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

(11) **EP 1 396 456 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
09.01.2008 Bulletin 2008/02

(21) Application number: **01932256.9**

(22) Date of filing: **24.05.2001**

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

(86) International application number:
PCT/JP2001/004374

(87) International publication number:
WO 2002/094701 (28.11.2002 Gazette 2002/48)

(54) **ELEVATOR APPARATUS**

AUFZUGSVORRICHTUNG

APPAREIL DE LEVAGE

(84) Designated Contracting States:
DE FI FR GB NL

(43) Date of publication of application:
10.03.2004 Bulletin 2004/11

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

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

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

(56) References cited:
EP-A- 0 731 052
EP-A1- 0 731 052
JP-A- 9 124 259
US-A1- 2004 035 645
EP-A- 1 031 528
WO-A-97/11020
JP-A- 2000 063 057

EP 1 396 456 B1

Printed by Jouve, 75001 PARIS (FR)

Description

Technical Field

[0001] This Invention relates to an elevator device having a main rope suspending a car and a counterweight and a drive rope for transmitting the drive force of a driving machine to the counterweight to cause the car and the counterweight to ascend and descend.

Background Art

[0002] EP-A-1 031 528 discloses an elevator system comprising a car, which travels vertically a predetermined path within a shaft, a counterweight having two counterweight pulleys, which are rotatively mounted on the counterweight, and a plurality of pulleys, which are rotatively mounted on the roof of the shaft. The elevator system further comprises a main cable, both ends of which are connected to the upper end of the shaft by means of anchors, and a hoisting machine, which is disposed on the exterior side surface of the car. The hoisting machine comprises a rotor, and a sheave is formed on the rotor. When the hoisting machine is energized, the sheave is rotated to thereby move the car and the counterweight in opposite directions by way of the main cable.

[0003] Fig. 12 is a diagram schematically showing the construction of a conventional elevator device similar, for example, to the one disclosed in EP 0 731 052 A1. In the drawing, in the upper portion of a hoistway 1, there are arranged first and second rotatable car suspension sheaves 2 and 3. A main rope 4 is wrapped around the first and second car suspension sheaves 2 and 3. A car 5 and a counterweight 6 are suspended in the hoistway 1 by the main rope 4. A 1:1 roping is adopted as the rope arrangement for the main rope 4.

[0004] Mounted on top of the counterweight 6 is an upper counterweight sheave 7 which is rotatable. Mounted underneath the counterweight 6 is a lower counterweight sheave 8 which is rotatable. Arranged in the upper portion of the hoistway 1 is an upper hoistway sheave 9 that is rotatable. Arranged in the lower portion of the hoistway 1 is a lower hoistway sheave 10 that is rotatable.

[0005] A drive rope 11 is wrapped around the upper counterweight sheave 7, the upper hoistway sheave 9, the lower hoistway sheave 10, and the lower counterweight sheave 8. one end portion (the upper end portion) of the drive rope 11 is connected to the top portion of the hoistway 1. Suspended from the other end portion (the lower end portion) of the drive rope 11 is a tension weight 12 for imparting tension to the drive rope 11. A 2:1 roping is adopted as the rope arrangement for the drive rope 11.

[0006] Further, connected to the lower hoistway sheave 10 is a driving machine (not shown) for causing the counterweight 6 to ascend and descend through the drive rope 11.

[0007] In this elevator device, the lower hoistway sheave 10 is rotated by the driving machine, whereby the counterweight 6 is caused to ascend and descend through the drive rope 11. Due to this arrangement, the car 5 connected to the counterweight 6 through the main rope 4 ascends and descends in the hoistway 1 along a guide rail (not shown).

[0008] In the conventional elevator device constructed as described above, the upper counterweight sheave 7 is arranged on top of the counterweight 6, and the lower counterweight sheave 8 is arranged underneath the counterweight 6, so that the dimension of the counterweight 6 in the height direction becomes large, with the result that the dimension of the hoistway 1 in the height direction is increased. This problem becomes conspicuous, in particular, when an emergency stop device is mounted an the counterweight 6.

Disclosure of the Invention

[0009] This invention has been made with a view toward solving the above problem in the prior art. Therefore it is an object of this invention to provide an elevator device capable of restraining an increase in the dimension of the counterweight in the height direction and of effectively utilizing the space inside the building.

[0010] To this end, according to one aspect of the present invention, there is provided an elevator device comprising: a hoistway; a rotatable car suspension sheave arranged in the upper portion of the hoistway; a main rope wrapped around the car suspension sheave; a car and a counterweight suspended in the hoistway by the main rope; a plurality of rotatable counterweight sheaves mounted on the counterweight; a plurality of rotatable hoistway sheaves arranged in the upper portion and the lower portion of the hoistway; a drive rope wrapped around the counterweight sheaves and the hoistway sheaves; and a driving machine which causes the counterweight to ascend and descend through the drive rope by rotating at least one of the counterweight sheaves and the hoistway sheaves, wherein all the counterweight sheaves are arranged on one of the upper portion and the lower portion of the counterweight, and the drive rope is arranged in an N:1 roping (N is a natural number not less than 2), and wherein the number of counterweight sheaves is N when N is an even number, and N-1 when N is an odd number.

Brief Description of the Drawings

[0011]

Fig. 1 is a schematic diagram showing the construction of an elevator device according to Embodiment 1 of this invention;

Fig. 2 is an explanatory diagram illustrating the rope arrangement of a drive rope of Fig. 1;

Fig. 3 is a development of Fig. 2;

Fig. 4 is a side view showing an example of a specific layout of the elevator device of Fig. 1;

Fig. 5 is a plan view showing the elevator device of Fig. 4;
Fig. 6 is a side view showing the positional relationship between a counterweight sheave and a hoistway sheave of Fig. 4;
Fig. 7 is a plan view showing an elevator device according to Embodiment 2 of this invention;
Fig. 8 is an explanatory diagram illustrating the rope arrangement of the drive rope of an elevator device according to Embodiment 3 of this invention;
Fig. 9 is a development of Fig. 8;
Fig. 10 is an explanatory diagram illustrating the rope arrangement of the drive rope of an elevator device according to Embodiment 4 of this invention;
Fig. 11 is a development of Fig. 10; and
Fig. 12 is a schematic diagram showing the construction of an example of a conventional elevator device.

