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# (54) Elevator system

Aufzugssystem

Dispositif d'ascenseur

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- **PATENT ABSTRACTS OF JAPAN vol. 2002, no. 11, 6 November 2002 (2002-11-06) -& JP 2002 199659 A (TEIJIN SEIKI CO LTD), 12 July 2002 (2002-07-12)**

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EP 1 702 877 B1

## Description

### BACKGROUND OF THE INVENTION

**[0001]** The present invention relates to an elevator system in which a car and a counter weight are moved along guide rails in an elevator shaft. An elevator system according to the preamble of claims 1 and 2 is already known i.e. from US-A-0035645.

### DESCRIPTION OF RELATED ART

**[0002]** Heretofore, there has been proposed an elevator system in which a car and a counterweight are suspended by 3:1 roping. For example, JP-A-2004-83231 teaches in paragraph 0023, Fig. 1, Fig. 7, etc. that the tension exerted to a rope becomes two third (2/3) as compared with a conventional 2:1 roping elevator system, the wind-up torque required of a drive unit is reduced and therefore the drive unit can be made small.

**[0003]** However, in the elevator system disclosed in the above-mentioned patent document, the vertical projection of an end of the drive unit on the side remote from a sheave protrudes beyond the vertical projection of the car. Thus, when a worker on the car does maintenance such as inspection or replacement for a brake section or a position detector of the drive unit on the side remote from the sheave, a space in front of the brake section or the position detector is too narrow to conveniently carry out the work.

### SUMMARY OF THE INVENTION

**[0004]** An object of the present invention is to provide an elevator system having a small-sized drive unit which facilitates maintenance of a brake section and a position detector thereof.

**[0005]** To attain the above end, the present invention provides an elevator system having a car and a counter weight suspended by a rope within an elevator shaft and driven by a hoist, which comprises a suspending pulley provided on the upper part of the car, a rope hitch provided on the car, a suspending pulley provided on the upper part of the counterweight, and a rope hitch provided on the upper part of the counter weight, wherein the vertical projection of a sheave of the hoist is not overlapped with that of the car while the vertical projection of a brake section on the side remote from the sheave lies within that of the car.

**[0006]** Further, the invention provides an elevator system having a car and a counter weight suspended in an elevator shaft by a rope and driven by a hoist, which comprises a suspending pulley provided on the upper part of the car, a rope hitch provided on the car, a suspending pulley provided on the upper part of the counter weight, and a rope hitch provided on the upper part of the counter weight, wherein the vertical projection of a sheave of the hoist is not overlapped with that of the car, and the vertical projection of an end of a position detector of the hoist on the side remote from the sheave lies within that of the car.

**[0007]** According to the invention, it is possible to provide the elevator system in which a drive unit is small and maintenance of the brake section and the position detector is facilitated.

**[0008]** Other objects, features and advantages of the invention will become apparent from the following description of embodiments of the invention taken in conjunction with accompanying drawings.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]**

Fig. 1 is a view for explaining how to wind a rope in an elevator system of the first embodiment of the invention.

Fig. 2 is a horizontal sectional view of illustrating an elevator shaft in the elevator system of the first embodiment of the invention.

Fig. 3 is a sectional view of a hoist in the elevator system of the first embodiment of the invention.

Fig. 4 is a right side view of the elevator shaft in the elevator system of the first embodiment of the invention.

Fig. 5 is a front view of the elevator shaft in the elevator system of the first embodiment of the invention.

Fig. 6 is a view explaining how to wind a rope 5 in an elevator system of the second embodiment of the invention.

Fig. 7 is a horizontal sectional view of an elevator shaft in the elevator system of the second embodiment of the invention.

Fig. 8 is an external view of a hoist in the elevator system of the second embodiment of the invention.

Fig. 9 is a right side view of the elevator shaft in the elevator system of the second embodiment of the invention.

Fig. 10 is a front view of the elevator shaft in the elevator system of the second embodiment of the invention.

Fig. 11 is a front view of an elevator shaft in an elevator system of the third embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

**[0010]** Explanation will be hereinbelow made on embodiments of the invention with reference to the accompanying drawing.

**[0011]** Fig. 1 is a view for explaining how to wind a rope 5 in the elevator system showing the first embodiment of the invention. Fig. 2 is a horizontal sectional view of an elevator shaft in the elevator system of the embodiment, and Fig. 3 is a sectional view illustrating a hoist in the elevator system of the embodiment. Fig. 4 is a right side view of the elevator shaft in the elevator system of the embodiment, and Fig. 5 is a front view of the elevator shaft in the elevator system of the embodiment.

**[0012]** The elevator system of the embodiment has a configuration in which a car 1 is moved up and down along guide rails 16a, 16b while a counter weight 12 is moved up and down along guide rails 17a, 17b. The car 1 and a counter weight 12 are suspended by the rope 5 and are driven by a flat type hoist 10. The flat type hoist referred to herein means a hoist having a shorter length in the direction of a rotational axis than a length in a direction orthogonal to the rotational axis. Further, an inward direction of the car 1 herein means the direction perpendicular to a car door 2, and the direction of coming away from the car door 2 in the elevator shaft will be referred to as rear. The right side of the car 1 means the right side of the car 1 as viewed from an elevator hall.

**[0013]** A car upper frame 3 is installed on the ceiling of the car 1, and a suspending pulley 8 is mounted on the car upper frame 3. Further, a rope hitch 4 is provided on the right side of the car 1 in the vicinity of a car floor. Also on the upper part of the counter weight 12, a rope hitch 15 and a suspending pulley 13 are mounted. The rope hitches 4, 15 have a function of taking up an elongation of the rope 5.

**[0014]** In the upper part of the elevator shaft, there are installed two first diverting pulleys 7a, 7b whose vertical projections are substantially parallel to each other, two second diverting pulleys 9a, 9b whose vertical projections are substantially parallel to each other, and another second diverting pulley 9c and a third diverting pulley 14 whose vertical projections are substantially perpendicular to the vertical projections of the second diverting pulleys 9a, 9b. The first diverting pulleys 7a, 7b, the suspending pulley 8, a drive sheave 11 of the flat type hoist 10 and the third diverting pulley 14 are arranged so that their vertical projections are substantially parallel with one another. The second diverting pulleys 9a, 9b are arranged so that their vertical projections are inclined to the vertical projections of the first diverting pulleys 7a, 7b. Every diverting pulley is located above the ceiling of the car 1. Further, the positions of the rope hitch 4, the diverting pulleys 7a, 7b and the suspending pulley 8 are changeable because of adjusting margins provided in left and right directions as viewed in Fig. 2, and a suspending condition of the car 1 may be adjusted during installation thereof.

