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(54) **ELEVATOR EQUIPMENT**

AUFZUGSEINRICHTUNG

EQUIPEMENT MONTE-CHARGE

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Description

Technical Field

[0001] The present invention relates to an art of layout in an elevator without a machine room.

Background Art

[0002] Fig. 11 is a plan view of a hoist-way in a conventional elevator without a machine room as disclosed in JP-A-2000-255933 (Pages 7 and 8, Figs. 15 and 16), showing relation between a sheave of a winding machine and turning pulleys provided at a top of the hoist-way, and Fig. 12 is a vertical sectional view of the hoist-way. The drawings show an elevator device having 2:1 roping which includes a cage 3 suspended by a hoisting rope 15 which is wound around a sheave 4a of a winding machine 4 at the top of the hoist-way, and a balance weight 9 which moves up and down in proportion to the cage. In this example, the winding machine 4, the sheave 4a and a first turning pulley 5 are arranged in parallel to a ceiling face of the hoist-way, and the hoisting rope is turned to a vertical direction by means of a second turningpulley 6 and then, wound around two suspending pulleys 18 which are pivotally attached to a lower part of the cage thereby to suspend the cage 3. On the other hand, the balance weight 9 is suspended by turning the hoisting rope 15 from the sheave 4a to a vertical direction by means of a turning pulley 7 at a side of the balance weight, and by winding the hoisting rope 15 around a suspending pulley 19 which is pivotally attached to the weight balance 9.

[0003] The reason why the winding machine, the sheave and the first turning pulley are arranged in parallel to the ceiling face of the hoist-way is to make a gap at the top of the cage as small as possible. However, due to a fact that the winding machine is provided on the ceiling face of the hoist-way, on occasion of maintenance and inspection, a worker is forced to climb on a roof of a cage room to do the work in an upwardly directed state, which will incur a heavy working load. As alternative means, there has been a method of providing a device for opening or closing the winding machine downwardly together with its mounting frame for the maintenance work, but this method has had a problem of incurring a high cost. Moreover, in the conventional elevator without a machine room, in case of 1:1 roping, it has been difficult to contain the winding machine and the turning pulleys in a narrow gap at the top. Therefore, an elevator having 2:1 roping in which the winding machine and the turning pulleys can be easily disposed on a side face of the cage and the small winding machine may be sufficient has been generally employed. Recently, it has become possible to make the winding machine, the sheave and the turning pulleys smaller in diameter, because a rope having excellent flexibility and a steel rope having a small diameter and high strength has been developed and produced. In this case, however, there has been such anxiety that rotation numbers of both the winding machine and the turning pulleys may be increased and noises may occur, when they are simply combined with the elevator having 2:1 roping.

[0004] WO 02-22486 is a prior art document which discloses features falling under the characterising portion of Claims 1 and 3. EP 1 057 771 A2 is further prior art.

Disclosure of the Invention

[0005] This invention has been made in order to solve the above described problems, and an object of the invention is to obtain an elevator having 1:1 roping in which a hoist-way is decreased to the smallest in size, while a maintenance space for a winding machine can be secured.

[0006] As means for solving the above described problems, an elevator device comprises the features of Claim 1.

[0007] Moreover, in the above described structure, the first turning pulley and the second turning pulley are in combination preferably having different diameters from each other.

[0008] Further, another solution of the problem is the elevator device having the features of Claim 3.

[0009] Still further, preferably, in the above described structure, the winding machine, sheave and turning pulleys are made smaller in size, and a plurality of the turning pulleys which are not in parallel to the ceiling of the hoistway are arranged in a gap between the cage and the wall of the hoist-way.

[0010] Still further, preferably, in each of the above described elevators, a rope having excellent flexibility or a steel rope having a small diameter and high strength is applied to the hoisting rope, and the winding machine, sheave and turning pulleys are made smaller in size.

Brief Description of the Drawings

[0011]

Fig. 1 is a plan view showing a top part of a hoistway in Embodiment 1 according to this invention.

Fig. 2 is a vertical sectional view of the hoist-way in Fig. 1.

Fig. 3 is a plan view showing a top part of a hoistway in Embodiment 2 according to this invention.

Fig. 4 is a vertical sectional view of both the hoistways in Figs. 3 and 5.

Fig. 5 is a plan view showing a top part of a hoistway in Embodiment 3 according to this invention.

Fig. 6 is a plan view showing a top part of a hoistway in Embodiment 4 according to this invention.

Fig. 7 is a vertical sectional view of both the hoistways in Figs. 6 and 8.

Fig. 8 is a plan view showing a top part of a hoistway in Embodiment 5 according to this invention.

Fig. 9 is a plan view showing a top part of a hoist-way in Embodiment 6 according to this invention.
Fig. 10 is a vertical sectional view of the hoist-way in Fig. 9.
Fig. 11 is a plan view showing a top part of a hoist-way in a conventional elevator without a machine room.
Fig. 12 is a vertical sectional view of the hoist-way in Fig. 11.

Best Mode for Carrying Out the Invention

[0012] Now, embodiments of the present invention will be described.

Embodiment 1

[0013] Fig. 1 is a plan view showing relation between a sheave of a winding machine and turning pulleys at the top of the hoist-way in Embodiment 1 according to this invention, and Fig. 2 is a vertical sectional view of the hoist-way. The drawings show an elevator device having 1:1 roping which includes a cage 3 moving up and down along a pair of guide rails 10 provided in the hoist-way, a hoisting rope 13 which is engaged at its one end with the cage 3 and engaged at the other end with a balance weight 9 moving up and down along other guide rails 11, and a winding machine 4 having a sheave 4a around which the hoisting rope is wound. The elevator device is constructed in such a manner that the winding machine 4 is arranged close to a wall of the hoist-way in an upper part of the hoist-way, the sheave 4a is provided so as not to be in parallel to a ceiling face of the hoist-way, a plurality of the ropes 13 are divided into more than two lines of a first turning pulley 5 and a second turning pulley 6 which are arranged in parallel to the ceiling face of the hoist-way to be deflected to a center of gravity of the cage, and the ropes are further turned to a vertical direction by means of a third turning pulley 8 and engaged with rope retaining parts of the cage thereby to suspend the cage.

[0014] Therefore, according to this layout, the 1:1 roping can be attained even in a narrow gap at the top of the hoist-way, and even though a number of the hoisting ropes are employed, a rope fleet angle, that is, an angle at which the ropes are likely to be detached from rope grooves in the sheave or the turning pulleys can be depressed to a small angle, because a plurality, more than two, of the first turning pulley and the second turning pulley are employed.

[0015] In addition, because the rope fleet angle can be made small, deflected abrasion of the rope grooves can be restrained, and noises can be decreased, thus enabling effective lives of the ropes to be prolonged.

Embodiment 2

[0016] Fig. 3 is a plan view corresponding to Fig. 1, showing Embodiment 2. Fig. 4 is a vertical sectional view of the hoist-way in Fig. 3. Embodiment 2 is the same as the above described structure, except that two turning pulleys, namely the second turning pulley 6 and a third turning pulley 6a are employed, while the first turning pulley 5 is single, in other words, the three turning pulleys in total from the first to the third are employed. Moreover, since the same members or equivalent members as in the foregoing embodiment are designated by the same reference numerals, further description will be omitted.

[0017] As the results, in addition to the advantages in the foregoing embodiment, because the two turning pulleys, namely the second turning pulley 6 and the third turning pulley 6a are employed in combination, while the first turning pulley 5 is single, shafts and bearing beams of the turning pulleys 6, 6a are positioned apart from the turning pulley 5 and interference will not occur. Accordingly, such an advantage that the turning pulleys can be arranged more close to each other in a vertical direction, and the above described rope fleet angle can be made smaller can be obtained.

