



(11) **EP 1 327 596 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
24.02.2010 Bulletin 2010/08

(21) Application number: **00955068.2**

(22) Date of filing: **28.08.2000**

(51) Int Cl.:
B66B 7/00 (2006.01) B66B 11/08 (2006.01)

(86) International application number:
PCT/JP2000/005796

(87) International publication number:
WO 2002/018256 (07.03.2002 Gazette 2002/10)

(54) **ELEVATOR DEVICE**
AUFZUGSANORDNUNG
DISPOSITIF D'ASCENSEUR

(84) Designated Contracting States:
CH DE FR LI NL

(43) Date of publication of application:
16.07.2003 Bulletin 2003/29

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

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

• **ANDO, Eiji,**
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- 1 018 480 EP-A2- 0 905 081
JP-A- 2000 177 949 JP-A- 2000 211 851
US-A- 6 006 865 US-A- 6 006 865

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).

EP 1 327 596 B1

Description

TECHNICAL FIELD

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

BACKGROUND ART

[0002] Conventionally, for example, Japanese Patent Application Laid-Open No. Hei 10-139321 shows an elevator apparatus, so called machine-room-less elevator that does not have a machine room above a hoistway, where a driving machine is disposed at an upper portion in the hoistway. In such an elevator apparatus, although the height of a building can be shortened in comparison to a case where the machine room is separately provided above the hoistway, there is a need to keep a space for disposing the driving machine at the upper portion in the hoistway. Accordingly, it is desirable that the height dimension of the hoistway be reduced by utilizing space in the hoistway as efficiently as possible.

[0003] EP 1 018 480 A2 refers to an elevator system having a hoistway, a car, a drive sheave, turning pulleys and a main cable, wherein the drive sheave has a rotor axis oriented vertically.

DISCLOSURE OF THE INVENTION

[0004] 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 space in a hoistway can be efficiently utilized, thereby reducing the height dimensions of the hoistway. To this end, according to one aspect of the present invention, there is provided an elevator apparatus comprising: a hoistway; a car raised and lowered in the hoistway; a counterweight disposed behind the car and raised and lowered in the hoistway; a driving machine for raising and lowering the car and the counterweight, having a driving machine body disposed at an upper portion in the hoistway and a driving sheave which is rotated by the driving machine body; and a main rope wound around the driving sheave and suspending the car and the counterweight in the hoistway, wherein the driving machine body is disposed to overlap a rear corner portion of the car in a vertically projected surface, the driving machine is disposed so that an axis of the driving sheave extends at an angle with respect to a width direction of the car, and first and second return pulleys guiding the main rope from the driving sheave to the car are disposed at the upper portion in the hoistway spaced from one another in a horizontal direction.

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 cross-sectional view of an essential portion taken along the line II-II in Fig. 1;

Fig. 3 is a cross-sectional view of an essential portion taken along the line III-III in Fig. 1;

Fig. 4 is a perspective view showing the construction of the main rope 12 in Fig. 1;

Fig. 5 is a plan view showing an elevator apparatus according to a second embodiment of the present invention; and

Fig. 6 is a cross-sectional view of an essential portion taken along the line VI-VI in Fig. 5.

BEST MODE FOR CARRYING OUT THE INVENTION

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

First Embodiment

[0007] Fig. 1 is a plan view showing an elevator apparatus according to a first embodiment of the present invention, Fig. 2 is a cross-sectional view of an essential portion taken along the line II-II in Fig. 1, and Fig. 3 is a cross-sectional view of an essential portion taken along the line III-III 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 disposed behind the car 4 and guided by the counterweight guide rails 3 to be raised and lowered in the hoistway 1.

[0009] A mounting frame 6 is fixed in the vicinity of the top portions of the car guide rails 2 and the counterweight guide rails 3. The mounting frame 6 has a plurality of beams 7 and a supporting base 8 fixed onto the beams 7. A driving machine 9 for raising and lowering the car 4 and the counterweight 5 are mounted on the supporting base 8. The driving machine 9 has a driving machine body 10 including a motor, and a driving sheave 11 which is rotated by the driving machine body 10.