**[0015]** Explanation will be now made of how to wind the rope 5 in the elevator system of the embodiment. Basically, the elevator system of the embodiment employs 3:1 roping in which the car 1 and the counter weight 12 are suspended with the use of the rope hitches 4, 15, and the suspending pulleys 8, 13. Specifically, as shown in Fig. 1, at first, one end of the rope 5 is fixed to the rope hitch 4 on the right side of the car 1 in the vicinity of the car floor, and the rope 5 is extended upward from the rope hitch 4 and is then extended horizontally from the first diverting pulley 7a to the other diverting pulley 7b by which the rope 5 is turned downward. Further, the rope 5 is turned upward by way of the suspending pulley 8 on the upper part of the car 1, then is wound around the upper part of the second diverting pulley 9a, and further, is wound around the upper part of the other second pulley 9b so as to be turned downward. Then, the rope 5 is wound around the lower part of the further other second diverting pulley 9c so as to be turned upward, and is then wound around the drive sheave 11 of the flat type hoist 10 so as to be turned downward. Then, the rope 5 is turned upward by way of the suspending pulley 13 on the upper part of the counter weight 12 and is extended to the rope hitch 15 on the upper part of the counter weight 12 by way of the third diverting pulley 14. The other end of the rope 5 is fixed to this rope hitch 15.

**[0016]** The flat type hoist 10 is installed so that a part of its vertical projection is positioned between the vertical projection of the car 1 and that of an elevator shaft wall 18, and the remainder of the vertical projection of the flat type hoist 10 is overlapped with that of the car 1. As shown in Figs. 2 and 3, the hoist is provided therein with a motor composed of a stator 27 and a rotor 28 on the side near the elevator shaft wall 18, and with a brake section 21 and a position detector 22 on the opposite side of the motor with the drive sheave 11 interposed therebetween.

**[0017]** Further, in this embodiment, the counter weight 12 is located in the rear of the car 1 in such a position that a part of the vertical projection of the flat type hoist 10 is overlapped with the vertical projection of the counter weight 12. Further, the vertical projection of the gravitational center of the flat type hoist 10 is positioned substantially between the vertical projections of the pair of guide rails 17a, 17bof the counter weight 12, and accordingly, a load of the flat type hoist 10 may be supported by the pair of guide rails 17a, 17b of the counter weight 12 through the intermediary of a support member which is not shown.

**[0018]** As described above, according to the embodiment, because of 3:1 roping, the suspended load is distributed to the three ropes, and accordingly, the suspended loads imparted to the diverting pulleys are reduced, resulting in reduction of the torque of the flat type hoist 10. That is, structural members and the flat type hoist 10 of the elevator system 10 may be made small and thereby it can be expected is possible to expect to reduce the manufacturing cost.

**[0019]** Further, with the provision of the second divert-

ing pulleys 9a, 9b, 9c, the position of the flat type hoist 10 may be adjusted. Thus, the position of the flat type hoist 10 is adjusted in this embodiment so that the vertical projection of the drive sheave 11 is not overlapped with that of the car 1 while the vertical projection of an end of the brake section 21 on the side remote from the sheave 11 is located within that of the car 1. With this configuration, the brake section 21 of the flat type hoist 10 is located facing a wide space in the elevator shaft, and accordingly, the maintenance of the brake section 21 can be easily carried out. Similarly, as the vertical projection of an end of the position detector 22 on the side remote from the sheave is also located in that of the car 1, a wide space is present before the position detector 22 of the flat type hoist 10, and accordingly, the maintenance of the position detector 22 can be simplified. Further, work may be done near the brake section 21 and the position detector 2, and accordingly, the maintenance work can be easy and safe in that the worker need not lean out of the car.

**[0020]** Further, in the embodiment, since the vertical projection of the position detector 22 is located within that of the car 1, there is such an advantage that even though the worker accidentally drops a component part during the servicing, the component part may highly possibly remain on the upper part of the car 1 without dropping onto the bottom of the elevator shaft.

**[0021]** Fig. 6 is a view for explaining how to wind the rope 5 in the elevator system showing the second embodiment of the invention, Fig. 7 is a horizontal sectional view of an elevator shaft in the elevator of this embodiment, Fig. 8 is an external view of a hoist in the elevator system of the embodiment, Fig. 9 is a right side view of the elevator shaft in the elevator system of the embodiment, and Fig. 10 is a front view of the elevator shaft in the elevator of the embodiment. The elevator system of this embodiment has a configuration basically the same as that of the first embodiment, and explanation will be made below with a focus on differences from the first embodiment.

**[0022]** In this embodiment, instead of the flat type hoist 10 used in the first embodiment, there is used a long type hoist 23. The long type hoist herein means a hoist having a longer length in the direction of a rotation axis than a length in the direction orthogonal to the rotational axis.

**[0023]** As shown in Figs. 7 and 8, a drive sheave 24 is arranged in the hoist on the side near an elevator shaft wall 18, and a brake section 25 and a position detector 26 are provided on the opposite side from the drive sheave 24 with a motor interposed therebetween.

**[0024]** According to this embodiment, technical advantages similar to those obtained in the first embodiment can be attained concerning the maintenance work of the long type hoist 23. Further, since not only the vertical projection of the position detector 26 but also that of the brake section 25 are positioned within the vertical projection of the car 1, there is such an advantage that even though the worker accidentally drops a component part during the maintenance work of the position detector 26 or the brake section 25, the component part may highly possibly remain in the upper part of the car 1, not dropping onto the bottom of the elevator shaft.

**[0025]** Fig. 11 is a front view of an elevator shaft in the elevator system showing the third embodiment of the invention. Since the elevator system of this embodiment has a configuration basically the same as that of the second embodiment, explanation will be made below with a focus on differences from the second embodiment.

**[0026]** In this embodiment, a rope hitch 19 is provided on the lower part of a floor panel of a car 1, and a fourth diverting pulley 20 is provided on the right end of the floor panel of the car 1.

**[0027]** Next, explanation will be made of how to wind a rope 5 in the elevator system of this embodiment. At first, one end of the rope 5 is fixed to the rope hitch 19 provided on the lower part of the floor panel of the car 1, and the rope 5 is extended from the rope hitch 19 upward along a side of the car 1 by way of the fourth diverting pulley 20 provided on the end of the floor panel of the car 1 to a first diverting pulley 7a. How to wind the rope 5 subsequently to the first diverting pulley 7a is the same as is in the other embodiments.

**[0028]** According to this embodiment, technical advantages similar to those obtained in the second embodiment can be attained. Further, since the rope hitch 19 for the rope 5 is arranged in a substantially horizontal direction, the vertical dimensions of the rope hitch 19 can be made small even when the length of the rope hitch 19 is required to be longer, and accordingly, it is possible to limit vertical dimensions of components provided underneath the floor of the car 1 to the extent of the diameter of the diverting pulley 7a. Thus, the vertical dimension of the car 1 can be decreased as compared with that in the second embodiment, and when the elevator system is installed in the elevator shaft of the same shape, an effective elevating stroke of the car 1 can be ensured of being longer than that in the second embodiment. Further, in comparison with the second embodiment, an application point of force exerted from the rope 5 to the lower part of the car 1 is divided into two positions of the rope hitch 19 and the diverting pulley 20, and thereby it is possible to effectively avoid the concentration of the force.

