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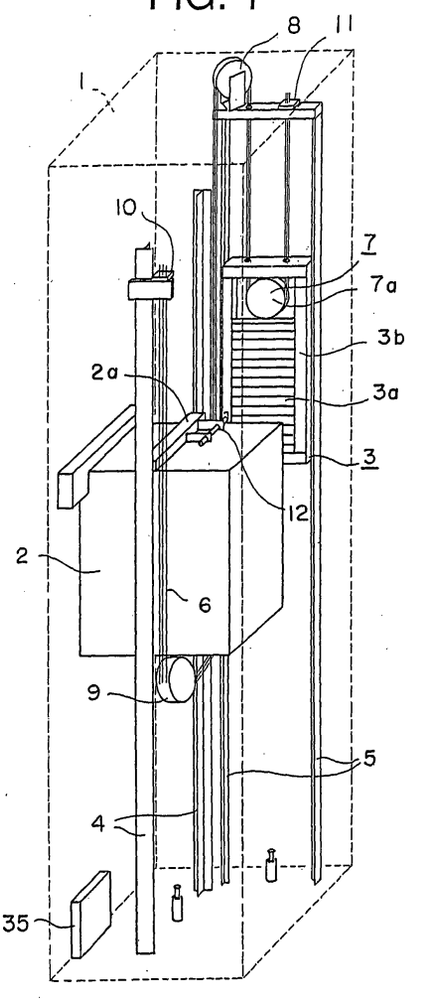
(54) DEVICE FOR SECURING CAGE OF ELEVATOR

(57) Disclosed is an elevator car fixing device to be provided in an elevator including: a rope 6 arranged in a hoistway 1 and wrapped around a return pulley 8 arranged in an upper portion of the hoistway 1; a car 2 suspended from one end of the rope 6; and a counterweight 3 suspended from a portion of the rope 6 between a counterweight-side rope fixing member 11, which is provided in the upper portion of the hoistway 1 and to which the other end of the rope 6 is fixed, and the return pulley 8, the counterweight 3 being adapted to ascend when the car 2 descends and to descend when the car 2 ascends and equipped with a driving machine 7 for causing the car 3 to ascend and descend, the elevator car fixing device including an advancing/retreating member 13 provided on one of the car 2 and the counterweight 3 and adapted to move toward and away from the other of the car 2 and the counterweight 3, and a locking mechanism 3b provided on the other of the car 2 and the counterweight 3 and adapted to be engaged with the advancing/retreating member 13 when the advancing/retreating member 13 advances to thereby lock the car 2 and the counterweight 3 with respect to each other in an ascent/descent direction.

FIG. 1



EP 1 538 122 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a self-propelled elevator in which a driving machine for causing a car and a counterweight to ascend and descend is mounted on the counterweight. In particular, the invention relates to an elevator car fixing device that fixes the car with respect to the counterweight in an elevator in which an operator gets on top of the car to perform maintenance operation on the driving machine.

BACKGROUND ART

[0002] Fig. 16 is a perspective view of a conventional self-propelled elevator as proposed, for example, in JP 9-124259 A. Fig. 17 is a diagram schematically illustrating this elevator apparatus. In Figs. 16 and 17, a car 2 and a counterweight 3 are arranged inside a hoistway of the elevator. The car 2 and the counterweight 3 ascend and descend within the hoistway while being guided by car-side guide rails 4 and counterweight-side guide rails 5 with a T-shaped sectional configuration, respectively.

[0003] Mounted on the counterweight 3 is a driving machine 7 for driving a rope 6 wrapped around it. The counterweight 3 is further equipped with a brake device 31 that holds the side surfaces of a flange protruding in the outer periphery of a sheave of the driving machine 7 by a spring pressure to effect braking.

[0004] Provided in an upper portion of the hoistway are a car-side rope fixing member 10 for fixing the portion of the rope 6 on the car 2 side and a weight-side rope fixing member 11 for fixing the portion of the rope 6 on the counterweight 3 side.

[0005] Installed at a predetermined position in a lower portion of the hoistway is an elevator control device 35 including a drive inverter for the driving machine 7 mounted on the counterweight 3.

[0006] Suspended inside the hoistway is an elevator cable 32 containing a power line for driving the driving machine 7 mounted on the counterweight 3, a brake drive line, a speed feedback encoder line for detecting speed and position, etc.

[0007] The elevator cable 32 is suspended between the control device 35 and the driving machine 7 by way of a building-side junction point 33 and a junction point 34 under the car 2.

[0008] The car 2 is suspended from the portion of the rope 6 between the car-side rope fixing member 10 and a return pulley 8. The car 2 is suspended by wrapping the rope 6 around a sash pulley 9 rotatably supported on a side surface of the car.

[0009] The counterweight 3 is suspended from the portion of the rope 6 between the counterweight-side rope fixing member 11 and the return pulley 8. The counterweight 3 is suspended by wrapping the rope 6 around the sheave of the driving machine 7.

[0010] When the driving machine 7 provided on the counterweight 3 is driven, the sheave rotates, and the car 2 and the counterweight 3 are caused to ascend and descend within the hoistway 1. When the car 2 descends, the counterweight 3 ascends, and when the car 2 ascends, the counterweight 3 descends.

[0011] In the elevator thus constructed, that is, in the so-called self-propelled elevator in which the driving machine 7 for causing the car 2 to ascend and descend is mounted on the counterweight 3, the operator gets on top of the car 2, and the car 2 is moved to a position where maintenance of the driving machine 7 is possible, that is, to the position where the car 2 passes the counterweight 3, the operator reaching out from the car 2 to inspect the driving machine 7.

[0012] Conventionally, there has been proposed a car fixing device for fixing the car to a stationary portion in the hoistway, such as a guide rail, as a device for mechanically preventing inadvertent movement of the car 2 during maintenance operation when the maintenance operation is thus to be performed on the driving machine 7 by reaching out from the top of the car 2.

[0013] Fig. 18 is a perspective view of a conventional car fixing device as disclosed, for example, in JP 2000-203774 A.

[0014] As shown in Fig. 18, there is provided on top of the car 2 an operating mechanism 50 having a lock bar 41 adapted to longitudinally advance and retreat and a bracket 42 for securing this lock bar 41 at a predetermined position. The lock bar 41 has an operating lever 43 protruding from a side surface portion thereof. When the operating lever 43 is removed from an operating lever insertion groove 42b of the bracket 42, and the lock bar 41 is moved toward a fixing mechanism 44 to insert the forward longitudinal end portion of the lock bar 41 into a lock bar insertion hole 44a of the fixing mechanism 44 which is provided on the guide rail, the car 2 is mechanically fixed in position. Thereafter, the operating lever 43 is inserted into an operating lever insertion groove 42a to thereby prevent the lock bar 41 from coming out of engagement with the fixing mechanism 44.

[0015] In this conventional elevator car fixing device, constructed as described above, the car 2 is fixed to a stationary portion in the hoistway, such as a guide rail. Thus, when the rope 6 becomes longer with age, the position of the driving machine 7 with respect to the car fixing position is lowered, which leads to a hindrance to maintenance operation.