Embodiment 3

[0018] Fig. 5 is a plan view corresponding to Fig. 3, showing Embodiment 3, and Fig. 4 is a vertical sectional view of the hoist-way in Fig. 5. In Embodiment 2, the two turning pulleys, namely the second turning pulley 6 and the third turning pulley 6a are combined, while the first turning pulley 5 is single. However, in this embodiment, the diameter of the turning pulley 5 is made smaller so as to match a turning angle of the rope 13 drawn out from the sheave 4a of the winding machine to the center of gravity of the cage in view of a layout, and a diameter of a single second turning pulley 6b is made larger instead of employing the two turning pulleys 6 and 6a. The diameter of the second turning pulley 6b is selected so as to match the turning angles of the sheave 4a and the turning pulley 5, thereby to restrict angles of the ropes with respect to respective rope grooves in the third turning pulley 8 within an allowable range. Further description will be omitted, because arrangement of the other members is the same as in Embodiment 2, and the same reference numerals designate the same members or equivalent members.

[0019] As the results, the optimum rope fleet angle can be obtained by making the diameters of the first turning pulley and the second turning pulley different from each other, and by selecting and combining the diameters of the turning pulleys so as to match differences between the turning angles of the rope. Moreover, in the same manner as in the foregoing embodiment, the shaft and bearing beam of the second turning pulley 6b are located apart from the first turning pulley 5, and interference will not occur. Accordingly, such an advantage that the turning pulleys can be positioned more close to each other in a vertical direction, and the above described rope fleet angle can be made smaller can be attained.

Embodiment 4

[0020] Fig. 6 is a plan view corresponding to Fig. 1, showing Embodiment 4, and Fig. 7 is a vertical sectional view of the hoist-way in Fig. 6. The drawings show an elevator device having the 1:1 roping which includes a cage, a hoisting rope which is engaged at its one end with the cage and engaged at the other end with a balance weight which moves up and down with respect to the cage, and a winding machine having a sheave around which the hoisting rope is wound. The elevator device is constructed in such a manner that the above described winding machine 4 is arranged close to the wall of the hoist-way in the upper part of the hoist-way, the above described sheave 4a is provided so as not to be in parallel to the ceiling face of the hoist-way, a plurality of the ropes 13 from the sheave 4a to the cage are divided to the first turning pulley 5 and the second turning pulley 6 which are arranged in parallel to the ceiling face of the hoist-way to be deflected, and the ropes are further turned to a vertical direction respectively by means of a third turning pulley 8a and a fourth turning pulley 8b for the purpose of dropping down the ropes to two rope retaining parts at both sides of the cage, thereby to suspend the cage.

[0021] As the results, the 1:1 roping can be attained in a narrow gap at the top of the hoist-way, and a deflected load will not be exerted on the cage, because the cage is suspended at two points surrounding the center of gravity of the cage. Therefore, this elevator device can be applied to the elevator having a large capacity. Even though a number of the hoisting ropes are employed, the rope fleet angle can be made small because the ropes are divided to the first turning pulley and the second turning pulley. In addition, because the rope fleet angle can be made small, deflected abrasion of the rope grooves can be restrained, and noises can be decreased, thus enabling effective lives of the ropes to be prolonged.

Embodiment 5

[0022] Fig. 8 is a plan view corresponding to Fig. 6, showing Embodiment 5, and Fig. 7 is a vertical sectional view of the hoist-way in Fig. 8. The winding machine, sheave and turning pulleys are made smaller in size, and all of a plurality of the turning pulleys which are not in parallel to the ceiling of the hoist-way are arranged in a gap between the cage and the wall of the hoist-way. Further description will be omitted, because arrangement of the other members is the same as in the foregoing embodiments, and the same reference numerals designate the same members or equivalent members.

[0023] As the results, in addition to the advantages in the foregoing embodiments, due to the fact that the turning pulleys are arranged in the gap between the cage and the wall of the hoist-way, they are not overlapped on a plain of the cage and become free from restraint in the gap above the top of the cage. Accordingly, such an advantage that the turning pulleys can be contained in the narrow gap above the top of the cage can be obtained.

Embodiment 6

[0024] Fig. 9 is a plan view corresponding to Fig. 8, showing Embodiment 6, and Fig. 10 is a vertical sectional view of the hoist-way in Fig. 9. In this embodiment, a rope having excellent flexibility or a steel rope having a small diameter and high strength is applied to the hoisting rope, and the winding machine, sheave and turning pulleys are made smaller in size, in the above described elevators. Further description will be omitted, because arrangement of the other members is the same as in the foregoing embodiments. It is self-explanatory that such application of the steel rope having the small diameter and high strength, and downsizing of the winding machine, sheave and turning pulleys can be also applied to Embodiments 1 to 4 in the same manner.

[0025] As the results, it is possible to further save space in each of the above described elevators without a machine room.

Industrial Applicability

[0026] This invention having the above described structure can attain such advantages as described below.

[0027] The elevator device having 1:1 roping which includes a cage moving up and down along a pair of guide rails provided in a hoist-way, a hoisting rope which is engaged at its one end with the aforesaid cage and engaged at the other end with a balance weight moving up and down along other guide rails, and a winding machine having a sheave around which the aforesaid hoisting rope is wound is constructed in such a manner that the aforesaid winding machine is disposed close to a wall of the hoist-way in an upper part of the hoist-way, having the aforesaid sheave arranged not in parallel to a ceiling face of the hoist-way, a plurality of the ropes stretched from the aforesaid sheave to the aforesaid cage are divided into more than two lines of a first turning pulley and a second turning pulley which are arranged in parallel to the ceiling of the hoist-way thereby to be deflected to a center of gravity of the cage, and then, the ropes are turned to a vertical direction by means of a third turning pulley, whereby the ropes are engaged with rope retaining parts of the cage to suspend the cage.

[0028] Therefore, according to the above described layout, the 1:1 roping can be attained even in the narrow gap at the top of the hoist-way, and even though a number of the hoisting ropes are employed, the rope fleet angle, that is, the angle at which the ropes are likely to-be detached from the rope grooves in the sheave or the turning pulleys can be depressed to a small angle, because a plurality of the first turning pulleys are employed.

[0029] Moreover, because the above described rope fleet angle can be made small, deflected abrasion of the rope grooves can be restrained, and noises can be de-

creased, thus enabling effective lives of the ropes to be prolonged.

Claims

1. An elevator device having 1:1 roping which comprises a cage (3) moving up and down along a pair of guide rails (10) provided in a hoist-way (1), a hoisting rope (13) which is engaged at its one end with said cage (3) and engaged at the other end with a balance weight (9) moving up and down along other guide rails (11), and a winding machine (4) having a sheave (4a) around which said hoisting rope (13) is wound, wherein said winding machine (4) is disposed close to a wall (2) of the hoist-way (1) in an upper part of the hoist-way (1),
characterized in that
said sheave (4a) is arranged not in parallel to a ceiling face of the hoist-way (1), a plurality of the ropes stretched from said sheave (4a) to said cage (3) are divided into more than or equal to two lines by means of a first turning pulley (5) and a second turning pulley (6,6a,6b) which are arranged in parallel to the ceiling of the hoist-way (1) thereby to be deflected to a center of gravity of the cage (3), and then, said ropes are turned to a vertical direction by means of a third turning pulley (8), whereby the ropes are engaged with rope retaining parts of the cage (3) to suspend the cage (3).

2. An elevator device as claimed in claim 1, **characterized in that** the first turning pulley (5) and the second turning pulley (6b) are different in diameter from each other.

