

(19)



(11)

EP 1 595 840 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
14.08.2013 Bulletin 2013/33

(51) Int Cl.: **B66B 11/00** (2006.01) **B66B 7/06** (2006.01)

(21) Application number: **03815967.9**

(86) International application number:
PCT/JP2003/001801

(22) Date of filing: **19.02.2003**

(87) International publication number:
WO 2004/074157 (02.09.2004 Gazette 2004/36)

(54) **ELEVATOR**

AUFZUG

ASCENSEUR

(84) Designated Contracting States:
DE

• **YASUE, Masanori,**
Mitsubishi Denki Kabushiki Kaisha
Tokyo 100-8310 (JP)

(43) Date of publication of application:
16.11.2005 Bulletin 2005/46

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

(60) Divisional application:
11171675.9 / 2 390 221

(73) Proprietor: **MITSUBISHI DENKI KABUSHIKI KAISHA**
Chiyoda-ku
Tokyo 100-8310 (JP)

(56) References cited:
EP-A1- 0 731 052 **WO-A1-99/43592**
WO-A1-02/094701 **JP-A- 6 009 178**
JP-A- 2000 255 932 **JP-A- 2002 173 281**
US-A- 6 085 874

(72) Inventors:
• **MORI, Akinobu,**
Mitsubishi Denki Kabushiki Kaisha
Tokyo 100-8310 (JP)

EP 1 595 840 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

DescriptionTECHNICAL 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.

[0009] WO99/43592 discloses features falling under the preamble of Claim 1. US 6,085,874 is further prior art.

DISCLOSURE OF INVENTION

[0010] 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.

[0011] 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.

[0012] In order to achieve the above object, according to one aspect of the present invention, there is provided an elevator having the features of Claim 1.

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 fac-

tory, 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) arranged to ascend and descend inside a hoistway;
- a counterweight (20) arranged to ascend and descend 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 plurality of hoisting machines (22a, 22b) mounted to said counterweight (20) for raising and lowering said car (1) and said counterweight (20) suspended by said rope (21),
 wherein
 a respective hoisting machine rope (27a, 27b) is wound onto each hoisting machine (22a, 22b), said respective hoisting machine rope 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 hoisting, and an intermediate portion wound onto said hoisting machine.
2. The elevator according to Claim 1, wherein:
 a control apparatus (11) for controlling driving of said hoisting machine (22a, 22b) is mounted to said counterweight (20) .
3. The elevator according to either of Claims 1 and 2, wherein:
 all of said plurality of hoisting machines (22a, 22b) are identical to each other.
4. The elevator according to any of Claims 1 to 3, wherein:
 tension controllers (26) for disposing each hoisting machine rope (27a, 27b) under tension are fixed to said ceiling, upper end portions of said hoisting machine ropes (27a, 27b) being connected to said tension controllers (26).
5. The elevator according to any of Claims 1 to 4, wherein:
 said hoisting machine ropes (27a, 27b) are flexible ropes.
6. The elevator according to any of Claims 1 to 5, wherein:
 said hoisting machines (22a, 22b) fit within an external shape of said counterweight (20) when viewed along an extended line of said hoistway.
7. The elevator according to any of Claims 3 to 6, as comprising the features of Claim 3, wherein:
 at least two of said counterweight (20), said hoisting machine (22a, 22b), and said control apparatus (11) are previously integrated before installation.

