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(11)

EP 1 312 573 A1

(12)

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

(43) Date of publication:

21.05.2003 Bulletin 2003/21

(51) Int Cl.7: **B66B 7/00, B66B 11/08**

(21) Application number: **00953535.2**

(86) International application number:
PCT/JP00/05585

(22) Date of filing: **21.08.2000**

(87) International publication number:
WO 02/016247 (28.02.2002 Gazette 2002/09)

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**

(72) Inventor: **HAMAGUCHI, Shuki**
Mitsubishi Denki Kabushiki Kaisha
Tokyo 100-8310 (JP)

(71) Applicant: **mitsubishi denki kabushiki
kaisha**
Tokyo 100-8310 (JP)

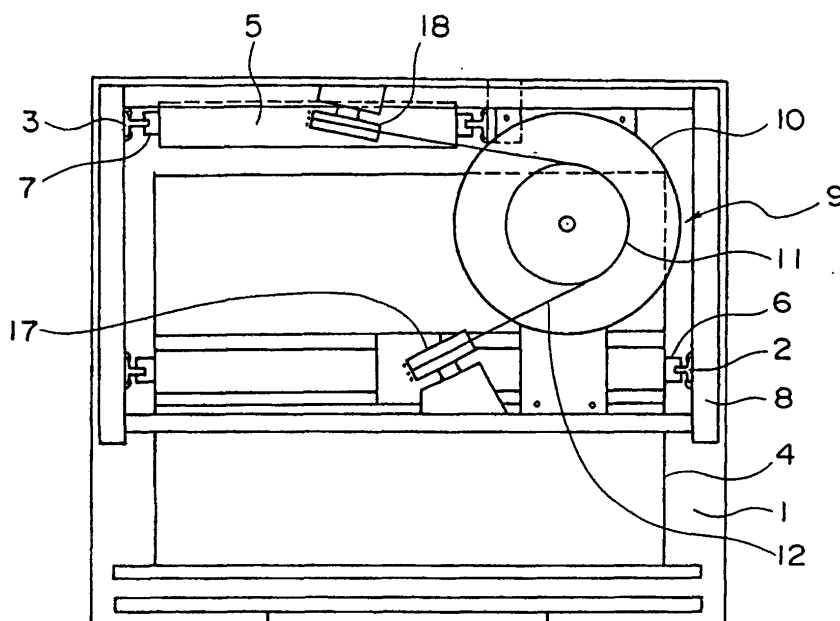
(74) Representative: **HOFFMANN - EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(54) **ELEVATOR DEVICE**

(57) In an elevator apparatus, a car and a counterweight are suspended in a hoistway in a 1:1 roping method. A driving machine is disposed so that the axis of the driving sheave extends in a vertical direction. A

first turning deflector sheave for guiding the main rope from the driving machine to the car and a second turning deflector sheave for guiding the main rope from the driving machine to the counterweight are disposed at an upper portion of the hoistway.

FIG. 1



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Description**BEST MODE FOR CARRYING OUT THE INVENTION****TECHNICAL FIELD**

[0001] The present invention relates to an elevator apparatus in which a hoisting machine is disposed at an upper portion in a hoistway.

[0006] Preferred embodiments of the present invention will be described below with reference to the accompanying drawings.

First Embodiment**BACKGROUND ART**

[0002] Conventionally, as disclosed for example, in Japanese Patent Application Laid-Open No. Hei 10-139321, a hoisting machine in an elevator apparatus is disposed at an upper portion in a hoistway. However, in this elevator apparatus, since a car and a counterweight are suspended in a 2:1 roping method, the number of component parts is increased and the layout is complicated.

[0007] Fig. 1 is a plan view showing a machine-room-less type elevator apparatus according to a first embodiment of the present invention, and Fig. 2 is a front view showing essential portions of the elevator apparatus in Fig. 1.

[0008] In the figures, a pair of car guide rails 2 and a pair of counterweight guide rails 3 are installed in a hoistway 1. A car 4 is guided by the car guide rails 2 to be raised and lowered in the hoistway 1. A counterweight 5 is guided by the counterweight guide rails 3 to be raised and lowered in the hoistway 1.

DISCLOSURE OF THE INVENTION

[0003] The present invention is made to solve the problem mentioned above, and an object of the present invention is to provide an elevator apparatus wherein the number of component parts can be reduced and the layout can be simplified.