## Claims

1. An elevator system having a car and a counter weight suspended by a rope and driven by a hoist, a suspending pulley (8) provided on an upper part of the car, a rope hitch (4) provided on the car, a suspending pulley (13) provided on an upper part of the counter weight, and a rope hitch (15) provided on the upper part of the counter weight, wherein a vertical projection of a sheave (11) of the hoist (10) is not overlapped with a vertical projection of the car, and **characterized by** a vertical projection of an end of a brake

section (21) of the hoist on a side remote from the sheave is positioned within the vertical projection of the car.

2. An elevator system having a car and a counter weight suspended by a rope and driven by a hoist, a suspending pulley (8) provided on an upper part of the car, a rope hitch (4) provided on the car, a suspending pulley (13) provided on an upper part of the counter weight and a rope hitch (15) provided on the upper part of the counter weight, wherein a vertical projection of a sheave (11) of the hoist (10) is not overlapped with a vertical projection of the car, and **characterized by** a vertical projection of an end of a position detector (22) of the hoist on a side remote from the sheave is positioned within the vertical projection of the car.

3. An elevator system according to claim 1 or 2, **characterized in that** the rope is fixed at one end thereof to the rope hitch provided on one side of the car, the rope is extended upward from the rope hitch, is then turned downward by way of a first diverting pulley, is turned upward by way of the suspending pulley of the car, is wound around the sheave of the hoist by way of a second diverting pulley to be turned downward, and is turned upward by way of the suspending pulley of the counter weight, and the rope is fixed at another end thereof to the rope hitch of the counter weight by way of a third diverting pulley.

4. An elevator system according to claim 1 or 2, **characterized in that** the rope is fixed at one end thereof to the rope hitch provided on a lower part of a floor panel of the car, the rope is extended upward from the rope hitch by way of a fourth diverting pulley provided on a side end part of a floor panel of the car, is then turned downward by way of a first diverting pulley, is turned upward by way of the suspending pulley of the car, is wound around the sheave of the hoist by way of a second diverting pulley to be turned downward, and is turned upward by way of the suspending pulley of the counter weight, and the rope is fixed at another end thereof to the rope hitch of the counter weight by way of a third diverting hitch.

5. An elevator system according to any one of claims 1 to 4, **characterized in** the hoist is of a flat type.

6. An elevator system according to any one of claims 1 to 4, **characterized in that** the hoist is of a long type.

**Patentansprüche**

1. Aufzugsystem mit einer Kabine und einem von einem Seil gehaltenen und von einer Hebevorrichtung angetriebenen Gegengewicht, einer an einem oberen Teil der Kabine vorgesehenen Halterolle (8), einer an der Kabine vorgesehenen Seilaufhängung (4), einer auf einem oberen Teil des Gegengewichts vorgesehenen Halterolle (13) und einer auf dem oberen Teil des Gegengewichts vorgesehenen Seilaufhängung (15), wobei ein vertikaler Vorsprung einer Scheibe (11) der Hebevorrichtung (10) nicht mit einem vertikalen Vorsprung der Kabine überlappt, **gekennzeichnet dadurch, dass** ein vertikaler Vorsprung eines Endes eines Bremsabschnitts (21) der Hebevorrichtung auf einer von der Scheibe entfernten Seite innerhalb des vertikalen Vorsprungs der Kabine angeordnet ist.

2. Aufzugsystem mit einer Kabine und einem von einem Seil gehaltenen und von einer Hebevorrichtung angetriebenen Gegengewicht, einer auf einem oberen Teil der Kabine vorgesehenen Halterolle (8), einer auf der Kabine vorgesehenen Seilaufhängung (4), einer auf einem oberen Teil des Gegengewichts vorgesehenen Halterolle (13) und einer auf dem oberen Teil des Gegengewichts vorgesehenen Seilaufhängung (15), wobei ein vertikaler Vorsprung einer Scheibe (11) der Hebevorrichtung (10) nicht mit einem vertikalen Vorsprung der Kabine überlappt, **gekennzeichnet dadurch, dass** ein vertikaler Vorsprung eines Endes eines Positionsdetektors (22) der Hebevorrichtung auf einer von der Scheibe entfernten Seite innerhalb des vertikalen Vorsprungs der Kabine angeordnet ist.

3. Aufzugsystem nach Anspruch 1 oder 2, **gekennzeichnet dadurch, dass** das Seil an seinem einen Ende an der auf einer Seite der Kabine vorgesehenen Seilaufhängung befestigt ist, wobei das Seil von der Seilaufhängung aus nach oben verläuft, dann mittels einer ersten Ablenkrolle nach unten umgelenkt wird, mittels der Halterolle der Kabine nach oben umgelenkt wird, mittels einer zweiten Ablenkrolle um die Scheibe der Hebevorrichtung gewunden wird, um nach unten umgelenkt zu werden, und mittels der Halterolle des Gegengewichts nach oben umgelenkt wird, und das Seil an seinem anderen Ende mittels einer dritten Ablenkrolle an der Seilaufhängung des Gegengewichts befestigt ist.

4. Aufzugsystem nach Anspruch 1 oder 2, **gekennzeichnet dadurch, dass** das Seil an seinem einen Ende an der auf einem unteren Teil einer Bodenplatte der Kabine vorgesehenen Seilaufhängung befestigt ist, das Seil mittels einer auf einem seitlichen Endstück einer Bodenplatte der Kabine vorgesehenen vierten Ablenkrolle von der Seilaufhängung aus nach oben verläuft, dann mittels einer ersten Ablenkrolle nach unten umgelenkt wird, mittels der Halterolle der Kabine nach oben umgelenkt wird, um die Scheibe der Hebevorrichtung mittels einer zweiten

Ablenkrolle gewunden wird, um nach unten gelenkt zu werden, und mittels der Halterolle des Gegengewichts nach oben umgelenkt wird, und das Seil an seinem anderen Ende an der Seilaufhängung des Gegengewichts mittels einer dritten Ablenkrolle befestigt ist.

**5.** Aufzugsystem nach einem der Ansprüche 1 bis 4, **gekennzeichnet dadurch, dass** die Hebevorrichtung von einem flachen Typ ist.

**6.** Aufzugsystem nach einem der Ansprüche 1 bis 4, **gekennzeichnet dadurch, dass** die Hebevorrichtung von einem länglichen Typ ist.

**Revendications**

**1.** Dispositif d'ascenseur ayant une cabine et un contrepoids suspendu par un câble et entraîné par un palan, une poulie de suspension (8) agencée sur une partie supérieure de la cabine, une attache de câble (4) agencée sur la cabine, une poulie de suspension (13) agencée sur une partie supérieure du contrepoids, et une attache de câble (15) agencée sur la partie supérieure du contrepoids, dans lequel une saillie verticale d'une poulie à gorge (11) du palan (10) n'est pas recouverte par une saillie verticale de la cabine, et **caractérisé en ce que** une saillie verticale d'une extrémité d'une section de frein (21) du palan sur un côté distant de la poulie à gorge est positionnée dans la saillie verticale de la cabine.

