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

(11) **EP 1 790 610 A1**

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

(43) Date of publication:
30.05.2007 Bulletin 2007/22

(21) Application number: **04773008.0**

(22) Date of filing: **13.09.2004**

(51) Int Cl.:
B66B 11/08 *(2006.01)*

(86) International application number:
PCT/JP2004/013326

(87) International publication number:
WO 2006/030483 (23.03.2006 Gazette 2006/12)

(84) Designated Contracting States:
DE

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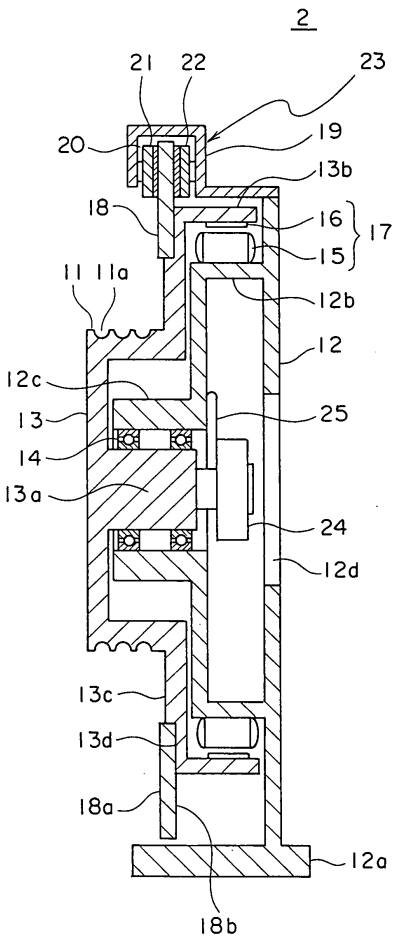
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(54) HOIST FOR ELEVATOR

(57) In an elevator hoisting machine, rotation of a drive sheave is braked by a brake portion. The brake portion has: a brake disk that is rotated together with the drive sheave; and a brake portion main body for braking rotation of the brake disk by gripping the brake disk. The brake disk is disposed radially outside the drive sheave. The brake disk also has first and second braking surfaces on opposite sides from each other. The brake portion main body has: a first braking segment separably placed in contact with the first braking surface; and a second braking segment separably placed in contact with the second braking surface.

FIG. 2



EP 1 790 610 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator hoisting machine having a drive sheave around which a main rope is wound, a motor portion for rotating the drive sheave, and a brake portion for braking rotation of the drive sheave.

BACKGROUND ART

[0002] In conventional elevator hoisting machines, a mounting portion for an armature and a drive sheave are disposed integrally on a bowl-shaped body. A braking apparatus for braking rotation of the bowl-shaped body is disposed inside the bowl-shaped body. A braking surface against which braking segments of the braking apparatus are separably placed in contact is formed on an inner periphery of the bowl-shaped body (See Patent Literature 1, for example).

[0003] Patent Document 1
Japanese Patent Laid-Open No. 2000-289954 (Gazette)

[0004] However, in conventional elevator hoisting machines such as that described above, since the braking apparatus is disposed inside the bowl-shaped body and the braking radius is small, a large braking force is required from the braking apparatus, requiring the braking apparatus to be enlarged.

DISCLOSURE OF THE INVENTION

[0005] The present invention aims to solve the above problems and an object of the present invention is to provide an elevator hoisting machine enabling a brake portion main body to be reduced in size.

[0006] In order to achieve the above object, according to one aspect of the present invention, there is provided an elevator hoisting machine comprising: a base body; a main shaft disposed on the base body; a drive sheave that is rotatable around the main shaft; a motor portion having a motor stator supported by the base body and a motor rotor that is rotatable together with the drive sheave, the motor portion rotating the drive sheave; and a brake portion for braking rotation of the drive sheave, wherein the brake portion has: a brake disk disposed radially outside the drive sheave, having first and second braking surfaces on opposite sides from each other, and being rotated together with the drive sheave; and a brake portion main body including a first braking segment separably placed in contact with the first braking surface, and a second braking segment separably placed in contact with the second braking surface, the brake portion main body braking rotation of the brake disk by gripping the brake disk between the first and second braking segments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

Figure 1 is a schematic side elevation showing an elevator apparatus according to Embodiment 1 of the present invention; and
Figure 2 is a cross section of an elevator hoisting machine from Figure 1.

BEST MODE FOR CARRYING OUT THE INVENTION

[0008] A preferred embodiment of the present invention will now be explained with reference to the drawings.

