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(54) ELEVATOR APPARATUS

AUFZUGSVORRICHTUNG

APPAREIL D'ASCENSEUR

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Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator apparatus of a type in which a hoisting machine is installed at a top of an interior of a hoistway.

BACKGROUND ART

[0002] There has been proposed in, for example, PCT Publication WO 02/16247, an elevator apparatus which adopts a 1:1 roping system and in which a hoisting machine is installed at a top of an interior of a hoistway such that a rotation axis of a drive sheave extends in a vertical direction thereof. The elevator apparatus thus constructed can achieve a reduction in number of components and simplification in its layout.

[0003] Generally speaking, however, in an elevator apparatus constructed as described above, an arc of contact of a main rope with respect to a drive sheave is small. Thus, in such an elevator apparatus, an expensive, special main rope made of a high friction material is adopted. Further, as amain rope engagement groove formed in order to enable the main rope to be wrapped around an outer peripheral surface of the drive sheave of a hoisting machine, an undercut groove of a special sectional configuration is adopted.

[0004] In an elevator realized through a combination of such a special rope and a main rope engagement groove of a special configuration, an increase in cost and a reduction in the service life of the main rope are involved.

[0005] Further, as stated above, in the elevator apparatus as proposed in PCT Publication WO 02/16247, the 1:1 roping system is adopted, and suspension portions are provided at tops of a car and a counterweight, respectively. That is, the respective top portions of the car and the counterweight are suspended by the main rope. Thus, it is necessary to ensure a vertical dimension corresponding to the suspension portions above the car and the counterweight.

[0006] EP-A-1 057 771 discloses an elevator system which includes a car and a counterweight disposed to move up and down in a hoistway. A main rope is used to suspend the car and the counterweight. A hoisting machine, of which the main rope is wound, is disposed aslant with respect to a horizontal direction in a top portion of the hoistway. As such, the hoisting machine can be installed in a hoistway of a height suited to a height of the highest floor level in a building.

DISCLOSURE OF THE INVENTION

[0007] The present invention has been made with a view toward solving the above problems in the prior art. It is an object of the present invention to provide an elevator apparatus which uses a general-purpose main rope to thereby achieve a reduction in cost, which allows a reduction in a vertical dimension of a hoistway, and which can elongate the service life of the main rope.

[0008] An elevator apparatus according to the present invention includes a driving machine arranged in an upper portion in a hoistway and having a drive sheave, a main rope wrapped around the drive sheave, and a car and a counterweight that are suspended in the hoistway by the main rope and raised and lowered by the driving machine, and in the elevator apparatus : the car and the counterweight are suspended in the hoistway in a 1:1 roping system; a first main rope is wrapped around the drive sheave such that two lead-out portions extending in different directions from the drive sheave cross each other at a predetermined position so that a predetermined frictional force may be generated between the first main rope and the drive sheave; in order that the first main rope may not undergo mutual contact at the position where it undergoes crossing, the driving machine is installed so as to be inclined such that a rotation axis of the drive sheave is at an acute angle with respect to a vertical line; and in the upper portion in the hoistway, there are provided a first deflector sheave guiding the first main rope from the driving machine to the car and a second deflector sheave guiding the first main rope from the driving machine to the counterweight.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a plan view of a machine-room-less type elevator apparatus according to Embodiment 1 of the present invention.

Fig. 2 is a front view showing a main portion of the elevator apparatus of Fig. 1.

Fig. 3 is a detailed roping diagram, as seen from the direction of the arrow A of Fig. 1, showing how drive sheaves and a deflector sheave are arranged.

Fig. 4 is a detailed roping diagram, as seen from the direction of the arrow B of Fig. 1, showing how a drive sheave and a deflector sheave are arranged.

Fig. 5 is a plan view of a hoisting machine, illustrating the arc of contact of a drive sheave.

Fig. 6 is a sectional view showing the configuration of main rope engagement grooves formed in the outer peripheral surface of a drive sheave.

Fig. 7 is a plan view of a machine-room-less type elevator apparatus according to Embodiment 2 of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

Embodiment 1

[0010] Fig. 1 is a plan view of a machine-room-less type elevator apparatus according to Embodiment 1 of the present invention, Fig. 2 is a front view showing a

main portion of the elevator apparatus of Fig. 1, Fig. 3 is a detailed roping diagram, as seen from the direction of the arrow A of Fig. 1, showing how drive sheaves and a deflector sheave are arranged, Fig. 4 is a detailed roping diagram, as seen from the direction of the arrow B of Fig. 1, showing how a drive sheave and a deflector sheave are arranged, Fig. 5 is a plan view of a hoisting machine, illustrating the arc of contact of a drive sheave, and Fig. 6 is a sectional view showing the configuration of main rope engagement grooves formed in the outer peripheral surface of a drive sheave. In Figs. 3 and 4, a second main rope 31 is omitted.

[0011] In the drawings, a pair of car guide rails 2 and a pair of counterweight guide rails 3 are provided inside a hoistway 1 so as to extend in the direction in which a car 4 ascends and descends. The car 4 ascends and descends inside the hoistway 1 while guided by the car guide rails 2. A counterweight 5 ascends and descends inside the hoistway 1 while guided by the counterweight guide rails 3.

[0012] At upper and lower ends of the side surface portions of the car 4, there are provided car guide shoes 6 adapted to be engaged with the car guide rails 2 and having a U-shaped sectional configuration. Further, at upper and lower ends of the side portions of the counterweight 5, there are provided a plurality of counterweight guide shoes 7 to be engaged with the counterweight guide rails 3.

[0013] At a top of the hoistway 1, a support stage 8 is mounted to upper end portions of the guide rails 2. The support stage 8 is composed of a main body portion 8a extending around an inner peripheral surface of the hoistway 1 and formed as a substantially rectangular frame, and a beam portion 8b extending across two opposing sides of the main body portion 8a.

