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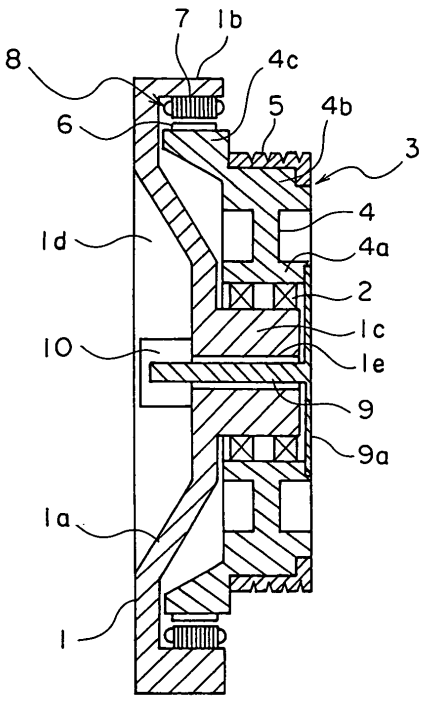
(54) ELEVATOR HOIST

(57) In an elevator hoisting machine, a rotary portion is rotatably supported by a base member. Further, the rotary portion has a rotary portion main body, and a drive sheave around which a main rope of an elevator is wound. The rotary portion is rotated by the drive force of a motor. The motor has a motor rotor mounted to the rotary portion main body, and a motor stator mounted to the base member so as to be opposed to the motor rotor. A sheave fixing portion, to which the drive sheave is fixed, is provided to the rotary portion main body.

FIG. 1



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Description

Technical Field

[0001] The present invention relates to an elevator hoisting machine in which a drive sheave around which a main rope of an elevator is wound is provided to a rotary portion.

Background Art

[0002] In the conventional elevator hoisting machine disclosed in JP 2000-289954 A, for example, a drive sheave around which a main rope is wound is provided integrally with a rotary member (cup-shaped member). Further, the rotary member is rotatably supported by a main shaft. The main shaft is supported by a support plate and a base member at its opposite end portions.

[0003] It is desirable, however, to change the supporting structure for the rotary member according to the weights of a car and a counterweight. That is, when the weights of the car and the counterweight are relatively large, the rotary member should be supported on both sides; however, when the weights of the car and the counterweight are relatively small, it is desirable to adopt a cantilever structure as the supporting structure for the rotary member. Conventionally, such a change in the supporting structure adopted necessitates manufacture of two kinds of hoisting machines differing from each other in most of their respective component parts.

Disclosure of the Invention

[0004] To this end, according to one aspect of the present invention, there is provided an elevator hoisting machine comprising: a base member; a rotary portion having a rotary portion main body, and a drive sheave around which a main rope of an elevator is wound, the rotary portion being rotatably supported by the base member; and a motor having a motor rotor mounted to the rotary portion main body, and a motor stator mounted to the base member such that the motor stator is opposed to the motor rotor, the motor causing the rotary portion to rotate, wherein the rotary portion main body is provided with a sheave fixing portion to which the drive sheave is fixed.

[0005] The present invention is made in order to overcome the problem as described above, and therefore it is an object of the present invention to provide an elevator hoisting machine capable of achieving commonality of parts between the case where a cantilever support structure is adopted for a drive sheave and the case where a double-cantilever support structure is adopted for the same.

Brief Description of the Drawings

[0006] Fig. 1 is a sectional view showing an elevator hoisting machine of a cantilever support structure according to Embodiment 1 of the present invention;
Fig. 2 is a sectional view showing a state in which the elevator hoisting machine of Fig. 1 is of a double-cantilever support structure;
Fig. 3 is a perspective view showing the outward appearance of the elevator hoisting machine of Fig. 2;
Fig. 4 is a sectional view showing a state in which an elevator hoisting machine according to Embodiment 2 of the present invention is of a double-cantilever support structure;
Fig. 5 is a sectional view showing a state in which an elevator hoisting machine according to Embodiment 3 of the present invention is of a double-cantilever support structure; and
Fig. 6 is a perspective view showing an example of the overall construction of an elevator apparatus to which the elevator hoisting machine of the present invention is applied.

