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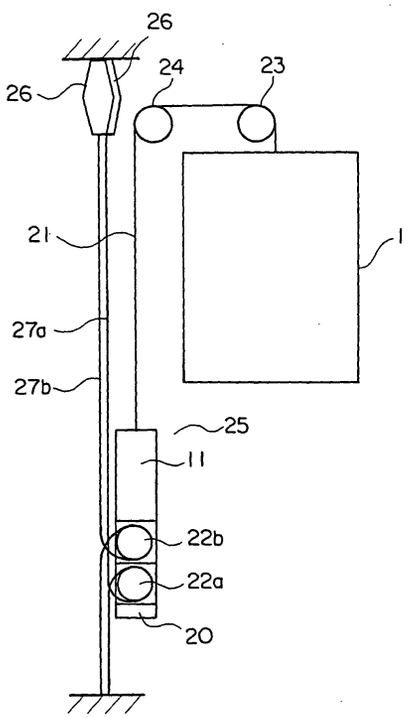
(54) ELEVATOR

(57) An object of the present invention is to provide an elevator not necessarily requiring a hoisting machine specifically for a given set of elevator specification modifications such as capacity, speed, etc., of a car.

The elevator according to the present invention includes: a car ascending and descending inside a hoistway; a counterweight ascending and descending inside the hoistway interdependently with the car; a rope by which the car and the counterweight are suspended inside the hoistway; and a hoisting machine mounted to the counterweight for raising and lowering the car and the counterweight by the rope; wherein: a plurality of the hoisting machines are mounted to the counterweight.

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator in which a hoisting machine for raising and lowering a car and a counterweight is mounted to the counterweight.

BACKGROUND ART

[0002] Figure 3 is a perspective of a conventional elevator shown in International Publication No. WO 00/53520 (Pamphlet).

[0003] The elevator includes: a car 1 ascending and descending inside a hoistway; a counterweight 5 ascending and descending inside the hoistway interdependently with the car 1; a rope 3 by which the car 1 and the counterweight 5 are suspended inside the hoistway; a hoisting machine 10 mounted to the counterweight 5 for raising and lowering the car 1 and the counterweight 5 by the rope 3; and a control apparatus 11 mounted to the counterweight 5 for controlling driving of the hoisting machine 10.

[0004] The car 1 is guided so as to be movable in a vertical direction of the hoistway by means of car rails 7 extending in the vertical direction and guide shoes (not shown) and guide rollers (not shown) disposed on sides of the car 1 near the car rails 7. The counterweight 5 is also similarly guided so as to be movable in a vertical direction of the hoistway by means of guide rails 8 extending in the vertical direction and rollers 9.

[0005] The rope 3 has one end portion fixed to a hoistway ceiling, and is suspended on top portion pulleys 4 by means of a pulley 2 fixed to a bottom surface of the car 1. The rope 3 also suspends an upper portion pulley 6 on the counterweight 5, and an end portion thereof is fixed to the hoistway ceiling.

[0006] In the above elevator, one of the rollers 9 contacting the guide rails 8 is connected to the hoisting machine 10, and the counterweight 5, the hoisting machine 10, and the control apparatus 11 are moved in the vertical direction by rotating the roller 9 by driving the hoisting machine 10, and the car 1 is also moved in an opposite direction together with that movement.

[0007] In an elevator configured as described above, the hoisting machine 10 is mounted to the counterweight 5, and the hoisting machine 10 itself serves part of the function of the counterweight 5, but one problem has been that a special hoisting machine 10 answering to specifications such as capacity, speed, etc., of the car 1 must be mounted to the counterweight 5.

[0008] Because the car 1 and the counterweight 5 are suspended by a single rope 3, another problem has been that it is not possible to select a rope that is optimum for both the car 1 and the counterweight 5.

DISCLOSURE OF INVENTION

[0009] The present invention aims to solve the above problems and an object of the present invention is to provide an elevator not necessarily requiring a hoisting machine specifically for a given set of elevator specification modifications such as capacity, speed, etc., of a car.

[0010] Another object of the present invention is to provide an elevator enabling a rope that is optimum for a car and for a hoisting machine to be selected by providing a separate rope for each.

[0011] In order to achieve the above object, according to one aspect of the present invention, there is provided an elevator including: a car ascending and descending inside a hoistway; a counterweight ascending and descending inside the hoistway interdependently with the car; a rope by which the car and the counterweight are suspended inside the hoistway; and a hoisting machine mounted to the counterweight for raising and lowering the car and the counterweight by the rope, wherein: a plurality of the hoisting machines are mounted to the counterweight.