[0016] The present invention has been made with a view toward solving the above problem in the prior art. It is an object of the present invention to provide an elevator car fixing device in which the car and the counterweight are fixed in position in a state they are connected together, so that the device is free from the influence of the expansion of the rope with age, making it possible to fix the position of the driving machine with respect to the car fixing position.

DISCLOSURE OF THE INVENTION

[0017] According to the present invention, there is provided an elevator car fixing device which is provided in an elevator, the elevator including: a rope arranged in a hoistway and wrapped around a return pulley arranged in an upper portion of the hoistway; a car suspended from one end of the rope; and a counterweight suspended from a portion of the rope between a counterweight-side rope fixing member, which is provided in the upper portion of the hoistway and to which the other end of the rope is fixed, and the return pulley, the counterweight being adapted to ascend when the car descends and to descend when the car ascends and equipped with a driving machine for causing the car to ascend and descend, the elevator car fixing device including an advancing/retreating member provided on one of the car and the counterweight and adapted to move toward and away from the other of the car and the counterweight, and a locking mechanism provided on the other of the car and the counterweight and adapted to be engaged with the advancing/retreating member when the advancing/retreating member advances to thereby lock the car and the counterweight with respect to each other in an ascent/descent direction. Thus, when the operator gets on top of the car to perform maintenance operation on the driving machine, any inadvertent motion of the car during the operation is mechanically inhibited, making it possible to perform the operation in a stable manner and with ease. The device is free from the influence of the expansion of the rope with age, making it possible to fix the position of the driving machine with respect to the car fixing position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a perspective view of an elevator, showing an elevator car fixing device according to Embodiment 1 of the present invention.
Fig. 2 is a diagram showing how an operator works on top of the car of the elevator of Fig. 1.
Fig. 3 is a schematic diagram schematically showing the elevator of Embodiment 1.
Fig. 4 is a schematic diagram illustrating how the operator performs maintenance operation, with the car and a counterweight being connected together.
Fig. 5 is a diagram for illustrating a connecting device according to Embodiment 1.
Fig. 6 is a diagram showing the connecting device of Fig. 5 in the connecting state.
Fig. 7 is a diagram for illustrating a connecting device according to Embodiment 2.
Fig. 8 is a diagram showing the connecting device of Fig. 7 in the connecting state.
Fig. 9 is a diagram for illustrating a connecting device according to Embodiment 3.
Fig. 10 is a diagram for illustrating a connecting device according to Embodiment 4.
Fig. 11 is a schematic diagram schematically showing an elevator according to Embodiment 5.
Fig. 12 is a schematic diagram illustrating how the operator performs maintenance operation, with the car and the counterweight being connected together.
Fig. 13 is a schematic diagram schematically showing an elevator according to Embodiment 6.
Fig. 14 is a schematic diagram illustrating how the operator performs maintenance operation, with the car and the counterweight being connected together.
Fig. 15 is a diagram showing the side surfaces, the top surface, the front surface, and the rear surface of a photoreceptor type detection switch.
Fig. 16 is a perspective view of a conventional self-propelled elevator.
Fig. 17 is a schematic view of a conventional elevator apparatus.
Fig. 18 is a perspective view of a conventional car fixing device.

BEST MODE FOR CARRYING OUT THE INVENTION

Embodiment 1

[0019] Fig. 1 is a perspective view of an elevator, showing an elevator car fixing device according to Embodiment 1 of the present invention. Further, Fig. 2 is a diagram showing how an operator works on top of the car of the elevator of Fig. 1. Fig. 3 is a schematic diagram schematically showing the elevator of this embodiment. Fig. 4 is a schematic diagram illustrating how the operator performs maintenance operation, with the car and a counterweight being connected together.

[0020] In the drawings, a car 2 and a counterweight 3 are arranged in a hoistway 1 of the elevator. The car 2 and the counterweight 3 ascend and descend inside the hoistway 1 while being guided by car-side guide rails 4 and weight-side guide rails 5 with a T-shaped sectional configuration, respectively. The counterweight 3 has a weight frame 3b formed by connecting together four frame members with a U-shaped section into a rectangular configuration, and a plurality of weights 3a accommodated in the weight frame 3b in different numbers for adjustment in weight. Further, mounted on the counterweight 3 is a driving machine 7 for causing the car 2 and the counterweight 3 to ascend and descend. As in the prior art, the counterweight 3 is equipped with a brake device, which is not shown here.

[0021] A return pulley 8 is provided in the upper portion of the hoistway 1. A rope 6 is wrapped around the return pulley 8, and dangles in the hoistway 1. One end portion of the rope 6 dangles first, and is then turned upwards to be fixed to a car-side rope fixing member 10 provided in the upper portion of the hoistway 1. Similarly,

the other end portion of the rope 6 dangles first, and is then turned upwards to be fixed to a counterweight-side rope fixing member 11 provided in the upper portion of the hoistway 1.

[0022] The car 2 is suspended from the portion of the rope 6 between the car-side rope fixing member 10 and the return pulley 8. In suspending the car 2, the rope 6 is wrapped around a sash pulley 9 provided under the car. The counterweight 3 is suspended from the portion of the rope 6 between the counterweight-side rope fixing member 11 and the return pulley 8. In suspending the counterweight 3, the rope 6 is wrapped around a sheave 7a of the driving machine 7.

[0023] When the driving machine 7 provided on the counterweight 3 is driven, the sheave 7a rotates, and the car 2 and the counterweight 3 ascend and descend within the hoistway 1. When the car 2 descends, the counterweight 3 ascends, and when the car 2 ascends, the counterweight 3 descends.

[0024] In this embodiment, there is used a so-called 2:1 roping type elevator, in which the ratio of the movement distance of the car 2 to the movement length of the rope 6 is 2:1.

[0025] On the top surface of the car 2, there is provided a connecting device 12 for connecting the car 2 and the counterweight 3 with each other in the ascent/descent direction.

[0026] In the lower portion of the hoistway 1, there is installed a control device 35 for operating the elevator. As in the prior art, between the control device 35 and the driving machine 7, there is provided an elevator cable, which is not shown here.

[0027] Fig. 5 is a diagram for illustrating the connecting device of this embodiment. Fig. 6 is a diagram showing the connecting device in the connecting state. The connecting device 12 has a lock bar 13 provided on the car 2 and serving as an advancing/retreating member 13 adapted to move toward and away from the counterweight 3, and a lock hole 3c which is provided in the counterweight 3 and into which the forward end portion of the lock bar 13 is inserted when the lock bar 13 advances. The lock hole 3c is formed in a weight frame 3b. The height of the lock hole 3c is determined such that, when the car 2 and the counterweight 3 are connected together, the driving machine 7 attains a height which facilitates the inspection thereof. The weight frame 3b is engaged with the lock bar 13 to constitute a locking mechanism for locking the car 2 and the counterweight 3 with respect to each other in the ascent/descent direction.