Best Mode for carrying out the Invention

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

Embodiment 1

[0008] Fig. 1 is a sectional view of an elevator hoisting machine of a cantilever support structure according to Embodiment 1 of the present invention. In the figure, a base member 1 is a stationary-side part fixed to a hoisting machine installation portion. Further, the base member 1 has a dish-shaped portion 1a, an outer cylinder portion 1b extending to one side from the outer peripheral portion of the dish-shaped portion 1a, and a main shaft 1c protruding to one side from the central portion of the dish-shaped portion 1a. The dish-shaped portion 1a, the outer cylinder portion, and the main shaft 1c are formed integrally with the base member 1.

[0009] Formed at the central portion of the dish-shaped portion 1a on the side opposite the main shaft 1c is a recessed portion 1d recessed with respect to the outer peripheral portion. This imparts the dish-shaped portion 1a with a dish-like, rather than planar, configuration. Provided at the center of the main shaft 1c is a through-hole 1e extending in the axial direction of the main shaft 1c and penetrating the main shaft 1c.

[0010] A rotary portion 3 is supported on the main shaft 1c through the intermediation of a bearing 2. The rotary portion 3 is rotatable about the main shaft 1c. Further, the rotary portion 3 has a rotary portion main body 4 having the bearing 2 mounted onto its inner peripheral portion, and a cylindrical drive sheave 5 fixed onto the outer peripheral portion of the rotary portion main body 4.

[0011] The rotary portion main body 4 has a cylindrical

bearing mounting portion 4a surrounding the main shaft 1c, a sheave fixing portion (step portion) 4b provided in the outer peripheral portion of the bearing mounting portion 4a, and an inner cylinder portion 4c arranged on the inner side with respect to the outer cylinder portion 1b. The bearing mounting portion 4a, the sheave fixing portion 4b, and the inner cylinder portion 4c are formed integrally with the rotary portion main body 4.

[0012] The drive sheave 5 is formed separately from the rotary portion main body 4 and fixed to the sheave fixing portion 4b. A plurality of main ropes for suspending an elevator car and a counterweight are wound around the drive sheave 5. Provided in the outer peripheral surface of the drive sheave 5 are a plurality of rope grooves in which the main ropes are inserted.

[0013] An armature 6 as a motor rotor is fixed to the outer peripheral surface of the inner cylinder portion 4c. Fixed to the inner peripheral surface of the outer cylinder portion 1b is a stator winding 7 as a motor rotor opposed to the armature 6. The rotary portion 3 is rotated by the drive force of a motor 8 having the armature 6 and the stator winding 7.

[0014] Inserted through the through-hole 1e is a rotation detecting shaft 9 that rotates integrally with the rotary portion 3. Provided at one end portion of the rotation detecting shaft 9 is a disc-shaped stationary portion 9a fixed to an axial end portion of the bearing mounting portion 4a. The other end portion of the rotation detecting shaft 9 projects into the depression 1d from the through-hole 1e.

[0015] Mounted to the dish-shaped portion 1a is a rotation detector 10 for detecting the rotation of the rotation detecting shaft 9. The rotation detector 10 is arranged within the depression 1d. Used as the rotation detector 10 is an encoder or the like, for example, whose specific construction is omitted in the drawing.

[0016] Further, the hoisting machine used is a thin hoisting machine whose overall axial dimension is smaller than the drive sheave 5 or its overall radial dimension.

[0017] Next, Fig. 2 is a sectional view showing a state in which the elevator hoisting machine of Fig. 1 is of a double-cantilever support structure. Referring to the figure, the base member 1 is fixed to a support stand 11. Fixed to the support stand 11 is a support frame 12 arranged at a spacing from the base member 1. A drive sheave 13 whose axial dimension is larger than that of the drive sheave 5 of Fig. 1 is fixed to the sheave fixing portion 4b. The drive sheave 13 is supported by the base member 1 through the intermediation of the rotary portion main body 4 and is also rotatably supported by the support frame 12.