Best Mode for carrying out the Invention

[0012] Preferred embodiments of this invention will now be described with reference to the drawings.

Embodiment 1

[0013] Fig. 1 is a schematic diagram showing the construction of an elevator device according to Embodiment 1 of this invention. In the drawing, first and second rotatable car suspension sheaves are arranged in the upper portion of a hoistway 1. A main rope 4 is wrapped around the first and second car suspension sheaves 2 and 3. A car 5 and a counterweight 6 are suspended in the hoistway 1 by the main rope 4. A 1:1 roping is adopted as the rope arrangement for the main rope 4.

[0014] First through fourth counterweight sheaves 21 through 24 are mounted above the counterweight 6. The first through fourth counterweight sheaves 21 through 24 are arranged coaxially and are independently rotatable.

[0015] In the upper portion of the hoistway 1, there are arranged first and second upper hoistway sheaves 25 and 26. The first and second upper hoistway sheaves 25 and 26 are arranged coaxially and are independently rotatable.

[0016] In the lower portion of the hoistway 1, there are arranged first and second lower hoistway sheaves 27 and 28. The first and second lower hoistway sheaves 27 and 28 are arranged coaxially and are independently rotatable.

[0017] A drive rope 29 is wrapped around the first through fourth counterweight sheaves 21 through 24, the first and second upper hoistway sheaves 25 and 26, and the first and second lower hoistway sheaves 27 and 28. One end portion (the upper end portion) of the drive rope 29 is connected to the top portion of the hoistway 1. From the other end portion (the lower end portion) of the drive rope 29, there is suspended a tension weight 30 for imparting tension to the drive rope 29. A 4:1 roping is adopted as the rope arrangement for the drive rope 29.

[0018] Connected to the first upper hoistway sheave 25 is the rotation shaft of a driving machine 31 for causing the counterweight 6 to ascend and descend through the drive rope 29. That is, the first upper hoistway sheave 25 also serves as the drive sheave of the driving machine 31. Further, the first car suspension sheave 2 is provided with a brake device 32.

[0019] Next, Fig. 2 is an explanatory diagram illustrating the rope arrangement of the drive rope 29 of Fig. 1, and Fig. 3 is a development of Fig. 2. Starting from one end portion thereof, the drive rope 29 is wrapped around the sheaves in the following order: the first counterweight sheave 21, the first upper hoistway sheave 25, the second counterweight sheave 22, the second upper hoistway sheave 26, the first lower hoistway sheave 27, the third counterweight sheave 23, the second lower hoistway sheave 28, and the fourth counterweight sheave 24.

[0020] Next, Fig. 4 is a side view showing an example of a specific layout of the elevator device of Fig. 1, Fig. 5 is a plan view showing the elevator device of Fig. 4, and Fig. 4 is a side view as seen from the direction of an arrow V of Fig. 5. Fig. 6 is a side view showing the positional relationship of the counterweight sheaves 21 through 24 and the hoistway sheaves 25 through 28.

[0021] As shown in Fig. 5, the counterweight sheaves 21 through 24 and the hoistway sheaves 25 through 28 are arranged such that, in plan view, their rotation centers cross the center line 6c of the counterweight 6 obliquely. Further, in order to lessen the overlap of the car 5 and the driving machine 31 in plan view, a thin type hoist having a small axial dimension is used as the driving machine 31.

[0022] Further, all the counterweight sheaves 21 through 24 and all the hoistway sheaves 25 through 28 are arranged such that their rotation shafts are superimposed one upon the other in plan view. That is, the upper hoistway sheaves 25 and 26 are arranged directly above the counterweight sheaves 21 through 24, and the lower hoistway sheaves 27 and 28 are arranged directly below the counterweight sheaves 21 through 24.

[0023] In Fig. 5, there are provided in the hoistway 1 car guide rails 33 for guiding the ascent/descent of the car 5 and a counterweight guide rail 34 for guiding the ascent/descent of the counterweight 6. The guide rails 33 and 34 are fixed in the hoistway 1 by a plurality of rail brackets 35.

[0024] Further, at each hoistway floor, there is provided a hoistway door 36. The car 5 is provided with a car door 37 opposed to the hoistway door 36.

[0025] In this elevator device, all the counterweight sheaves 21 through 24 are arranged above the counterweight 6, so that it is possible to restrain an increase in the dimension of the counterweight 6 in the height direction, making it possible to diminish the height dimension of the hoistway 1, whereby it is possible to effectively utilize the space in the building.

[0026] Further, since the first through fourth counterweight sheaves 21 through 24 are arranged coaxially, it

is possible to simplify the construction and reduce the number of parts.

[0027] Further, since the first and second upper hoistway sheaves 25 and 26 are arranged coaxially, and the first and second lower hoistway sheaves 27 and 28 are arranged coaxially, it is possible to further simplify the construction and reduce the number of parts.

[0028] Furthermore, since all the counterweight sheaves 21 through 24 and all the hoistway sheaves 25 through 28 are arranged such that, in plan view, their rotation shafts are superimposed one upon the other, it is possible to effectively utilize the space in the hoistway 1.

[0029] Further, since the first car suspension sheave 2 is provided with the brake device 32, if the drive rope 29 should break, it is possible to prevent the car 5 from falling. Thus, it is possible to provide only one drive rope 29.

Embodiment 2

[0030] Next, Fig. 7 is a plan view of an elevator device according to Embodiment 2 of this invention. In the drawing, the counterweight sheaves 21 through 24 and the hoistway sheaves 25 through 28 are arranged such that, in plan view, their rotation shafts extend parallel to the center line 6c of the counterweight 6. Further, a vertical type hoist having a large axial dimension is used as a driving machine 38. otherwise, this embodiment is of the same construction as Embodiment 1.

[0031] In this elevator device also, it is possible to make the drive side layout compact and to effectively utilize the space in the building.

Embodiment 3

[0032] Next, Fig. 8 is an explanatory diagram illustrating the rope arrangement of the drive rope of an elevator device according to Embodiment 3 of this invention, and Fig. 9 is a development of Fig. 8. In Embodiment 3, a 2:1 roping is adopted as the rope arrangement for the drive rope.