[0028] The lock bar 13 is slidably supported by a bracket 14 serving as a guide member provided on the car frame 2a. Two side surfaces of the bracket 14 have through-holes 14a. The lock bar 13 is passed through these two through-holes 14a, and is supported so as to be capable of moving toward and away from the counterweight 3. An operating lever 13a protrudes from the outer peripheral surface of the lock bar 13. This operating lever 13a is engaged with a U-shaped guide slit 14b formed in the bracket 14, and regulates the movement of the lock bar 13. When the operating lever 13a is engaged with a lateral groove at the advance end of the guide slit 14b, the lock bar 13 is secured in the connecting position. When the operating lever 13a is engaged with a lateral groove at the retreat end of the guide slit 14b, the lock bar 13 is secured in the retreat position.

[0029] As in this embodiment, in a so-called self-propelled elevator, in which the elevator driving machine 7 is mounted on the counterweight 3, the operator gets on top of the car 2, as shown in Figs. 2 and 4, when maintenance is to be performed on the driving machine 7, and moves close to the place where the car 2 and the counterweight 3 pass each other, reaching out from the car to perform maintenance on the driving machine 7.

[0030] When the car 2 and the counterweight 3 are to be connected together, the operator performs positioning on the car 2 and the counterweight 3. When the position has been reached where the positioning on the car 2 and the counterweight 3 is complete, the operating lever 13a is removed from the lateral groove at the retreat position, and the lock bar 13 is caused to advance, and inserted into the lock hole 3c, with the operating lever 13a being fixed to the lateral groove at the connecting position. By this operation, the car 2 and the counterweight 3 are mutually regulated in their movement in the ascent/descent direction.

[0031] The elevator car fixing device, constructed as described above, is provided in an elevator having: the rope 6 wrapped around the return pulley 8 and arranged in the hoistway 1, with the return pulley 8 being arranged in the upper portion of the elevator hoistway; the car 2 suspended from one end of the rope 6; and the counterweight 3 suspended from the portion of the rope 6 between the counterweight-side rope fixing member 11 in the upper portion of the hoistway 1, to which the other end of the rope 6 is fixed, and the return pulley 8, the counterweight 3 being adapted to ascend when the car 2 descends and to descend when the car 2 ascends, and equipped with the driving machine 7 for causing the car 2 to ascend and descend, wherein the car fixing device is equipped with the lock bar 13 provided on the car 2 and adapted to move toward and away from the counterweight 3, and the weight frame 3b adapted to be engaged with the lock bar 13 when the lock bar 13 provided on the car 2 advances, thereby mutually locking the car 2 and the counterweight 3 in the ascent/descent direction. Therefore, when the operator gets on top of the car 2 to perform maintenance on the driving machine 7, it is possible to mechanically prevent any inadvertent motion of the car 2 during the maintenance operation, making it possible to perform the operation in a stable manner and with ease. Further, the device is free from the influence of an expansion of the rope 6 with age, making it possible to always keep the position of the driving machine 7 with respect to the car fixing position fixed.

[0032] Further, the lock bar 13 is substantially formed

as a bar extending in the advancing/retreating direction and slidably guided in the advancing/retreating direction by the bracket 14, and the weight frame 3b has the lock hole 3c into which the forward end portion of the lock bar 13 is inserted. Thus, it is possible to easily form the mechanism for mutually locking the car and the counterweight in the ascent/descent direction.

[0033] While in this embodiment the lock bar 13 is provided on the car 2 and the lock hole 3c is provided in the counterweight 3, conversely, it is also possible to provide the lock hole 3c in the car 2 and to provide the lock bar 13 on the counterweight 3.

Embodiment 2

[0034] Fig. 7 is a diagram for illustrating a connecting device according to Embodiment 2. Fig. 8 is a diagram showing the connecting device in the connecting state. The connecting device of this embodiment has a lock bar 16 mounted to the weight frame 3b and a lock member 17 provided on the car frame 2a. The lock bar 16 is formed as a substantially T-shaped member composed of a short base portion 16b and a long main body portion 16a connected to the center of the base portion 16b, with the base portion 16b being rotatably supported by a shrouding ring 18. The lock bar 16 rotates using the base portion 16b as a fulcrum, and horizontally moves between a retreat position, where the lock bar 16 is substantially parallel to the weight frame 3b, and a connecting position, where the lock bar 16 is substantially perpendicular to the weight frame 3b.

[0035] The lock member 17 provided on the car frame 2a has a lock groove 17a open horizontally outwards. At the position where positioning on the car 2 and the counterweight 3 is complete, rotation of the lock bar 16 toward the connecting position causes the main body portion 16a of the lock bar 16 to be engaged with the lock groove 17a of the lock member 17. The lock member 17 is engaged with the lock bar 16 to form a locking mechanism for mutually locking the car 2 and the counterweight 3 in the ascent/descent direction.

[0036] The lock bar 16 and the shrouding ring 18, mounted to the weight frame 3b, are provided so as to attain a height which allows easy inspection of the driving machine 7 when the position has been reached where the car 2 and the weight 3 are connected together.

[0037] In this elevator car fixing device, constructed as described above, when the operator gets on top of the car 2 to perform maintenance on the driving machine 7, the car 2 is fixed in position by connecting the car 2 with the counterweight 3, making it possible to mechanically prevent any inadvertent movement of the car during the maintenance operation.

Embodiment 3

[0038] Fig. 9 is a diagram for illustrating a connecting device according to Embodiment 3. In this embodiment, the car frame 2a is equipped with an accommodation confirming switch 20 for detecting that the lock bar 13 of the connecting device 12 is at an accommodation position. This accommodation confirming switch 20 is electrically connected to the control device 35 of the elevator. In addition to signals from other peripheral apparatuses, the control device 35 takes in a signal from the accommodation confirming switch 20, and forms a safety circuit for preventing the elevator from being driven when the lock bar 13 is not in the accommodation position. Otherwise, this embodiment is of the same construction as Embodiment 1.

[0039] In this elevator car fixing device, constructed as described above, the elevator cannot be operated if the lock bar 13 is not completely accommodated in the accommodation position. Thus, there is no fear of the elevator being operated without canceling the lock of the connecting device 12, making it possible to prevent damage to the relevant apparatuses, etc.

Embodiment 4

[0040] Fig. 10 is a diagram for illustrating a connecting device according to Embodiment 4. In this embodiment, there is stretched between the bracket 14 and the rear end of the lock bar 13 a tension spring 21 serving as an elastic member for urging the lock bar 13 in the advancing direction. Further, a roller 22 is provided at the forward end of the lock bar 13.

[0041] The weight frame 3b as the locking mechanism has a parallel surface 3d parallel to the ascent/descent direction and the lock hole 3c formed in this parallel surface 3d. Urged by the tension spring 21, the lock bar 13 brings the roller 22 into contact with the parallel surface 3d and causes the roller 22 to slide thereon. When it is matched in position with the lock hole 3, the forward end portion of the lock bar is inserted into the lock hole 3c.