Embodiment 1

[0009] Figure 1 is a schematic side elevation showing an elevator apparatus (machine-roomless elevator) according to Embodiment 1 of the present invention. In the figure, an elevatorhoistingmachine 2 is installed in a lower portion (pit) of a hoistway 1. A thin hoisting machine having an axial dimension that is less than an outside diameter dimension in a direction perpendicular to an axial direction is used for the elevator hoisting machine 2. A car 3 and a counterweight 4 are raised and lowered inside the hoistway 1 by a driving force from the elevator hoisting machine 2.

[0010] First and second car suspension sheaves 5a and 5b are disposed on a lower portion of the car 3. A counterweight suspension sheave 6 is disposed on an upper portion of the counterweight 4. A car return sheave 7 and first and second counterweight return sheaves 8a and 8b are disposed in an upper portion inside the hoistway 1.

[0011] The car 3 and the counterweight 4 are suspended inside the hoistway 1 using a plurality of main ropes 9 (only one is shown in the figure). The rope end connecting portion 10 is fixed to an upper portion inside the hoistway 1. The main ropes 9 have: first end portions 9a connected to the rope end connecting portions 10; and second end portions (not shown).

[0012] The elevator hoisting machine 2 has a drive sheave 11 onto which the main ropes 9 are wound. The main ropes 9 are wound from the first end portions 9a sequentially around the first car suspension sheave 5a, the second car suspension sheave 5b, the car return sheave 7, the drive sheave 11, the first counterweight return sheave 8a, the second counterweight return sheave 8b, and the counterweight suspension sheave 6. In other words, the car 3 and the counterweight 4 are suspended by the main ropes 9 using a two-to-one (2:1) roping method.

[0013] Figure 2 is a cross section of the elevator hoisting machine 2 from Figure 1. In the figure, a metal base body 12 has: a foot portion 12a installed on an installation surface; a cylindrical stator mount portion 12b; and a cylindrical main shaft insertion portion 12c. The stator

mount portion 12b and the main shaft insertion portion 12c are disposed so as to be coaxial to each other. An inside diameter and an outside diameter of the stator mount portion 12b are greater than an inside diameter and an outside diameter of the main shaft insertion portion 12c.

[0014] A metal bowl-shaped rotating body 13 is rotatably supported by the base body 12. The bowl-shaped rotating body 13 has: a main shaft 13a constituting a center of rotation of the bowl-shaped rotating body 13; a drive sheave 11; and a cylindrical the rotor mount portion 13b. In other words, the main shaft 13a, the drive sheave 11, and the rotor mount portion 13b are disposed integrally in a shared bowl-shaped rotating body 13. Furthermore, the main shaft 13a, the drive sheave 11, and the rotor mount portion 13b are disposed so as to be coaxial to each other.

[0015] The main shaft 13a is inserted inside the main shaft insertion portion 12c from a first side of the base body 12. An inner peripheral surface of the drive sheave 11 faces an outer peripheral surface of the main shaft insertion portion 12c. In other words, the main shaft 13a and the main shaft insertion portion 12c are disposed inside the drive sheave 11. A plurality of rope grooves 11a into which the main ropes 9 are inserted are disposed on an outer peripheral surface of the drive sheave 11.

[0016] The rotor mount portion 13b is disposed so as to be adjacent to a second side of the drive sheave 11 in an axial direction of the main shaft 13a. An inside diameter and an outside diameter of the rotor mount portion 13b are greater than an inside diameter and an outside diameter of the drive sheave 11. An inner peripheral surface of the rotor mount portion 13b faces an outer peripheral surface of the stator mount portion 12b. In other words, the stator mount portion 12b is surrounded by the rotor mount portion 13b.

[0017] A flange portion 13c is disposed between the drive sheave 11 and the rotor mount portion 13b. A disk mount portion (stepped portion) 13d is disposed on the flange portion 13c. An end portion of the bowl-shaped rotating body 13 on a side near the rotor mount portion 13b is open.

[0018] A plurality of bearings 14 are interposed between an outer peripheral surface of the main shaft 13a and an inner peripheral surface of the main shaft insertion portion 12c so as to be spaced apart from each other in the axial direction of the main shaft 13a. Thus, the main shaft 13a is supported so as to be rotatable relative to the main shaft insertion portion 12c.

[0019] A motor stator 15 is mounted to an outer peripheral surface of the stator mount portion 12b. In other words, the motor stator 15 is supported by the base body 12. A motor rotor 16 facing the motor stator 15 is mounted to the inner peripheral surface of the rotor mount portion 13b. In other words, the motor rotor 16 is rotatable together with the bowl-shaped rotating body 13. A motor portion 17 includes the motor stator 15 and the motor rotor 16 and generates a driving force for rotating the bowl-shaped rotating body 13 around the main shaft 13a.