[0018] Provided integrally with the drive sheave 13 is a sheave shaft 13a protruding to one side. The support frame 12 rotatably supports the sheave shaft 13a through the intermediation of a bearing 14. Provided in the support shaft 12 is a shaft receiving hole 12a in which the bearing 14 is fitted. Otherwise, the construction is the same as that shown in Fig. 1.

[0019] Fig. 3 is a perspective view showing the outward appearance of the elevator hoisting machine of Fig. 2. The elevator hoisting machine is provided with a brake device 15 for braking the rotation of the rotary portion 3.

[0020] As shown in Fig. 1, the above-described elevator hoisting machine can be used as a hoisting machine of a cantilever support structure by fixing the cantilever-support drive sheave 5 to the sheave fixing portion 4b of the rotary portion main body 4. Further, when, as shown in Fig. 2, the drive sheave 13 for double cantilevered support is fixed to the sheave fixing portion 4b and the drive sheave 13 is supported by the support frame 12, the above elevator hoisting machine can be used as a hoisting machine of a double-cantilever support structure.

[0021] That is, one of two kinds of drive sheaves, the drive sheave 5 of the kind which is supported only by the rotary portion main body 4, and the drive sheave 13 of the kind which is supported by both the support frame 12 and the rotary portion main body 4, is selectively fixed to the sheave fixing portion 4b. In other words, of the plural kinds of drive shaves 5, 13 differing in axial length, one kind of drive sheave is selectively fixed to the sheave fixing portion 4b.

[0022] This structure makes it possible to achieve commonality of many parts, such as the base member 1, the rotary portion main body 4, the motor 8, the rotation detecting shaft 9, and the rotation detector 10, between the case where a cantilever support structure is adopted as the supporting structure for the drive sheave and the case where a double-cantilever support structure is adopted for the same, thereby achieving a reduction in cost.

[0023] Further, the overall structure can be made compact, allowing its installation in, for example, an upper or lower portion of the hoistway in a machine room-less elevator.

[0024] Further, the main shaft 1c is formed integrally with the base member 1, thereby achieving a reduction in the number of parts.

Embodiment 2

[0025] Next, Fig. 4 is a sectional view showing a state where an elevator hoisting machine according to Embodiment 2 of the present invention is of a double-cantilever support structure. While in Embodiment 1 the sheave shaft 13a and the drive sheave 13 are formed integrally with each other, a sheave shaft 16 separate from the drive sheave 13 is fixed to the drive sheave 13 in Embodiment 2. The sheave shaft 16 protrudes to one side of the drive sheave 13 and is rotatably supported by the support frame 12 through the intermediation of the bearing 14. The rotation detecting shaft 9 is fixed to the sheave shaft 16. Otherwise, Embodiment 2 is of the same construction as Embodiment 1. Further, the state where a cantilever support structure is adopted is the same as that shown in Fig. 1.

[0026] In this way, the sheave shaft 16 and the drive

sheave 13 may be formed separate from each other.

Embodiment 3

[0027] Next, Fig. 5 is a sectional view showing a state where an elevator hoisting machine according to Embodiment 3 of the present invention is of a double-cantilever support structure. While in Embodiment 1 the sheave shaft 13a is provided to the drive sheave 13, a sheave shaft 17 separate from the drive sheave 13 and the support frame 12 is fixed to the support frame 12 in Embodiment 3. Further, the drive sheave 13 is rotatably supported by the sheave shaft 17 through the intermediation of the bearing 14. The rotation detecting shaft 9 is fixed to the drive sheave 13. Otherwise, Embodiment 3 is of the same construction as Embodiment 1. Further, the state where a cantilever support structure is adopted is the same as that shown in Fig. 1.