[0014] A driving machine (hoisting machine) 9 and a return wheel 10 are provided on the support stage 8. The driving machine 9 has a motor 11 and a drive sheave 12 rotated by the motor 11. The driving machine 9 has a thin and flat external configuration whose axial length is smaller than the outer diameter thereof. As shown in Figs. 3 and 4, the driving machine 9 is arranged such that the axis of the drive sheave 12 extends substantially in the vertical direction and is inclined by 2.5 degrees with respect to the vertical line. Similarly, the return wheel 10 is arranged such that its axis extends in the vertical direction and is inclined by 2.5 degrees with respect to the vertical line. As shown in Fig. 1, the driving machine 9 is arranged above a corner portion of the car 4.

[0015] As first and second main ropes, general-purpose main ropes 30 and 31 for elevators are wrapped around the drive sheave 12 at an arc of contact of approximately 255 degrees. As shown in Fig. 5, the arc of contact refers to the angle of the portion where the main ropes 30 and 31 wrapped around the outer periphery of the drive sheave 12 are in contact with the drive sheave 12, and more specifically, the angle indicating the distance from the contact start point to the contact end point of the main ropes 30, 31 with respect to the drive sheave 12.

[0016] The car 4 is suspended at first ends of the main ropes 30, 31. The counterweight 5 is suspended at second ends of the main ropes 30, 31. That is, the car 4 and the counterweight 5 are suspended inside the hoistway 1 in the 1:1 roping system. As shown in Fig. 2, the first end of the main rope 30 is connected to a lower beam end portion 4a (on the right-hand side in Fig. 2) of the car 4 by a suspension portion 20a composed of a rope shackle 13a and a buffer member 14a. The first end of the main rope 31 is connected to a lower beam end portion 4b (on the left-hand side in Fig. 2) of the car 4 by a suspension portion 20b composed of a rope shackle 13b and a buffer member 14b. The second ends of the main ropes 30 and 31 are connected to the top portion of the counterweight 5 by a rope shackle 15 and a buffer member 16.

[0017] As shown in Figs. 1 and 2, on the support stage 8, there are further provided a first direction changing deflector sheave 17, a second direction changing deflector sheave 18, and a third direction changing deflector sheave 19. The first direction changing deflector sheave 17 changes the direction of the first main rope 30 extending from the drive sheave 12 and guides it to the lower beam end portion 4a of the car 4. The third direction changing deflector sheave 19 changes the direction of the second main rope 31 extending from the drive sheave 12 and turned back by the return wheel 10 and guides it to the lower beam end portion 4b of the car 4. The second direction changing deflector sheave 18 changes the direction of the two main ropes 30 and 31 wrapped around the drive sheave 12 and then extending to the other side and guides them to the counterweight 5.

[0018] The second direction changing deflector sheave 18 is arranged so as not to involve mutual interference, at the position where the two main ropes 30 and 31 respectively extending from the drive sheave 12 to the first direction changing deflector wheel 17 and the return wheel 10 and the two main ropes 30 and 31 extending to the third direction changing deflector sheave 19 after being wrapped around the drive sheave 12 cross each other.

[0019] The first, second, and third direction changing deflector sheaves 17, 18, and 19 are arranged such that their respective rotation axes extend horizontally. The first and third direction changing deflector sheaves 17 and 19 are arranged so as to overlap the car 4 in a vertical plane of projection. The second direction changing deflector sheave 18 is arranged so as to overlap the counterweight 5 in a vertical plane of projection.

[0020] Further provided on the support stage 8 are elevator devices, such as a control panel 32 for controlling the elevator and a speed governor 33 for controlling the elevator speed. These elevator devices are arranged so as to be within the requisite vertical dimension D (Fig. 2) for the driving machine 9 and the first, second, and third direction changing deflector sheaves 17, 18, and 19.

[0021] Fig. 6 is a sectional view showing the configuration of main rope engagement grooves 12a for wrapping the first and second main ropes 30 and 31 around the drive sheave 12. As shown in Fig. 6, the twomain rope engagement grooves 12a formed in the outer peripheral surface of the drive sheave 12 are grooves of a U-shaped sectional configuration having a groove width approximate to the diameter of the main ropes 30 and 31, thus increasing the contact area between the main ropes 30, 31 and the drive sheave 12 to reduce the contact pressure.

[0022] In this way, in order to generate a predetermined frictional force between the drive sheave 12 and itself, the first main rope 30 is wrapped around the drive sheave 12 such that two lead-out portions 30a and 30b extending in different directions from the drive sheave 12 cross each other at a predetermined position. In order that the first main rope 30 may not undergo mutual contact at the position where it crosses, the driving machine 9 is installed such that the rotation axis of the drive sheave 12 is inclined with respect to the vertical line by an acute angle (2.5 degrees). In the upper portion in the hoistway 1, there are provided the first deflector sheave 17 guiding the first main rope 30 from the driving machine 9 to the car 4 and the second deflector sheave 18 guiding the first main rope 30 from the driving machine 9 to the counterweight 5.

[0023] Further, in order to generate a predetermined frictional force between the drive sheave 12 and itself, the second main rope 31 is wrapped around the drive sheave 12 such that two lead-out portions 31a and 31b extending in different directions from the drive sheave 12 cross each other at a predetermined position. In the upper portion in the hoistway 1, there are further provided the return wheel 10 turning back the second main rope 31 extending in a predetermined direction from the driving machine 9 and the third deflector sheave 19 guiding the second main rope 31 turned back by the return wheel 10 to the car 4, and the return wheel 10 is installed such that the rotation axis thereof is inclined with respect to the vertical line by an acute angle (2.5 degrees) in order that the portion of the second main rope 31 extending from the driving machine 9 toward the second deflector sheave 18 may not come into contact with the portion of the second main rope 31 extending from the return wheel 10 toward the third deflector sheave 19.

[0024] Due to this construction, the elevator apparatus of this embodiment can be constructed at low cost by using the general-purpose main ropes 30 and 31 and, further, can elongate the service life of the main ropes 30 and 31.

[0025] Further, since the driving machine 9 has a thin and flat external configuration whose axial length is smaller than the outer diameter thereof, it is possible to reduce the vertical dimension of the hoistway 1.