[0010] The driving machine body 10 is disposed to overlap a corner portion of the rear portion of the car 4 in a vertically projected surface. Also, the driving machine 9 is disposed so that the axis of the driving sheave 11 extends at an angle with respect to a width direction of the car 4 (the right and left direction in Fig. 1).

[0011] A plurality of main ropes 12 (only one of the ropes 12 is shown in the figures) suspending the car 4 and the counterweight 5 in the hoistway 1 are wound around the driving sheave 11. One end portion of the main ropes 12 are connected to the mounting frame 6 through a counterweight side rope fastener 13. A car side rope fastener 14 is fixed in the vicinity of the upper end

portions of the car guide rails 2. The other end portions of the main ropes 12 are connected to the car side rope fastener 14.

[0012] A pair of car suspending sheaves 15 around which the main ropes 12 are wound are provided at the bottom portion of the car 4. A counterweight suspending sheave 16 around which the main ropes 6 are wound is provided at the top portion of the counterweight 5.

[0013] Rotatable first and second return pulleys 17 and 18 guiding the main ropes 12 from the driving sheave 11 to the car 4 are attached to the mounting frame 6 spaced from one another in a horizontal direction. The first and second return pulleys 17 and 18 are disposed to be located between a side surface of the car 4 and a wall surface 1a of the hoistway 1 when the car 4 moves to the upper portion in the hoistway 1.

[0014] The main ropes 12 are extended downward from the driving sheave 11, wound around the first return pulley 17, extended obliquely upward, further wound around the second return pulley 18, and extended downward. That is to say, the positions of the main ropes 12 in the horizontal direction are shifted by the combination of the first and second return pulleys 17 and 18. Because of this, the main ropes 12 are guided to the car suspending sheaves 15 at a reasonable angle.

[0015] Fig. 4 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 2a 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. This synthetic fiber rope has a higher friction coefficient and superior flexibility in comparison to steel rope.

[0018] In such an elevator apparatus, since the counterweight 5 is disposed behind the car 4, the driving machine 9 is obliquely disposed above the corner portion of the rear portion of the car 4, and the positions of the main ropes 12 extending to the car 4 are shifted by the combination of the first and second return pulleys 17 and 18, the space in the hoistway 1 can be efficiently utilized, thereby reducing the height dimension of the hoistway 1.

[0019] Further, if the dimension in the depth direction

(the vertical direction in Fig. 1) of the car 4 is changed, it can be easily dealt with by merely changing the distance between the first and second return pulleys 17 and 18.

[0020] Furthermore, since the first and second return pulleys 17 and 18 are disposed to be located between the side surface of the car 4 and the wall surface 1a of the hoistway 1 when the car 4 moves to the upper portion in the hoistway 1, the height dimension of the hoistway 1 is not increased by the first and second return pulleys 17 and 18, thereby efficiently utilizing the space in the hoistway 1.

[0021] More, since the driving machine 9 and the first and second return pulleys 17 and 18 are mounted on the common mounting frame 6, the construction is simplified and installation is facilitated. Also, since the other end portions of the main ropes 12 are connected to the mounting frame 6, installation is further facilitated.

[0022] Further, since the main ropes 12 are composed of a synthetic fiber rope having a high friction coefficient and superior flexibility, the diameters of the driving sheave 11 and the first and second return pulleys 17 and 18 can be reduced, thereby reducing the size of installation space. Accordingly, the space in the hoistway 1 can be utilized even more efficiently, thereby reducing the height dimension of the hoistway 1.

Second Embodiment

[0023] Next, Fig. 5 is a plan view showing an elevator apparatus according to a second embodiment of the present invention, and Fig. 6 is a cross-sectional view of an essential portion taken along the line VI-VI in Fig. 5. In the figures, first and second counterweight suspending sheaves 31 and 32 around which the main ropes 12 are wound are provided at the upper portion of the counterweight 5 spaced from one another in a horizontal direction. Further, the width dimension of the car 4 is larger than that in the first embodiment and the weight of the car 4 is also heavier, and consequently the width dimension of the counterweight also becomes larger. The other constructions are the same as in the first embodiment.