[0028] In this way, the drive sheave 13 may be rotatably supported by the sheave shaft 17 fixed to the support frame 12.

[0029] Here, Fig, 6 is a perspective view showing an example of the overall construction of an elevator apparatus to which the elevator hoisting machine of the present invention is applied. Referring to the figure, installed in a hoistway 21 are a pair of guide rails 22 and a pair of counterweight guide rails 23. A car 24 is caused to ascend and descend in the hoistway 21 as it is guided by the car guide rails 22. A counterweight 25 is caused to ascend and descend in the hoistway 21 as it is guided by the counterweight guide rails 23.

[0030] A machine unit box 26 is placed on top of the hoistway 21. The machine unit box 26 accommodates a hoisting machine 27 such as one illustrated in any one of Embodiments 1 through 3. The hoisting machine 27 is placed such that the rotation axis of the drive sheave 5, 13 becomes horizontal.

[0031] A main rope 28 is wound around the drive sheave 5, 13. The car 24 is suspended at one end portion of the main rope 28. The counterweight 25 is suspended at the other end portion of the main rope 28. That is, the car 24 and the counterweight 25 are suspended by means of a 1:1 roping system.

[0032] Further, a control panel 29 for controlling the hoisting machine 27 is installed in the hoistway 21.

[0033] With the elevator apparatus as described above, the rotation of the drive sheave 5, 13 causes the car 24 and the counterweight 25 to ascend and descend in the hoistway 21 along the guide rails 22, 23, respectively.

[0034] While in the above-described example the main shaft 1c is fixed to the base member 1, it is also possible to provide the main shaft to the rotary portion so that the main shaft is rotatably supported by the base member.

[0035] Further, while the two kinds of drive sheaves 5, 13 are used in the above-described example, it is also possible to mount three or more kinds of drive sheaves.

[0036] Further, the hoisting machine of the present invention is applicable to various types of elevator apparatuses other than the elevator apparatus of the type shown in Fig. 6. For example, the present invention is also applicable to both an elevator apparatus in which the hoisting machine is installed in the machine room and a machine room-less elevator apparatus in which the hoisting machine is arranged in the hoistway. Further, the hoisting machine may be arranged in a lower portion of the hoistway. Further, the roping system is not limited to 1:1 roping but may be, for example, 2:1 roping.

Claims

1. An elevator hoisting machine comprising:

a base member;
a rotary portion having a rotary portion main body, and a drive sheave around which a main rope of an elevator is wound, the rotary portion being rotatably supported by the base member; and
a motor having a motor rotor mounted to the rotary portion main body, and a motor stator mounted to the base member such that the motor stator is opposed to the motor rotor, the motor causing the rotary portion to rotate,
wherein the rotary portion main body is provided with a sheave fixing portion to which the drive sheave is fixed.

2. The elevator hoisting machine according to Claim 1, wherein the base member has an outer cylinder portion to which the motor stator is fixed, and a main shaft protruding to one side, and
wherein the rotary portion main body has an inner cylinder portion arranged on an inner side with respect to the outer cylinder portion and to which the motor rotor is mounted, and is supported by the main shaft such that the rotary portion main body is rotatable about the main shaft.

3. The elevator hoisting machine according to Claim 2, wherein the main shaft has a through-hole provided at its center, the through-hole extending in an axial direction of the main shaft and penetrating the main shaft,
wherein the rotary portion is provided with a rotation detecting shaft inserted through the through-hole and rotating integrally with the rotary portion, and
wherein the base member is provided with a rotation detector that detects rotation of the rotation detecting shaft.

4. The elevator hoisting machine according to Claim 1, wherein from among the drive sheave of a kind that is supported by only the rotary portion main body and the drive sheave of a kind that is supported by

both a support frame, which is arranged at a spacing from the base member, and the rotary portion main body, one kind of the drive sheave is selectively fixed to the drive sheave fixing portion.