3. An elevator device having 1:1 roping which comprises a cage (3) moving up and down along a pair of guide rails (10) provided in a hoist-way (1), a hoisting rope (13) which is engaged at its one end with said cage (3) and engaged at the other end with a balance weight (9) moving up and down along other guide rails (11), and a winding machine (4) having a sheave (4a) around which said hoisting rope (13) is wound, wherein said winding machine (4) is disposed close to a wall (2) of the hoist-way (1) in an upper part of the hoist-way (1),
characterised in that
said sheave (4a) is arranged not in parallel to a ceiling face of the hoist-way (1), a plurality of the ropes stretched from said sheave (4a) to said cage (3) are deflected in respective two directions by means of a respective first turning pulley (5, 5a) and a respective second turning pulley (6, 6c) which are arranged in parallel to the ceiling of the hoist-way (1), and then, said ropes are turned to a vertical direction by means of a third turning pulley (8b, 8c) and a fourth turning pulley (8a, 8d) for dropping down the ropes to two rope retaining parts (17a, 17b) at both sides of the cage (3) thereby to suspend the cage (3).

4. An elevator device as claimed in claim 3, **characterized in that** the winding machine (4), sheave (4a) and turning pulleys (8c, 8d, 5a, 6c) are made smaller in size, and a plurality of the turning pulleys (8c, 8d) which are not in parallel to the ceiling of the hoist-way (1) are arranged in a gap between the cage (3) and a wall (2) of the hoist-way (1).

5. An elevator device as claimed in any one of claims 1 to 4, **characterized in that** a rope having excellent flexibility or a steel rope having a small diameter and high strength is applied to the hoisting rope (13), and the winding machine (4), sheave (4a) and turning pulleys (5a, 6c, 8c, 8d) are made smaller in size.

Patentansprüche

1. Aufzugseinrichtung mit einer 1:1-Abseilung, welche eine Kabine (3), die sich entlang eines Paars Führungsschienen (10), die in einem Schacht (1) vorgesehen sind, nach oben und unten bewegt, ein Hubseil (13), das an seinem einen Ende mit der Kabine (3) im Eingriff ist und am anderen Ende mit einem Gegengewicht (9) im Eingriff ist, welches sich entlang anderer Führungsschienen (11) nach oben und unten bewegt, und eine Wicklungsmaschine (4) aufweist, die eine Seilrolle (4a) aufweist, um die das Hubseil (13) gewickelt ist, wobei die Wicklungsmaschine (4) nahe an einer Wand (2) des Schachts (1) in einem oberen Teil des Schachts (1) vorgesehen ist,
dadurch gekennzeichnet, dass
die Seilrolle (4a) nicht parallel zu einer Deckenfläche des Schachts (1) angeordnet ist, wobei mehrere Seile, die sich von der Seilrolle (4a) zur Kabine (3) erstrecken, in mehr als oder gleich zwei Stränge mittels einer ersten Umlenkrolle (5) und einer zweiten Umlenkrolle (6, 6a, 6b) aufgespalten sind, die parallel zur Decke des Schachts (1) angeordnet sind, sodass sie zu einem Schwerpunkt der Kabine (3) hin abgelenkt werden und dass dann die Seile in eine vertikale Richtung mittels einer dritten Umlenkrolle (8) umgelenkt werden, wobei die Seile mit Seilrückhalteteilen der Kabine (3) im Eingriff sind, um die Kabine (3) aufzuhängen.

2. Aufzugseinrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die erste Umlenkrolle (5) und die zweite Umlenkrolle (6b) im Durchmesser voneinander verschieden sind.

3. Aufzugseinrichtung mit einer 1:1-Abseilung, die eine Kabine (3), die sich entlang eines Paars Führungsschienen (10), die in einem Schacht (1) vorgesehen

sind, nach oben und nach unten bewegt, ein Hubseil (13), das an seinem einen Ende mit der Kabine (3) und am anderen Ende mit einem Gegengewicht (9) im Eingriff ist, welches sich entlang anderer Führungsschienen (11) nach oben und unten bewegt, und eine Wicklungsmaschine (4) aufweist, die eine Seilrolle (4a) aufweist, um die das Hubseil (13) gewickelt ist, wobei die Wicklungsmaschine (4) nahe an einer Wand (2) des Schachts (1) in einem oberen Teil des Schachts (1) vorgesehen ist,
dadurch gekennzeichnet, dass
die Seilrolle (4a) nicht parallel zu einer Deckenfläche des Schachts (1) angeordnet ist, wobei mehrere Seile, die sich von der Seilrolle (4a) zu der Kabine (3) erstrecken, in jeweilige zwei Richtungen mittels einer jeweiligen ersten Umlenkrolle (5, 5a) und einer jeweiligen zweiten Umlenkrolle (6, 6c) abgelenkt sind, welche parallel zu der Decke des Schachts (1) angeordnet sind, und dann die Seile in eine vertikale Richtung mittels einer dritten Umlenkrolle (8b, 8c) und einer vierten Umlenkrolle (8a, 8b) umgelenkt sind, um die Seile zu zwei Seilrückhalteteilen (17a, 17b) an beiden Seiten der Kabine (3) herunterhängen zu lassen, um dadurch die Kabine (3) aufzuhängen.

4. Aufzugseinrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** die Wicklungsmaschine (4), Seilrolle (4a) und Umlenkrollen (8c, 8d, 5a, 6c) in der Größe kleiner ausgebildet sind und dass mehrere Umlenkrollen (8c, 8d), die nicht parallel zur Decke des Schachts (1) sind, in einer Lücke zwischen der Kabine (3) und einer Wand (2) des Schachts (1) angeordnet sind.

5. Aufzugseinrichtung nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** ein Seil mit einer hervorragenden Flexibilität oder ein Stahlseil mit einem kleinen Durchmesser und einer hohen Festigkeit für das Hubseil (13) verwendet wird und dass die Wicklungsmaschine (4), Seilrolle (4a) und die Umlenkrollen (5a, 6c, 8c, 8d) in der Größe kleiner ausgebildet sind.

Revendications

1. Dispositif formant ascenseur ayant un système de câbles 1:1 qui comprend une cabine (3) se déplaçant vers le haut et vers le bas le long d'un couple de rails de guidage (10) disposés dans une cage d'ascenseur (1), un câble de levage (13) qui est en prise au niveau d'une extrémité particulière avec ladite cabine (3) et en prise au niveau de l'autre extrémité avec un contrepoids (9) se déplaçant vers le haut et vers le bas le long d'autres rails de guidage (11), et une machine à enrouler (4) ayant une poulie (4a) autour de laquelle ledit câble de levage (13) est enroulé, dans lequel ladite machine à enrouler (4) est disposée près d'une paroi (2) de la cage d'ascenseur (1) dans une partie supérieure de la cage d'ascenseur (1),
caractérisé en ce que
ladite poulie (4a) n'est pas agencée parallèlement à une face formant plafond de la cage d'ascenseur (1), une pluralité des câbles tendus entre ladite poulie (4a) et ladite cabine (3) sont divisés en deux ou plusieurs lignes au moyen d'une première poulie d'orientation (5) et d'une deuxième poulie d'orientation (6, 6a, 6b) qui sont agencées parallèlement au plafond de la cage d'ascenseur (1) pour être déviés de ce fait vers un centre de gravité de la cabine (3), et ensuite, lesdits câbles sont orientés dans une direction verticale au moyen d'une troisième poulie d'orientation (8), de sorte que les câbles sont en prise avec des éléments de retenue de câble de la cabine (3) pour suspendre la cabine (3).

2. Dispositif formant ascenseur selon la revendication 1, **caractérisé en ce que** la première poulie d'orientation (5) et la deuxième poulie d'orientation (6b) ont un diamètre différent l'une de l'autre.