[0004] To this end, according to one aspect of the present invention, there is provided an elevator apparatus comprising: a driving machine disposed at an upper portion in a hoistway and having a driving sheave; a main rope wound around the driving sheave; and a car and a counterweight suspended in the hoistway by the main rope to be raised and lowered by the driving machine, wherein the car and the counterweight are suspended in the hoistway in a 1:1 roping method, the driving machine is disposed horizontally so that an axis of the driving sheave extends along a vertical direction, and a first turning deflector sheave for guiding the main rope from the driving machine to the car and a second turning deflector sheave for guiding the main rope from the driving machine to the counterweight are disposed at the upper portion in the hoistway.

[0009] A plurality of car guide shoes 6 which engage with the car guide rails 2 are provided at the car 4. A plurality of counterweight guide shoes 7 which engage with the counterweight guide rails 3 are provided at the counterweight 5.

[0010] A supporting pedestal 8 is attached to the upper end portions of the guide rails 2 and 3. A driving machine (hoisting machine) 9 is mounted on the supporting pedestal 8. The driving machine 9 has a motor 10 and a driving sheave 11 rotated by the motor 10. Also, driving machine 9 has a thin configuration in which its length in the axial direction is shorter than its diameter. Further, the driving machine 9 is disposed so that the axis of the driving sheave 11 extends in a vertical direction. Furthermore, the driving machine 9 is disposed above the corner portion of the car 4.

[0011] A main rope 12 composed of a synthetic fiber rope is wound around the driving sheave 11. The car 4 is suspended at one end portion of the main rope 12. The counterweight 5 is suspended at the other end portion of the main rope 12. In other words, the car 4 and the counterweight 5 are suspended in the hoistway 1 in a 1:1 roping method.

[0012] One end portion of the main rope 12 is connected to an upper beam 4a of the car 4 through a rope shackle 13 and a buffer 14. The other end portion of the main rope 12 is connected to an upper beam 5a of the counterweight 5 through a rope shackle 15 and a buffer 16.

[0013] A first turning deflector sheave 17 guiding the main rope 12 from the driving machine 9 to the car 4 and a second turning deflector sheave 18 guiding the main rope 12 from the driving machine 9 to the counterweight 5 are supported by the supporting pedestal 8. The first and second turning deflector sheaves 17 and 18 are disposed so that their rotation axes extend along the horizontal direction. Also, the first and second turning deflector sheaves 17 and 18 are disposed so as to overlap the car 4 and the counterweight 5, respectively,

BRIEF DESCRIPTION OF THE DRAWINGS**[0005]**

Fig. 1 is a plan view showing an elevator apparatus according to a first embodiment of the present invention;

Fig. 2 is a front view showing essential portions of the elevator apparatus in Fig. 1;

Fig. 3 is a perspective view showing the construction of the main rope in Fig. 1; and

Fig. 4 is a plan view showing an elevator apparatus according to a second embodiment of the present invention.

in a vertically projected surface.

[0014] Further, dimensions in the vertical direction of the first and second turning deflector sheaves 17 and 18 are shorter than the thickness of the driving machine 9. Therefore, the first and second turning deflector sheaves 17 and 18 and the supporting pedestal 8 are disposed within the vertical dimensions of the driving machine 9.

[0015] Fig. 3 is a perspective view showing the construction of the main rope 12 in Fig. 1. In the figure, an inner strand layer 24 having a plurality of inner strands 22 and filling strands 23 disposed in gaps between the inner strands 22 is disposed around a core rope 21. Each inner strand 22 is composed of a plurality of aramid fibers and an impregnating agent such as polyurethane or the like. The filling strands 23 are composed of, for example, polyamide.

[0016] An outer strand layer 26 having a plurality of outer strands 25 is disposed around the outer periphery of the inner strand layer 24. Each outer strand 25 is composed of a plurality of aramid fibers and an impregnating agent such as polyurethane or the like just as in the inner strands 22.

[0017] A friction reducing covering layer 27 for preventing abrasion from friction between strands 22 and 25 at the sheaves such as at the driving sheave 11 or the like is disposed between the inner strand layer 24 and the outer strand layer 26. Further, a protective covering layer 28 is disposed around the outer periphery of the outer strand layer 26.

[0018] The car 4 and the counterweight 5 are suspended in the hoistway 1 by a plurality of main ropes 12 having the above described construction. Further, in the main rope 12, load is transmitted only by the strands 22 and 25. Furthermore, the synthetic fiber rope has a higher friction coefficient and superior flexibility in comparison to a steel rope.

[0019] In such an elevator apparatus, since the driving machine 9 is disposed horizontally at the upper portion in the hoistway 1 so that the axis of the driving sheave 11 extends in the vertical direction, the car 4 and the counterweight 5 are suspended in the hoistway 1 in the 1:1 roping method, and the first and second turning deflector sheaves 17 and 18 are disposed at the upper portion in the hoistway, the number of component parts can be reduced and the layout can be simplified.