5. The elevator hoisting machine according to Claim 1, wherein from among plural kinds of the drive sheaves differing in axial length, one kind of the drive sheave is selectively fixed to the sheave fixing portion.

6. The elevator hoisting machine according to Claim 1, further comprising a support frame arranged at a spacing from the base member,
wherein the drive sheave is supported by the base member through the rotary portion main body and is rotatably supported by the support frame.

7. The elevator hoisting machine according to Claim 6, wherein the drive sheave has a sheave shaft protruding to one side, and the support frame rotatably supports the sheave shaft.

8. The elevator hoisting machine according to Claim 6, wherein a sheave shaft separate from the drive sheave is fixed to the drive sheave, the sheave shaft being rotatably supported by the support frame.

9. The elevator hoisting machine according to Claim 6, wherein the support frame is provided with a sheave shaft protruding toward the drive sheave, the drive sheave being rotatably supported by the sheave shaft.

FIG. 1

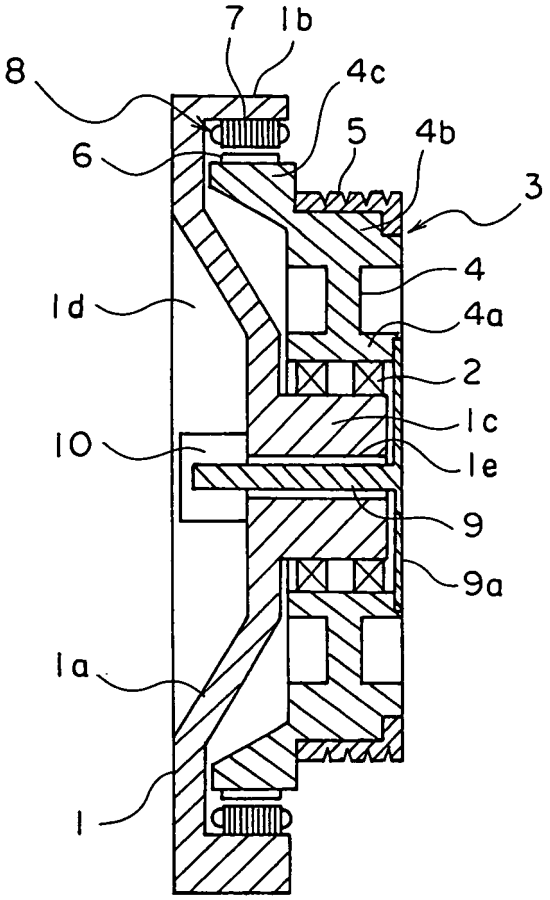


FIG. 2

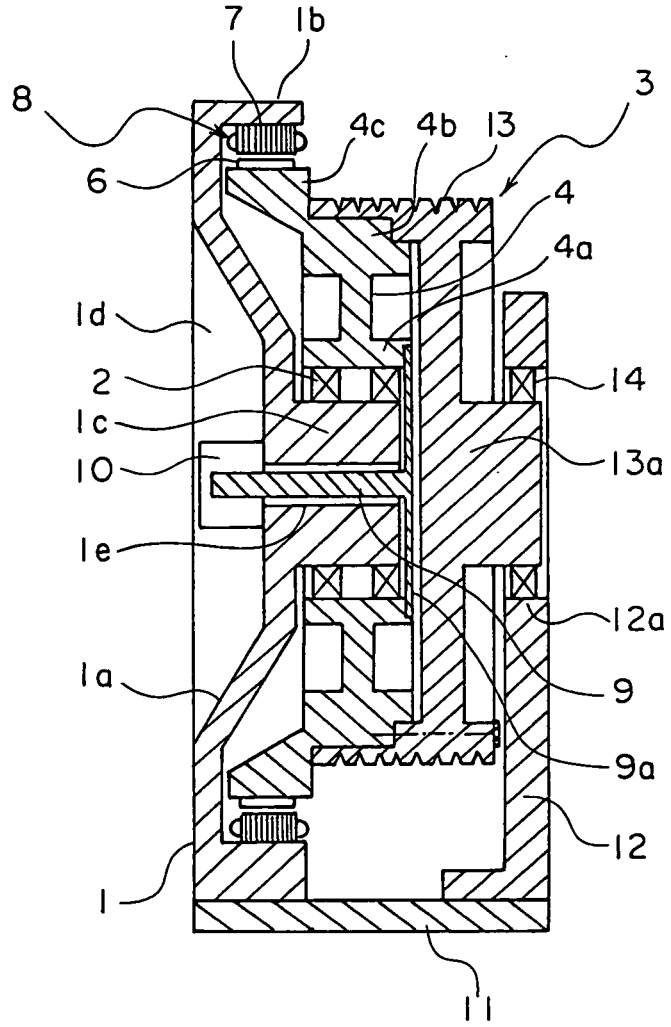


FIG. 3

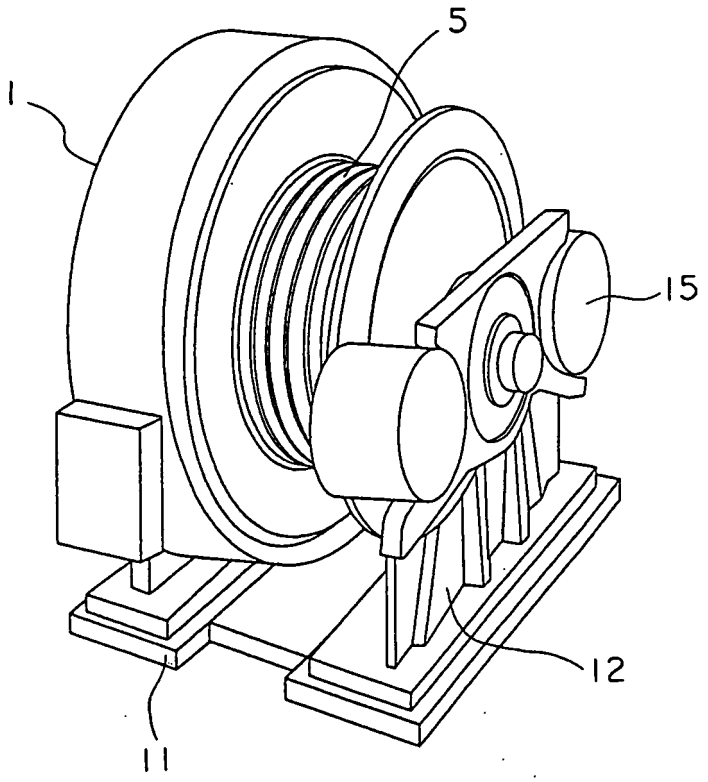


FIG. 4

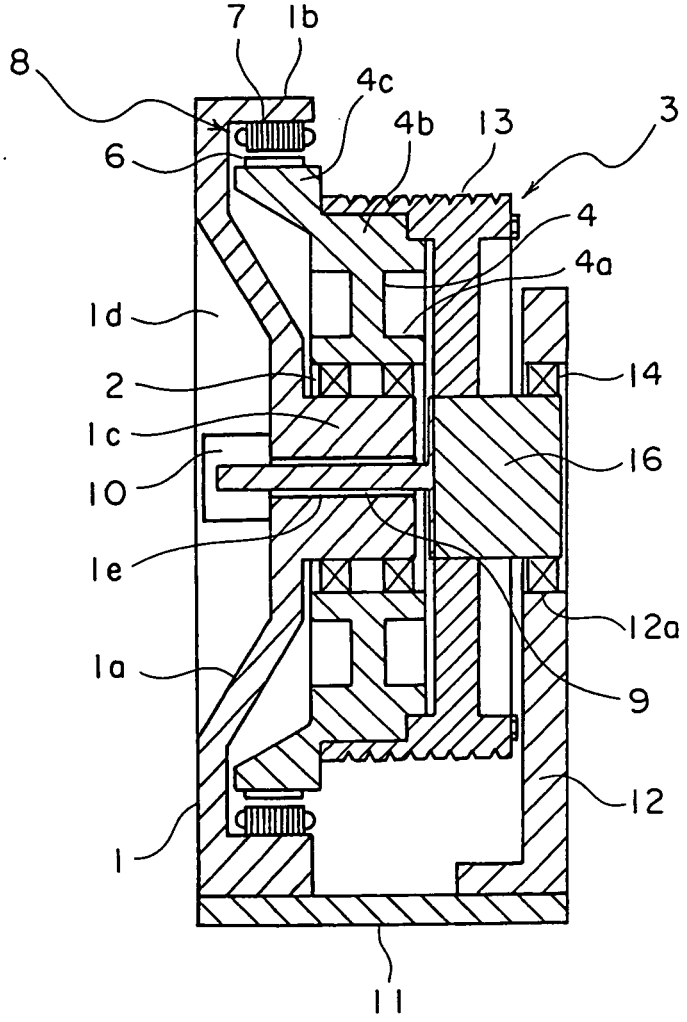


FIG. 5

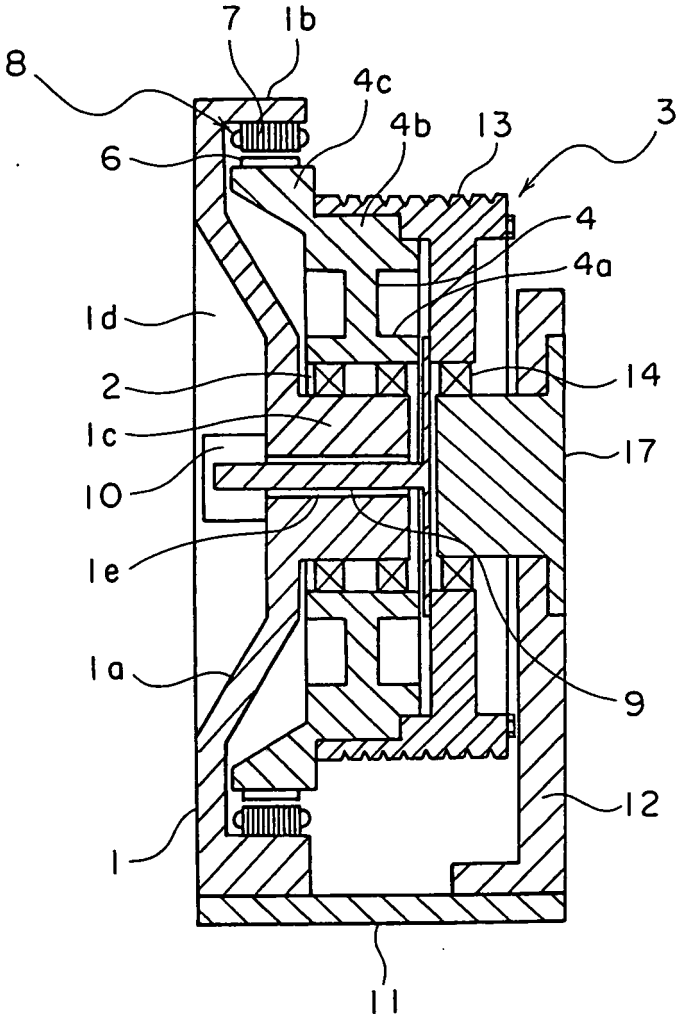