Patentansprüche

1. Aufzug mit:

- einer Kabine (1), die angeordnet ist, um innerhalb eines Aufzugsschachtes aufzufahren und abzufahren;
 einem Gegengewicht (20), das angeordnet ist, um in Abhängigkeit von der Kabine (1) innerhalb des Aufzugsschachtes aufzufahren und abzufahren;
 einem Kabinenseil (21) durch das die Kabine (1) und das Gegengewicht (20) innerhalb des Aufzugsschachtes aufgehängt sind; und
 mehrere Hebezeuge (22a, 22b), die an dem Gegengewicht (20) angebracht sind, um die Kabine (1) und das Gegengewicht (20) die durch das Seil (21) aufgehängt sind, anzuheben und abzusenken, wobei
 ein entsprechendes Hebezeugseil (27a, 27b) auf jedes Hebezeug (22a, 22b) gewickelt ist, wobei
 das entsprechende Hebezeugseil (27a, 27b) einen oberen Endabschnitt, der direkt oder indirekt mit einer Decke des Aufzugsschachtes verbunden ist, einen unteren Endabschnitt, der mit einer Bodenfläche des Aufzugsschachtes verbunden ist und einen Mittelabschnitt, der auf das Hebezeug gewickelt ist, aufweist.
2. Aufzug gemäß Anspruch 1, bei dem eine Steuervorrichtung (11) zum Steuern des Antriebs des Hebezeugs (22a, 22b) an dem Gegengewicht (20) angebracht ist.
3. Aufzug gemäß einem der Ansprüche 1 und 2, bei dem alle der mehreren Hebezeuge (22a, 22b) identisch zueinander sind.
4. Aufzug gemäß einem der Ansprüche 1 bis 3, bei dem Spannungssteuerungen (26), um jedes Hebezeugseil (27a, 27b) zu spannen, an der Decke befestigt sind, wobei obere Endabschnitte der Hebezeugseile (27a, 27b) mit den Spannungssteuerungen (26) verbunden sind.
5. Aufzug gemäß einem der Ansprüche 1 bis 4, bei dem die Hebezeugseile (27a, 27b) flexible Seile sind.
6. Aufzug gemäß einem der Ansprüche 1 bis 5, bei dem die Hebezeuge (22a, 22b), betrachtet entlang einer ausgedehnten Linie des Aufzugsschachtes, in eine Außenform des Gegengewichts (20) passen.
7. Aufzug gemäß einem der Ansprüche 3 bis 6 mit den Merkmalen des Anspruchs 3, bei dem zumindest zwei aus dem Gegengewicht (20), dem Hebezeug (22a, 22b) und der Steuervorrichtung (11) vor der

Installation integriert werden.

lesdits câbles de machine de levage (27a, 27b) sont des câbles souples.

Revendications

1. Ascenseur comprenant :

une cabine (1) agencée pour monter et descendre à l'intérieur d'une cage d'ascenseur ;
 un contrepoids (20) agencé pour monter et descendre à l'intérieur de ladite cage d'ascenseur de façon interdépendante avec ladite cabine (1) ;
 un câble de cabine (21) par lequel ladite cabine (1) et ledit contrepoids (20) sont suspendus à l'intérieur de ladite cage d'ascenseur ; et
 une pluralité de machines de levage (22a, 22b) montées sur ledit contrepoids (20) pour élever et abaisser ladite cabine (1) et ledit contrepoids (20) suspendus par ledit câble (21),
 dans lequel
 un câble de machine de levage respectif (27a, 27b) est enroulé sur chaque machine de levage (22a, 22b),
 ledit câble de machine de levage respectif ayant
 une partie d'extrémité supérieure reliée directement ou indirectement à un plafond de ladite cage d'ascenseur, une partie d'extrémité inférieure reliée à une surface de plancher de ladite cage d'ascenseur et une partie intermédiaire enroulée sur ladite machine de levage.

2. Ascenseur selon la revendication 1, dans lequel :

un appareil de commande (11) pour commander le pilotage de ladite machine de levage (22a, 22b) est monté sur ledit contrepoids (20).

3. Ascenseur selon l'une quelconque des revendications 1 et 2, dans lequel :

toutes les machines de ladite pluralité de machines de levage (22a, 22b) sont identiques les unes aux autres.

4. Ascenseur selon l'une quelconque des revendications 1 à 3, dans lequel :

des unités de commande de tension (26) pour mettre chaque câble de machine de levage (27a, 27b) sous tension sont fixées audit plafond, des parties d'extrémité supérieure desdits câbles de machine de levage (27a, 27b) étant reliées auxdites unités de commande de tension (26).

5. Ascenseur selon l'une quelconque des revendications 1 à 4, dans lequel :

6. Ascenseur selon l'une quelconque des revendications 1 à 5, dans lequel :

lesdites machines de levage (22a, 22b) s'ajustent dans une forme externe dudit contrepoids (20) lorsque l'on regarde le long d'une ligne prolongée de ladite cage d'ascenseur.