[0024] Thus, since the first and second counterweight suspending sheaves 31 and 32 are juxtaposed with each other, if the width dimension of the counterweight 5 is changed according to a change in the dimensions of the car 4 in the width direction, it can be easily dealt with by merely changing the distance between the first and second counterweight suspending sheaves 31 and 32.

Claims

1. An elevator apparatus comprising:

- a hoistway (1);
- a car (4) raised and lowered in said hoistway (1);
- a counterweight (5) disposed behind said car (4) and raised and lowered in said hoistway (1);

a driving machine (9) for raising and lowering said car (4) and said counterweight (5), having a driving machine body (10) disposed at an upper portion in said hoistway (1) and a driving sheave (11) which is rotated by said driving machine body (10);

and

a main rope (12) wound around said driving sheave (11) and suspending said car (4) and said counterweight (5) in said hoistway (1),

characterized in that

said driving machine body (10) is disposed to overlap a rear corner portion of said car (4) in a vertically projected surface, said driving machine (9) is disposed so that an axis of said driving sheave (11), as seen from the top, extends at an angle with respect to a width direction of said car (4), and first and second return pulleys (17, 18) guiding said main rope (12) from said driving sheave (11) to said car (4) are disposed at the upper portion in said hoistway (1) spaced from one another in a horizontal direction.

2. An elevator apparatus according to claim 1, wherein said first and second return pulleys (17, 18) are disposed to be located between a side surface of said car (4) and a wall surface (1a) of said hoistway (1) when said car (4) moves to the upper portion in said hoistway (1).
3. An elevator apparatus according to claim 1, wherein first and second counterweight suspending sheaves (31, 32) around which said main rope (12) is wound are disposed to be spaced from one another in a horizontal direction at an upper portion in said hoistway (1).
4. An elevator apparatus according to claim 1, further comprising a mounting frame (6) fixed at the upper portion of said hoistway (1), on which said driving machine (9) and said first and second return pulleys (17, 18) are mounted.
5. An elevator apparatus according to claim 4, wherein at least one end portion of said main rope (12) is connected to said mounting frame (6).
6. An elevator apparatus according to claim 1, wherein said main rope (12) is composed of synthetic fiber rope.

Patentansprüche

1. Aufzugvorrichtung, umfassend:

einen Schacht (1),
eine Kabine (4), die im Schacht (1) angehoben

und abgesenkt wird,

ein Gegengewicht (5), das hinter der Kabine (4) angeordnet ist und im Schacht (1) angehoben und abgesenkt wird,

eine Antriebsmaschine (9) zum Anheben und Absenken der Kabine (4) und des Gegengewichts (5) mit einem in einem oberen Abschnitt im Schacht (1) angeordneten Antriebsmaschinenkörper (10) und mit einer durch den Antriebsmaschinenkörper (10) gedrehten Antriebs-scheibe (11), und

ein um die Antriebsscheibe (11) gewundenes und die Kabine (4) und das Gegengewicht (5) im Schacht (1) aufhängendes Hauptseil (12),

dadurch gekennzeichnet, dass

der Antriebsmaschinenkörper (10) so angeordnet ist, damit er einen hinteren Eckenabschnitt der Kabine (4) in einer vertikal projizierten Fläche überlappt, die Antriebsmaschine (9) derart angeordnet ist, dass sich eine Achse der Antriebsscheibe (11), von oben betrachtet, in einem Winkel bezüglich einer Breitenrichtung der Kabine (4) erstreckt, und eine das Hauptseil (12) von der Antriebsscheibe (11) zur Kabine (4) führende erste und zweite Rückführrolle (17, 18) am oberen Abschnitt im Schacht (1) voneinander in einer horizontalen Richtung beabstandet angeordnet sind.