[0033] In the drawings, first and second counterweight sheaves 41 and 42 are mounted on top of the counterweight 6. The first and second counterweight sheaves 41 and 42 are arranged coaxially and are independently rotatable. In the upper portion of the hoistway 1, there is arranged a rotatable upper hoistway sheave 43. In the lower portion of the hoistway 1, there is arranged a rotatable lower hoistway sheave 44.

[0034] The drive rope 29 is wrapped around the first and second counterweight sheaves 41 and 42, the upper hoistway sheave 43, and the lower hoistway sheave 44. One end portion (the upper end portion) of the drive rope 29 is connected to the top portion of the hoistway 1. A tension weight 30 imparting tension to the drive rope 29 is suspended from the other end portion (the lower end portion) of the drive rope 29.

[0035] Starting from one end portion thereof, the drive rope 29 is successively wrapped in the following order: the first counterweight sheave 41, the upper hoistway sheave 43, the lower hoistway sheave 44, and the second counterweight sheave 42.

[0036] In this way, also in the case in which the drive rope 29 is arranged in a 2:1 roping, it is possible to restrain an increase in the height dimension of the counterweight 6 and diminish the height dimension of the hoistway 1 by arranging the first and second counterweight sheaves 41 and 42 on top of the counterweight 6. Further, by arranging the first and second counterweight sheaves 41 and 42 coaxially, it is possible to simplify the construction and reduce the number of parts.

[0037] Here, when the upper hoistway sheave 43, which also functions as the drive sheave, is rotated in the direction of the arrow in the drawing, the first and second counterweight sheaves 41 and 42 are rotated in the same direction as each other. However, the rotating speeds of the first and second counterweight sheaves 41 and 42 may slightly differ according to the expansion of the drive rope 29. When a gravitational force Wg is applied to the tension weight 30, and the drive sheave generates a torque T, the tension applied to the first counterweight sheave 41 is Wg + T, and the tension applied to the second counterweight sheave 42 is Wg - T.

[0038] In this way, it can happen that while the first and second counterweight sheaves 41 and 42 rotate in the same direction, the rotating speeds of the first and second counterweight sheaves 41 and 42 slightly differ. Further, the tensions applied to the first and second counterweight sheaves 41 and 42 also differ. Thus, independently of the rope arrangement, it is necessary to form the first and second counterweight sheaves 41 and 42 as separate components.

Embodiment 4

[0039] Next, Fig. 10 is an explanatory diagram illustrating the rope arrangement of the drive rope of an elevator device according to Embodiment 4 of this invention, and Fig. 11 is a development of Fig. 10. This Embodiment 4 adopts a 3:1 roping as the rope arrangement for the drive rope.

[0040] In the drawings, first and second counterweight sheaves 51 and 52 are mounted on top of the counterweight 6. The first and second counterweight sheaves 51 and 52 are arranged coaxially, and are independently rotatable.

[0041] In the upper portion of the hoistway 1, there are arranged first and second upper hoistway sheaves 53 and 54. The first and second upper hoistway sheaves 53 and 54 are arranged coaxially, and are independently rotatable.

[0042] In the lower portion of the hoistway 1, there are arranged first and second lower hoistway sheaves 55 and 56. The first and second lower hoistway sheaves 55 and 56 are arranged coaxially, and are independently

rotatable.

[0043] The drive rope 29 is wrapped around the first and second counterweight sheaves 51 and 52, the first and second upper hoistway sheaves 53 and 54, and the first and second lower hoistway sheaves 55 and 56. Both end portions of the drive rope 29 are connected to the counterweight 6. A tension weight 30 imparting tension to the drive rope 29 is suspended from the first and second lower hoistway sheaves 55 and 56.

[0044] Starting from one end portion thereof, the drive rope 29 is successively wrapped around the sheaves in the following order: the first upper hoistway sheave 53, the first counterweight sheave 51, the second upper hoistway sheave 54, the first lower hoistway sheave 55, the second counterweight sheave 52, and the second lower hoistway sheave 56.

[0045] In this way, also in the case in which the drive rope 29 is arranged in a 3:1 roping, it is possible to restrain an increase in the height dimension of the counterweight 6 and diminish the height dimension of the hoistway 1 by arranging the first and second counterweight sheaves 51 and 52 on top of the counterweight 6. Further, by coaxially arranging the first and second counterweight sheaves 51 and 52, it is possible to simplify the construction and reduce the number of parts.

[0046] While in the above examples the driving machine is connected to the upper hoistway sheaves, it is also possible to connect the driving machine to other sheaves around which the drive rope is wrapped. That is, it is also possible to use other sheaves as the drive sheaves. Thus, the driving machine may also be mounted in the lower portion of the hoistway or on the counterweight.

[0047] Further, while in the above examples the counterweight sheaves are mounted only on top of the counterweight, it is also possible to mount them only on the lower side thereof.

[0048] Further, while in the above examples all the counterweight sheaves are arranged coaxially, it is also possible to arrange a plurality of counterweight sheaves side by side on the upper or lower side of the counterweight, thereby restraining an increase in the height dimension of the counterweight.

[0049] Furthermore, it is also possible to use a flat rope having a flat sectional configuration as the drive rope. In this case, by reducing the sheave diameter, it is possible to achieve an overall reduction in size.

[0050] Further, it is possible to use a synthetic fiber rope consisting of a synthetic fiber such as an aramid fiber. A synthetic fiber rope has a high friction coefficient and is superior in flexibility. Thus, it makes it possible to reduce the sheave diameter and achieve an overall reduction in size.

[0051] Further, the rope arrangement of the drive rope is not restricted to those of the above examples; it is possible to employ an arbitrary N:1 roping (where N is a natural number not less than 2). That is, by making N large while restraining an increase in the height dimension of the counterweight, it is possible for the driving machine to be a small and inexpensive one, making it possible to effectively utilize the space in the building.

[0052] Here, assuming that an N:1 roping is adopted as the rope arrangement for the drive rope, the number of counterweight sheaves is N when N is an even number, and N-1 when N is an odd number. Further, the number of upper hoistway sheaves is N/2 when N is an even number and N-1 when N is an odd number. Similarly, the number of lower hoistway sheaves is N/2 when N is an even number, and N-1 when N is an odd number.