7. Ascenseur selon l'une quelconque des revendications 3 à 6, caractérisé en ce qu'il comprend les particularités de la revendication 3, dans lequel :

au moins deux desdits contrepoids (20), ladite machine de levage (22a, 22b), et ledit appareil de commande (11) ont été intégrés à l'avance avant installation.

FIG. 1

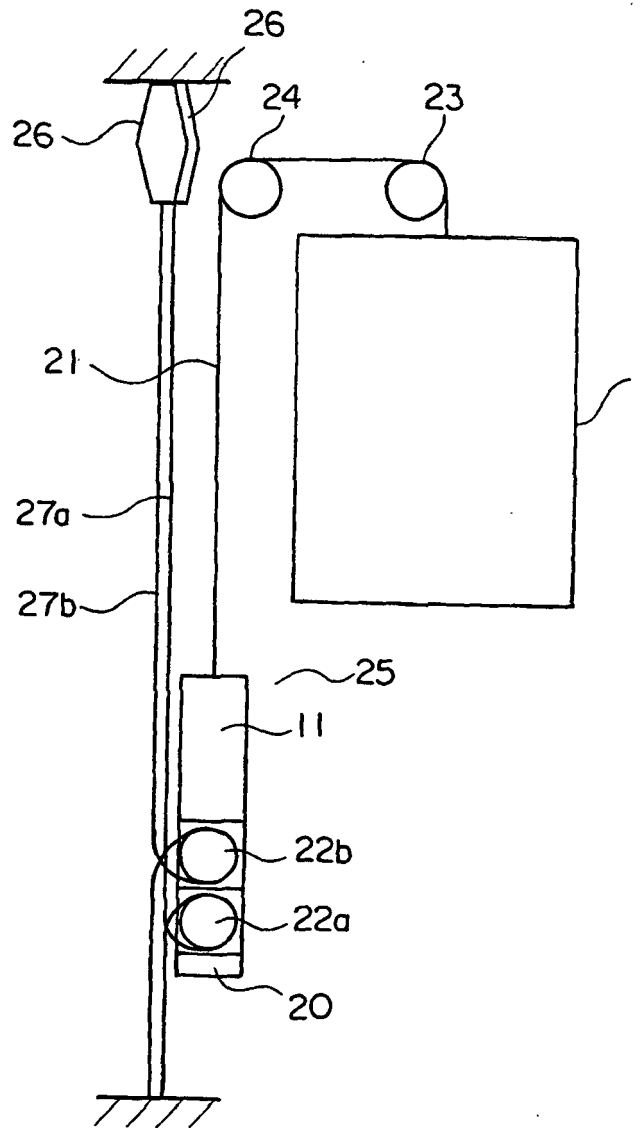


FIG. 2

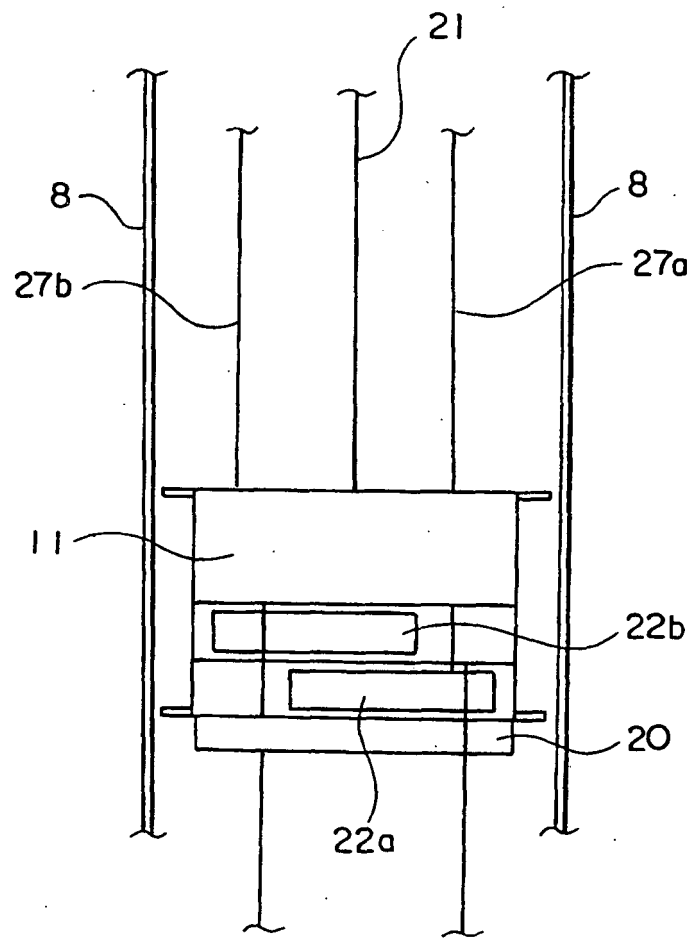
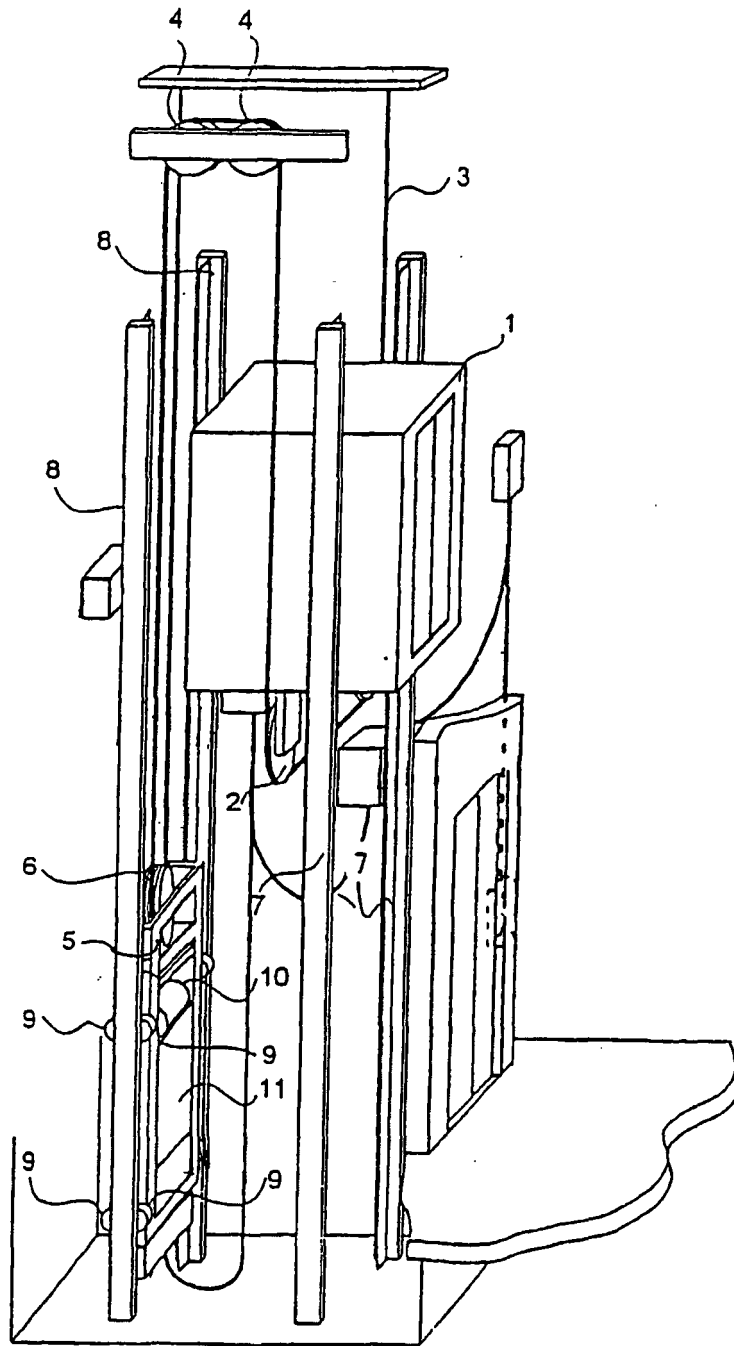


FIG. 3



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 0053520 A [0002]
- WO 9943592 A [0009]
- US 6085874 A [0009]