[0026] Further, the main rope engagement grooves 12 formed in the outer peripheral surface of the driving machine 9 and adapted to be engaged with the main ropes 30 and 31 have a U-shaped sectional configuration. Thus, it is possible to enlarge the contact area between the drive sheave 12 and the main ropes 30 and 31, making it possible to easily generate a predetermined frictional force. Further, the car 4 is suspended with the main ropes 30 and 31 being connected to the lower portion of the car 4. That is, the car 4 is suspended with the main ropes 30 and 31 being connected to the lower beam end portions 4a and 4b, so that the length of the suspension portions 20a and 20b composed of the rope shackles 13a and 13b extending upwardly from the lower beam end portions 4a and 4b and the buffer members 14a and 14b is balanced by the vertical length of the car 4, whereby the vertical dimension of the entire car 4 can be made smaller than in the prior art, and, by extension, it is possible to reduce the vertical dimension of the hoistway 1.

[0027] Further, the first, second, and third deflector sheaves 17, 18, and 19 are installed such that their respective rotation axes are horizontal and that they overlap the car 4 or the counterweight 5 in a vertical plane of projection, so that it is possible to reduce the cross-sectional area of the hoistway 1, thus realizing a small-space elevator apparatus.

[0028] Further, the driving machine 9, the speed governor 33, the return wheel 10, the first, second, and third deflector sheaves 17, 18, and 19, and the control panel 32 are mounted to the support stage 8 provided in the upper portion in the hoistway 1, and the driving machine 9, the speed governor 33, the return wheel 10, and the control panel 32 are installed within the range (indicated by symbol D) as defined by the vertical dimension of the first, second, and third deflector sheaves 17, 18, and 19 and between the rope groove 12a of the drive sheave 9 on the opposite side of the motor and the end surface of the drive sheave 12 on the opposite side of the motor. Thus, it is possible to achieve a reduction in the vertical dimension of the hoistway 1.

[0029] Further, the support stage 8 is supported at the upper ends of the guide rails 2. Thus, the support structure can be easily constructed, making it possible to realize an inexpensive elevator apparatus. Further, the support stage 8 is supported by the guide rails 2 through the intermediation of vibration-proof members 34. Thus, it is possible to prevent the vibration of the apparatuses, such as the driving machine 9, the speed governor 33, the return wheel 10, and the first, second, and third deflector sheaves 17, 18, and 19, generated during ascent and descent of the car 4, from being transmitted to the guide rails 2, thus achieving a reduction in vibration with a simple structure, whereby the elevator is made comfortable to ride in, and no increase in cost is involved.

[0030] In this way, in the elevator apparatus of this embodiment, the arc of contact of the main ropes 30 and 31 with respect to the drive sheave 12 is increased as compared with that in the prior art, and, further, the drive sheave 12 is provided with main rope engagement grooves with a U-shaped sectional configuration to thereby increase the contact area, whereby, in contrast to the

prior art, there is no need to use an expensive, high-friction main rope or to provide a drive sheave with a main rope engagement groove of a special configuration into which such a high friction main rope is forced to achieve an increase in traction, making it possible to ensure a predetermined traction with a general-purpose main rope and, further, to elongate the service life of the main ropes 30 and 31.

[0031] In this embodiment, two main ropes of the first and second main ropes 30 and 31 are used as the main ropes; this is mainly for the purpose of connecting the main ropes to the bottom portion of the car 4. That is, in this embodiment, a single main rope suffices if the suspension of the car is to be effected with the main rope connected to the top portion of the car 4, and either of the main ropes may be omitted.

[0032] Further, in this embodiment, the first and second main ropes 30 and 31 are wrapped around the drive sheave 12 at an arc of contact of approximately 255 degrees; this is due to the fact that the hoisting machine 9 is arranged at a position farthest apart from the deflector sheaves 17 through 19 in order to minimize the angular error with which the main ropes 30 and 31 paid out from the sheave grooves 12a are engaged with the grooves of the deflector sheaves 17 through 19.

[0033] Further, in this embodiment, the inclination angle of the driving machine 9 and the return wheel 10 with respect to the vertical line is 2.5 degrees; if the inclination angle is larger than this, it is highly possible that the main ropes 30 and 31 will be detached or that the corners of the sheave grooves 12a will come into contact with the main ropes when the main ropes 30 and 31 are attached with/detached from the sheave grooves 12a, resulting in the main ropes 30 and 31 and the rope grooves 12a being damaged.

[0034] While this embodiment employs general-purpose main ropes, it is also possible to adopt main ropes with high tension and small diameter. In the case inwhich suchmain ropes are used, it is possible, by adopting small diameter ropes, to reduce the diameter of the drive sheave 12 and that of the first, second, and third direction changing deflector sheaves 17, 18 and 19 (sheave-diameter/main-rope-diameter ≥ 40). For the same reason, it is also possible to achieve a reduction in the size of the driving machine 9.

[0035] Further, as stated above, in this embodiment, the driving machine 9 is arranged above a corner of the car 4, so that it is possible to ensure, between the driving machine 9 and the first, second, and third direction changing deflector sheaves 17, 18, and 19, a sufficient distance for twisting the main ropes 30 and 31, and, at the same time, it is possible to ensure a sufficient arc of contact with respect to the drive sheave 12.

Embodiment 2

[0036] Fig. 7 is a plan view of a machine-room-less type elevator apparatus according to Embodiment 2 of the present invention. In Embodiment 1, the counterweight 5 is arranged by the side of, that is, laterally to, the car 4 in the hoistway 1, whereas, in this embodiment, the counterweight 5 is by the side of the car 4 in the hoistway 1, as shown in Fig. 7. Otherwise, this embodiment is of the same construction as Embodiment 1.

[0037] The present invention is also applicable to an elevator apparatus thus constructed; in this embodiment, the counterweight 5 is arranged on the opposite side of the first deflector sheave 17 and the return wheel 10 with respect to the car 4, so that it is possible for the arc of contact to be larger than that in the apparatus of Embodiment 1.

[0038] While in Embodiments 1 and 2 the driving machine 9 and the first, second, and third direction changing deflector sheaves 17, 18, and 19 are mounted at the upper end of the guide rails 2 by means of the support stage 8, it is also possible for the driving machine and the direction changing deflector sheaves to be directly supported by the ceiling of the hoistway 1 or the building. Alternatively, the support stage 8 may be directly supported by the ceiling of the hoistway 1 or the building.