[0053] Further, when N is large, the arrangement of the drive rope becomes rather complicated, so that it is desirable to use a small number of drive ropes, thus simplifying the overall arrangement. For this purpose, it is desirable to provide a brake device on the main rope side as shown in Embodiment 1.

Claims

1. Elevator device comprising:

a hoistway (1);
a rotatable car suspension sheave (2) arranged in the upper portion of the hoistway (1);
a main rope (4) wrapped around the car suspension sheave (2);
a car (5) and a counterweight (6) suspended in the hoistway (1) by the main rope (4);
aplurality of rotatable counterweight sheaves (21-24, 41, 42, 51, 52) mounted on the counterweight (6);
a plurality of rotatable hoistway sheaves (25-28, 53-56) arranged in the upper portion and the lower portion of the hoistway (1);
a drive rope (29) wrapped around the counterweight sheaves (21-24, 41, 42, 51, 52) and the hoistway sheaves (25-28, 52-56) and
a driving machine (31, 38) which causes the counterweight (6) to ascend and descend through the drive rope (29) by rotating at least one of the counterweight sheaves (21-24, 41, 42, 51, 52) and the hoistway sheaves (25-28, 53-56),
further defined in that
all the counterweight sheaves (21-24, 41, 42, 51, 52) are arranged on one of the upper portion and the lower portion of the counterweight (6), and
the drive rope (29) is arranged in an N:1 roping, N is a natural number not less than 2, and wherein the number of counterweight sheaves (21-24, 41, 42, 51, 52) is N when N is an even number, and N-1 when N is an odd number.

2. Elevator device according to claim 1, wherein all the counterweight sheaves (21-24, 41, 42, 51, 52) are

arranged coaxially.

3. Elevator device according to any one of claims 1 or 2, wherein a plurality of hoistway sheaves (25-28, 53-56) are arranged coaxially in at least one of the upper portion and the lower portion of the hoistway (1).

4. Elevator device according to any one of claims 1 to 3, wherein the rotation shafts of all the counterweight sheaves (21-24, 41, 42, 51, 52) and the rotation shafts of all the hoistway sheaves (25-28, 52-56) are arranged such that, in plan view, they are superimposed one upon the other.

5. Elevator device according to any one of claims 1 to 4, wherein the driving machine (31, 38) is arranged in one of the upper portion and the lower portion of the hoistway (1), and wherein the rotation shaft of the driving machine (31, 38) is connected to one of the hoistway sheaves (25-28, 53-56).

6. Elevator device according to any one of claims 1 to 5, wherein the drive rope (29) is a flat rope with a flat sectional configuration.

7. Elevator device according to any one of claims 1 to 6, wherein the drive rope (29) is a synthetic fiber rope.

8. Elevator device according to any one of claims 1 to 7, wherein the car suspension sheave (2) is provided with a brake device (32).

Patentansprüche

1. Aufzugsvorrichtung, mit:

einem Aufzugsschacht (1) ;
einer drehbaren Fahrkorbaufhängungsscheibe (2), die in dem oberen Abschnitt des Aufzugsschachts (1) angeordnet ist;
einem Hauptseil (4), das um die Fahrkorbaufhängungsscheibe (2) herum gewickelt ist;
einem Fahrkorb (5) und einem Gegengewicht (6), das in dem Aufzugsschacht (1) durch das Hauptseil (4) aufgehängt ist;
einer Vielzahl von drehbaren Gegengewichtscheiben (21-24, 41, 51, 52), die an dem Gegengewicht (6) angebracht sind;
einer Vielzahl von drehbaren Aufzugsschachtscheiben (25-28, 53-56), die in dem oberen Abschnitt und dem unteren Abschnitt des Aufzugsschachts (1) angeordnet sind;
einem Antriebsseil (29), das um die Gegengewichtscheiben (21-24, 41, 42, 51, 52) und die Aufzugsschachtscheiben (25-28, 53-56) herum gewickelt ist, und
einer Antriebsmaschine (31, 38), die bewirkt, dass das Gegengewicht (6) mittels des Antriebsseils (29) hinauf geht und herunter geht, durch Rotieren von zumindest einer der Gegengewichtscheiben (21-24, 41, 42, 51, 52) und der Aufzugsschachtscheiben (25-28, 53-56),
ferner **dadurch** definiert, dass sämtliche der Gegengewichtscheiben (21-24, 41, 42, 51, 52) an einem des oberen Abschnitts und des unteren Abschnitts des Gegengewichts (6) angeordnet sind, und
wobei das Antriebsseil (29) in einer N:1 Abseilung angeordnet ist, wobei N eine natürliche Zahl nicht kleiner als 2 ist, und wobei die Anzahl von Gegengewichtscheiben (21-24, 41, 42, 51, 52) N ist, wenn N eine gerade Zahl ist, und N-1, wenn N eine ungerade Zahl ist.

2. Aufzugsvorrichtung nach Anspruch 1, bei der sämtliche der Gegengewichtscheiben (21-24, 41, 42, 51, 52) koaxial angeordnet sind.

3. Aufzugsvorrichtung nach Anspruch 1 oder 2, bei der eine Vielzahl von Aufzugsschachtscheiben (25-28, 53-56) in dem oberen Abschnitt und/oder dem unteren Abschnitt des Aufzugsschachts (1) koaxial angeordnet sind.

4. Aufzugsvorrichtung nach einem der Ansprüche 1 bis 3, bei der die Rotationswellen sämtlicher der Gegengewichtscheiben (21-24, 41, 42, 51, 52) und die Rotationswellen sämtlicher der Aufzugsschachtscheiben (25-28, 53-56) derart angeordnet sind, dass, in Draufsicht, sie eine auf der anderen übereinandergelagert sind.

5. Aufzugsvorrichtung nach einem der Ansprüche 1 bis 4, bei der die Antriebsmaschine (31, 38) in einem des oberen Abschnitts oder des unteren Abschnitts des Aufzugsschachts (1) angeordnet ist, und wobei die Rotationswelle der Antriebsmaschine (31, 38) mit einer der Aufzugsschachtscheiben (25-28, 53-56) verbunden ist.