[0020] An annular brake disk 18 is fixed to the disk mount portion 13d. The brake disk 18 is disposed radially outside the drive sheave 11 and is rotated together with the drive sheave 11. The brake disk 18 has first and second braking surfaces 18a and 18b on opposite sides from each other. The first and second braking surfaces 18a and 18b are parallel to a plane that is perpendicular to an axis of the main shaft 13a.

[0021] A brake supporting frame 19 is fixed to an upper portion of the base body 12. A brake portion main body 20 is mounted to the brake supporting frame 19. The brake portion main body 20 has: a first braking segment 21 separably placed in contact with the first braking surface 18a; and a second braking segment 22 separably placed in contact with the second braking surface 18b. The brake portion main body 20 brakes rotation of the brake disk 18 and the drive sheave 11 by gripping the brake disk 18 between the first and second braking segments 21 and 22. A brake portion 23 includes the brake disk 18 and the brake portion main body 20.

[0022] An electromagnetic braking apparatus, for example, is used for the brake portion main body 20. In the electromagnetic braking apparatus, the first and second braking segments 21 and 22 are pressed against the first and second braking surfaces 18a and 18b by spring force from braking springs (not shown) to brake rotation of the brake disk 18. The first and second braking segments 21 and 22 are separated from the braking surface 18a and 18b in opposition to the braking springs by exciting electromagnets (not shown) to release braking.

[0023] A rotation detector for detecting rotation of the main shaft 13a, such as an encoder 24, for example, is supported by the base body 12. The encoder 24 is mounted to the base body 12 with a mounting leaf spring 25 interposed. A base end portion of the mounting leaf spring 25 is fixed to an edge portion on a second side of the main shaft insertion portion 12c. An opening portion 12d for exposing the encoder 24 on an opposite side from the main shaft 13a is disposed on the base body 12. The encoder 24 generates a signal corresponding to a rotational speed of the drive sheave 11. Signals from the encoder 24 are sent to a control apparatus (not shown) for controlling operation of the elevator hoisting machine 2.

[0024] In an elevator hoisting machine 2 of this kind, because rotation of the brake disk 18 and the drive sheave 11 is braked by gripping the brake disk 18 between the first and second braking segments 21 and 22, approximately twice the braking force can be achieved compared to when braking segments are pressed against only a single surface of a brake disk, enabling the brake portion main body 20 to be reduced in size. Because the brake portion main body 20 grips the brake disk 18, which is disposed radially outside the drive sheave 11, braking radius can be increased compared to when a brake portion main body is disposed inside a drive sheave, thereby also enabling the brake portion

main body 20 to be reduced in size.

[0025] In addition, since the brake disk 18 and the brake portion main body 20 are disposed outside the bowl-shaped rotating body 13, assembly work on the brake portion main body 20, and maintenance inspection work on the brake portion main body 20 and the brake disk 18, etc., are facilitated. For example, adjustment of gaps between the braking surfaces 18a and 18b and the braking segments 21 and 22, and checking of the gaps, etc., are facilitated.

[0026] Because the main shaft 13a, the drive sheave 11, and the rotor mount portion 13b are disposed integrally in a shared bowl-shaped rotating body 13, axial dimensions of the entire elevator hoisting machine 2 can be reduced.

Because the main shaft 13a is rotated together with the drive sheave 11, the encoder 24 can be mounted to the base body 12 by the mounting leaf spring 25 alone, facilitating mounting and removal of the encoder to and from the base body 12. For this reason, mounting and maintenance of the encoder 24 are facilitated.

[0027] Moreover, in the above example, the brake disk 18 is configured as a separate part from the bowl-shaped rotating body 13, but a brake disk may also be disposed integrally on a bowl-shaped rotating body.

In the above example, the elevator hoisting machine 2 is installed such that the main shaft 13a is horizontal, but it is also possible to install and use the elevator hoisting machine 2 such that the main shaft 13a is vertical or generally vertical.

In addition, in the above example, the elevator hoisting machine 2 is installed in a lower portion inside the hoistway 1, but the elevator hoisting machine according to the present invention is not limited to being installed in this position. For example, it can also be installed in an upper portion inside the hoistway 1 or inside a machine room above the hoistway 1.

[0028] In the above example, the car 2 and the counterweight 3 were suspended by using a two-to-one (2:1) roping method, but the roping method is not limited to this and, for example, a one-to-one (1:1) roping method may also be used.

Steel ropes may be used for the main ropes, but resin-coated ropes in which an outer layer coating body constituted by a high-friction resin material is disposed on an outer peripheral portion can also be used, enabling diameters of drive sheaves, return sheaves, and suspension sheaves to be reduced and space to be saved inside the hoistway.