INDUSTRIAL APPLICABILITY

[0039] The present invention is most suitable for an elevator to be installed in a small space. Further, it is most suitable for an elevator that is required to be inexpensive and easy to maintain.

Claims

1. An elevator apparatus comprising a driving machine (9) arranged in an upper portion in a hoistway (1) and having a drive sheave (12), a main rope (30, 31) wrapped around the drive sheave (12), and a car (4) and a counterweight (5) that are suspended in the hoistway (1) by the main rope (30, 31) and raised and lowered by the driving machine (9),
wherein the car (4) and the counterweight (5) are suspended in the hoistway (1) in a 1:1 roping system,
a first main rope (30) is wrapped around the drive sheave (12) such that two lead-out portions (30a, 30b) extending in different directions from the drive sheave (12) cross each other at a predetermined position so that a predetermined frictional force may be generated between the first main rope (30) and the drive sheave (12),
in order that the first main rope (30) may not undergo mutual contact at the position where it undergoes crossing, the driving machine (9) is installed so as to be inclined such that a rotation axis of the drive sheave (12) is at an acute angle with respect to a vertical line, and
in the upper portion in the hoistway (1), there are provided a first deflector sheave (17) guiding the first main rope (30) from the driving machine (9) to the

car (4) and a second deflector sheave (18) guiding the first main rope (30) from the driving machine (9) to the counterweight (5), **characterized in that** the second deflector sheave (18) is arranged so as to overlap the counterweight (5) in a vertical plane of projection, and
the second deflector sheave (18) is arranged on the opposite side of the first deflector sheave (17) or the drive sheave (12) with respect to the car (4), wherein an arc of contact of the first main rope (30) with respect to the drive sheave (12) ranges from 250 degrees to 280 degrees.

2. An elevator apparatus according to Claim 1, further comprising a second main rope (31) wrapped around the drive sheave (12) such that two lead-out portions (31a, 31b) extending in different directions from the drive sheave (12) cross each other at a predetermined position so that a predetermined frictional force may be generated between the second main rope (31) and the drive sheave (12),
in the upper portion in the hoistway (1), there are further provided a return wheel (10) turning back the second main rope (31) extending in a predetermined direction from the driving machine (9), and a third deflector sheave (19) guiding the second main rope (31) turned back by the return wheel (10) to the car (4), and
the return wheel (10) is installed so as to be inclined such that its rotation axis is at an acute angle with respect to the vertical line in order that a portion of the second main rope (31) extending from the driving machine (9) toward the second deflector sheave (18) and a portion of the second main rope (31) extending from the return wheel (10) toward the third deflector sheave (19) may not come into contact with each other.

3. An elevator apparatus according to Claim 2, wherein the driving machine (9) and the return wheel (10) are installed so as to be inclined such that their respective rotation axes are at not more than 2.5 degrees with respect to the vertical line.

4. An elevator apparatus according to any one of Claims 1 to 3, wherein the driving machine (9) has a thin and flat external configuration whose axial length is smaller than an outer diameter thereof.

5. An elevator apparatus according to any one of Claims 1 to 4, wherein a main rope engagement groove (12a) formed in an outer peripheral surface of the driving machine (9) and adapted to be engaged with the main rope (30, 31) has a U-shaped sectional configuration.

6. An elevator apparatus according to any one of Claims 1 to 5, wherein the car (4) is suspended with the main rope (30, 31) being connected to a lower portion of the car (4).

7. An elevator apparatus according to any one of Claims 2 to 6, wherein the first, second, and third deflector sheaves (17, 18, 19) are installed such that their respective rotation axes are horizontal and that they each overlap the car (4) or the counterweight (5) in a vertical plane of projection.

8. An elevator apparatus according to any one of Claims 2 to 7, wherein the driving machine (9), a speed governor (33), the return wheel (10), the first, second, and third deflector sheaves (17, 18, 19), and a control panel (32) are mounted to a support stage (8) provided in the upper portion in the hoistway (1), and the driving machine (9), the speed governor (33), the return wheel (10), and the control panel (32) are installed within a range defined by the vertical dimension of the first, second, and third deflector sheaves (17, 18, 19) and extending from a rope groove (12a) of the drive sheave (12) on the opposite side of a motor (11) to the end surface of the drive sheave (12) on the opposite side of the motor (11).

9. An elevator apparatus according to Claim 8, wherein the support stage (8) is supported by a guide rail (2, 3) or the hoistway (1).

Patentansprüche

1. Aufzugvorrichtung, umfassend: eine Antriebsmaschine (9), die in einem oberen Abschnitt in einem Schacht (1) angeordnet ist und eine Antriebsscheibe (12) aufweist, ein um die Antriebsscheibe (12) gewundenes Hauptseil (30, 31), und eine Kabine (4) und ein Gegengewicht (5), die im Schacht (1) durch das Hauptseil (30, 31) aufgehängt sind und durch die Antriebsmaschine (9) angehoben und abgesenkt werden,
wobei die Kabine (4) und das Gegengewicht (5) in einem 1:1-Seilsystem im Schacht (1) aufgehängt sind,
ein erstes Hauptseil (30) derart um die Antriebsscheibe (12) gewunden ist, dass zwei sich in unterschiedliche Richtungen von der Antriebsscheibe (12) erstreckende, herausführende Abschnitte (30a, 30b) derart an einer vorbestimmten Position gegenseitig kreuzen, dass eine vorbestimmte Reibkraft zwischen dem ersten Hauptseil (30) und der Antriebsscheibe (12) erzeugt werden kann,
damit das erste Hauptseil (30) an der Position keinem gegenseitigen Kontakt ausgesetzt ist, wo es dem Kreuzen ausgesetzt ist, die Antriebsmaschine (9) so installiert ist, dass sie derart geneigt ist, dass eine Drehachse der Antriebsscheibe (12) in einem spitzen Winkel bezüglich einer vertikalen Linie ist,

und
im oberen Abschnitt im Schacht (1) eine erste Umlenkscheibe (17) vorgesehen ist, die das erste Hauptseil (30) von der Antriebsmaschine (9) zur Kabine (4) führt, und eine zweite Umlenkscheibe (18) vorgesehen ist, die das erste Hauptseil (30) von der Antriebsmaschine (9) zum Gegengewicht (5) führt, **dadurch gekennzeichnet, dass** die zweite Antriebsscheibe (18) so angeordnet ist, dass sie das Gegengewicht (5) in einer vertikalen Projektionsebene überlappt, und
die zweite Umlenkscheibe (18) an der gegenüberliegenden Seite der ersten Umlenkscheibe (17) oder der Antriebsscheibe (12) bezüglich der Kabine (4) angeordnet ist, wobei ein Kontaktbogen des ersten Hauptseils (30) bezüglich der Antriebsscheibe (12) von 250 Grad bis 280 Grad reicht.