6. Aufzugsvorrichtung nach einem der Ansprüche 1 bis 5, bei der das Antriebsseil (29) ein flaches Seil mit einer flachen Querschnittsausgestaltung ist.

7. Aufzugsvorrichtung nach einem der Ansprüche 1 bis 6, bei der das Antriebsseil (29) ein Kunstfaserseil ist.

8. Aufzugsvorrichtung nach einem der Ansprüche 1 bis 7, bei der die Fahrkorbaufhängungsscheibe (2) mit einer Bremsvorrichtung (32) versehen ist.

Revendications

1. Dispositif élévateur, comprenant :

une cage (1) ;
une poulie de suspension de cabine tournante (2) agencée dans la partie supérieure de la cage (1) ;
un câble principal (4) enroulé autour de la poulie de suspension de cabine (2) ;
une cabine (5) et un contre-poids (6) suspendus dans la cage (1) par le câble principal (4);
une pluralité de poulies de contre-poids tournantes (21-24, 41, 42, 51, 52) montées sur le contre-poids (6);
une pluralité de poulies de cage tournantes (25-28, 53-56) agencées dans la partie supérieure et la partie inférieure de la cage (1) ;
un câble d'entraînement (29) enroulé autour des poulies de contre-poids (21-24, 41, 42, 51, 52) et des poulies de cage (25-28, 53-56), et
une machine d'entraînement (31, 38) qui amène le contre-poids (6) à monter et à descendre par l'intermédiaire du câble d'entraînement (29) en faisant tourner au moins l'une des poulies de contre-poids (21-24, 41, 42, 51, 52) et des poulies de cage (25-28, 53-56),
défini, en outre, en ce que
toutes les poulies de contre-poids (21-24, 41, 42, 51, 52) sont agencées sur l'une de la partie supérieure et de la partie inférieure du contre-poids (6), et
le câble d'entraînement (29) est agencé selon un rapport de câblage de N:1, N étant un entier naturel non inférieur à 2, et dans lequel le nombre de poulies de contre-poids (21-24, 41, 42, 51, 52) est N lorsque N est un nombre pair, et N-1 lorsque N est un nombre impair.

2. Dispositif élévateur selon la revendication 1, dans lequel toutes les poulies de contre-poids (21-24, 41, 42, 51, 52) sont agencées coaxialement.

3. Dispositif élévateur selon la revendication 1 ou 2, dans lequel une pluralité des poulies de cage (25-28, 53-56) sont agencées coaxialement dans au moins l'une de la partie supérieure et de la partie inférieure de la cage (1).

4. Dispositif élévateur selon l'une quelconque des revendications 1 à 3, dans lequel les arbres de rotation de toutes les poulies de contre-poids (21-24, 41, 42, 51, 52) et les arbres de rotation de toutes les poulies de cage (25-28, 53-56) sont agencés de telle manière que, en vue en plan, ils se superposent les uns aux autres.

5. Dispositif élévateur selon l'une quelconque des revendications 1 à 4, dans lequel la machine d'entraînement (31, 38) est agencée dans l'une de partie supérieure et de la partie inférieure de la cage (1), et dans lequel l'arbre de rotation de la machine d'entraînement (31, 38) est raccordé à l'une des poulies de cage (25-28, 53-56).

6. Dispositif élévateur selon l'une quelconque des revendications 1 à 5, dans lequel le câble d'entraînement (29) est un câble plat présentant une configuration en section droite plate.

7. Dispositif élévateur selon l'une quelconque des revendications 1 à 6, dans lequel le câble d'entraînement (29) est un câble à fibres synthétiques.

8. Dispositif élévateur selon l'une quelconque des revendications 1 à 7, dans lequel la poulie de suspension de cabine (2) comporte un dispositif de frein (32).