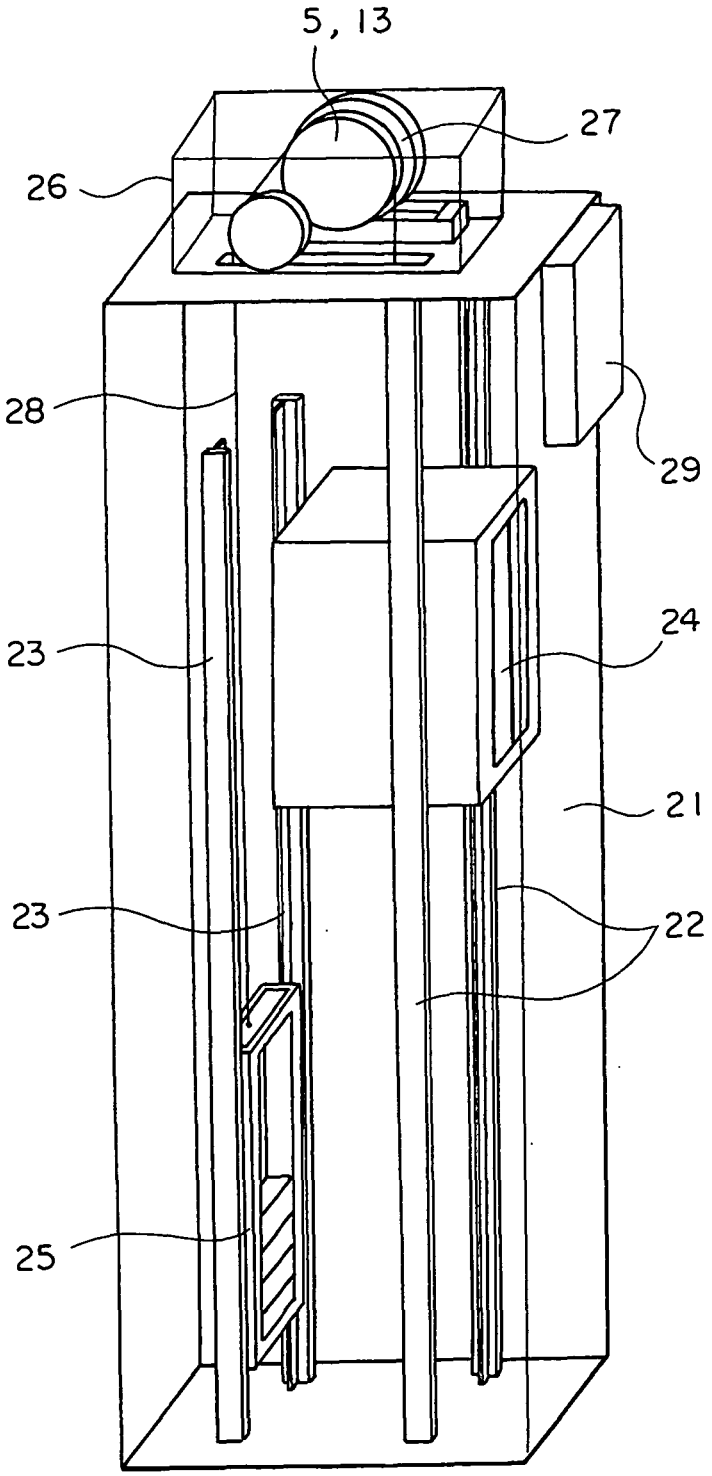


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/000235

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] B66B11/00-11/08

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.
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Y	JP 2003-104666 A (Meidensha Corp.), 09 April, 2003 (09.04.03), Page 2, column 2, Par. No. [0019] & EP 1298084 A2 & US 2003/0070881 A1	3
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A	JP 5-238663 A (Otis Elevator Co.), 17 September, 1993 (17.09.93), & US 5201821 A1 & EP 0545369 A2 & US 5226508 A1	9

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

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Date of the actual completion of the international search	Date of mailing of the international search report
30 April, 2004 (30.04.04)	25 May, 2004 (25.05.04)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/000235

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 63-277190 A (Mitsubishi Electric Corp.), 15 November, 1988 (15.11.88), (Family: none)	1-9
A	JP 9-317841 A (Wittur Aufzugteile GmbH & Co.), 12 December, 1997 (12.12.97), & DE 19634629 A1	1-9

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REFERENCES CITED IN THE DESCRIPTION

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