2. Aufzugvorrichtung gemäß Anspruch 1, bei der die erste und zweite Rückführrolle (17, 18) so angeordnet sind, dass sie zwischen einer Seitenfläche der Kabine (4) und einer Wandfläche (1a) des Schachts (1) gelegen sind, wenn sich die Kabine (4) zum oberen Abschnitt im Schacht (1) bewegt.
3. Aufzugvorrichtung gemäß Anspruch 1, bei der eine erste und eine zweite Gegengewichtsaufhängescheibe (31, 32), um die das Hauptseil (12) gewunden ist, so angeordnet sind, dass sie an einem oberen Abschnitt im Schacht (1) voneinander in einer horizontalen Richtung beabstandet sind.
4. Aufzugvorrichtung gemäß Anspruch 1, weiter umfassend einen am oberen Abschnitt des Schachts (1) fixierten Befestigungsrahmen (6), an dem die Antriebsmaschine (9) und die erste und zweite Rückführrolle (17, 18) befestigt sind.
5. Aufzugvorrichtung gemäß Anspruch 4, bei der zumindest ein Endabschnitt des Hauptseils (12) mit dem Befestigungsrahmen (6) verbunden ist.
6. Aufzugvorrichtung gemäß Anspruch 1, bei der das Hauptseil (12) aus einem Synthetikfaserseil aufgebaut ist.

Revendications**1.** Appareil d'ascenseur comprenant :

une cage (1) ;
 une cabine (4) montant et descendant dans ladite cage (1) ;
 un contrepoids (5) disposé derrière ladite cabine (4) et monté et descendu dans ladite cage (1) ;
 une machine d'entraînement (9) destinée à faire monter et descendre ladite cabine (4) et ledit contrepoids (5), comportant un corps de machine d'entraînement (10) disposé dans une partie supérieure dans ladite cage (1) et une poulie d'entraînement (11) qui est tournée par ledit corps de machine d'entraînement (10) ;
 et
 un câble principal (12) enroulé autour de ladite poulie d'entraînement (11) et suspendant ladite cabine (4) et ledit contrepoids (5) dans ladite cage (1),

caractérisé en ce que

ledit corps de machine d'entraînement (10) est disposé pour chevaucher une partie d'angle arrière de ladite cabine (4) dans une surface en saillie verticalement, ladite machine d'entraînement (9) est disposée de sorte qu'un axe de ladite poulie d'entraînement (11), tel qu'elle est vue du dessus, s'étende à un angle par rapport à un sens de la largeur de ladite cabine (4), et des première et seconde poulies de retour (17, 18) guidant ledit câble principal (12) de ladite poulie d'entraînement (11) à ladite cabine (4) sont disposées dans la partie supérieure dans ladite cage (1), espacées l'une de l'autre dans un sens horizontal.

2. Appareil d'ascenseur selon la revendication 1, dans lequel lesdites première et seconde poulies de retour (17, 18) sont disposées pour être positionnées entre une surface latérale de ladite cabine (4) et une surface de paroi (1a) de ladite cage (1) lorsque ladite cabine (4) se déplace jusqu'à la partie supérieure dans ladite cage (1).

3. Appareil d'ascenseur selon la revendication 1, dans lequel des première et seconde poulies de suspension de contrepoids (31, 32) autour desquelles ledit câble principal (12) est enroulé sont disposées pour être espacées l'une de l'autre dans un sens horizontal dans une partie supérieure dans ladite cage (1).

4. Appareil d'ascenseur selon la revendication 1, comprenant en outre un cadre de montage (6) fixé dans la partie supérieure de ladite cage (1), sur lequel ladite machine d'entraînement (9) et lesdites première et seconde poulies de retour (17, 18) sont montées.

5. Appareil d'ascenseur selon la revendication 4, dans lequel au moins une partie d'extrémité dudit câble principal (12) est reliée audit cadre de montage (6).

6. Appareil d'ascenseur selon la revendication 1, dans lequel ledit câble principal (12) se compose de câble en fibres synthétique.