FIG. 1

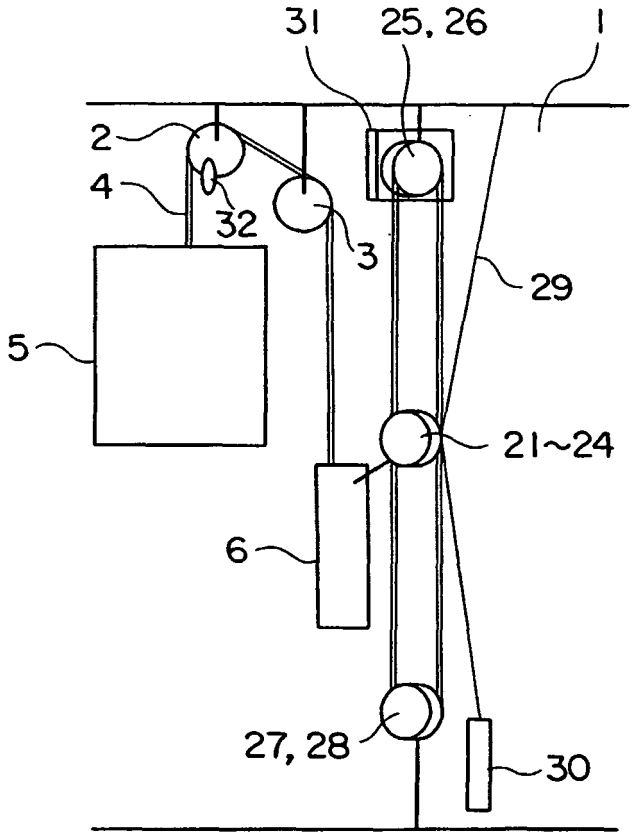


FIG. 2

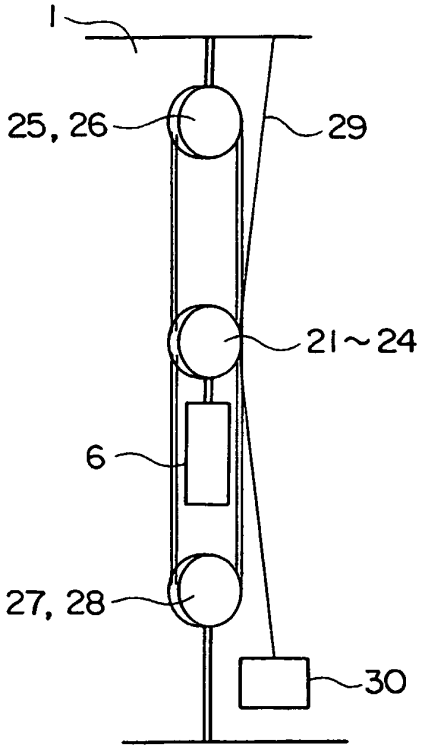


FIG. 3

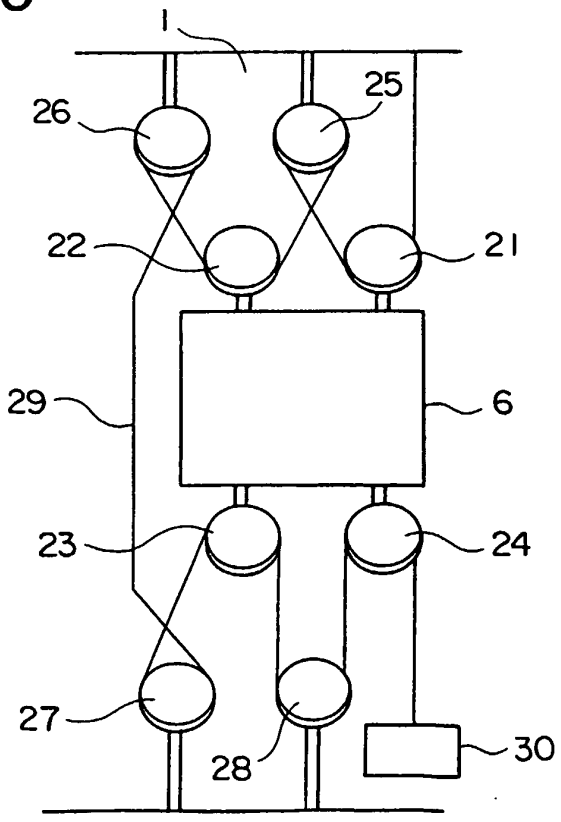


FIG. 4

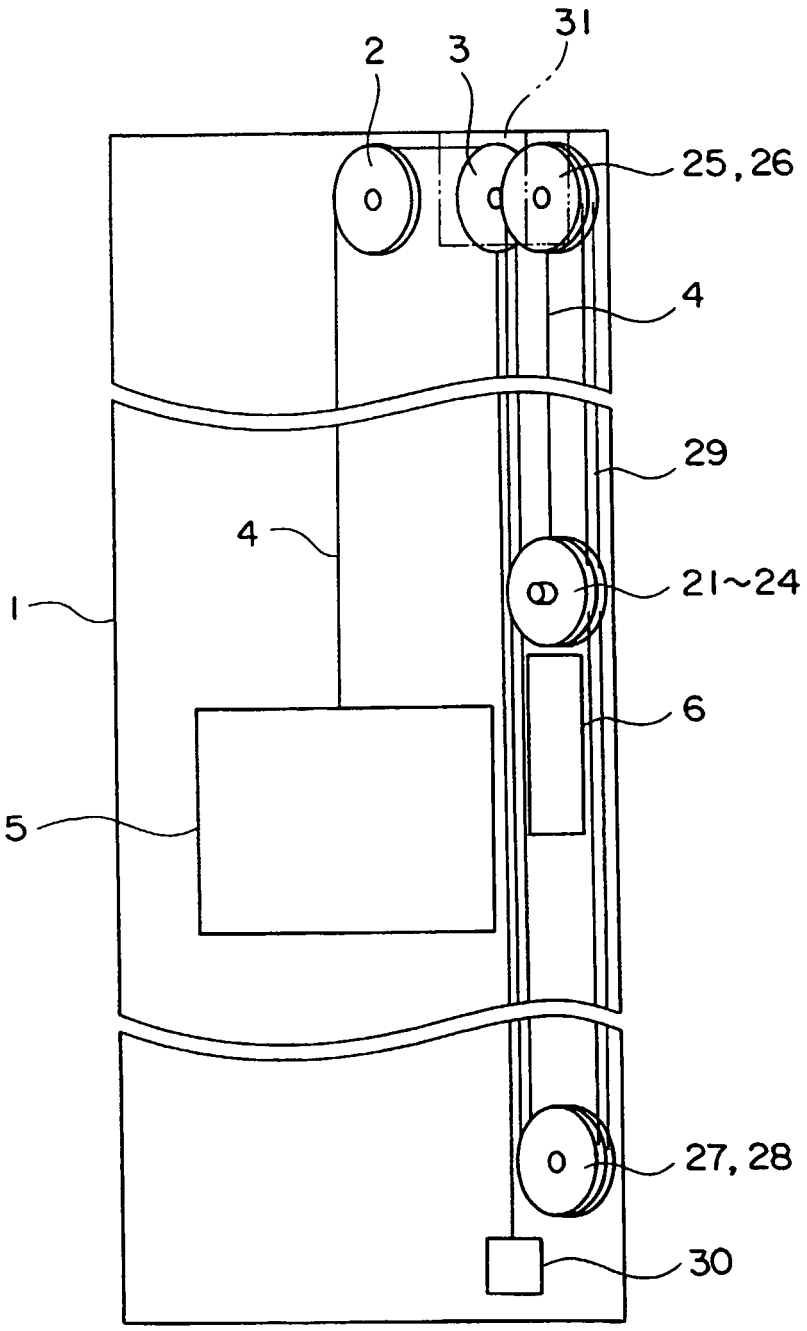


FIG. 5

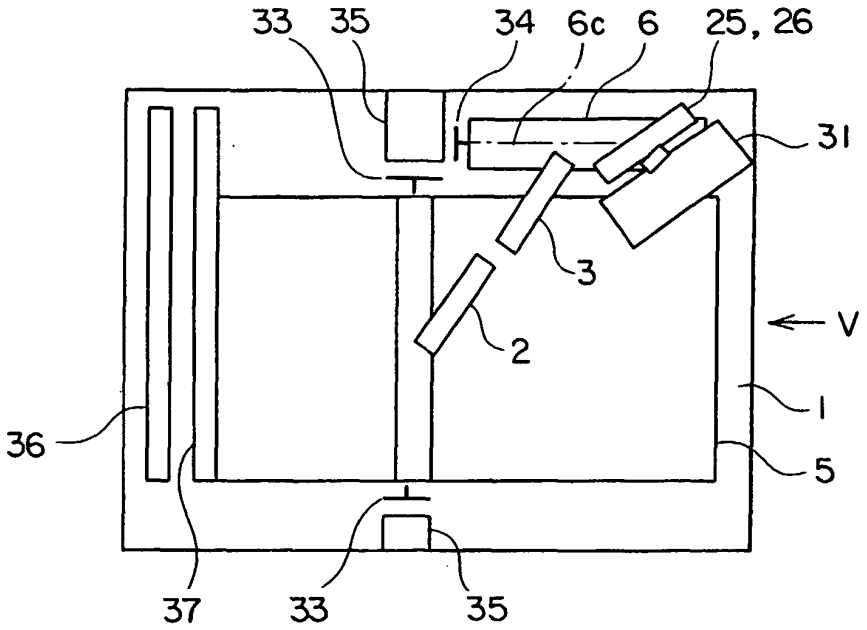

33
35
34
6c
6