[0042] Further, there is provided a retreat confirming switch 20 for detecting that the lock bar 13 is at a retreat position. This retreat confirming switch 20 is electrically connected to the elevator control apparatus 35. In addition to signals from other peripheral apparatuses, the control device 35 takes in a signal from the retreat confirming switch 20, minimizing the car ascent/descent speed when the lock bar 13 is not at the retreat position. Further, when the lock bar 13 is inserted into the lock hole 3c for locking, it stops the ascent/descent of the car. That is, the control device 35 constitutes an operation restricting means.

[0043] In this elevator car fixing device, constructed as described above, when, for example, the lock bar 13 is brought into contact with the parallel surface 3d of the weight frame 3b, with the counterweight 3 being slightly above the position to be attained through positioning, the lock bar 13 is urged toward the counterweight 3 by the force of the tension spring 21. When, in this state, the alignment between the counterweight 3 and the car

2 is pursued, the roller 22 slides on the parallel surface 3d, and the lock bar 13 automatically enters the lock hole 3c upon matching in position between the lock bar 13 and the lock hole 3c. Thus, the alignment operation is facilitated.

Embodiment 5

[0044] Fig. 11 is a schematic diagram schematically showing an elevator apparatus according to Embodiment 5. Fig. 12 is a schematic diagram showing how the operator performs maintenance operation, with the car and the counterweight being connected together. In the drawings, two return pulleys 8 are provided in the upper portion of the hoistway. The rope 6 is wrapped around the return pulleys 8, and dangles inside the hoistway 1. One end portion of the rope 6 first dangles, and is then turned upwards to be fixed to the counterweight-side rope fixing member 11 provided in the upper portion of the hoistway 1.

[0045] The counterweight 3 is suspended from the portion of the rope 6 between the counterweight-side rope fixing member 11 and the return pulleys 8. Further, mounted on the counterweight 3 is the driving machine 7 for causing the car 2 and the counterweight 3 to ascend and descend. The counterweight 3 is suspended by wrapping the rope 6 around the sheave 7a of the driving machine 7.

[0046] The other end portion of the rope 6 dangles downward similarly to be connected to the car 2, whereby the car 2 is suspended from the rope 6.

[0047] When the driving device 7 provided on the counterweight 3 is driven, the sheave 7a rotates, and the car 2 and the counterweight 3 ascend and descend within the hoistway 1. When the car 2 descends, the counterweight 3 ascends, and when the car 2 ascends, the counterweight 3 descends. On the top surface of the car 2, there is provided the connecting device 12 similar to that of Embodiment 1.

[0048] In this elevator car fixing device, constructed as described above, it is possible to apply the connecting device 12 also to a so-called 1:1 roping type self-propelled elevator, in which the ratio of the movement distance of the car 2 to the movement length of the rope 6 is 1:1.

Embodiment 6

[0049] Fig. 13 is a schematic diagram schematically showing an elevator according to Embodiment 6. Fig. 14 is a schematic diagram showing how the operator performs connecting operation, with positioning having being effected on the car and the counterweight. Fig. 15 is a diagram showing the side surfaces, the top surface, the front surface, and the rear surface of a photoreceptor type detection switch. In this embodiment, there is provided on top of the car 2 a photoreceptor type detection switch 24 which detects approach of an object by receiving a laser beam emitted therefrom. A reflection plate 25 is provided on the counterweight 3. The photoreceptor type detection switch 24 constitutes a positioning detection means which receives detection light emitted toward the reflection plate 25 to thereby detect positioning.

[0050] As shown in Fig. 15, the photoreceptor type detection switch 24 has on its front side an emitting portion 24a and a light receiving portion 24b. A laser beam serving as the detection light emitted from the emitting portion 24a is received by the light receiving portion 24b. When the counterweight 3 has reached the position to be attained through positioning, the reflection plate 25 reflects the laser beam to the light receiving portion 24b.

[0051] A buzzer 26 is provided at the rear of the photoreceptor type detection switch 24. The buzzer 26 is operated to generate a beep based on a detection signal output when the photoreceptor type detection switch 24 receives detection light. The buzzer 26 constitutes an informing means for informing the operator of the completion of the positioning.

[0052] In this elevator car fixing device, constructed as described above, by keeping the photoreceptor type detection switch 24 ON, a beep is issued when the car 2 and the counterweight 3 are aligned with each other, thus facilitating the positioning operation.

[0053] While in this embodiment the buzzer 26 is used as the informing means, it is also possible to adopt, for example, an arrangement in which a lamp illuminates upon alignment.

INDUSTRIAL APPLICABILITY

[0054] According to the present invention, there is provided the elevator car fixing device that fixes the car with respect to the counterweight, which is suitable for use in the self-propelled elevator in which the driving machine for causing the car and the counterweight to ascend and descend is mounted on the counterweight, in particular, the elevator in which the operator gets on top of the car to perform maintenance operation on the driving machine.

Claims

1. An elevator car fixing device provided in an elevator, the elevator including:

   a rope arranged in a hoistway and wrapped around a return pulley arranged in an upper portion of the hoistway;
   a car suspended from one end of the rope; and
   a counterweight suspended from a portion of the rope between a counterweight-side rope fixing member, which is provided in the upper portion of the hoistway and to which the other end of the rope is fixed, and the return pulley,

the counterweight being adapted to ascend when the car descends and to descend when the car ascends and equipped with a driving machine for causing the car to ascend and descend,
the elevator car fixing device being **characterized by** comprising:

an advancing/retreating member provided on one of the car and the counterweight and adapted to move toward and away from the other of the car and the counterweight; and
a locking mechanism provided on the other of the car and the counterweight and adapted to be engaged with the advancing/retreating member when the advancing/retreating member advances to thereby lock the car and the counterweight with respect to each other in an ascent/descent direction.

2. An elevator car fixing device according to Claim 1,
wherein the advancing/retreating member is formed substantially as a bar extending in the advancing/retreating direction and slidably guided in an advancing/retreating direction by a guide member, and
wherein the locking mechanism has a lock hole into which a forward end portion of the advancing/retreating member is inserted.

3. An elevator car fixing device according to Claim 2, further comprising an elastic member urging the advancing/retreating member in the advancing direction,
wherein the advancing/retreating member has a roller at the forward end portion,
wherein the locking mechanism has a parallel surface that is parallel to the ascent/descent direction, and the lock hole formed in the parallel surface, and
wherein the advancing /retreating member is urged by the elastic member to cause the roller to slide on the parallel surface while being held in contact with the parallel surface, causing the forward end portion to be inserted into the lock hole when a position corresponding to the lock hole is reached.

4. An elevator car fixing device according to Claim 1,
wherein the advancing/retreating member is formed substantially as a bar and is provided so as to be rotatable within a horizontal plane while being axially supported at its rear end, and
wherein the locking mechanism has a lock groove with which a main body portion of the advancing/retreating member is engaged.

5. An elevator car fixing device according to any one of Claims 1, 2, and 4, further comprising:

a retreat confirming switch for detecting a retreat position of the advancing/retreating member; and
a safety circuit which operates based on a signal from the retreat confirming switch and which inhibits a drive of the elevator when the advancing/retreating member is not at the retreat position.

