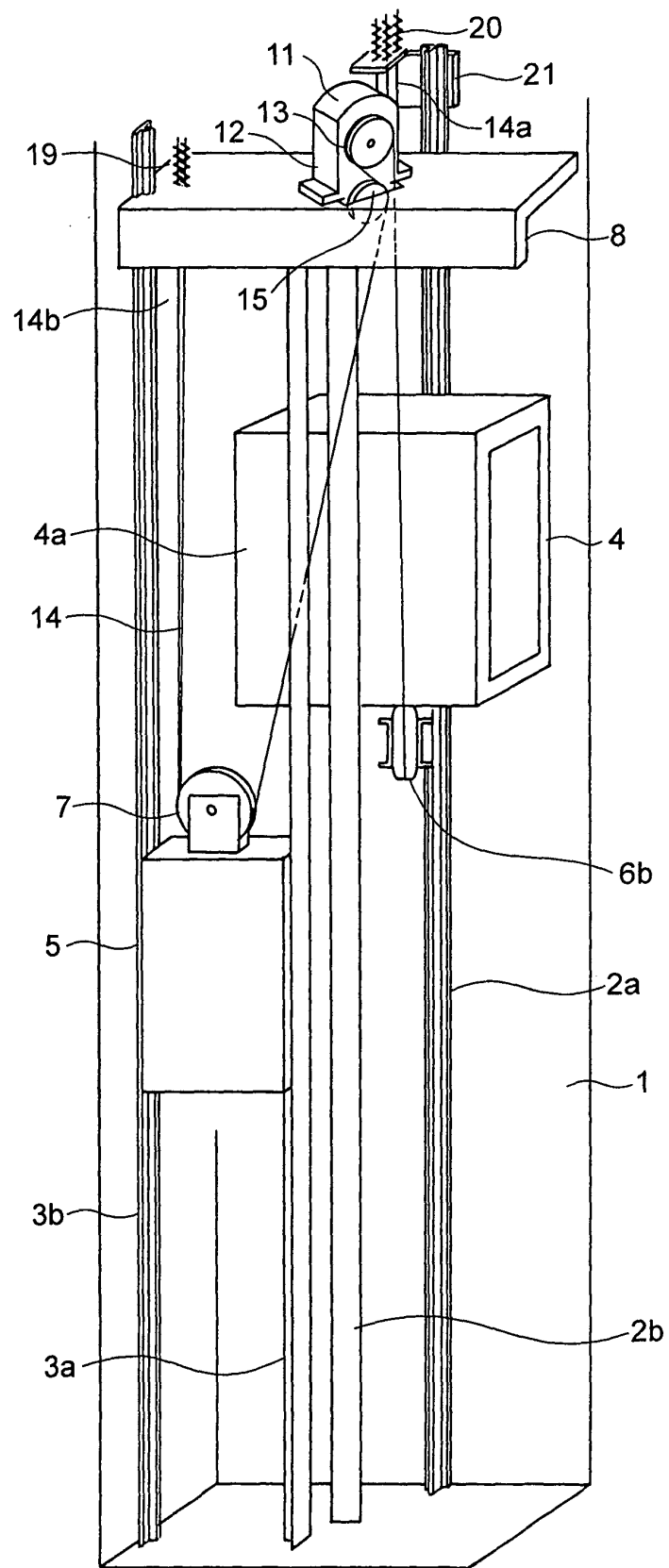


FIG. 10

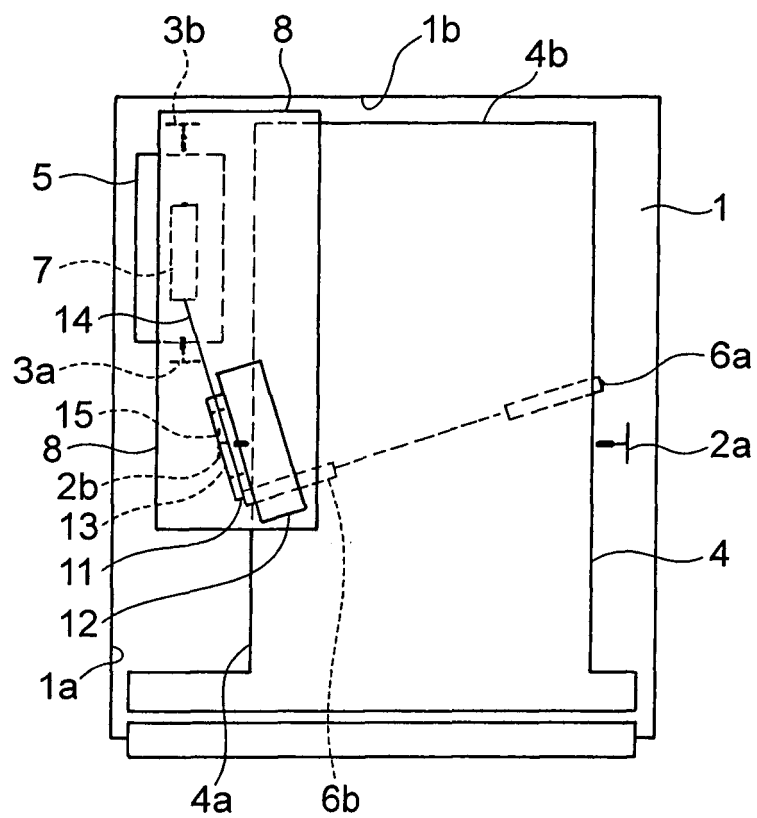


FIG. 11

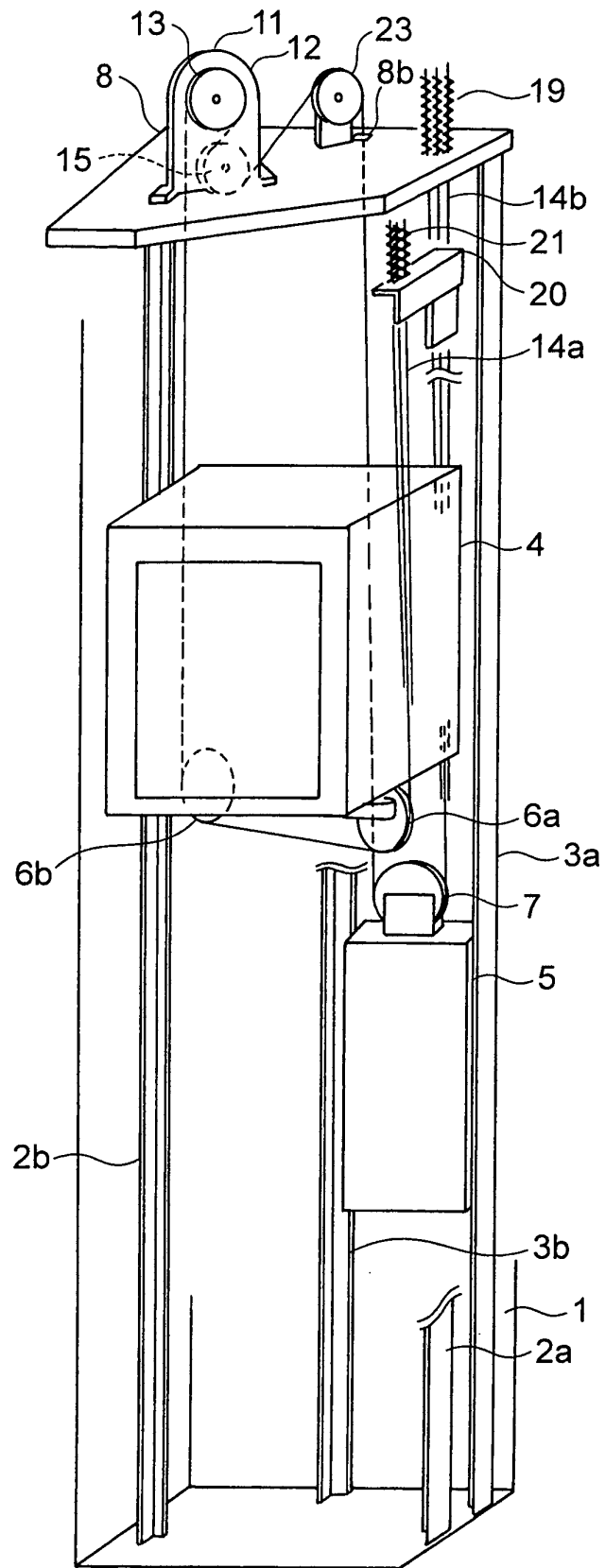
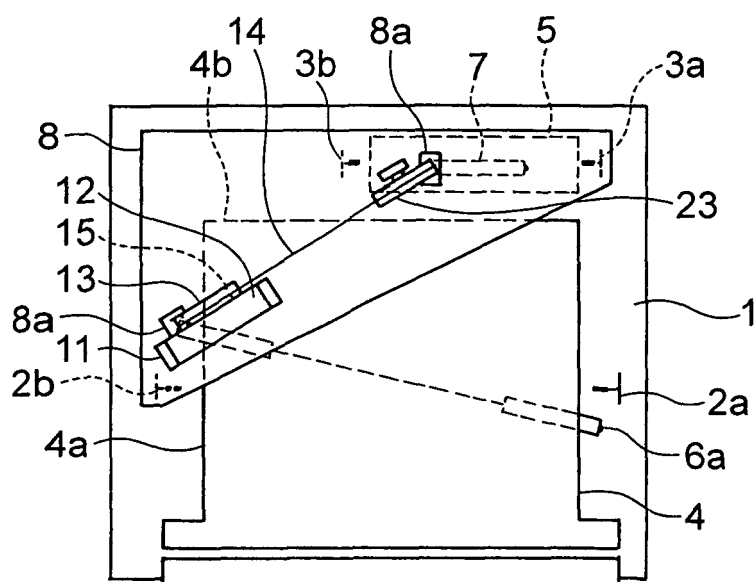


FIG. 12



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2004/02472

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. ⁷ B66B11/08		
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 B66B7/00-11/08		
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 1996-2004 Kokai Jitsuyo Shinan Koho 1971-2004 Toroku Jitsuyo Shinan Koho 1994-2004		
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	WO 03/031310 A1 (Mitsubishi Electric Corp.), 17 April, 2003 (17.04.03), Description, page 4, line 8 to page 5, line 24 & EP 1431231 A1	1-2, 4-7
X	JP 2004-26424 A (Toshiba Elevator and Building Systems Corp.), 29 January, 2004 (29.01.04), Par. Nos. [0015] to [0024] (Family: none)	1, 4, 9
X	JP 7-61744 A (Otis Elevator Co.), 07 March, 1995 (07.03.95), Claim 1; Fig. 1 (Family: none)	1, 10
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Date of the actual completion of the international search 01 December, 2004 (01.12.04)		Date of mailing of the international search report 14 December, 2004 (14.12.04)
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2004/002472

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	WO 01/42121 A1 (Mitsubishi Electric Corp.), 14 June, 2001 (14.06.01), Description, page 5, line 11 to page 8, line 22 & EP 1151955 A1	1, 3, 5-8
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REFERENCES CITED IN THE DESCRIPTION

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