25, 26
31
3
2
V
1
36
5
37
33
35

FIG. 6

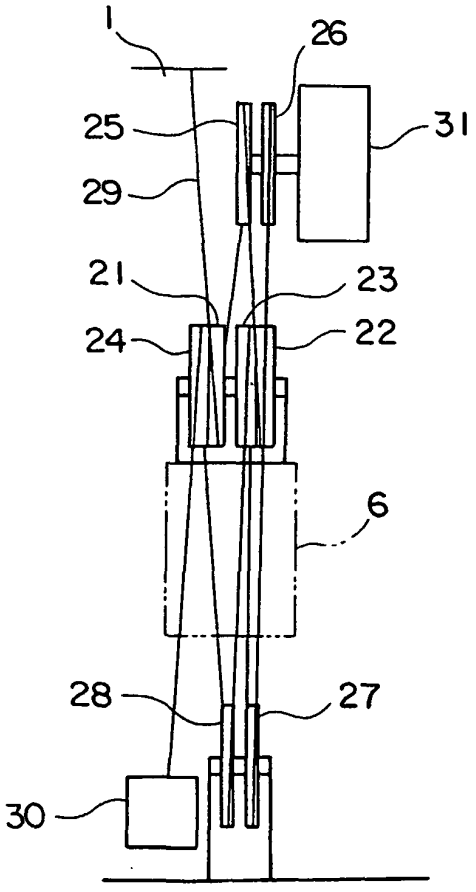

1
26
25
31
29
21
23
24
22
6
28
27
30

FIG. 7

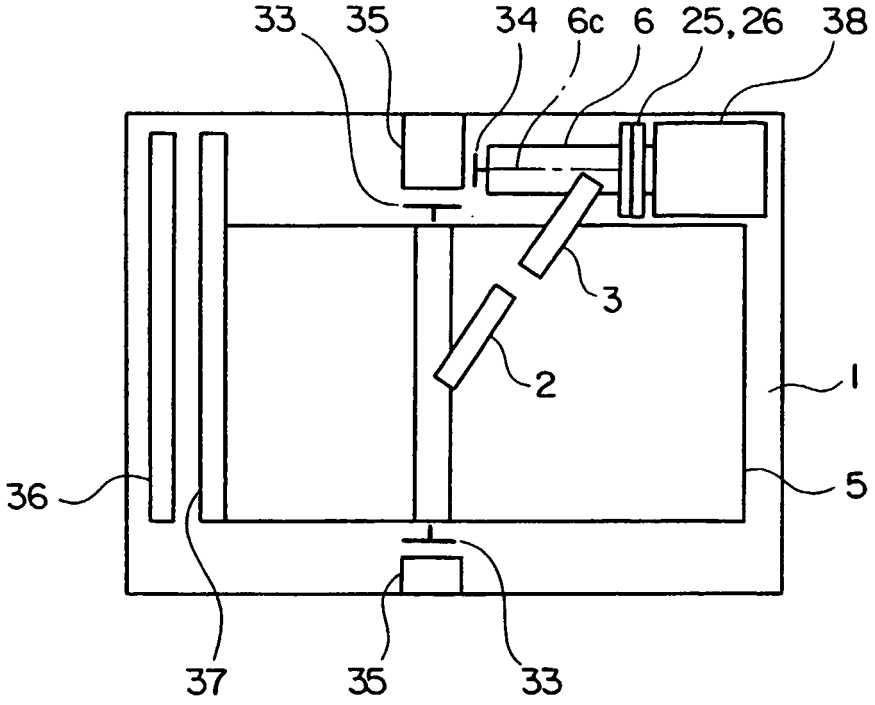


FIG. 8

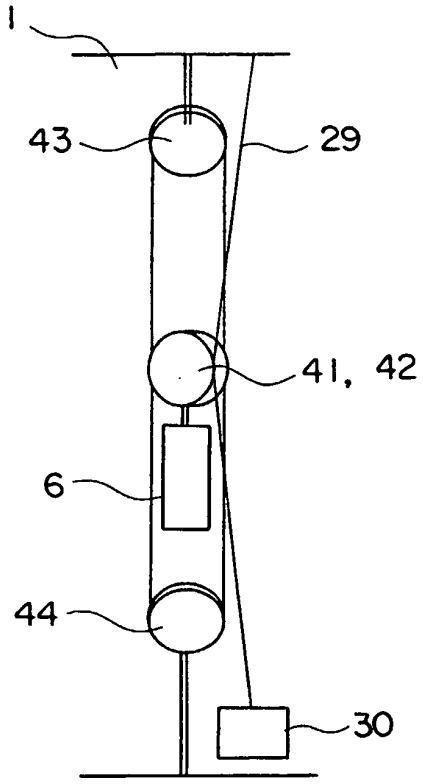


FIG. 9

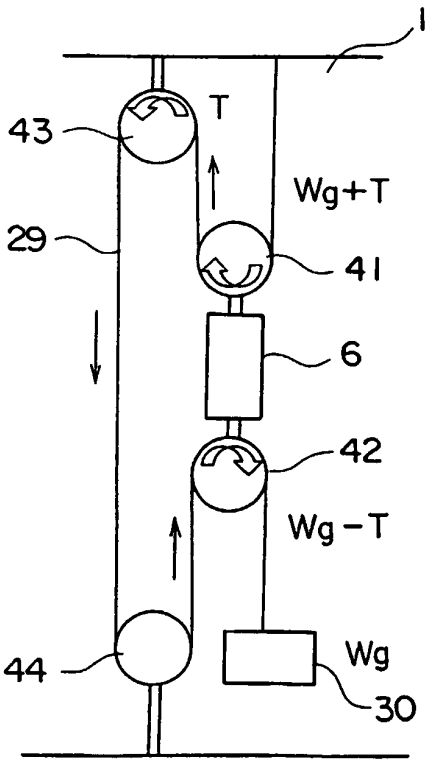