6. An elevator car fixing device according to any one of Claims 1 to 4, further comprising:

a retreat confirming switch for detecting a retreat position of the advancing/retreating member; and
an operation restricting means which operates based on a signal from the retreat confirming switch, for minimizing an ascent/descent speed of the car when the advancing/retreating member is not at the retreat position.

7. An elevator car fixing device according to any one of Claims 1 through 6, further comprising:

a positioning detection means for detecting positioning performed on the car and the counterweight; and
an informing means for informing an operator of completion of the positioning.

8. An elevator car fixing device according to Claim 7, wherein the positioning detection means has a reflection plate provided on one of the car and the counterweight and a photoreceptor type detection switch provided on the other of the car and the counterweight and adapted to receive a detection light emitted toward the reflection plate to detect the positioning.

9. An elevator car fixing device according to any one of Claims 1 through 8, wherein the advancing/retreating member is provided on the car.

10. An elevator car fixing device according to any one of Claims 1 through 8, wherein the advancing/retreating member is provided on the counterweight.

11. An elevator car fixing device according to any one of Claims 1 through 10,
wherein the other end of the rope is fixed to a car-side rope fixing member in the upper portion of the hoistway, and
wherein the car is connected with a sash pulley arranged between the car-side rope fixing member and the return pulley and suspended from the

rope.

12. An elevator car fixing device according to any one of Claims 1 through 10, wherein the other end of the rope is connected to the car.