3. Dispositif formant ascenseur ayant un système de câbles 1:1 qui comprend une cabine (3) se déplaçant vers le haut et vers le bas le long d'un couple de rails de guidage (10) disposés dans une cage d'ascenseur (1), un câble de levage (13) qui est en prise au niveau d'une extrémité particulière avec ladite cabine (3) et en prise au niveau de l'autre extrémité avec un contrepoids (9) se déplaçant vers le haut et vers le bas le long d'autres rails de guidage (11), et une machine à enrouler (4) ayant une poulie (4a) autour de laquelle ledit câble de levage (13) est enroulé, dans lequel ladite machine à enrouler (4) est disposée près d'une paroi (2) de la cage d'ascenseur (1) dans une partie supérieure de la cage d'ascenseur (1),
caractérisé en ce que
ladite poulie (4a) n'est pas agencée parallèlement à une face formant plafond de la cage d'ascenseur (1), une pluralité des câbles tendus entre ladite poulie (4a) et ladite cabine (3) sont déviés dans deux directions respectives au moyen d'une première poulie d'orientation respective (5, 5a) et d'une deuxième poulie d'orientation respective (6, 6c) qui sont agencées parallèlement au plafond de la cage d'ascenseur (1), et ensuite, lesdits câbles sont orientés dans une direction verticale au moyen d'une troisième poulie d'orientation (8b, 8c) et d'une quatrième poulie d'orientation (8a, 8d) pour faire dérouler les câbles vers deux éléments de retenue de câble (17a, 17b) au niveau des deux côtés de la cabine (3) pour suspendre de ce fait la cabine (3).

4. Dispositif formant ascenseur selon la revendication

3, **caractérisé en ce que** la machine à enrouler (4), la poulie (4a) et les poulies d'orientation (8c, 8d, 5a, 6c) sont rendues plus petites en taille, et une pluralité des poulies d'orientation (8c, 8d) qui ne sont pas parallèles au plafond de la cage d'ascenseur (1) sont agencées dans un espacement entre la cabine (3) et une paroi (2) de la cage d'ascenseur (1).

5. Dispositif formant ascenseur selon l'une quelconque des revendications 1 à 4, **caractérisé en ce qu'**un câble ayant une souplesse excellente ou un câble d'acier ayant un petit diamètre et une haute résistance est appliqué au câble de levage (13), et la machine à enrouler (4), la poulie (4a) et les poulies d'orientation (5a, 6c, 8c, 8d) sont rendues plus petites en taille.