2. Aufzugvorrichtung gemäß Anspruch 1, weiter umfassend:

ein zweites Hauptseil (31), das derart um die Antriebsscheibe (12) gewickelt ist, dass zwei sich in unterschiedliche Richtungen von der Antriebsscheibe (12) erstreckende herausführende Abschnitte (31a, 31b) gegenseitig an einer vorbestimmten Position derart kreuzen, dass eine vorbestimmte Reibkraft zwischen dem zweiten Hauptseil (31) und der Antriebsscheibe (12) erzeugt werden kann,
im oberen Abschnitt im Schacht (1) weiter ein Umkehrrad (10) vorgesehen ist, welches das sich in einer vorbestimmten Richtung von der Antriebsmaschine (9) erstreckende zweite Hauptseil (31) umkehrt, und eine dritte Umlenkscheibe (19) vorgesehen ist, die das durch das Umkehrrad (10) umgekehrte zweite Hauptseil (31) zur Kabine (4) führt, und
das Umkehrrad (10) so installiert ist, dass es derart geneigt ist, dass seine Drehachse bezüglich der vertikalen Linie in einem spitzen Winkel ist, damit ein sich von der Antriebsmaschine (9) in Richtung der zweiten Umlenkscheibe (18) erstreckender Abschnitt des zweiten Seils (31) und ein sich vom Umkehrrad (10) in Richtung der dritten Umlenkscheibe (19) erstreckender Abschnitt des zweiten Hauptseils (31) nicht miteinander in Kontakt kommen.

3. Aufzugvorrichtung gemäß Anspruch 2, bei der die Antriebsmaschine (9) und das Umkehrrad (10) so installiert sind, dass sie derart geneigt sind, dass ihre entsprechenden Drehachsen nicht mehr als 2,5 Grad bezüglich der vertikalen Linie befindlich sind.

4. Aufzugvorrichtung gemäß einem der Ansprüche 1 bis 3, bei welcher die Antriebsmaschine (9) einen dünnen und flachen Außenaufbau aufweist, dessen Axiallänge kleiner ist als ein Außendurchmesser hiervon.

5. Aufzugvorrichtung gemäß einem der Ansprüche 1 bis 4, bei der eine Hauptseileingriffsnut (12a), die in einer Außenumfangsfläche der Antriebsmaschine (9) ausgebildet ist und mit dem Hauptseil (30, 31) in Eingriff gebracht werden kann, einen U-förmigen Querschnittsaufbau aufweist.

6. Aufzugvorrichtung gemäß einem der Ansprüche 1 bis 5, bei der die Kabine (4) mit dem an einem unteren Abschnitt der Kabine (4) verbundenen Hauptseil (30, 31) aufgehängt ist.

7. Aufzugvorrichtung gemäß einem der Ansprüche 2 bis 6, bei der die erste, zweite und dritte Umlenkscheibe (17, 18, 19) derart installiert sind, dass ihre entsprechenden Drehachsen horizontal sind, und dass sie jeweils die Kabine (4) oder das Gegengewicht (5) in einer vertikalen Projektionsebene überlappen.

8. Aufzugvorrichtung gemäß einem der Ansprüche 2 bis 7, bei der die Antriebsmaschine (9), ein Geschwindigkeitsregler (33), das Umkehrrad (10), die erste, zweite und dritte Umlenkscheibe (17, 18, 19), und ein Steuerpaneel (32) an einem im oberen Abschnitt des Schachts (1) vorgesehenen Stützgestell (8) befestigt sind, und die Antriebsmaschine (9), der Geschwindigkeitsregler (33), das Umkehrrad (10) und das Steuerpaneel (32) innerhalb eines Bereichs installiert sind, der durch die vertikale Dimension der ersten, zweiten und dritten Umlenkscheibe (17, 18, 19) definiert ist und sich von einer Seilnut (12a) der Antriebsscheibe (12) an der gegenüberliegenden Seite eines Motors (11) zur Endfläche der Antriebsscheibe (12) an der gegenüberliegenden Seite des Motors (11) erstreckt.

9. Aufzugvorrichtung gemäß Anspruch 8, bei der das Stützgestell (8) durch eine Führungsschiene (2, 3) oder den Schacht (1) gestützt wird.

Revendications

1. Appareil d'ascenseur comprenant une machine d'entraînement (9) agencée dans une partie supérieure dans une cage d'ascenseur (1) et ayant une poulie d'entraînement (12), un câble principal (30, 31) enroulé autour de la poulie d'entraînement (12), et une cabine (4) et un contrepoids (5) qui sont suspendus dans la cage d'ascenseur (1) par le câble principal (30, 31) et élevés et abaissés par la machine d'entraînement (9),
dans lequel la cabine (4) et le contrepoids (5) sont suspendus dans la cage d'ascenseur (1) dans un

système de liaison par câble 1 : 1,
un premier câble principal (30) est enroulé autour de la poulie d'entraînement (12) de sorte que deux parties de sortie (30a, 30b) s'étendant dans des directions différentes à partir de la poulie d'entraînement (12) se croisent à une position prédéterminée de sorte qu'une force de friction prédéterminée peut être produite entre le premier câble principal (30) et la poulie d'entraînement (12),
afin que le premier câble principal (30) ne puisse pas subir de contact mutuel à la position où il subit un croisement, la machine d'entraînement (9) est installée de façon à être inclinée de sorte qu'un axe de rotation de la poulie d'entraînement (12) fait un angle aigu par rapport à une ligne verticale, et
dans la partie supérieure dans la cage d'ascenseur (1), il y a une première poulie de déviation (17) guidant le premier câble principal (30) depuis la machine d'entraînement (9) jusqu'à la cabine (4) et une deuxième poulie de déviation (18) guidant le premier câble principal (30) depuis la machine d'entraînement (9) jusqu'au contrepoids (5), **caractérisé en ce que** la deuxième poulie de déviation (18) est agencée de façon à chevaucher le contrepoids (5) dans un plan vertical de projection, et
la deuxième poulie de déviation (18) est agencée sur le côté opposé de la première poulie de déviation (17) ou de la poulie d'entraînement (12) par rapport à la cabine (4), dans laquelle un arc de contact du premier câble principal (30) par rapport à la poulie d'entraînement (12) va de 250 degrés à 280 degrés.