FIG. 1

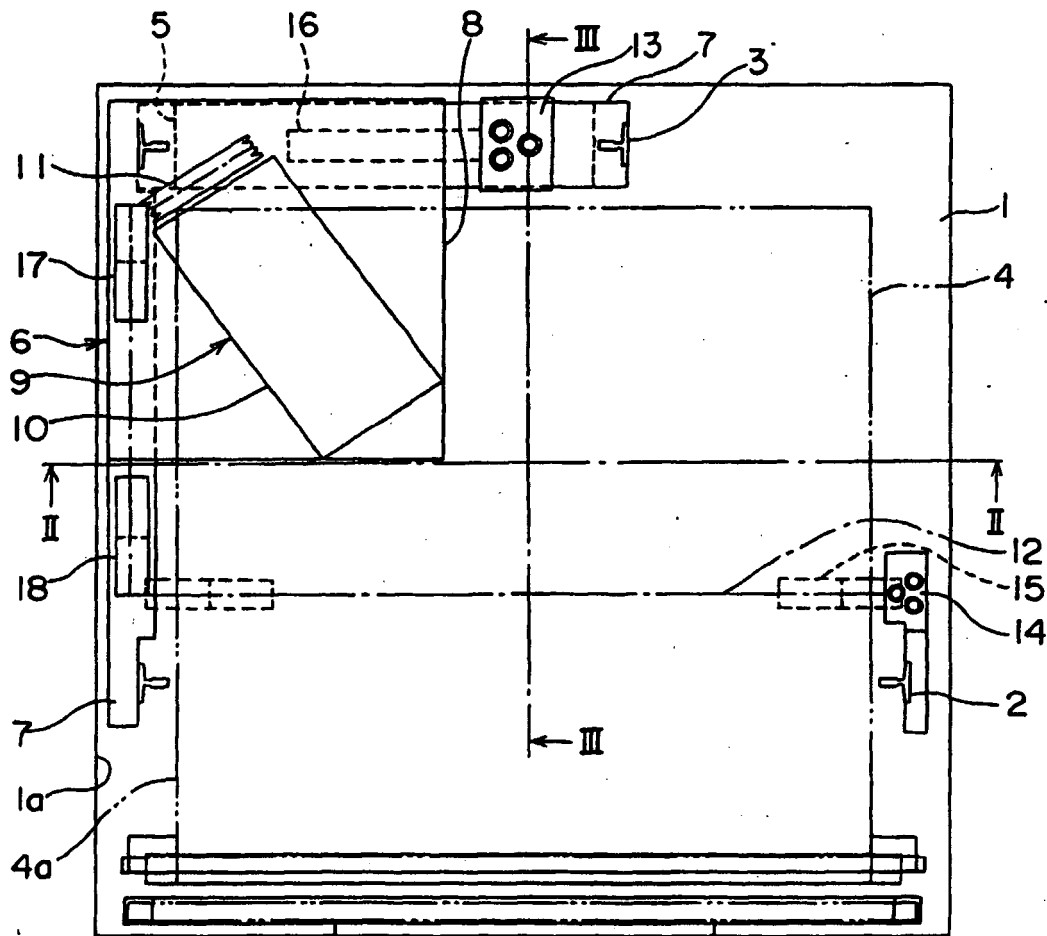


FIG. 2

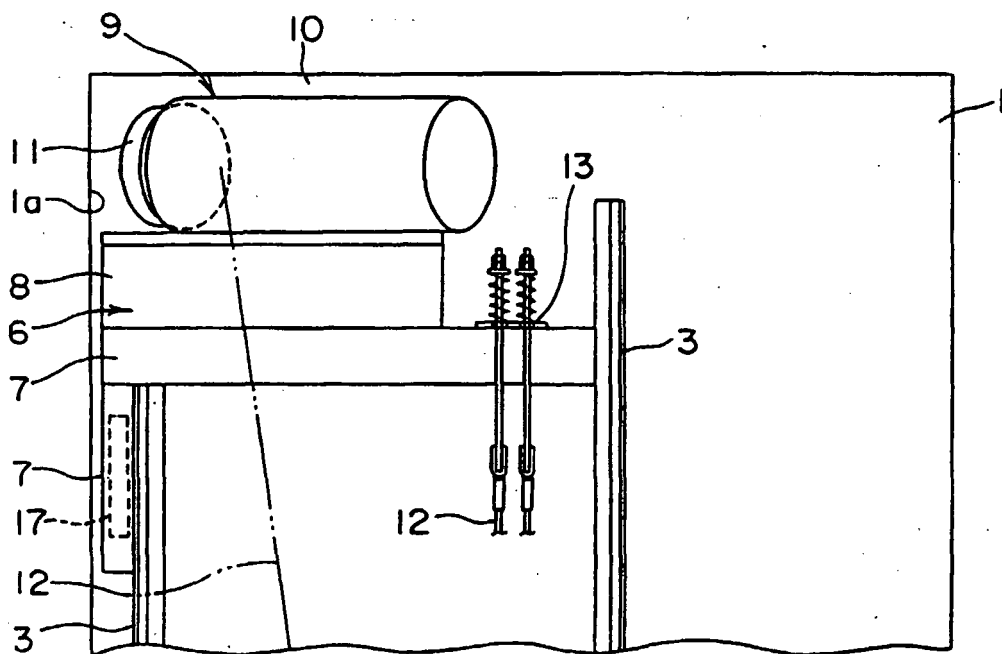


FIG. 3