FIG. 1

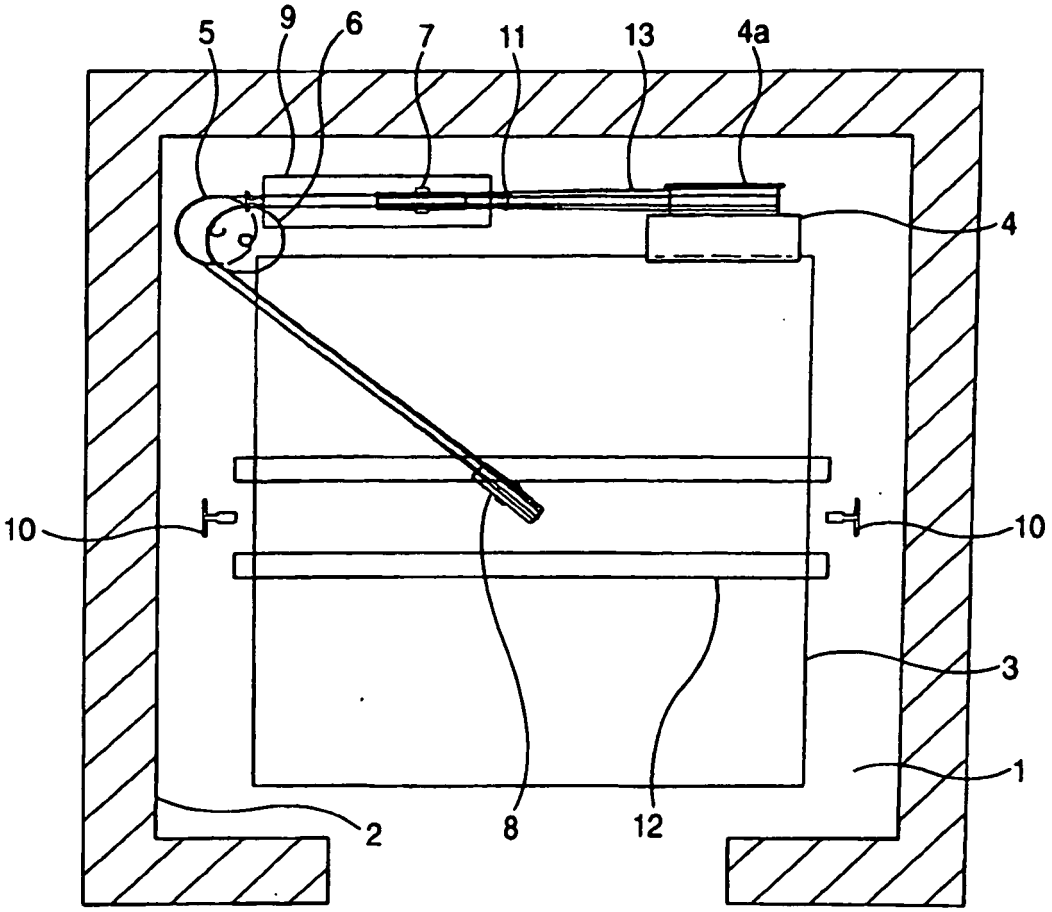


FIG. 2

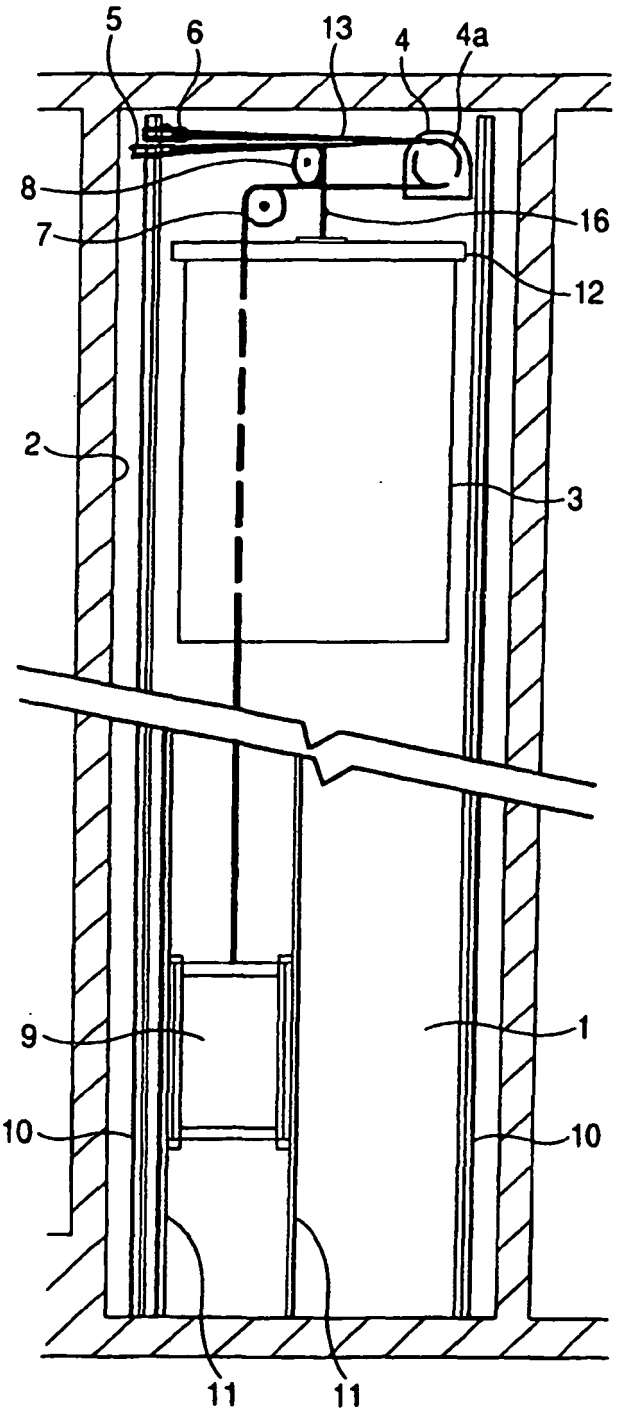


FIG. 3

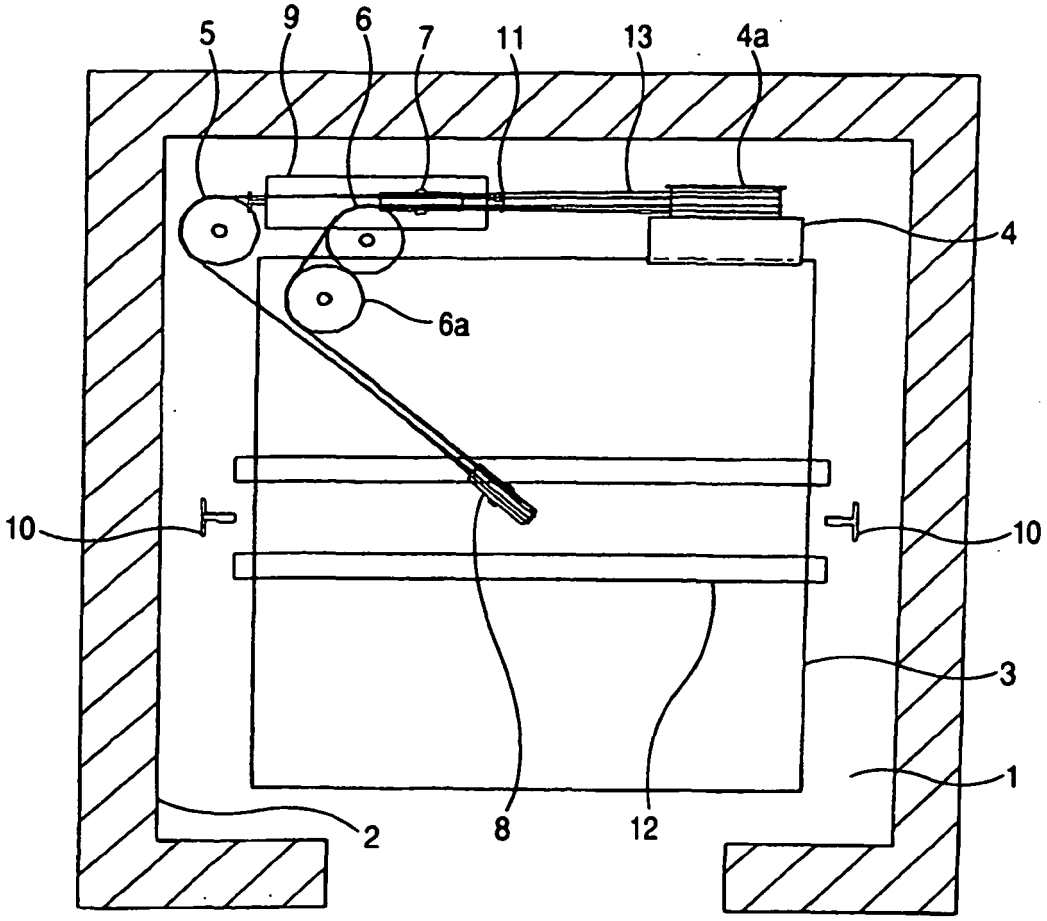


FIG. 4