FIG. 1

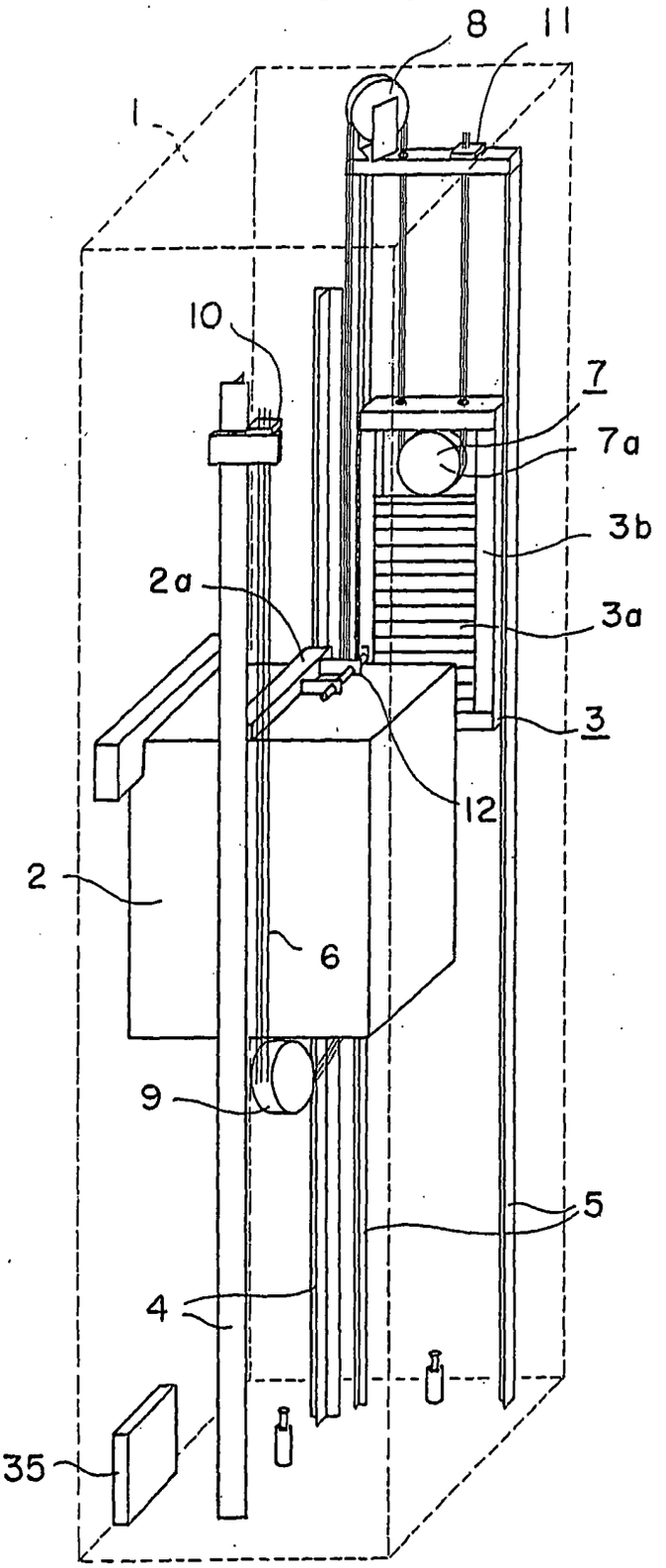


FIG. 2

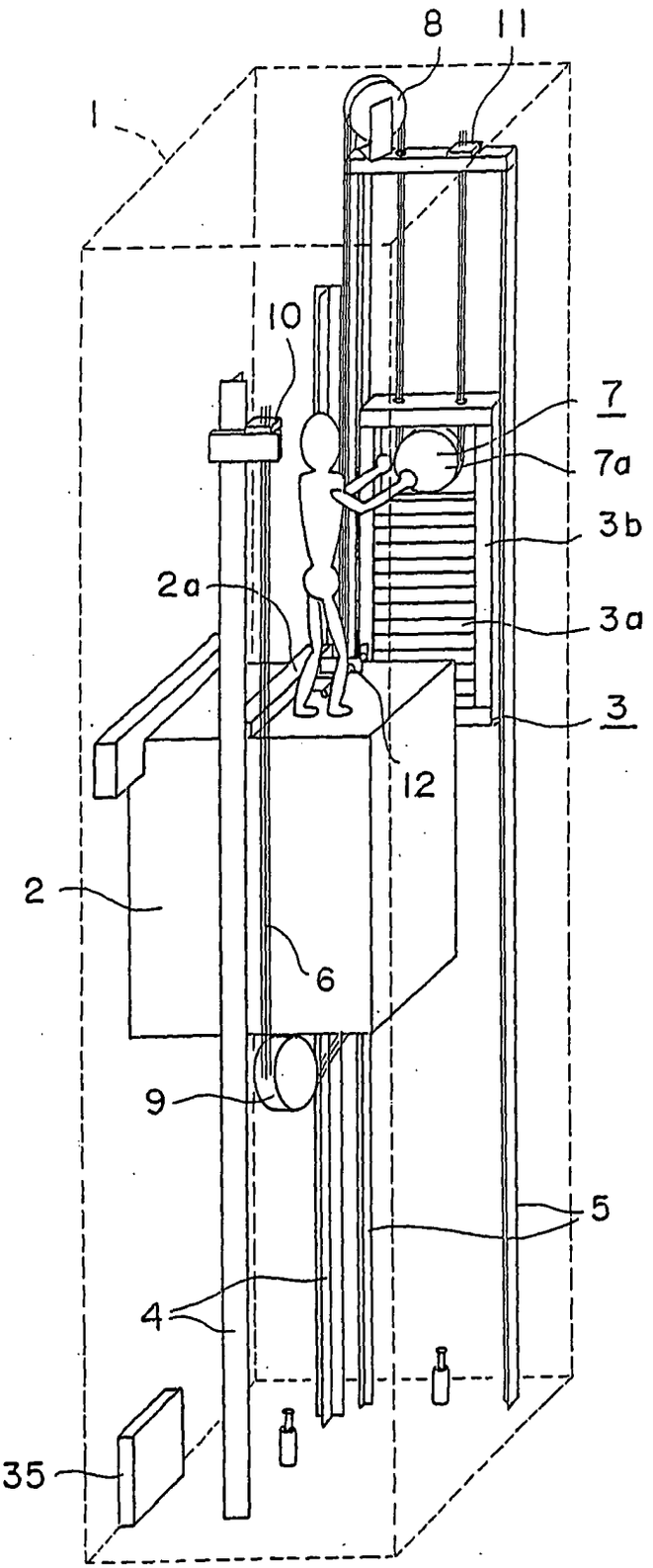


FIG. 3

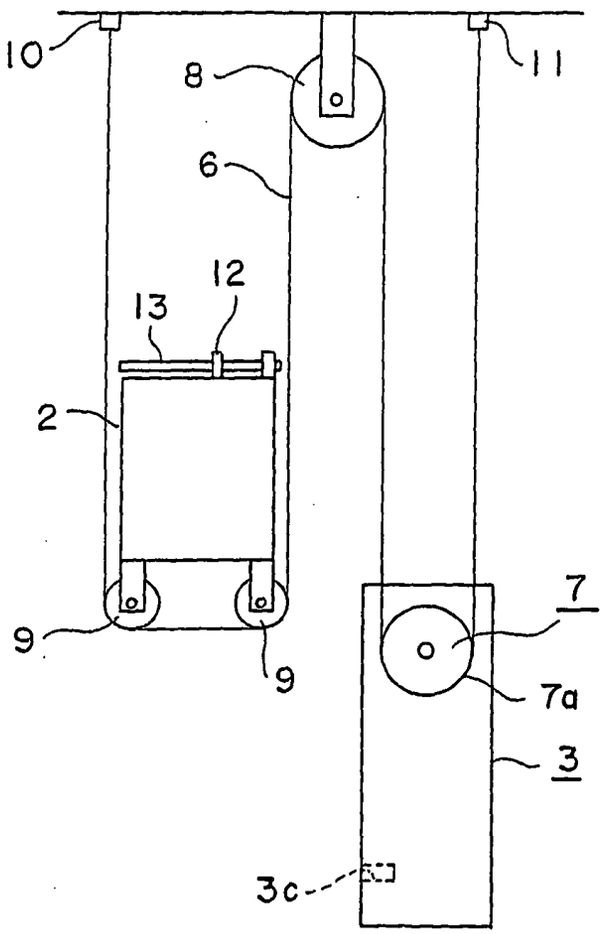