[0012] According to another aspect of the present invention, there is provided an elevator including: a car ascending and descending inside a hoistway; a counterweight ascending and descending inside the hoistway interdependently with the car; a car rope by which the car and the counterweight are suspended inside the hoistway; and a hoisting machine mounted to the counterweight for raising and lowering the car and the counterweight by moving the car rope, wherein the elevator further includes: a hoisting machine rope having an upper end portion connected directly or indirectly to a ceiling of the hoistway, a lower end portion connected to a floor surface of the hoistway, and an intermediate portion wound onto the hoisting machine.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Figure 1 is a structural diagram of an elevator according to Embodiment 1 of the present invention;
Figure 2 is a partial front elevation of the elevator in Figure 1; and
Figure 3 is a perspective of a conventional elevator.

BEST MODE FOR CARRYING OUT THE INVENTION

[0014] A preferred embodiment of the present invention will now be explained with reference to the drawings, and members and portions identical to or corresponding to those in the conventional configuration will be explained using identical numbering.

Embodiment 1

[0015] Figure 1 is a structural diagram of an elevator according to Embodiment 1 of the present invention.

[0016] This elevator includes: a car 1 ascending and descending inside a hoistway; a counterweight 20 ascending and descending inside the hoistway interdependently with the car 1; two hoisting machines 22a and 22b mounted to the counterweight 20; a control apparatus 11 mounted to the hoisting machines 22a and 22b for controlling driving of the hoisting machines 22a and 22b; a car rope 21 having one end portion connected to the car 1, and another end portion connected to the control apparatus 11 via a suspension sheave 23 and a return sheave 24; and hoisting machine ropes 27a and 27b each having an upper end portion connected to a ceiling of the hoistway by means of a tension controller 26, a lower end portion connected to a floor surface of the hoistway, and an intermediate portion wound onto a respective hoisting machine 22a or 22b.

[0017] The hoisting machines 22a and 22b have identical specifications. Furthermore, the counterweight 20, the hoisting machines 22a and 22b, and the control apparatus 11 are already integrated before installation in the elevator, in other words, before shipping from a factory, and constitute a counterweight main body 25.

[0018] The hoisting machines 22a and 22b fit inside an external shape of the counterweight 22 when viewed along an extended line of the hoistway.

[0019] The hoisting machine ropes 27a and 27b are ropes made of a resin, or ropes coated with a resin, are flexible, and can be wound 360 degrees around the hoisting machines 22a and 22b, and constant tension is always provided in the hoisting machine ropes 27a and 27b by the tension controllers 26, even against age-related stretching, vibration, etc.

[0020] In the above elevator, when the hoisting machines 22a and 22b are driven simultaneously in a counterclockwise direction in Figure 1, for example, the counterweight main body 25 including the hoisting machines 22a and 22b onto which the hoisting machine ropes 27a and 27b are wound ascends, and the car 1 descends interdependently with the counterweight main body 25.

[0021] When the hoisting machines 22a and 22b are rotated in a clockwise direction in Figure 1, the counterweight main body 25 including the hoisting machines 22a and 22b onto which the hoisting machine ropes 27a and 27b are wound descends, and the car 1 ascends interdependently with the counterweight main body 25.

[0022] In an elevator configured as described above, two identical hoisting machines 22a and 22b are mounted to the counterweight 20, and capacity and speed of the car 1 are handled by the two hoisting machines 22a and 22b being driven simultaneously rather than by a hoisting machine having special specifications. By adopting a configuration of this kind, it is not necessary to prepare a hoisting machine having special specifications for the capacity and speed of the car.

[0023] Because the hoisting machines 22a and 22b are identical to each other (in shape, dimensions, and output), installation work and parts management are simplified, and maintenance is also facilitated.

[0024] The hoisting machine ropes 27a and 27b and the car rope 21 are separate, enabling ropes that are optimum for their respective operating conditions to be selected, and the loads on the ropes 27a and 27b and the car rope 21 are reduced proportionately, enabling extended service life, and also there is no need to replace all of the ropes together, making it sufficient that only ropes requiring replacement be replaced.

[0025] Because tension controllers 26 for disposing the hoisting machine ropes 27a and 27b under tension are fixed to the ceiling, and tension in the hoisting machine ropes 27a and 27b is adjusted by these tension controllers 26 so as to be always constant, the hoisting machine ropes 27a and 27b are prevented from dislodging from the hoisting machines 22a and 22b in an axial direction during driving of the hoisting machines 22a and 22b, etc., reliably transmitting driving force from the hoisting machines 22a and 22b as hoisting force to the counterweight main body 25 and the car 1.