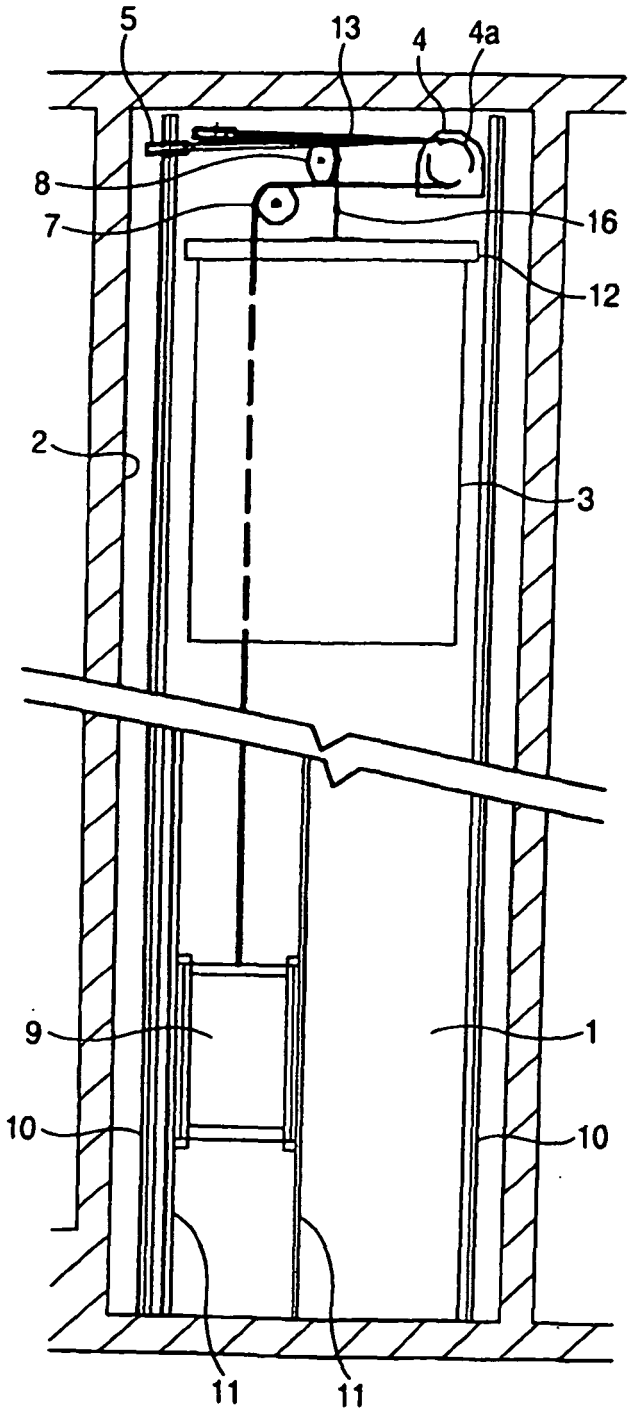


FIG. 5

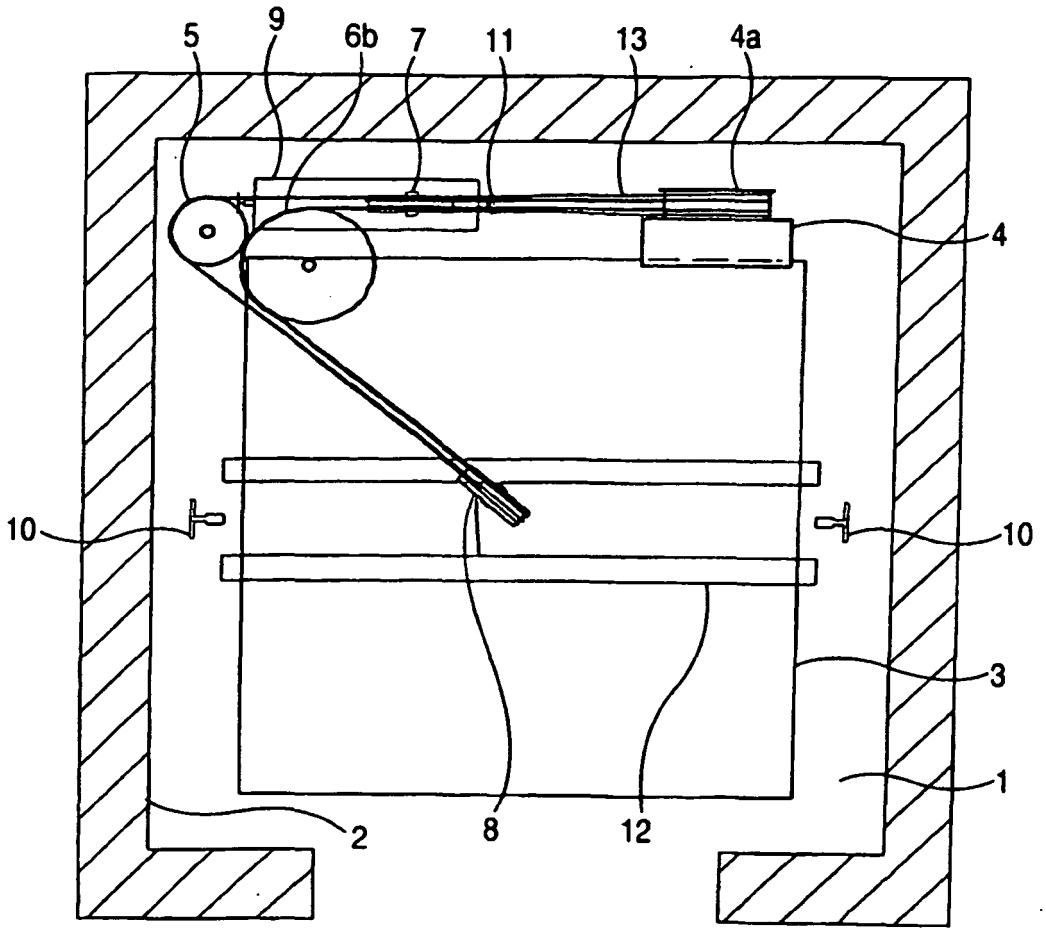


FIG. 6

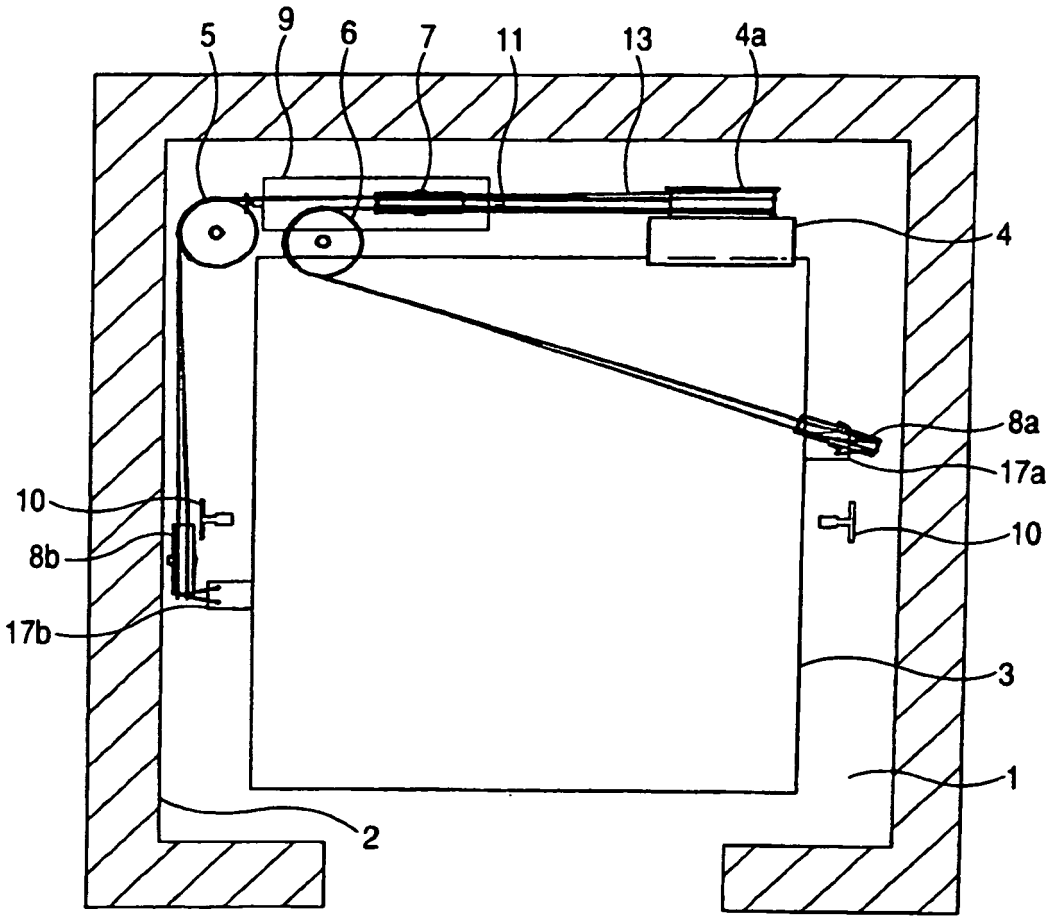


FIG. 7

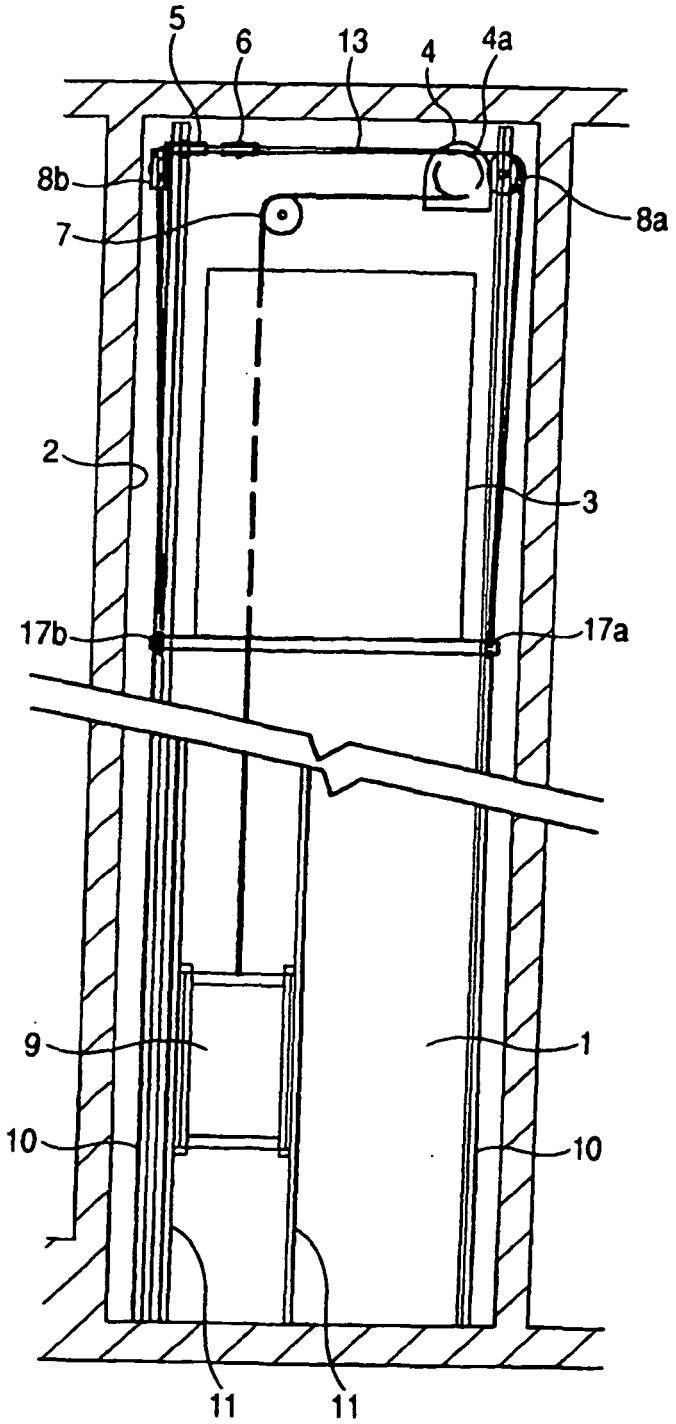