In addition, in the above example, the main shaft 13a is a rotating shaft, but it is also possible to make the main shaft a fixed shaft, and make the drive sheave rotatable relative to the main shaft.

There may also be one brake portion main body or a plurality thereof. In other words, a plurality of brake portion main bodies may also be disposed on a circumference of a single brake disk.

Claims

1. An elevator hoisting machine comprising:

a base body;
a main shaft disposed on the base body;
a drive sheave that is rotatable around the main shaft;
a motor portion having a motor stator supported by the base body and a motor rotor that is rotatable together with the drive sheave, the motor portion rotating the drive sheave; and
a brake portion for braking rotation of the drive sheave,

wherein the brake portion has:

a brake disk disposed radially outside the drive sheave, having first and second braking surfaces on opposite sides from each other, and being rotated together with the drive sheave; and
a brake portion main body including a first braking segment separably placed in contact with the first braking surface, and a second braking segment separably placed in contact with the second braking surface, the brake portion main body braking rotation of the brake disk by gripping the brake disk between the first and second braking segments.

2. The elevator hoisting machine according to Claim 1, wherein a rotor mount portion to which the motor rotor is mounted, the main shaft, and the drive sheave are disposed integrally on a shared bowl-shaped rotating body.

3. The elevator hoisting machine according to Claim 2, wherein the brake disk is mounted between the drive sheave and the rotor mount portion of the bowl-shaped rotating body, and the first and second braking surfaces are parallel to a plane that is perpendicular to an axis of the main shaft.