[0020] Further, since a thin type driving machine 9 is used, installation space for the driving machine 9 can be reduced, thereby reducing the height dimension of the upper portion of the hoistway 1. Furthermore, when the capacity of the driving machine 9 is to be increased, it can be dealt with by merely increasing a diameter.

[0021] More, since a main rope 12 composed of the synthetic fiber rope having the higher friction coefficient and superior flexibility is used, D/d (sheave diameter/rope diameter) of the first and second turning deflector sheaves 17 and 18 can be reduced. For example, although the D/d of steel rope is over 40, the D/d of syn-

thetic fiber rope can be reduced to about 25. Because of this, the first and second turning deflector sheaves 17 and 18 can be disposed above the car 4 and the counterweight 5 to overlap them without increasing the height dimension of the upper portion of the hoistway 1, and the layout can be simplified.

[0022] Further, since the driving machine 9 is disposed above the corner portion of the car 4, enough distance for twisting the main rope 12 can be secured between the driving machine 9 and the first and second turning deflector sheaves 17 and 18, and sufficient winding angle relative to the driving sheave 11 can be secured. Second Embodiment

[0023] It should be noted that, while, in the first embodiment, the counterweight 5 is disposed behind the car 4 in the hoistway 1, this invention is also applicable to an elevator apparatus where the counterweight 5 is disposed beside the car 4 in the hoistway 1, for example, as shown in Fig. 4.

[0024] Further, while, the driving machine 9 and the first and second turning deflector sheaves 17 and 18 are supported by the guide rails 2 and 3 through the supporting pedestal 8 in the first and second embodiments, it is also possible that they be supported by wall portions of the hoistway 1 or a building.

Claims

1. An elevator apparatus comprising:

a driving machine disposed at an upper portion of a hoistway and having a driving sheave;
a main rope wound around the driving sheave;
and
a car and a counterweight suspended in the hoistway by the main rope to be raised and lowered by the driving machine,

wherein the car and the counterweight are suspended in the hoistway in a 1:1 roping method, the driving machine is disposed horizontally so that an axis of the driving sheave extends along a vertical direction, and a first turning deflector sheave for guiding the main rope from the driving machine to the car and a second turning deflector sheave for guiding the main rope from the driving machine to the counterweight are disposed at the upper portion in the hoistway.

2. An elevator apparatus according to claim 1, wherein the driving machine has a thin configuration in which length of the machine the axial direction is shorter than its diameter.

3. An elevator apparatus according to claim 1, wherein the main rope is a synthetic fiber rope.

4. An elevator apparatus according to claim 1, wherein the first and second turning deflector sheaves are disposed so that their rotation axes extend horizontally and so as to overlap the car and the counterweight in a vertically projected surface. 5
5. An elevator apparatus according to claim 1, wherein the driving machine is disposed above a corner portion of the car. 10
6. An elevator apparatus according to claim 1, wherein the driving machine is supported by a supporting pedestal, and the first and second turning deflector sheave and the supporting pedestal are disposed within a dimensional range of the driving machine in a vertical direction. 15