FIG. 8

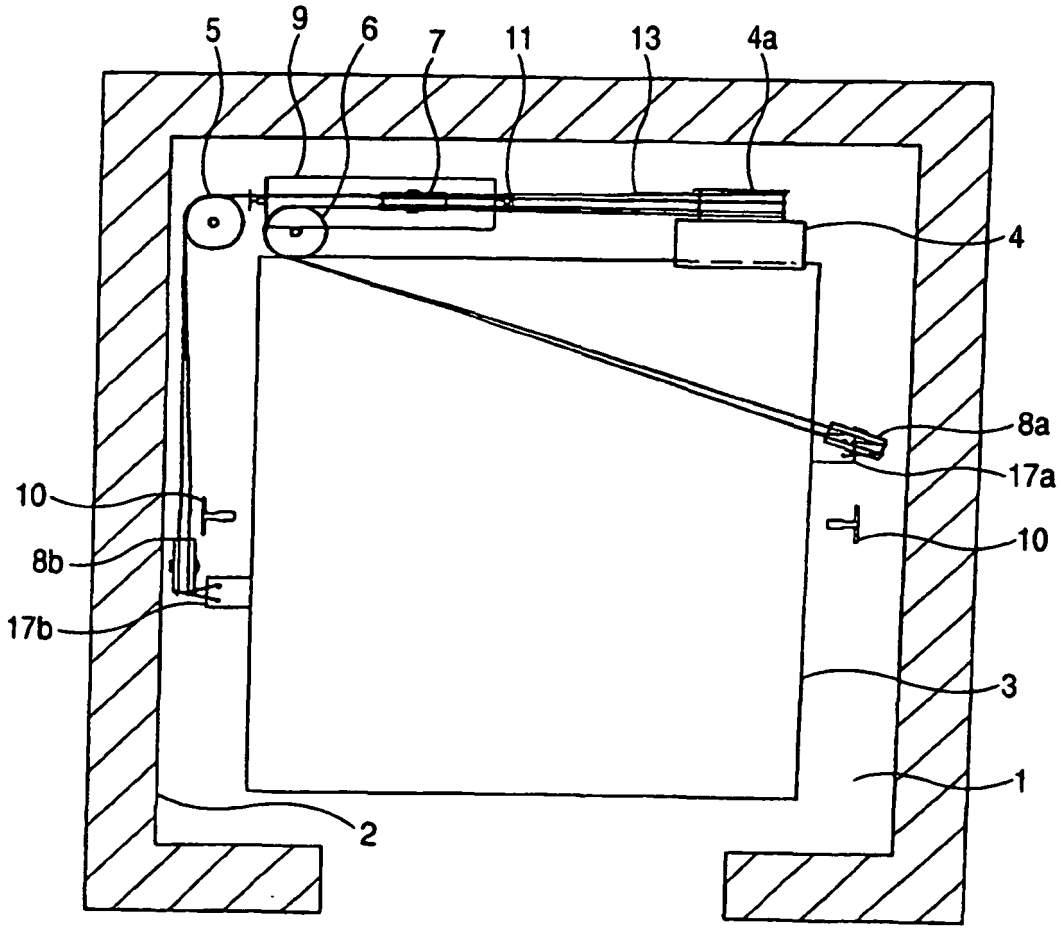


FIG. 9

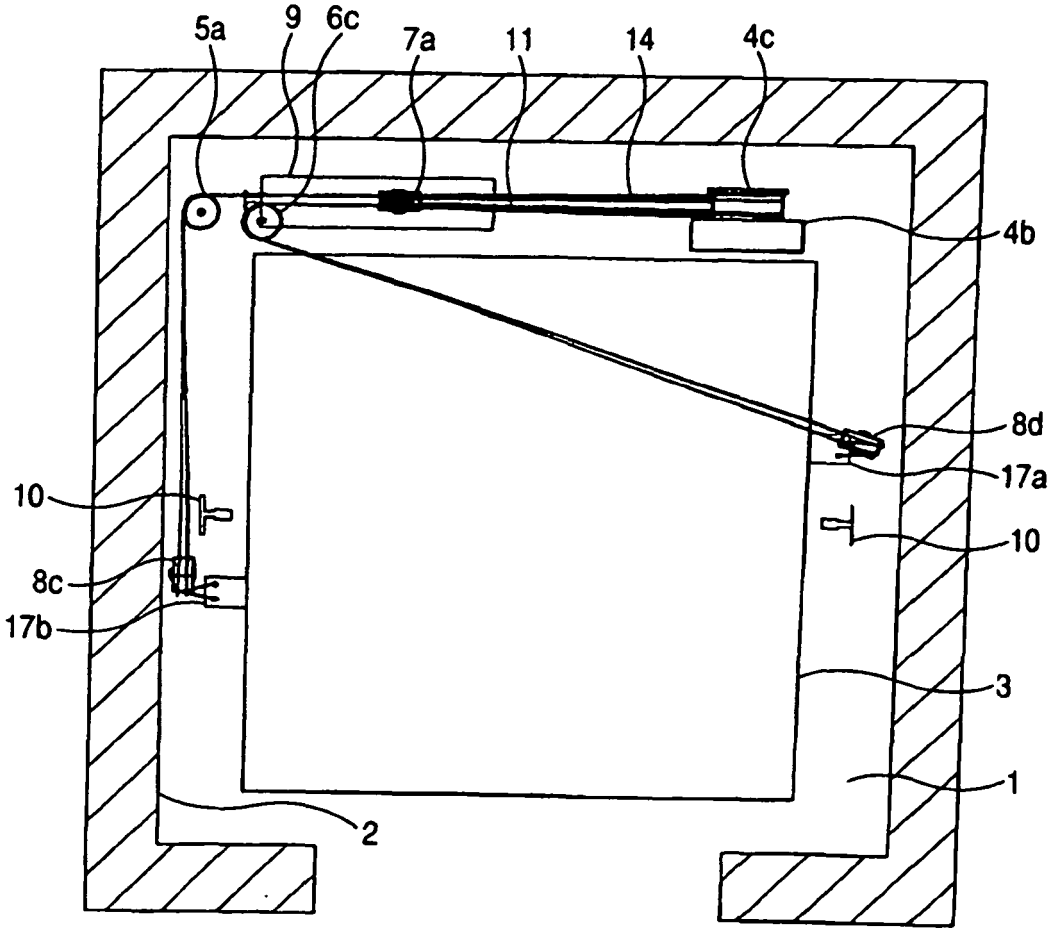


FIG. 10

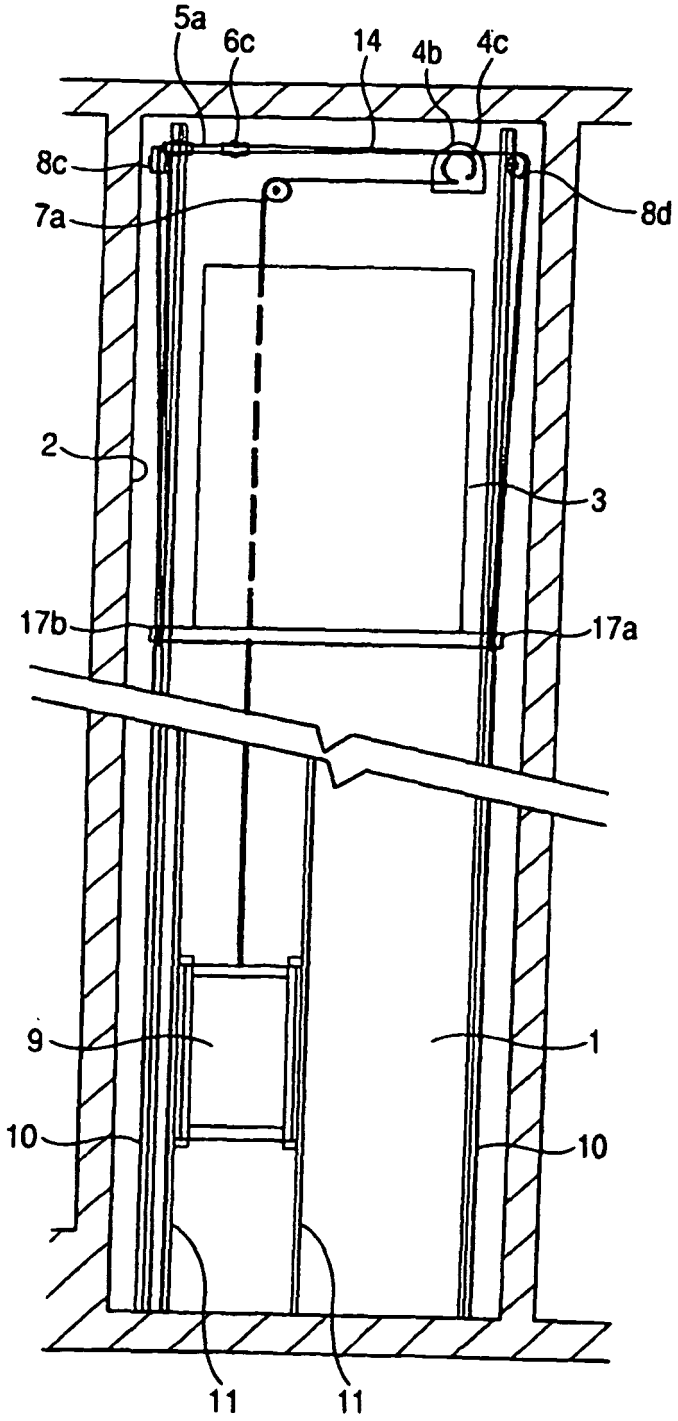


FIG. 11