**2.** Dispositif d'ascenseur ayant une cabine et un contrepoids suspendu par un câble et entraîné par un palan, une poulie de suspension (8) agencée sur une partie supérieure de la cabine, une attache de câble (4) agencée sur la cabine, une poulie de suspension (13) agencée sur une partie supérieure du contrepoids et une attache de câble (15) agencée sur la partie supérieure du contrepoids, dans lequel une saillie verticale d'une poulie à gorge (11) du palan (10) n'est pas recouverte par une saillie verticale de la cabine, et **caractérisé en ce que** une saillie verticale d'une extrémité d'un détecteur de position (22) du palan sur un côté distant de la poulie à gorge est positionnée dans la saillie verticale de la cabine.

**3.** Dispositif d'ascenseur selon la revendication 1 ou 2, **caractérisé en ce que** le câble est fixé à l'une de ses extrémités à l'attache de câble agencée sur un côté de la cabine, le câble est tendu vers le haut depuis l'attache de câble, et tourne ensuite vers le bas par l'intermédiaire d'une première poulie de renvoi, et tourne vers le haut par l'intermédiaire de la poulie de suspension de la cabine, et s'enroule autour de la poulie à gorge du palan par l'intermédiaire d'une deuxième poulie de renvoi pour tourner vers le bas, et tourne vers le haut par l'intermédiaire de la poulie de suspension du contrepoids, et le câble est fixé à son autre extrémité à l'attache de câble du contrepoids par l'intermédiaire d'une troisième poulie de renvoi.

**4.** Dispositif d'ascenseur selon la revendication 1 ou 2, **caractérisé en ce que** le câble est fixé à l'une de ses extrémités à l'attache de câble agencée sur une partie inférieure d'un panneau de plancher de la cabine, le câble est tendu vers le haut depuis l'attache de câble par l'intermédiaire d'une quatrième poulie de renvoi agencée sur une partie d'extrémité latérale d'un panneau de plancher de la cabine, tourne ensuite vers le bas par l'intermédiaire d'une première poulie de renvoi, tourne vers le haut par l'intermédiaire de la poulie de suspension de la cabine, s'enroule autour de la poulie à gorge du palan par l'intermédiaire d'une deuxième poulie de renvoi pour tourner vers le bas, et tourne vers le haut par l'intermédiaire de la poulie de suspension du contrepoids, et le câble est fixé à son autre extrémité à l'attache de câble du contrepoids par l'intermédiaire d'une troisième poulie de renvoi.

**5.** Dispositif d'ascenseur selon l'une quelconque des revendications 1 à 4, **caractérisé en ce que** le palan est d'un type plat.

**6.** Dispositif d'ascenseur selon l'une quelconque des revendications 1 à 4, **caractérisé en ce que** le palan est d'un type long.