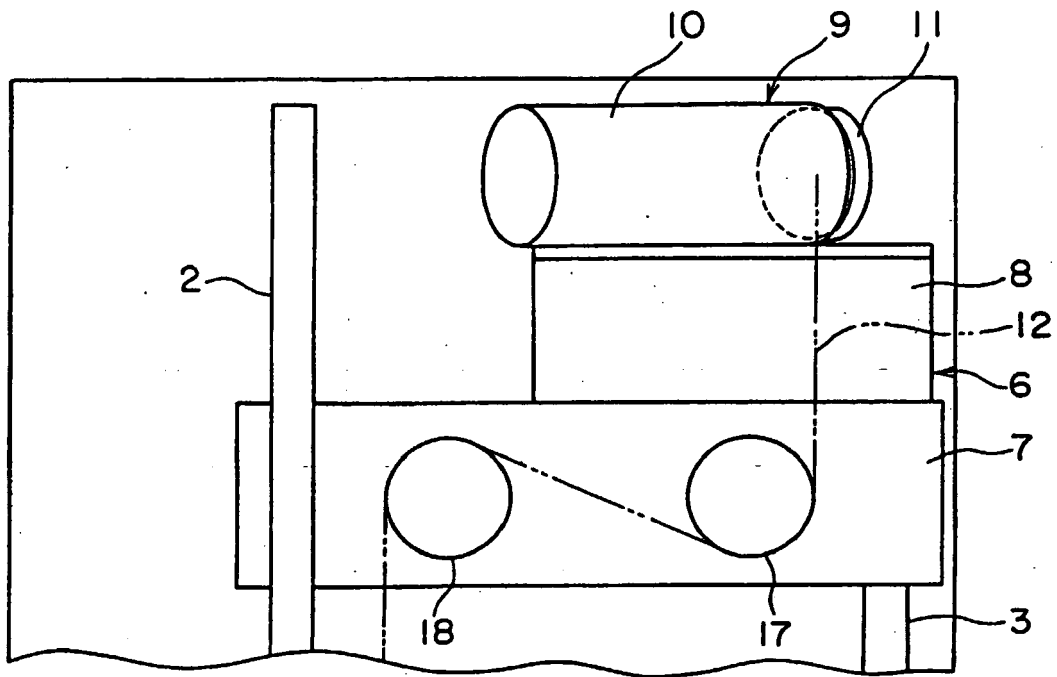


FIG. 4

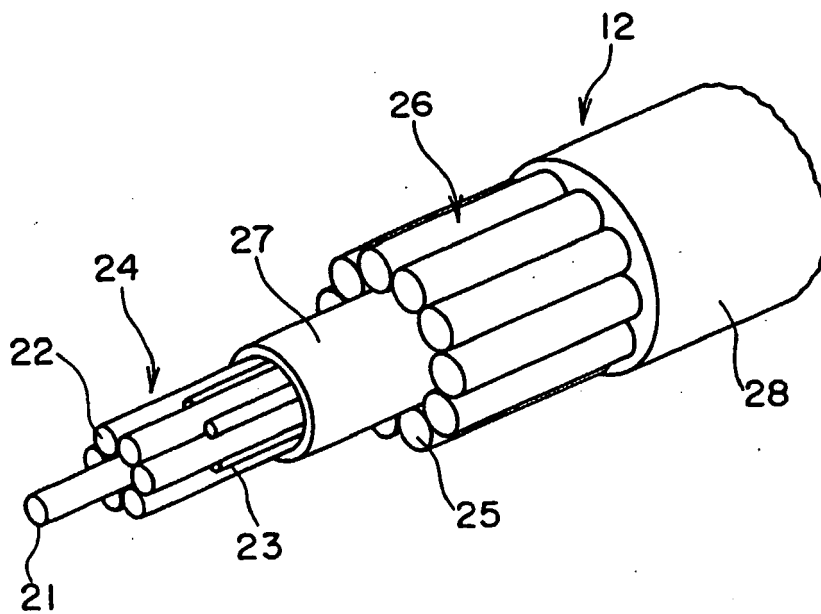
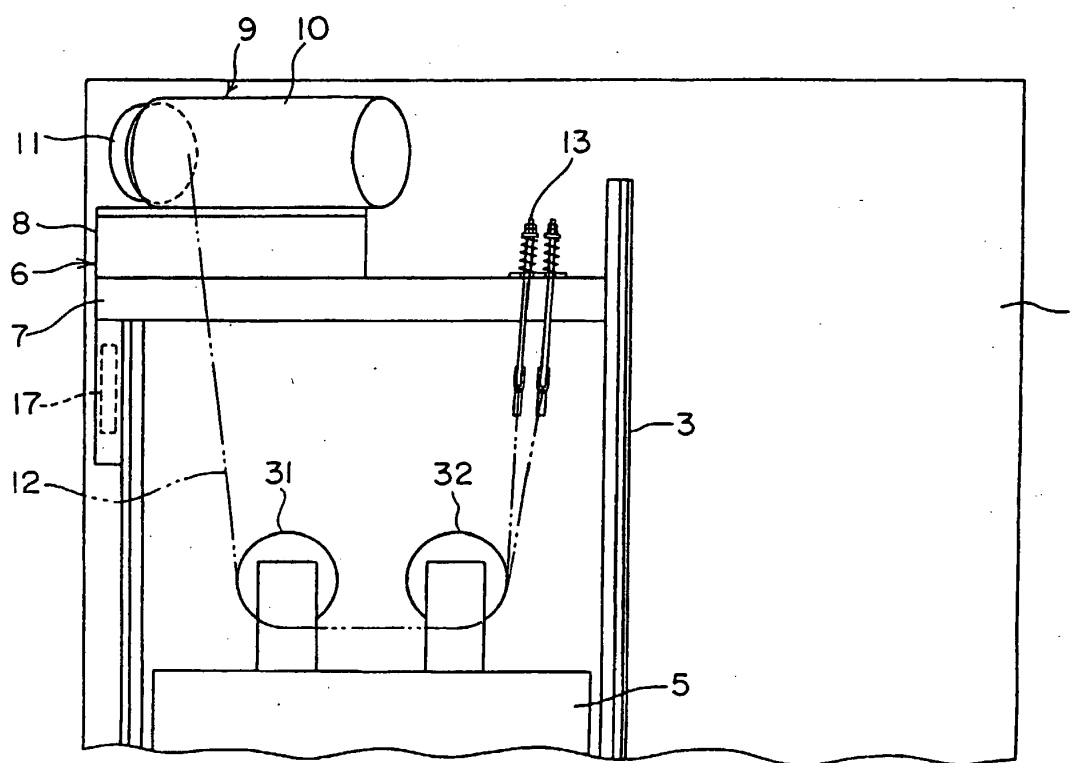


FIG. 6



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

- JP HEI10139321 B [0002]
- EP 1018480 A2 [0003]