2. Appareil d'ascenseur selon la revendication 1, comprenant en outre un second câble principal (31) enroulé autour de la poulie d'entraînement (12) de sorte que deux parties de sortie (31a, 31b) s'étendant dans des directions différentes à partir de la poulie d'entraînement (12) se croisent à une position prédéterminée de sorte qu'une force de friction prédéterminée peut être produite entre le second câble principal (31) et la poulie d'entraînement (12),
dans la partie supérieure dans la cage d'ascenseur (1), il y a en outre une roue de retour (10) déviant le second câble principal (31) s'étendant dans une direction prédéterminée à partir de la machine d'entraînement (9), et une troisième poulie de déviation (19) guidant le second câble principal (31) déviré par la roue de retour (10) jusqu'à la cabine (4), et
la roue de retour (10) est installée de façon à être inclinée de sorte que son axe de rotation est à un angle aigu par rapport à la ligne verticale afin qu'une partie du second câble principal (31) s'étendant à partir de la machine d'entraînement (9) vers la deuxième poulie de déviation (18) et une partie du second câble principal (31) s'étendant à partir de la roue de retour (10) vers la troisième poulie de déviation (19) ne puissent pas entrer en contact l'une avec l'autre.

3. Appareil d'ascenseur selon la revendication 2, dans lequel la machine d'entraînement (9) et la roue de retour (10) sont installées de façon à être inclinées de sorte que leurs axes de rotation respectifs ne sont pas à plus de 2,5 degrés par rapport à la ligne verticale.

4. Appareil d'ascenseur selon l'une quelconque des revendications 1 à 3, dans lequel la machine d'entraînement (9) a une configuration externe mince et plate dont la longueur axiale est plus petite qu'un diamètre extérieur de cette dernière.

5. Appareil d'ascenseur selon l'une quelconque des revendications 1 à 4, dans lequel une rainure de mise en prise de câble principal (12a) formée dans une surface périphérique extérieure de la machine d'entraînement (9) et conçue pour être en prise avec le câble principal (30, 31) a une configuration en coupe en forme de U.

6. Appareil d'ascenseur selon l'une quelconque des revendications 1 à 5, dans lequel la cabine (4) est suspendue, le câble principal (30, 31) étant relié à une partie inférieure de la cabine (4).

7. Appareil d'ascenseur selon l'une quelconque des revendications 2 à 6, dans lequel les première, deuxième et troisième poulies de déviation (17, 18, 19) sont installées de sorte que leurs axes de rotation respectifs sont horizontaux et qu'ils chevauchent chacun la cabine (4) ou le contrepoids (5) dans un plan vertical de projection.

8. Appareil d'ascenseur selon l'une quelconque des revendications 2 à 7, dans lequel la machine d'entraînement (9), un régulateur de vitesse (33), la roue de retour (10), les première, deuxième et troisième poulies de déviation (17, 18, 19), et un panneau de commande (32) sont montés sur une platine de support (8) disposée dans la partie supérieure dans la cage d'ascenseur (1), et la machine d'entraînement (9), le régulateur de vitesse (33), la roue de retour (10), et le panneau de commande (32) sont installés à l'intérieur d'une plage définie par la dimension verticale des première, deuxième et troisième poulies de déviation (17, 18, 19) et s'étendant à partir d'une rainure de câble (12a) de la poulie d'entraînement (12) sur le côté opposé d'un moteur (11) jusqu'à la surface d'extrémité de la poulie d'entraînement (12) sur le côté opposé du moteur (11).

9. Appareil d'ascenseur selon la revendication 8, dans lequel la platine de support (8) est supportée par un rail de guidage (2, 3) ou la cage d'ascenseur (1).