FIG. 1

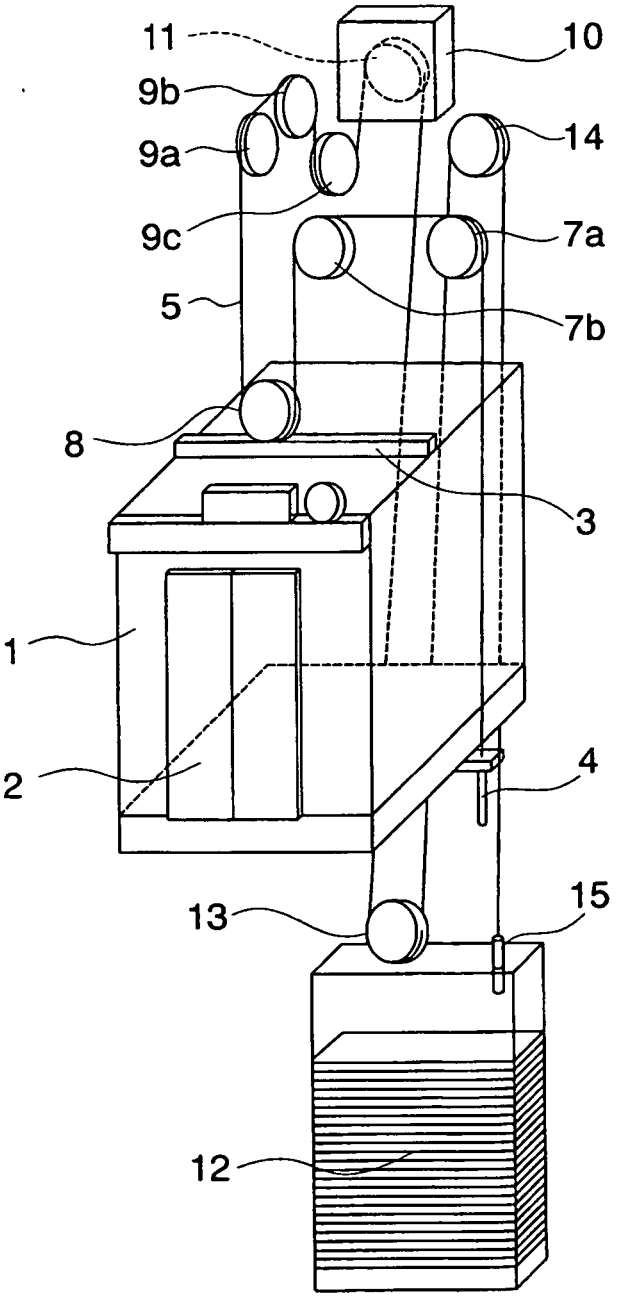


FIG. 2

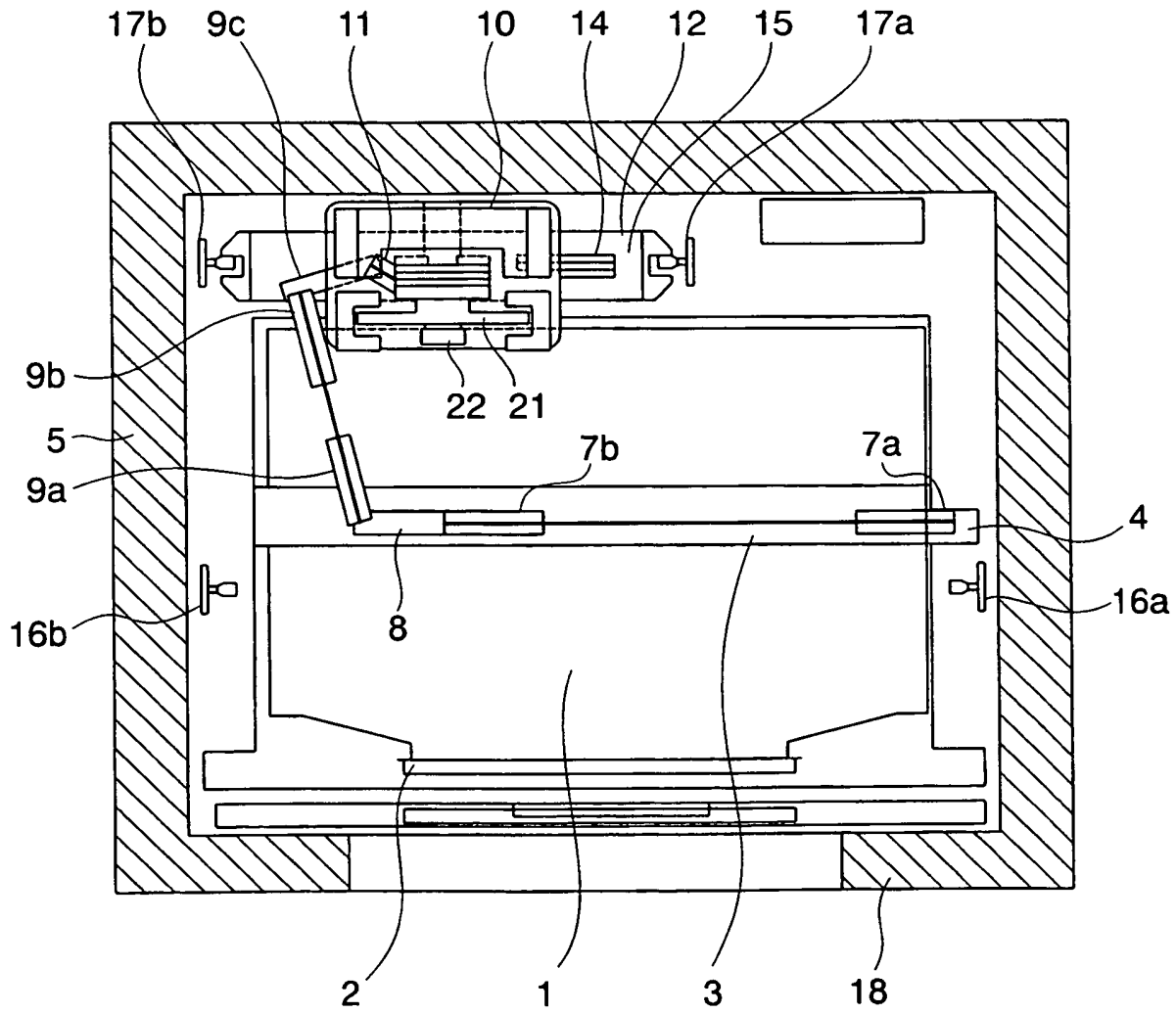


FIG. 3

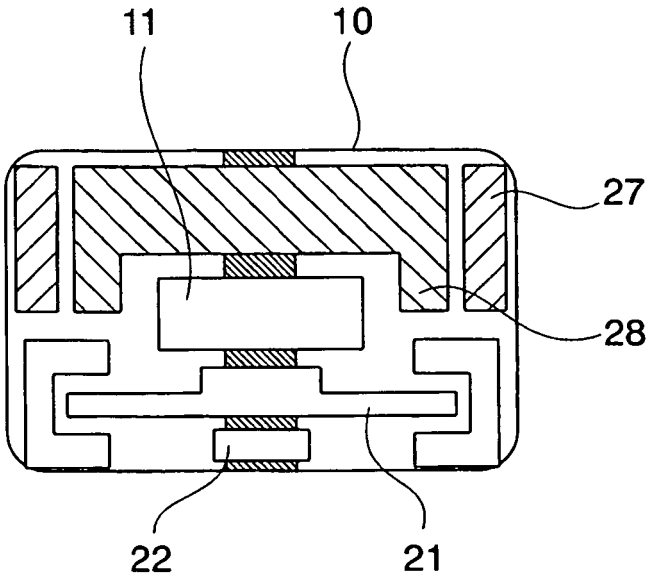

11
10
27
28
22
21

FIG. 4

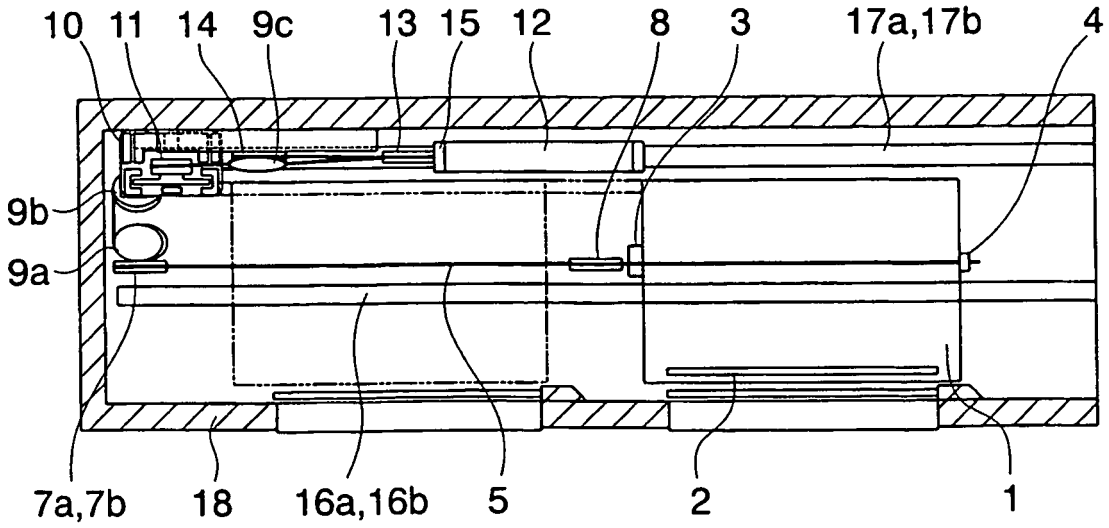

10
11