FIG. 1

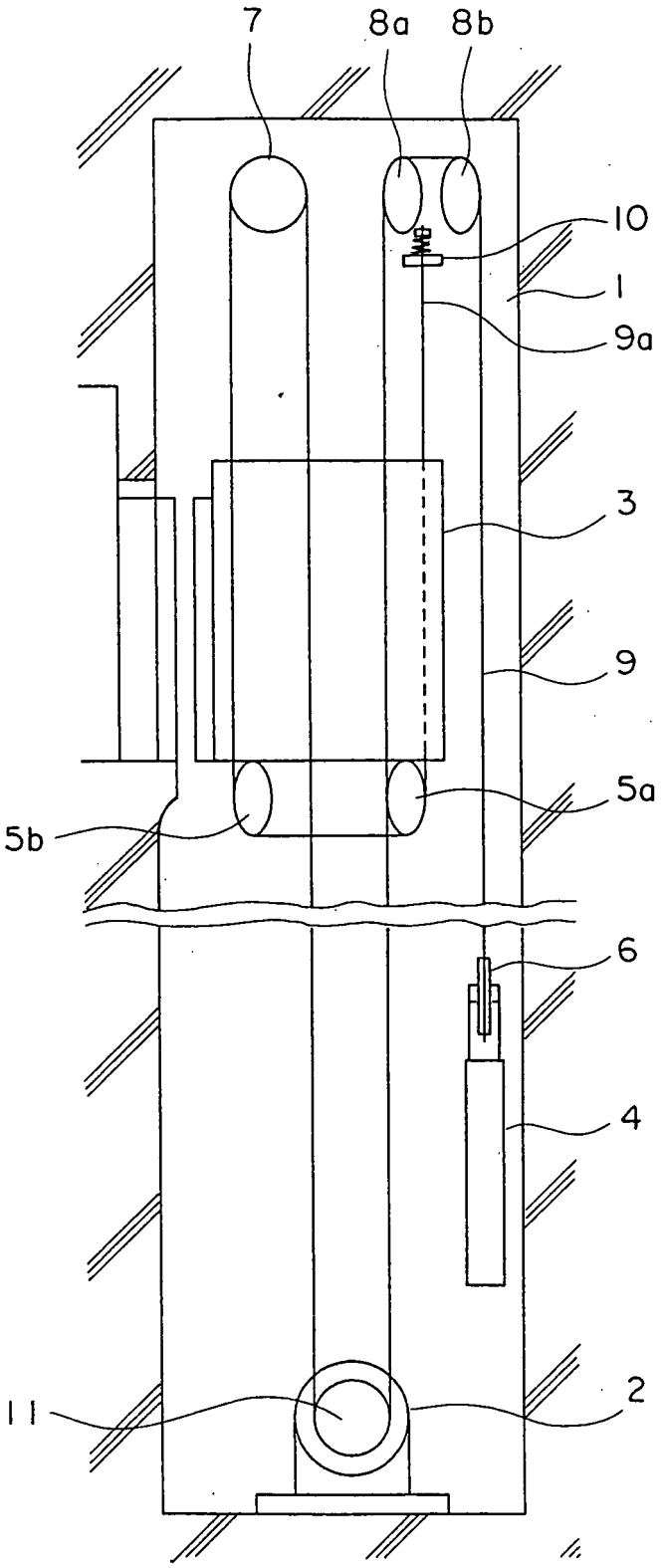
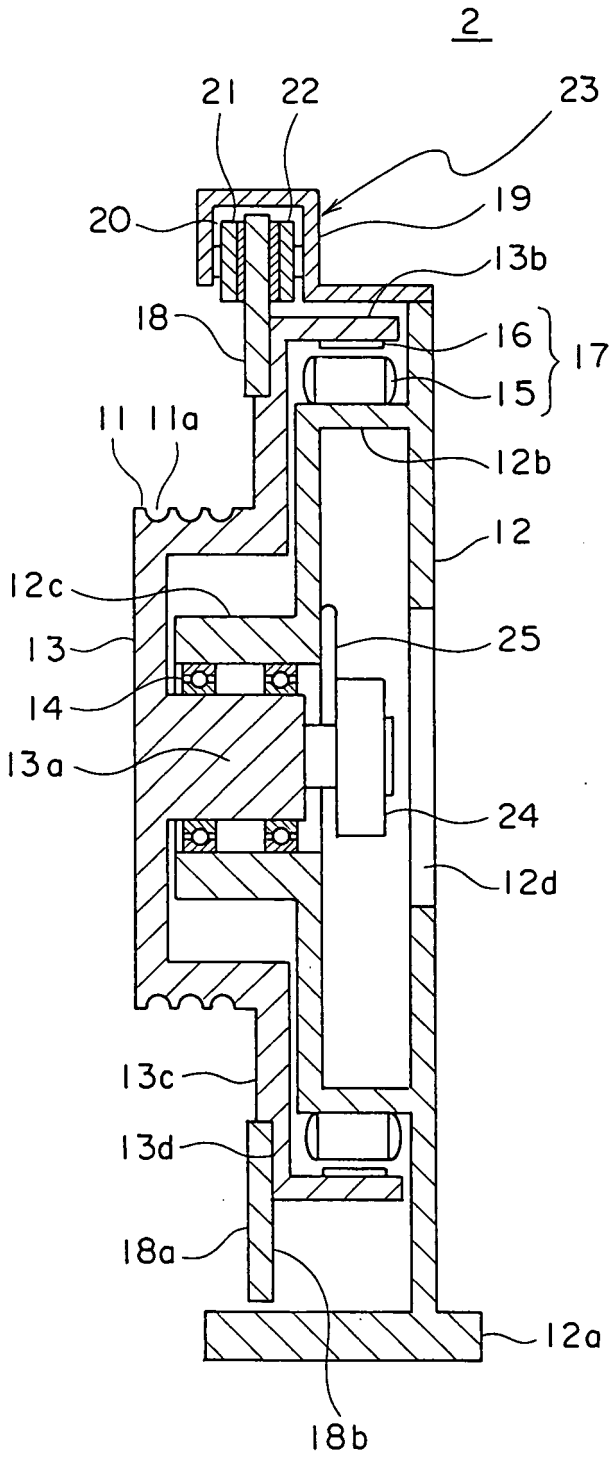


FIG. 2


2
21
22
23
20
19
13b
18
16
17
15
11
11a
12b
12
12c
25
13
14
13a
24
12d
13c
13d
18a
12a
18b

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/013326

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-B66B11/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2005
Kokai Jitsuyo Shinan Koho 1971-2005 Toroku Jitsuyo Shinan Koho 1994-2005

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 Y	JP 2004-137037 A (Tiesu Koporeshon Kabushiki Kaisha), 13 May, 2004 (13.05.04), Pay attention to Par. Nos. [0010] to [0031]; Figs. 1 to 2 (Family: none)	1 2-3
Y	JP 2001-151443 A (Toshiba Digital Media Engineering Kabushiki Kaisha), 05 June, 2001 (05.06.01), Pay attention to abstract; Fig. 1 (Family: none)	2-3

☒ 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
10 June, 2005 (10.06.05)	28 June, 2005 (28.06.05)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/013326

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 11-130365 A (Hitachi, Ltd.), 18 May, 1999 (18.05.99), Pay attention to Par. Nos. [0009] to [0015]; Figs. 1 to 3 (Family: none)	3
A	JP 2000-86127 A (Hitachi, Ltd.), 28 March, 2000 (28.03.00), Pay attention to abstract; Fig. 3 (Family: none)	1

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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