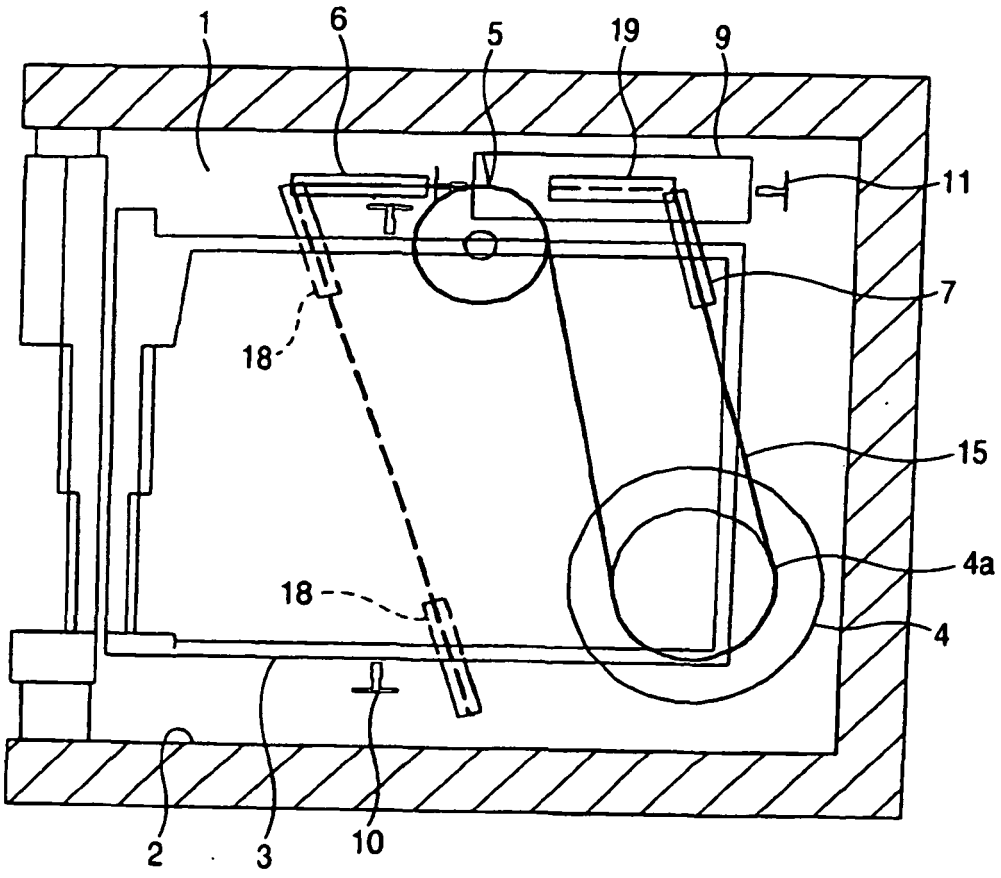
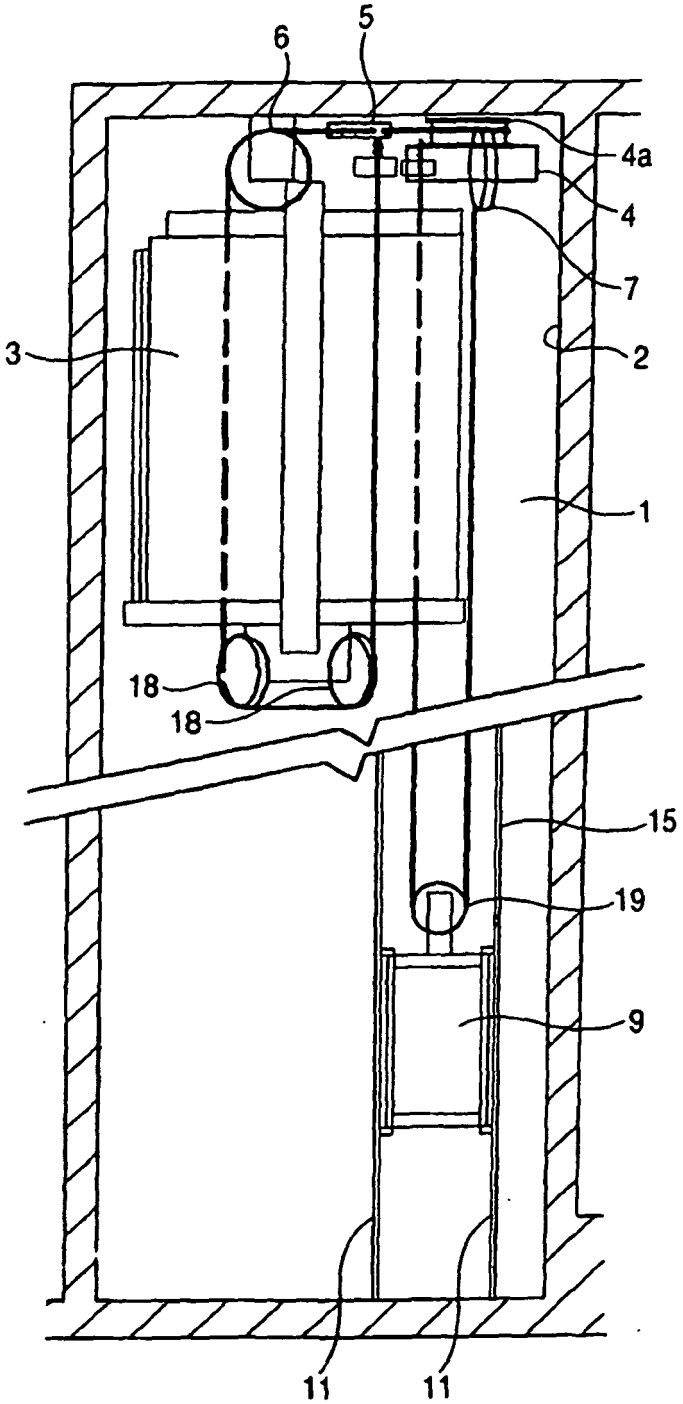


FIG. 12



REFERENCES CITED IN THE DESCRIPTION

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