14
9c
13
15
12
8
3
17a,17b
4
9b
9a
7a,7b
18
16a,16b
5
2
1

FIG. 5

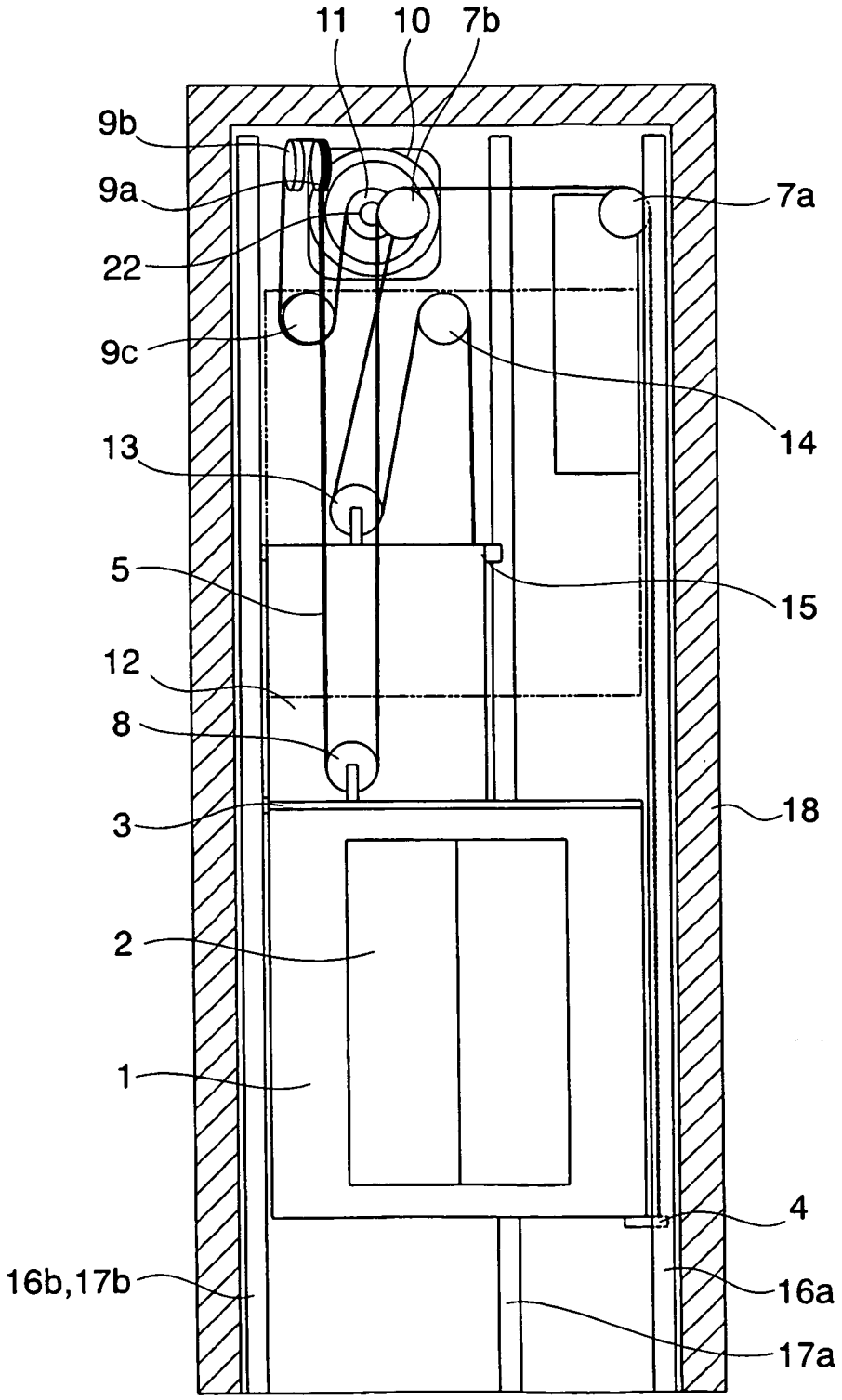


FIG. 6

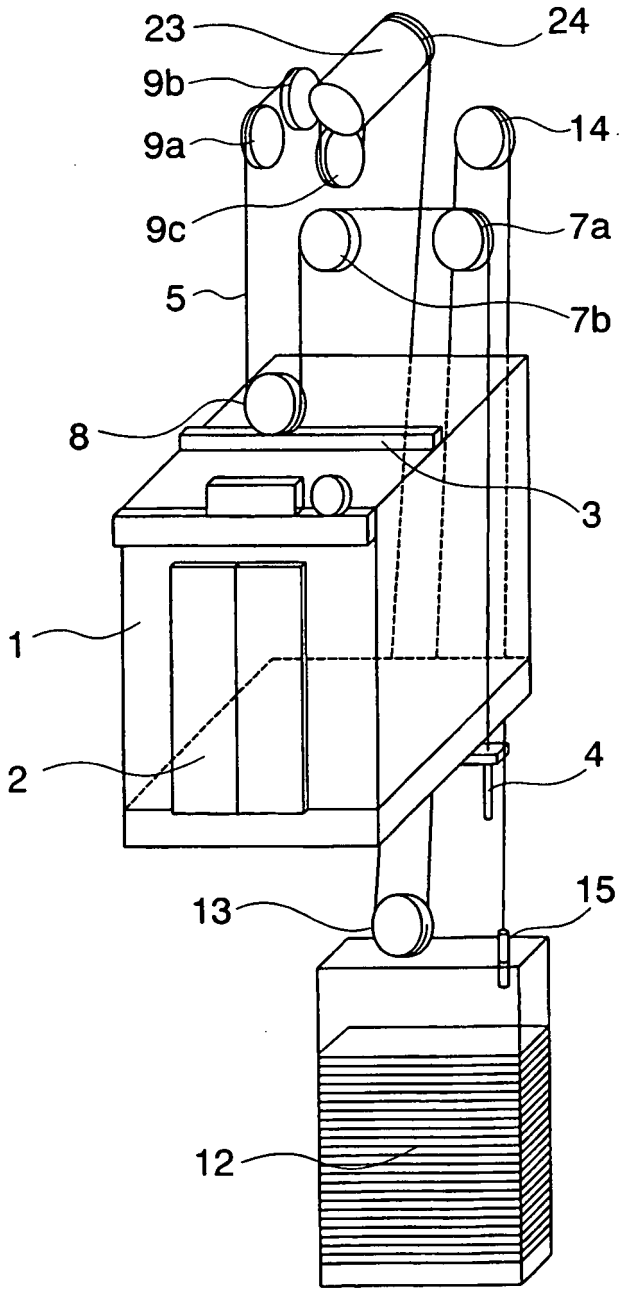


FIG. 7

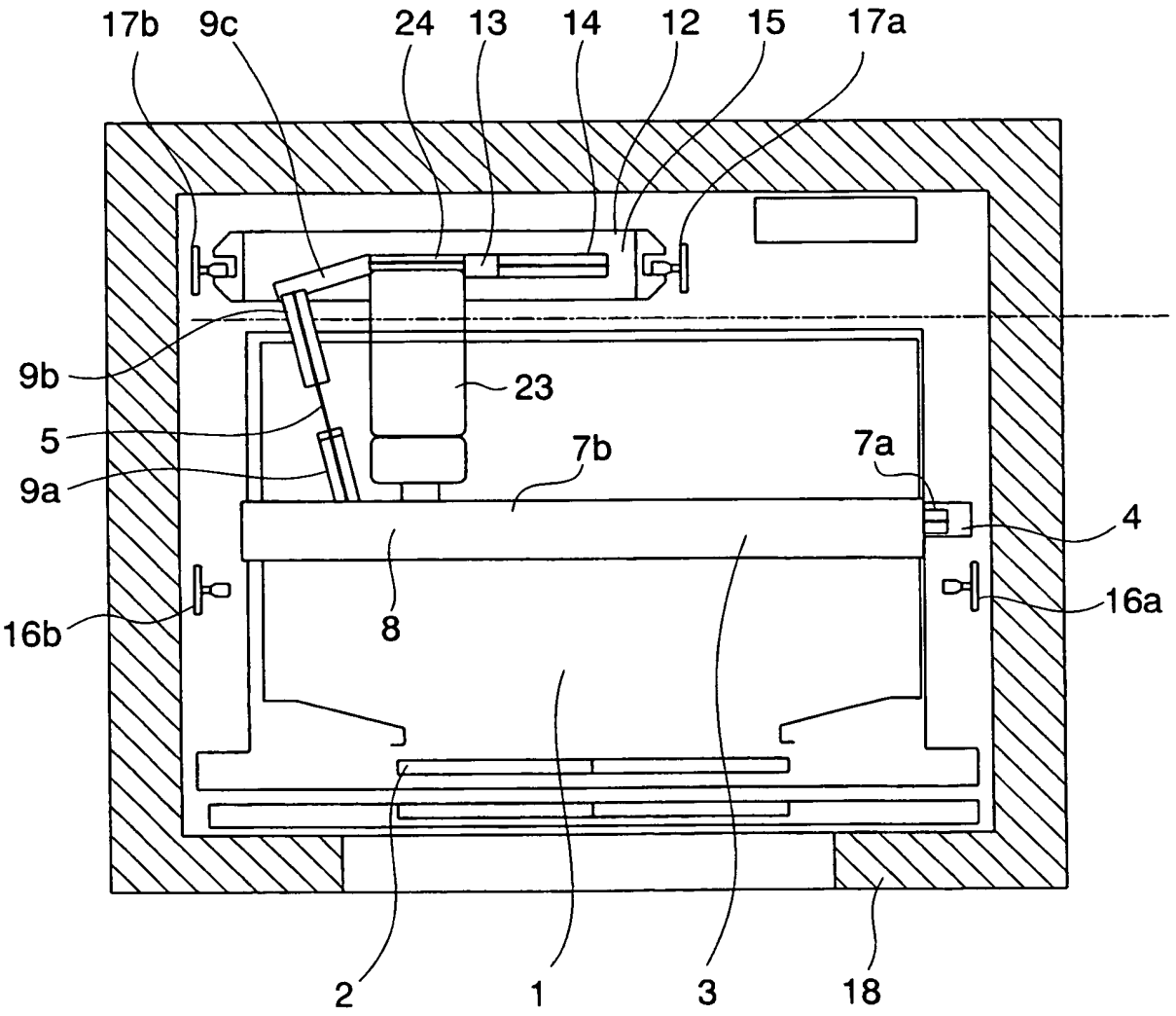


FIG. 8