[0026] Because the hoisting machine ropes 27a and 27b are flexible ropes, the hoisting machine ropes 27a and 27b can be simply wound around the hoisting machines 22a and 22b, which have a small radius of curvature.

[0027] Because the hoisting machines 22a and 22b have external dimensions that fit inside the external shape of the counterweight 20 when viewed along an extended line of the hoistway, it is not necessary to increase horizontal surface area for the hoisting machines 22a and 22b.

[0028] Because the counterweight 20, the hoisting machines 22a and 22b, and the control apparatus 11 are already integrated before installation, on-site installation time for the counterweight 20, the hoisting machines 22a and 22b, and the control apparatus 11 is shortened. Moreover, the counterweight 20 and the hoisting machines 22a and 22b may also be integrated in advance before installation, and the hoisting machines 22a and 22b and the control apparatus 11 may also be integrated.

[0029] Moreover, in the above embodiment, an elevator was explained in which two hoisting machines 22a and 22b are mounted to the counterweight 20, and a car rope 21 and hoisting machine ropes 27a and 27b are provided, but a plurality of hoisting machines may also be mounted to a counterweight in an elevator in which a car and the counterweight are suspended by a single rope.

[0030] A car may also be suspended by a car rope, and a hoisting machine suspended by a hoisting machine rope, in an elevator in which one hoisting machine is mounted to a counterweight.

[0031] There may also be three or more hoisting machines.

[0032] End portions of the hoisting machine ropes may also be fixed directly onto the hoistway ceiling.

[0033] In the above embodiment, the control apparatus 11 is mounted to the counterweight 20, but the present invention can of course be applied to an elevator in which the control apparatus 11 is not mounted to a counterweight.

INDUSTRIAL APPLICABILITY

[0034] As explained above, the present invention is useful in an elevator in which a hoisting machine is mounted to a counterweight due to the fact that it is not necessary to provide a hoisting machine having special specifications.

Claims

1. An elevator comprising:

a car (1) ascending and descending inside a hoistway;
a counterweight (20) ascending and descending inside said hoistway interdependently with said car (1);
a rope (21) by which said car (1) and said counterweight (20) are suspended inside said hoistway; and
a hoisting machine (22a, 22b) mounted to said counterweight (20) for raising and lowering said car (1) and said counterweight (20) by said rope (21),

wherein:

a plurality of said hoisting machines (22a, 22b) are mounted to said counterweight (20).

2. An elevator comprising:

a car (1) ascending and descending inside a hoistway;
a counterweight (20) ascending and descending inside said hoistway interdependently with said car (1);
a car rope (21) by which said car (1) and said counterweight (20) are suspended inside said hoistway; and
a hoisting machine (22a, 22b) mounted to said counterweight (20) for raising and lowering said car (1) and said counterweight (20) by moving said car rope (21),

wherein said elevator further comprises:

a hoisting machine rope (27a, 27b) having an upper end portion connected directly or indirectly to a ceiling of said hoistway, a lower end portion connected to a floor surface of said hoistway, and an intermediate portion wound onto said hoisting machine (22a, 22b).

3. The elevator according to either of Claims 1 or 2, wherein:

a control apparatus (11) for controlling driving of said hoisting machine (22a, 22b) is mounted to said counterweight (20).

4. The elevator according to either of Claims 2 or 3, wherein:

a plurality of said hoisting machines (22a, 22b) are mounted to said counterweight (20).

5. The elevator according to either of Claims 1 or 4, wherein:

a plurality of said hoisting machines (22a, 22b) are identical to each other.

6. The elevator according to any of Claims 2 to 5, wherein:

a tension controller (26) for disposing said hoisting machine rope (27a, 27b) under tension is fixed to said ceiling, said upper end portion of said hoisting machine rope (27a, 27b) being connected to said tension controller (26).

7. The elevator according to any of Claims 2 to 6, wherein:

said hoisting machine rope (27a, 27b) is a flexible rope.

8. The elevator according to any of Claims 1 to 7, wherein:

said hoisting machine (22a, 22b) fits within an external shape of said counterweight (20) when viewed along an extended line of said hoistway.

9. The elevator according to any of Claims 3 to 9, wherein:

at least two of said counterweight (20), said hoisting machine (22a, 22b), and said control apparatus (11) are previously integrated before installation.