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FIG. 1

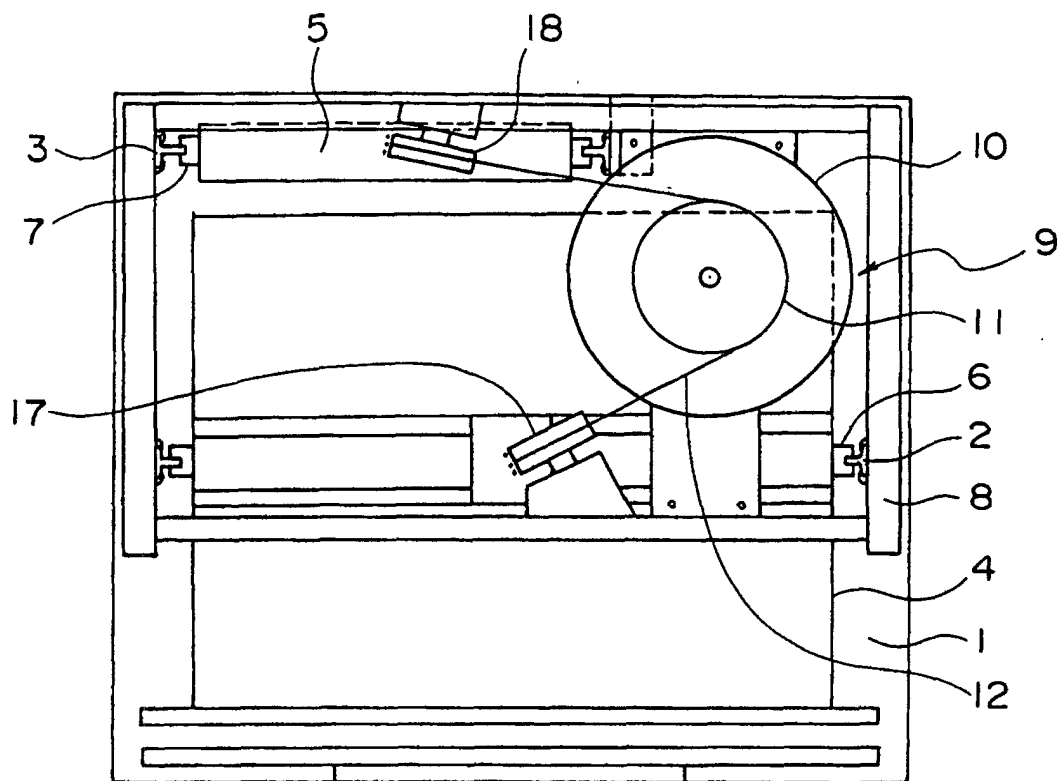


FIG. 2

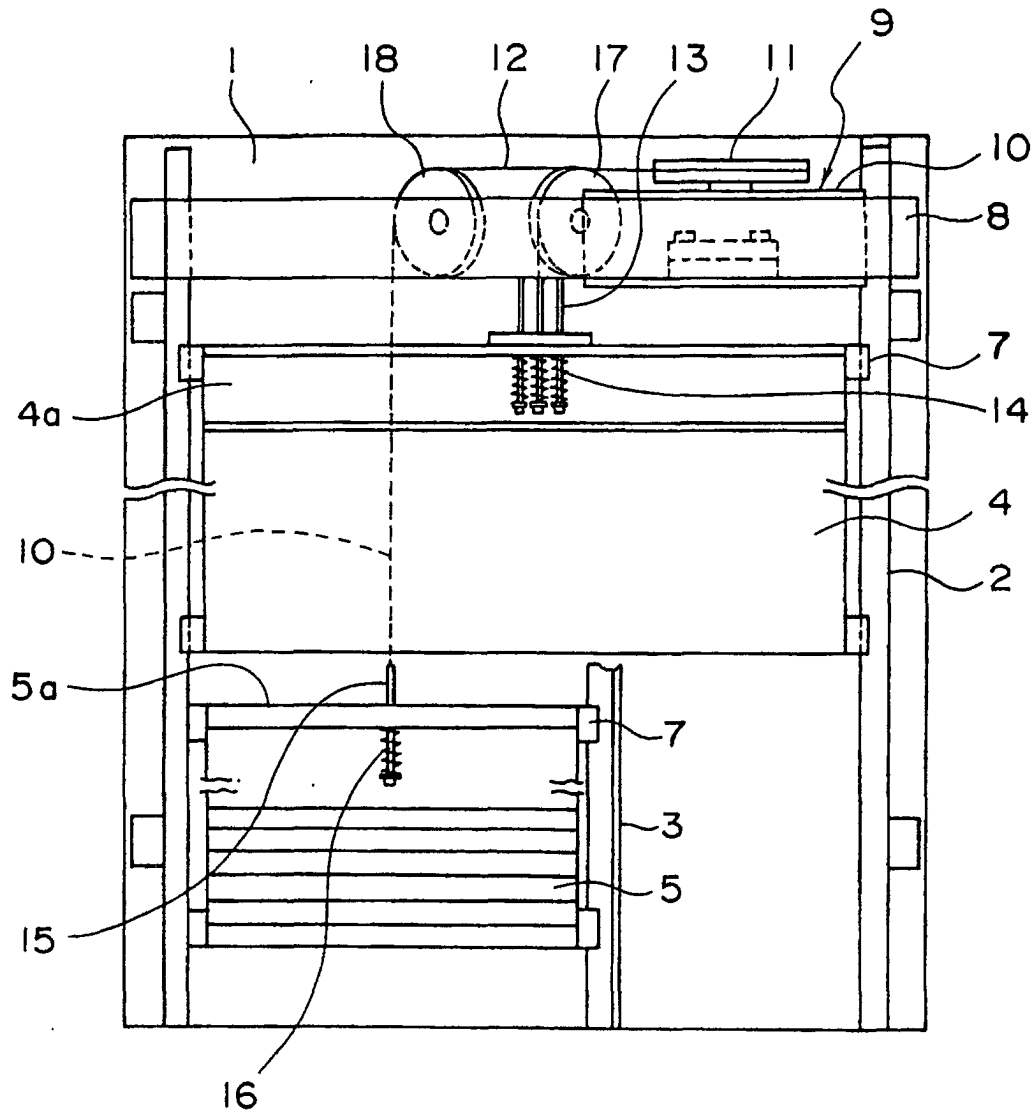


FIG. 3

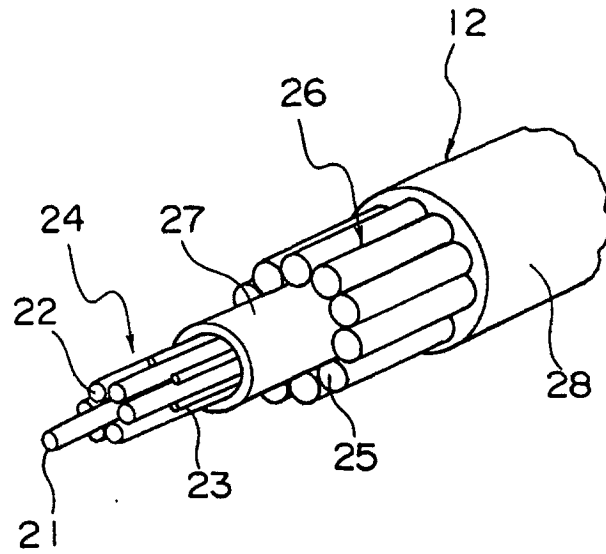
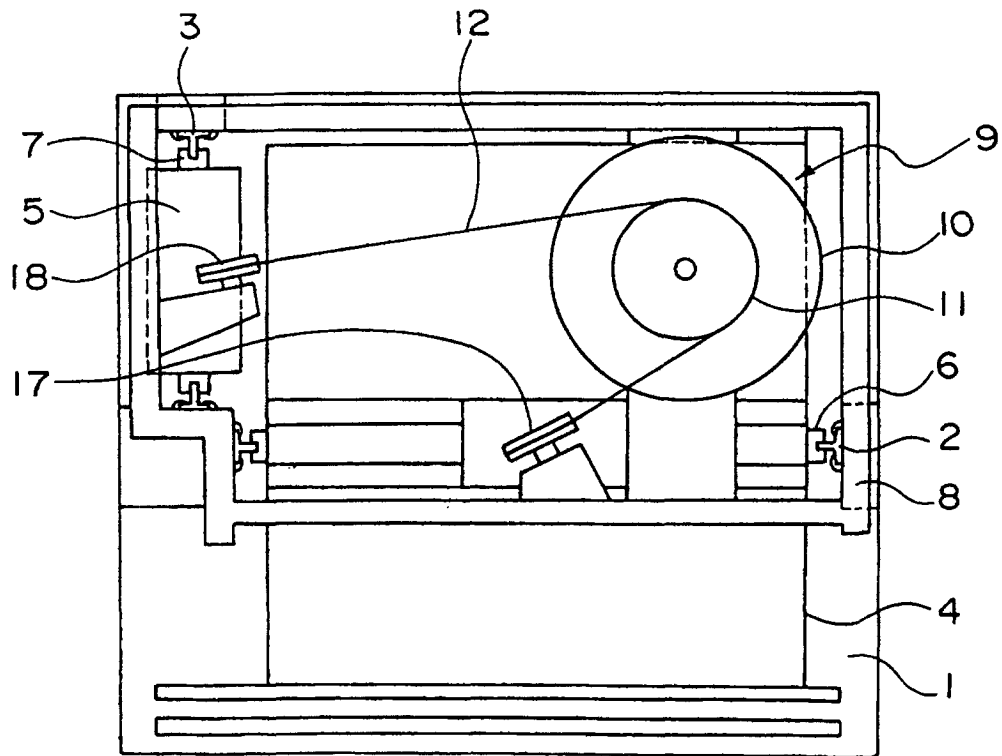


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP00/05585

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl.⁷ B66B 7/00, 11/08

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 B66B 7/00-11/08

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 1996-2000
Kokai Jitsuyo Shinan Koho 1971-2000 Toroku Jitsuyo Shinan Koho 1994-2000

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	JP 10-139321 A (Inventio AG) 26 May, 1998 (26.05.98) & US 6006865 A & CA 2220582 A & EP 0841283 A1	1-6

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"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
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Date of the actual completion of the international search
11 September, 2000 (11.09.00)

Date of mailing of the international search report
19 September, 2000 (19.09.00)

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