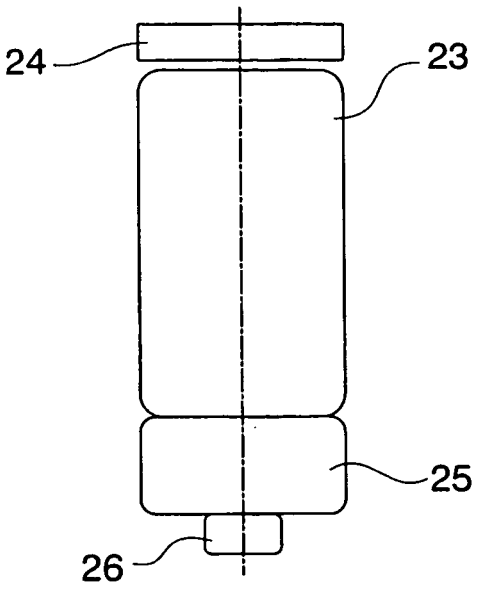

24
23
25
26

FIG. 9

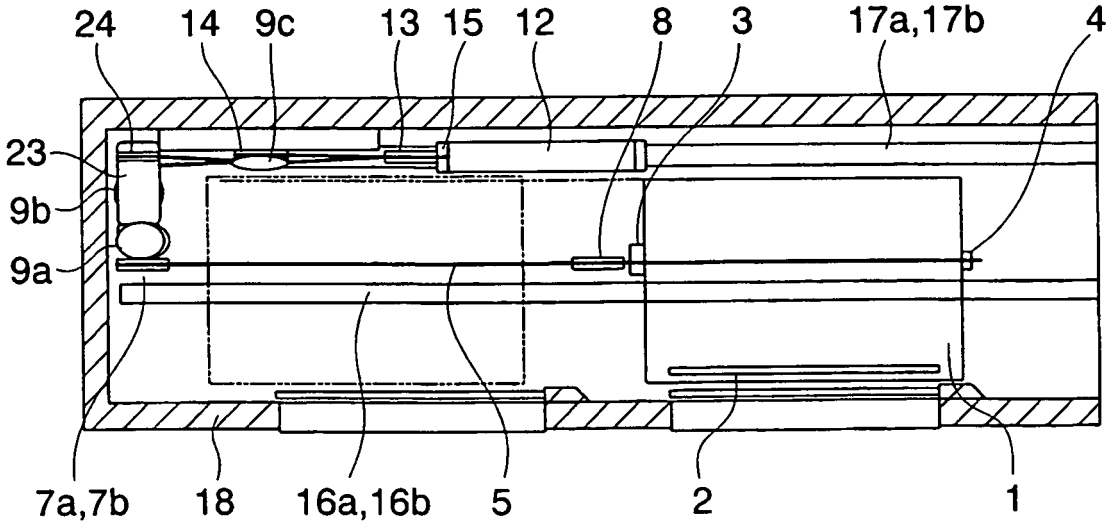

24
14
9c
13
15
12
8
3
17a,17b
4
23
9b
9a
7a,7b
18
16a,16b
5
2
1

FIG. 10

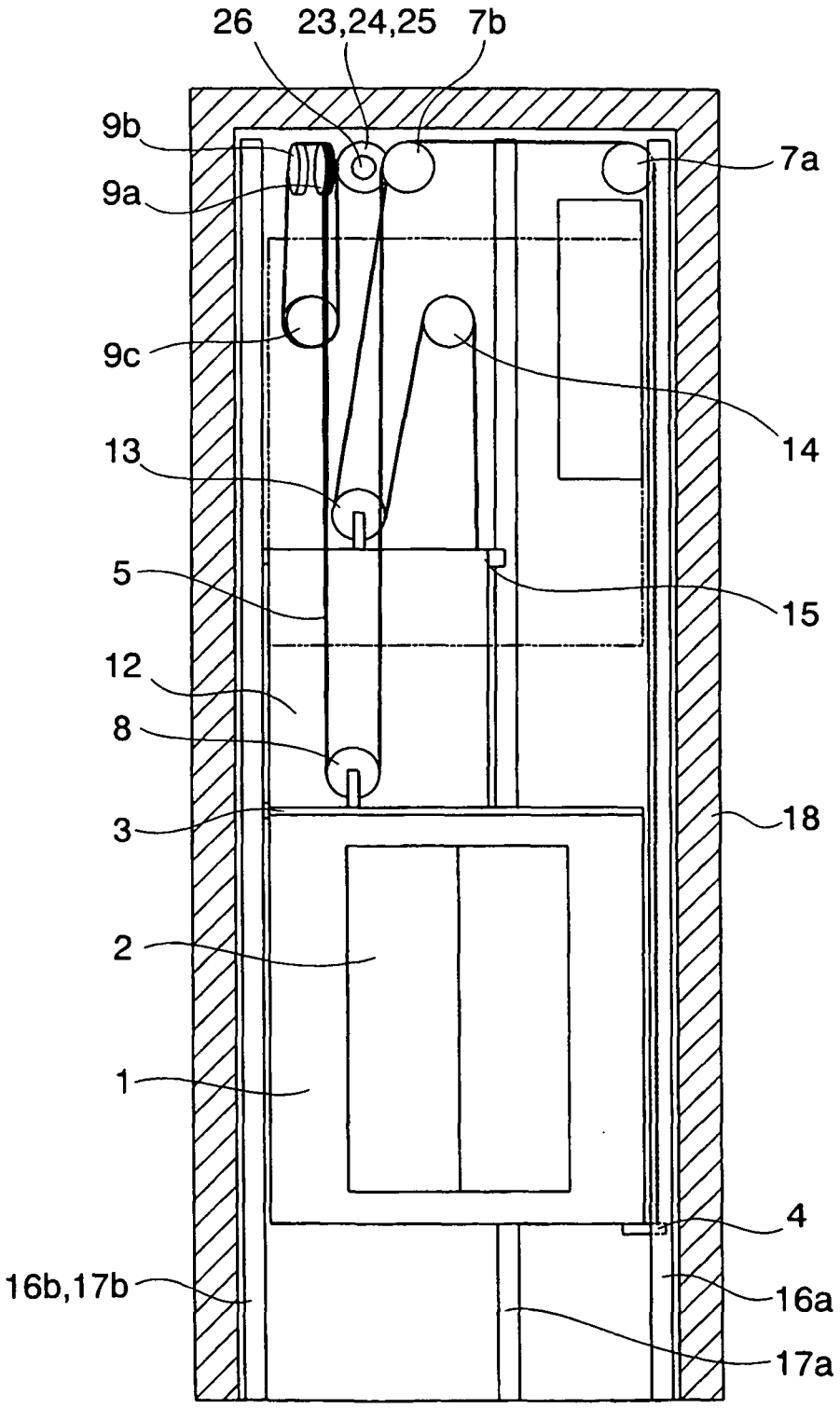