FIG. 1

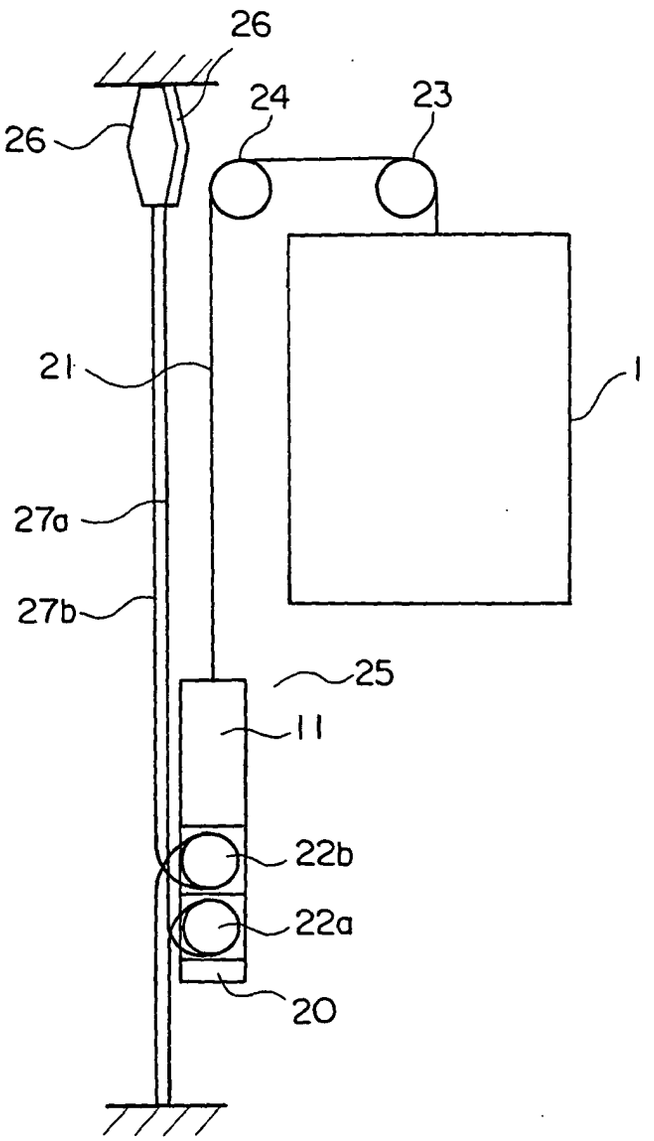


FIG. 2

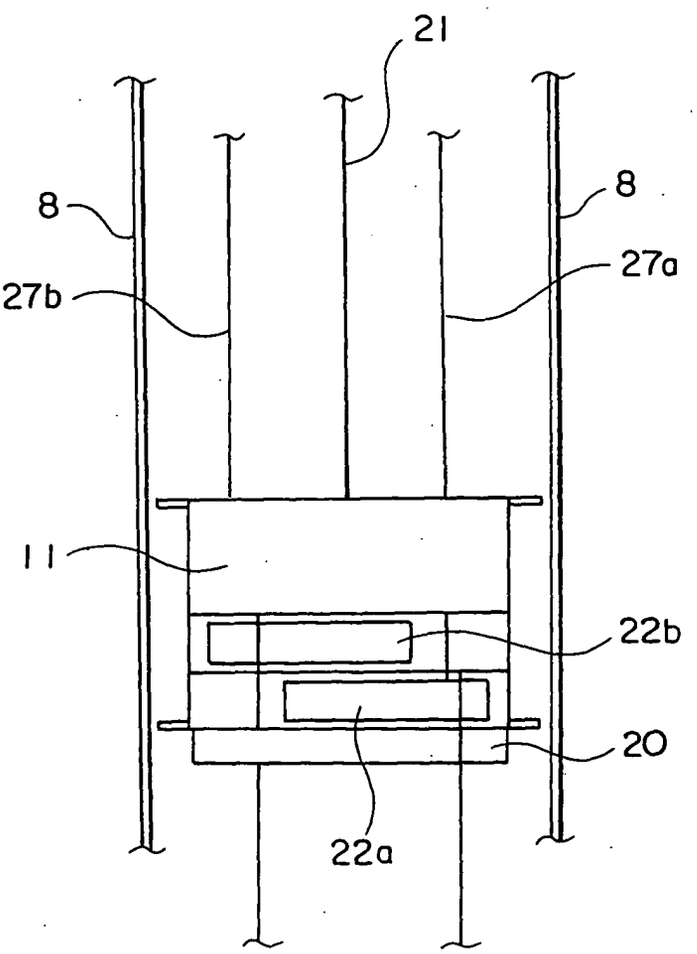
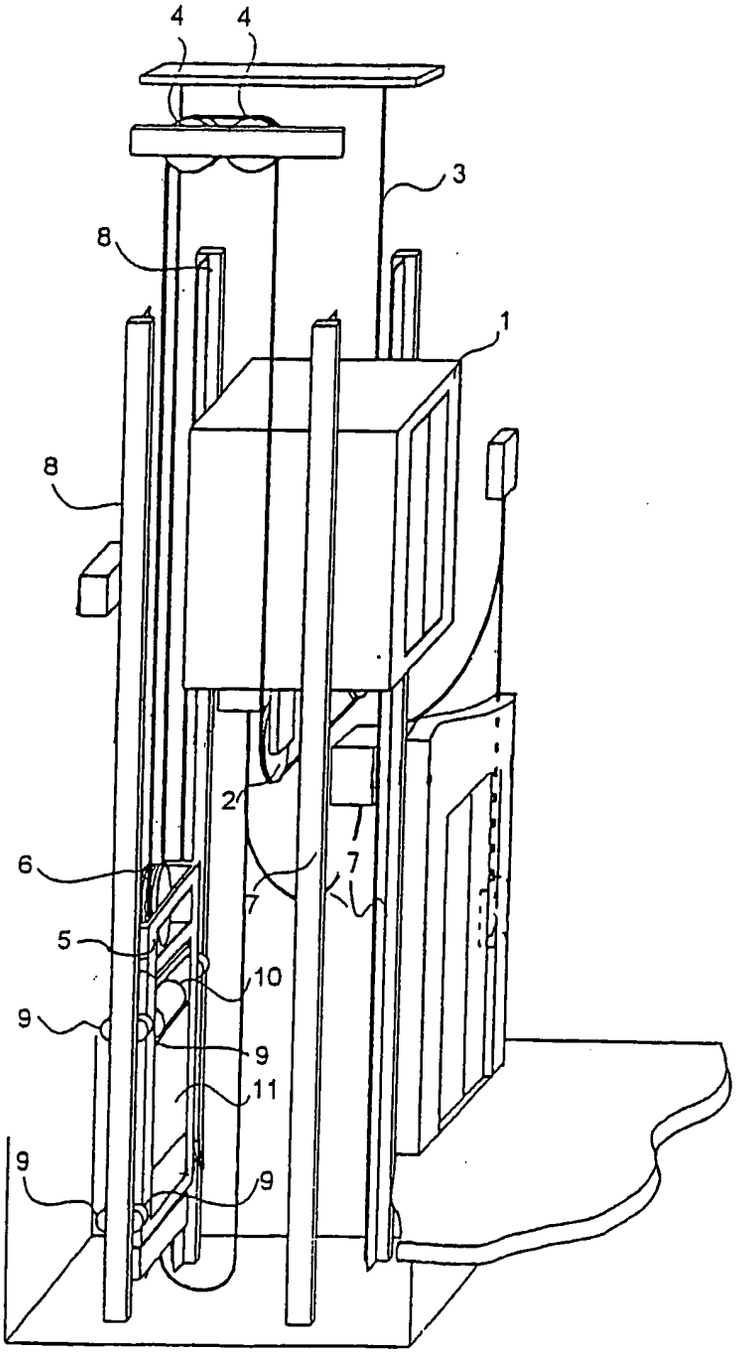


FIG. 3



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/01801

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B11/00, B66B7/06

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-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	1996-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Toroku Jitsuyo Shinan Koho	1994-2003

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 2000-255932 A (Toshiba Corp.), 19 September, 2000 (19.09.00), (Family: none)	1
X Y	JP 6-9178 A (Werner Hagel), 18 January, 1994 (18.01.94), & EP 0565516 A1 & AT 397379 B	2,4-5 3,6-9
Y	JP 2002-173281 A (Toshiba Elevator and Building Systems Corp.), 21 June, 2002 (21.06.02), (Family: none)	3,8-9
Y	EP 0731052 A1 (DOVER EUROPE AUFZÜGE GMBH.), 11 September, 1996 (11.09.96), Fig. 3 & DE 19507628 A & CA 2170813 A	6

☒ 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 07 November, 2003 (07.11.03)	Date of mailing of the international search report 25 November, 2003 (25.11.03)
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/JP03/01801

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 02/094701 A1 (Mitsubishi Electric Corp.), 28 November, 2002 (28.11.02), Description, page 8, lines 18 to 21 (Family: none)	7

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