FIG. 4

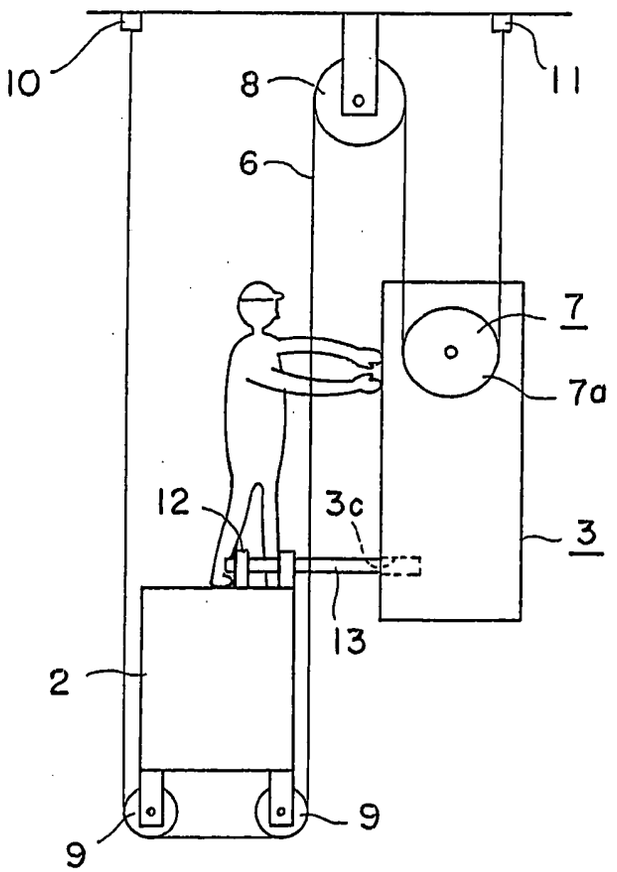


FIG. 5

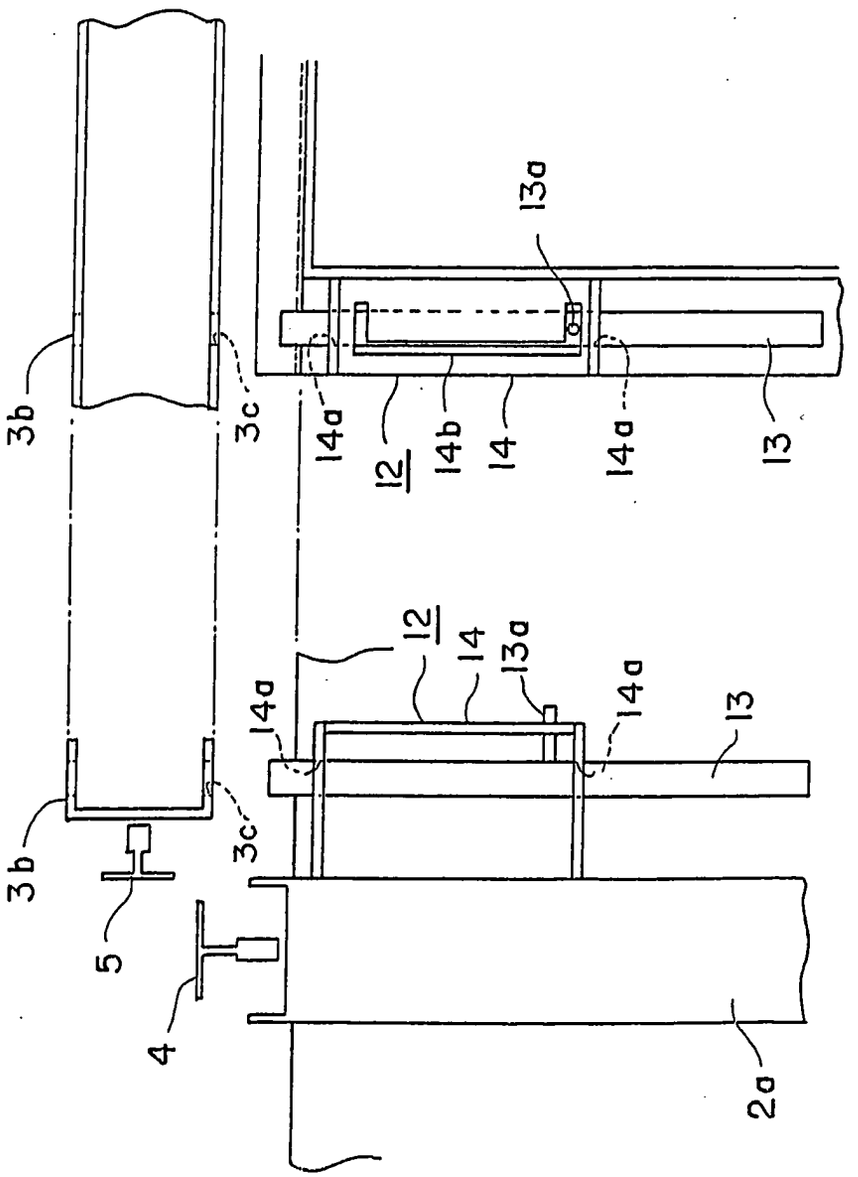


FIG. 6

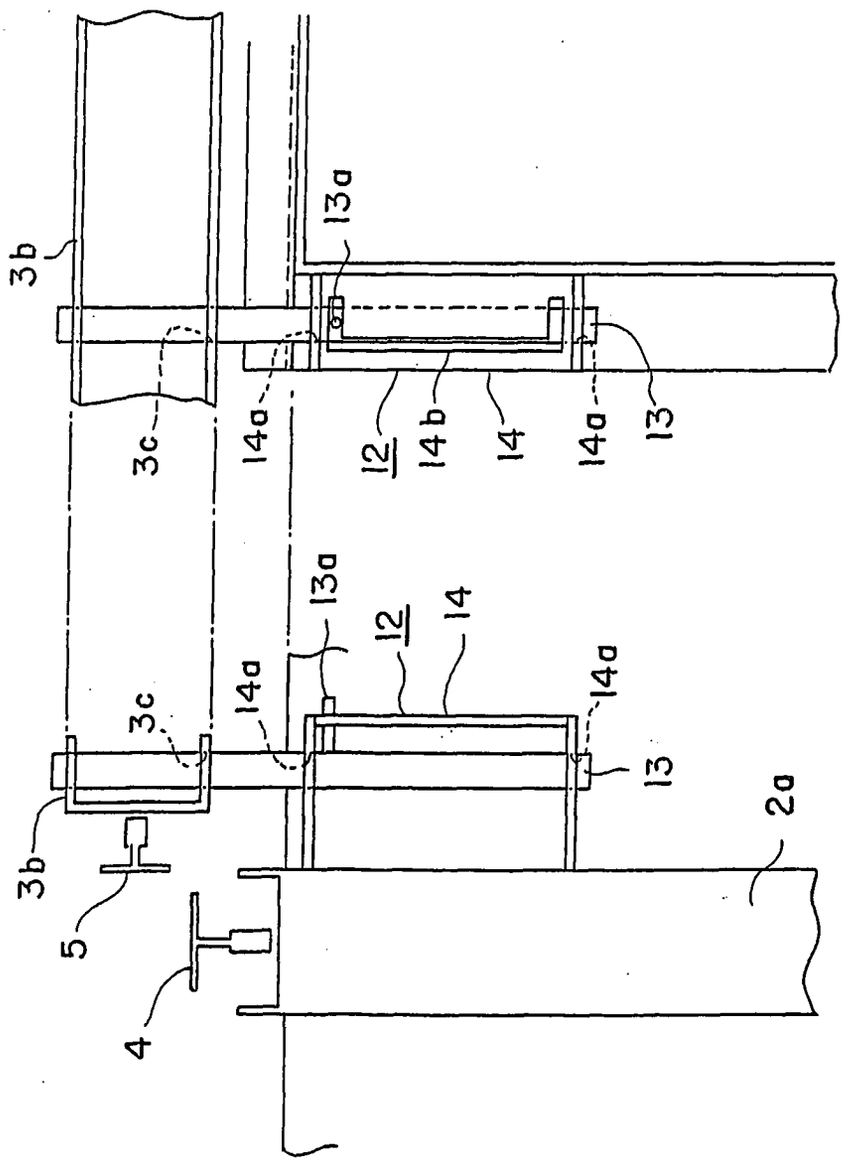