FIG. 1

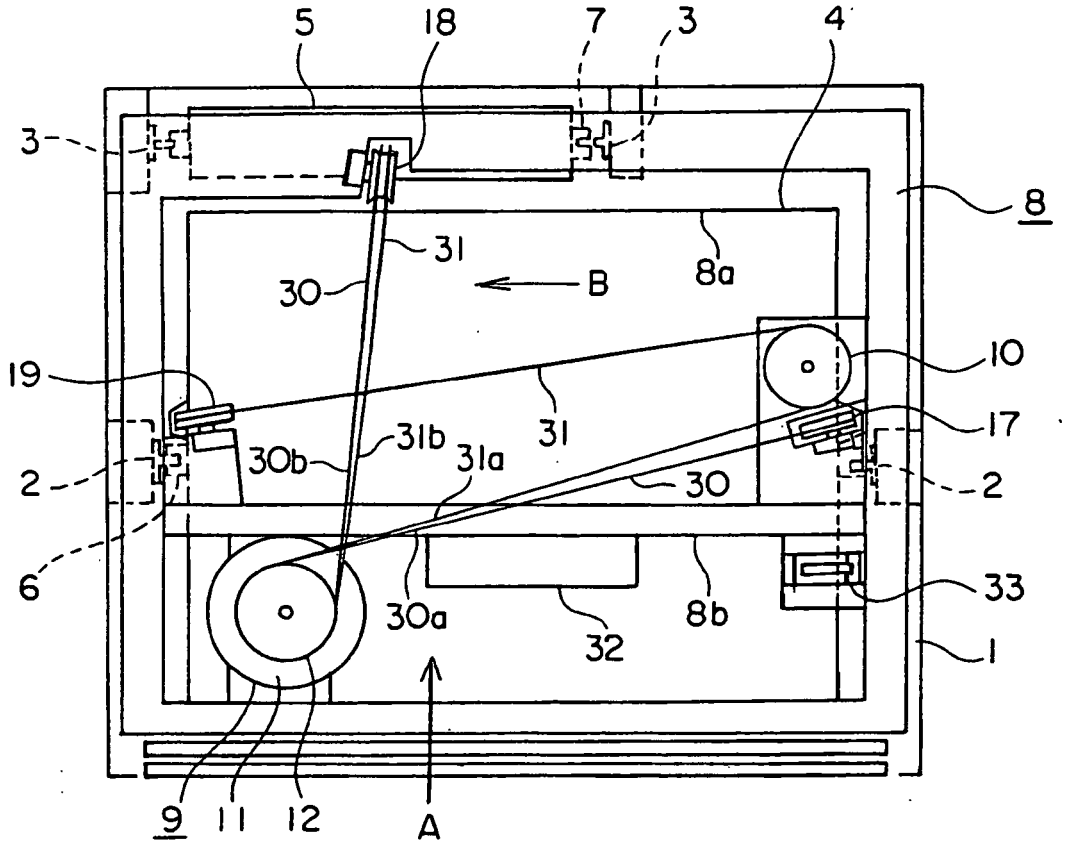

5
18
7
3
4
3
8
31
30
B
8a
19
10
31
17
30b
31b
31a
2
30
2
6
33
30a
32
8b
1
9
11
12
A

FIG. 2

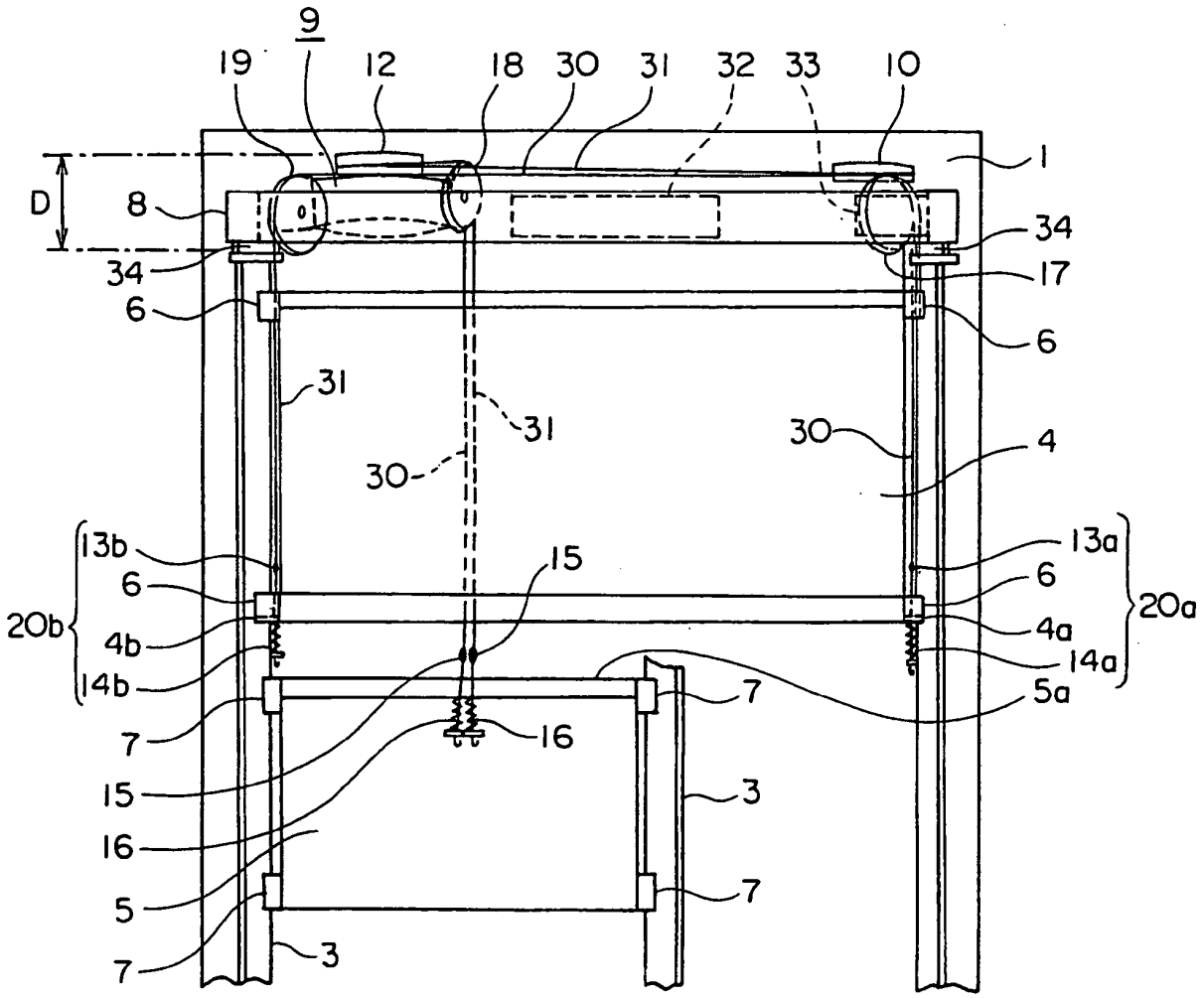

9
19
12
18
30
31
32
33
10
1
D
8
34
17
6
31
30
4
13b
13a
15
20b
20a
4b
4a
14b
14a
5a
7
16
3
5