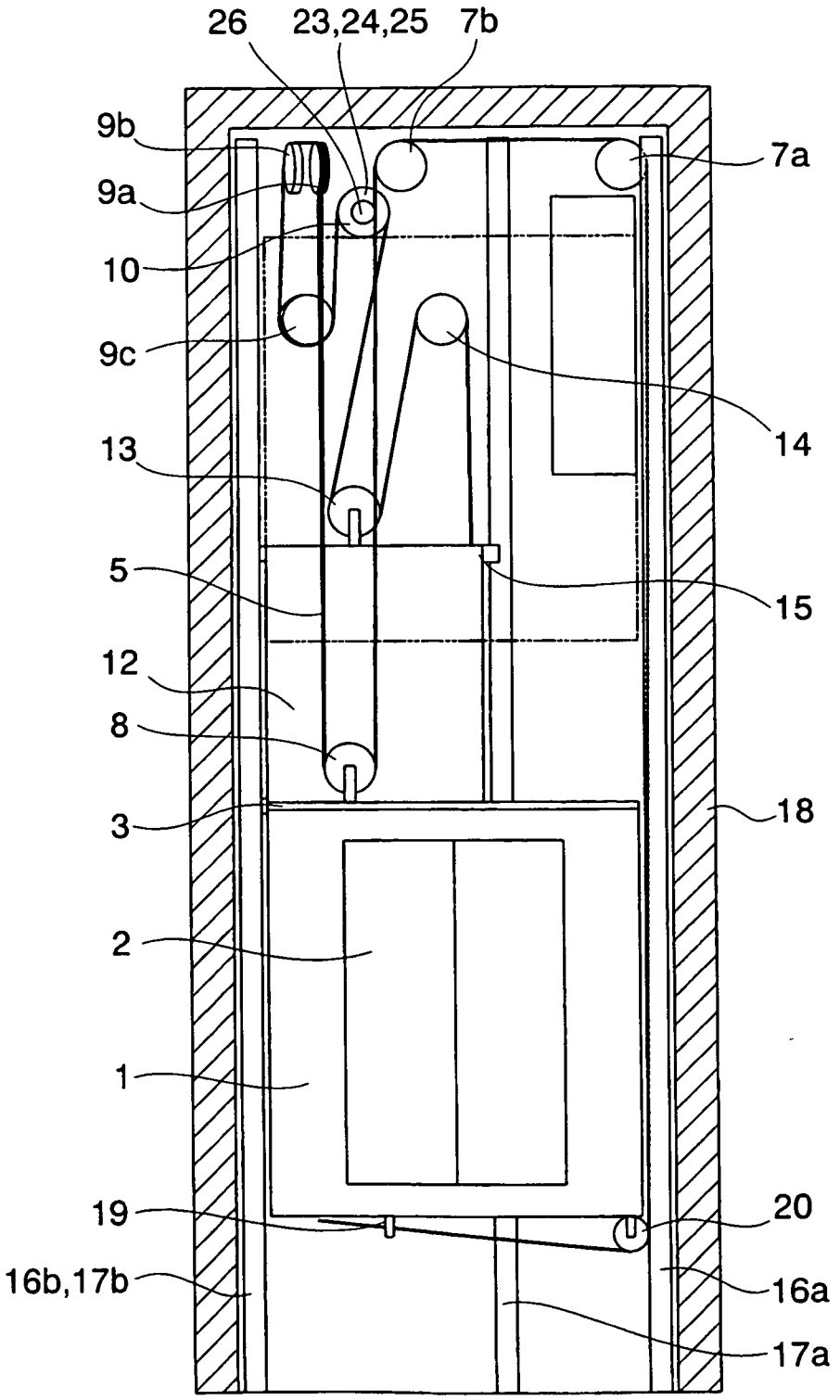


FIG. 11


26
23,24,25
7b
9b
7a
9a
10
9c
14
13
5
15
12
8
18
3
2
1
19
20
16b,17b
16a
17a

## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


- US 0035645 A **[0001]**
- JP 2004083231 A **[0002]**