FIG. 10

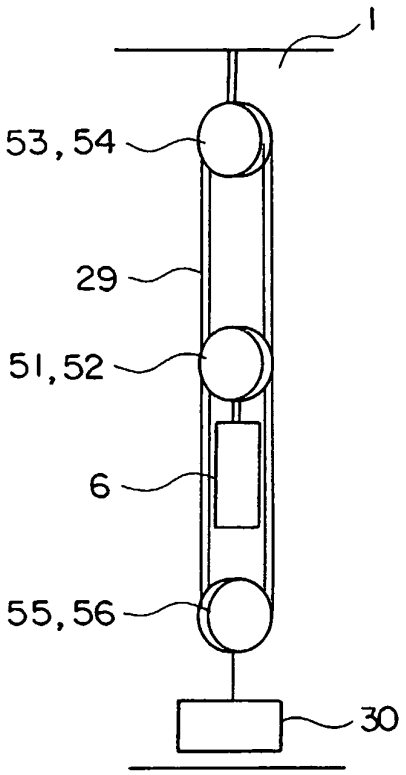


FIG. 11

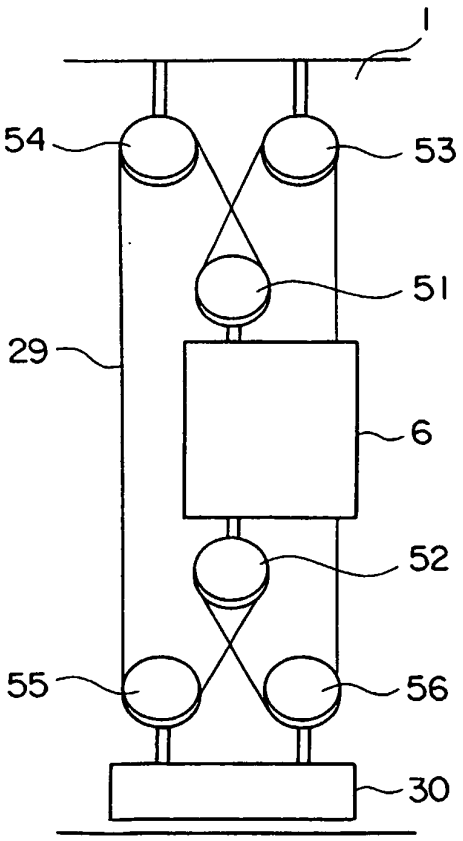
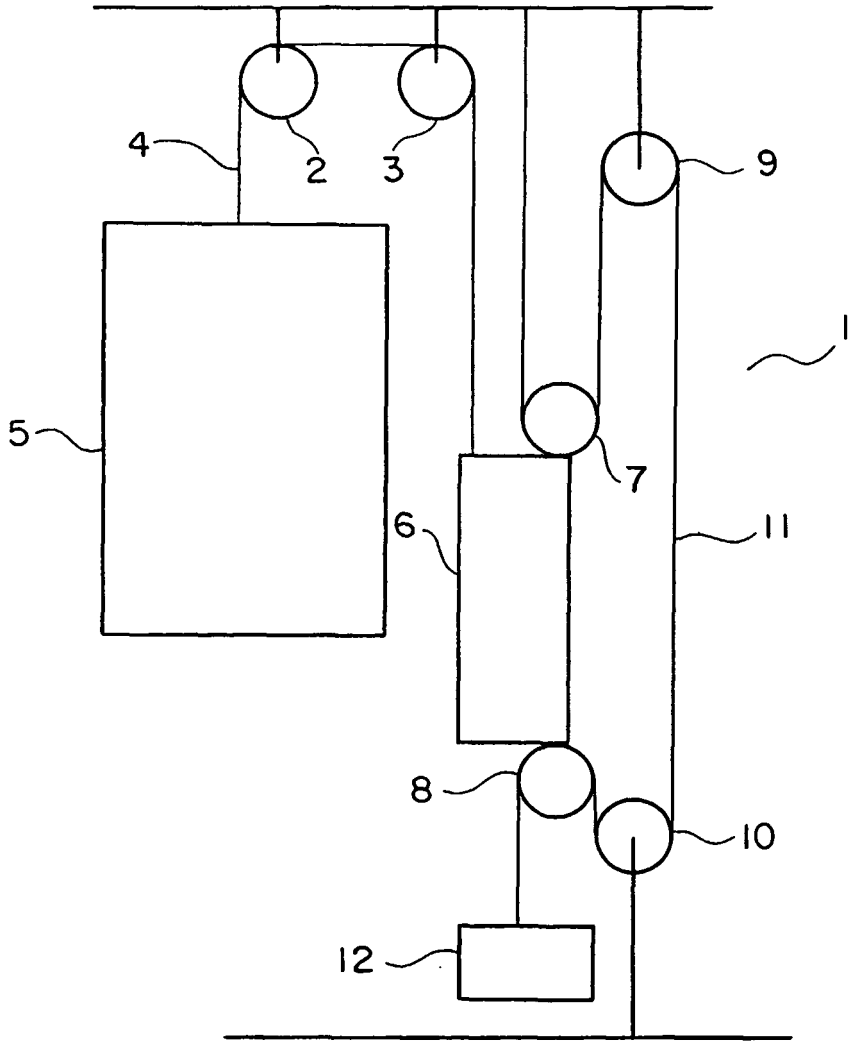


FIG. 12



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

- EP 1031528 A **[0002]**
- EP 0731052 A1 **[0003]**