FIG. 3

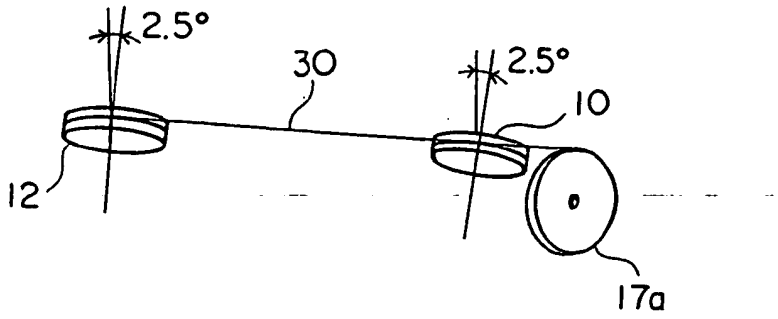


FIG. 4

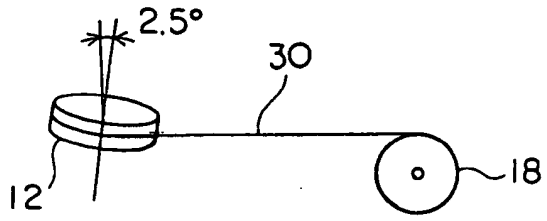


FIG. 5

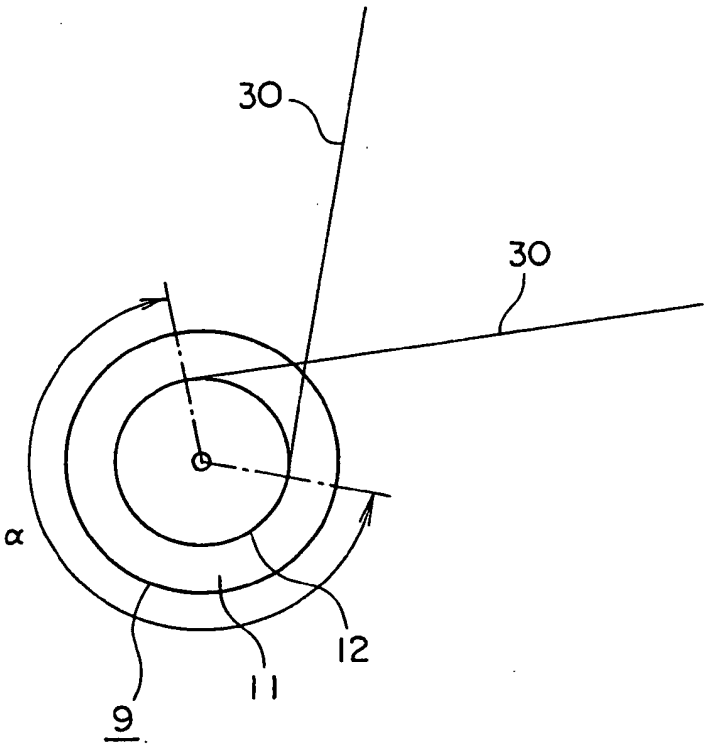


FIG. 6

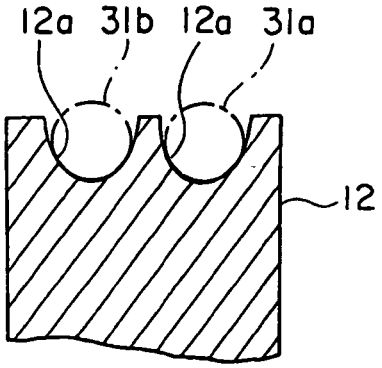
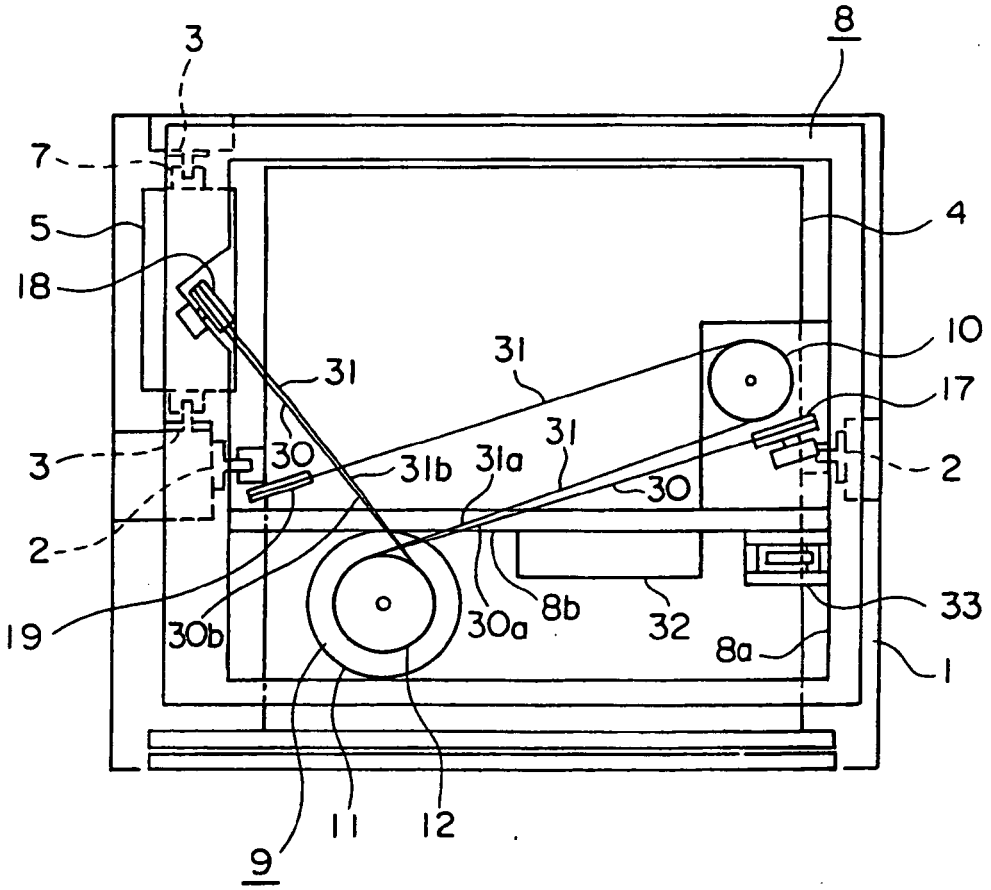

12a
31b
12a
31a
12

FIG. 7


3
8
7
5
18
4
10
31
31
17
31
3
30
31b
31a
31
2
30
2
19
30b
30a
8b
32
33
8a
1
9
11
12

REFERENCES CITED IN THE DESCRIPTION

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- EP 1057771 A **[0006]**