FIG. 7

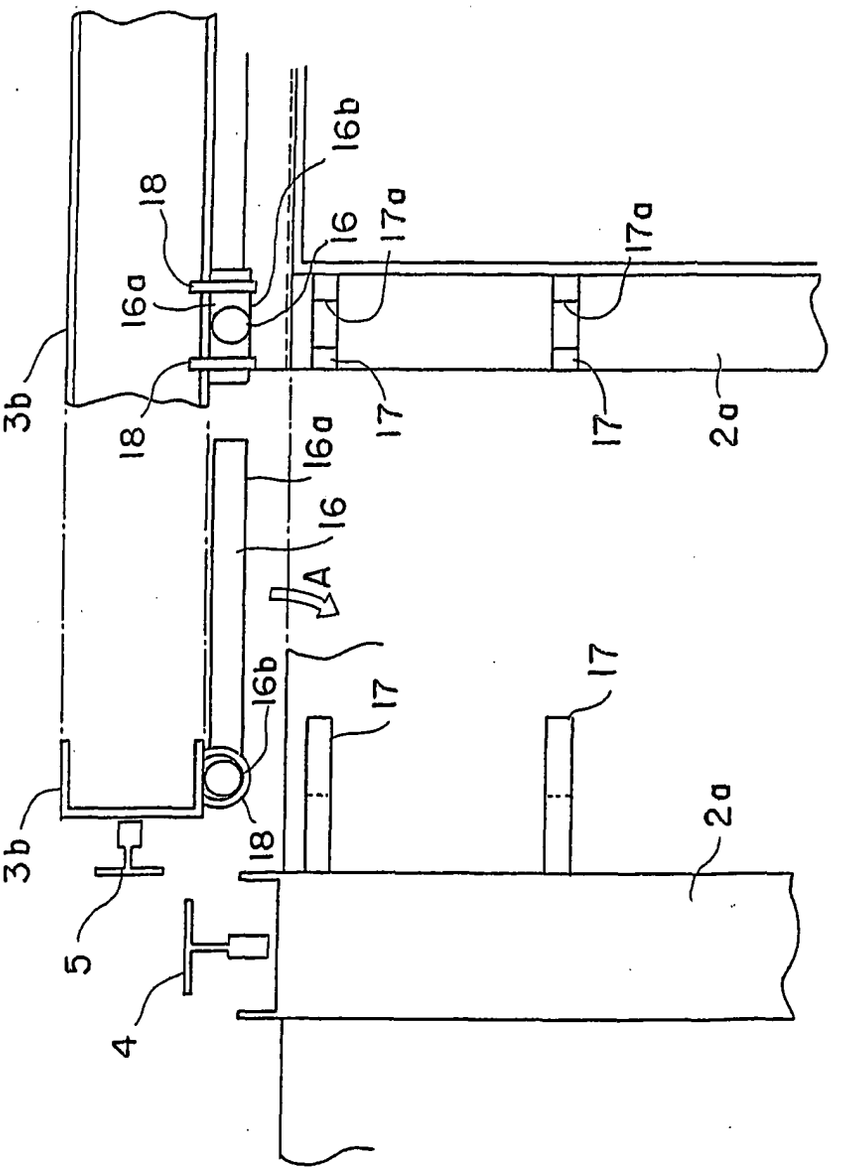


FIG. 8

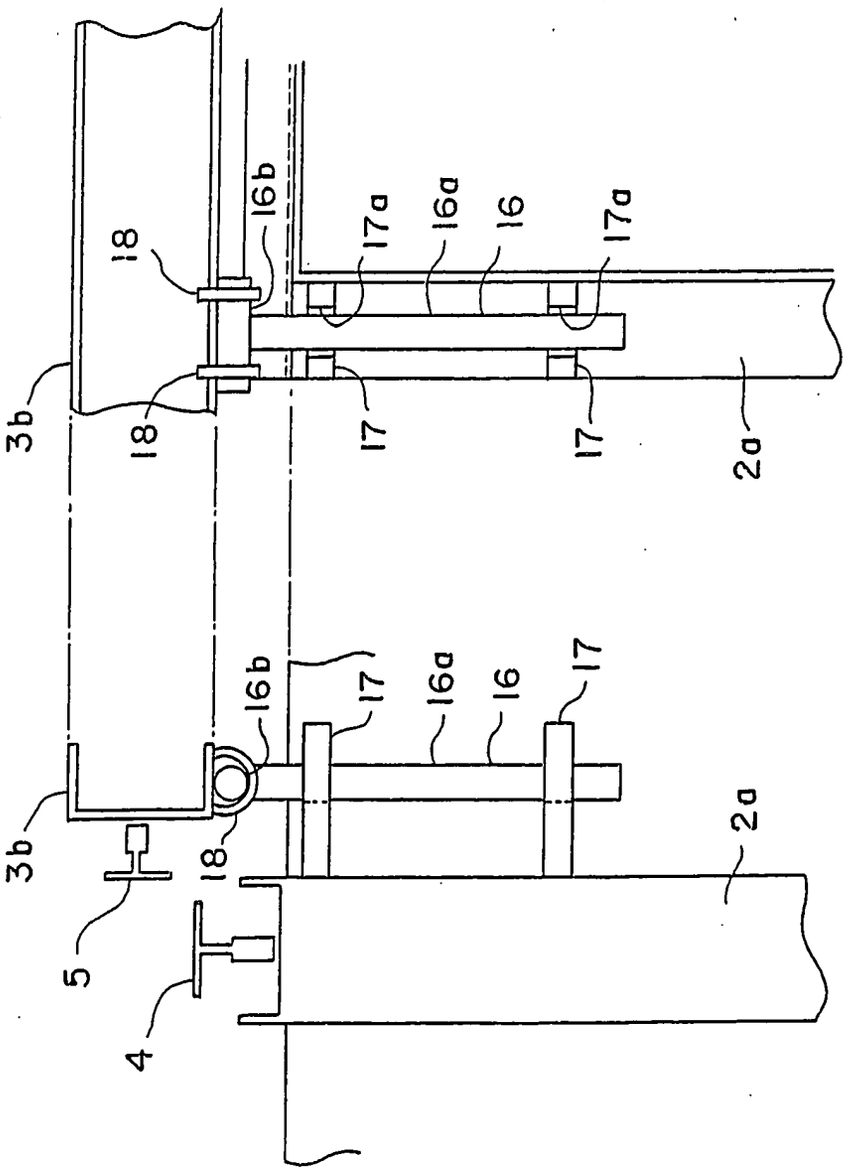


FIG. 9

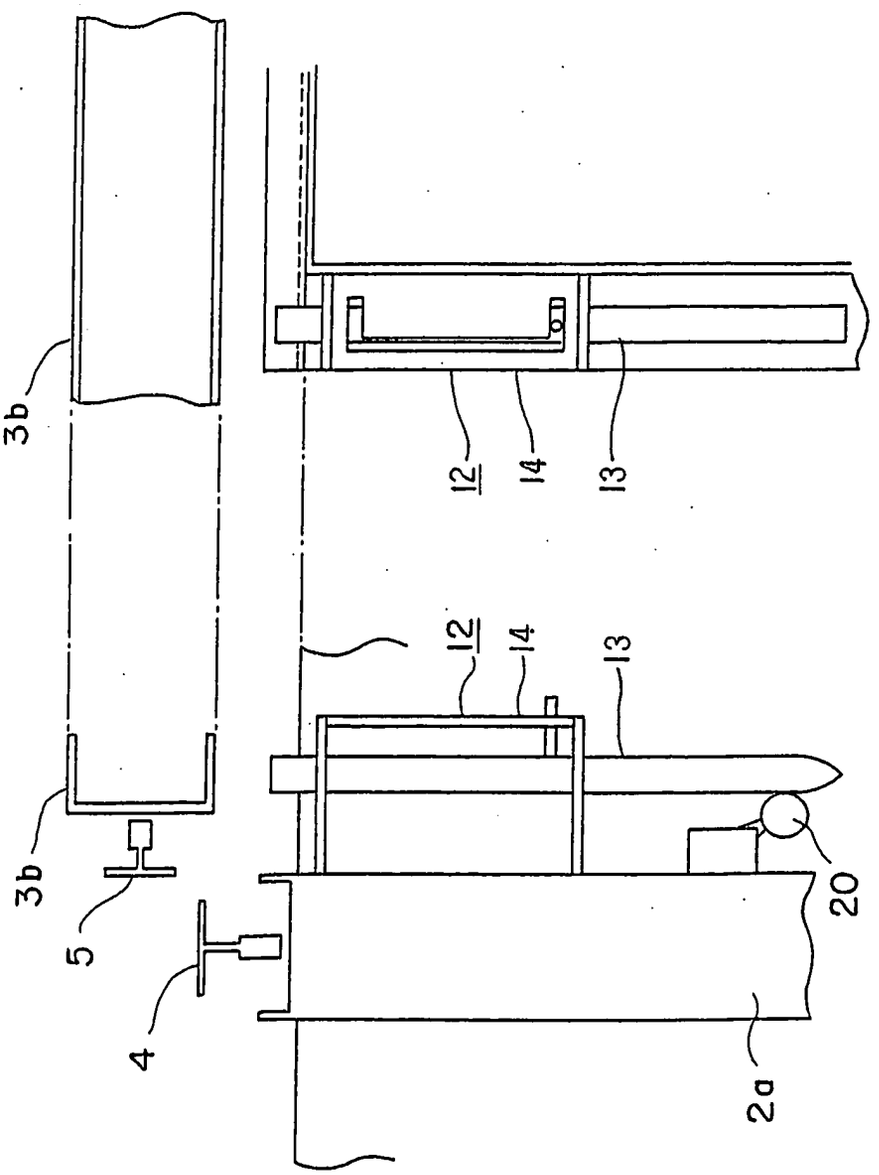
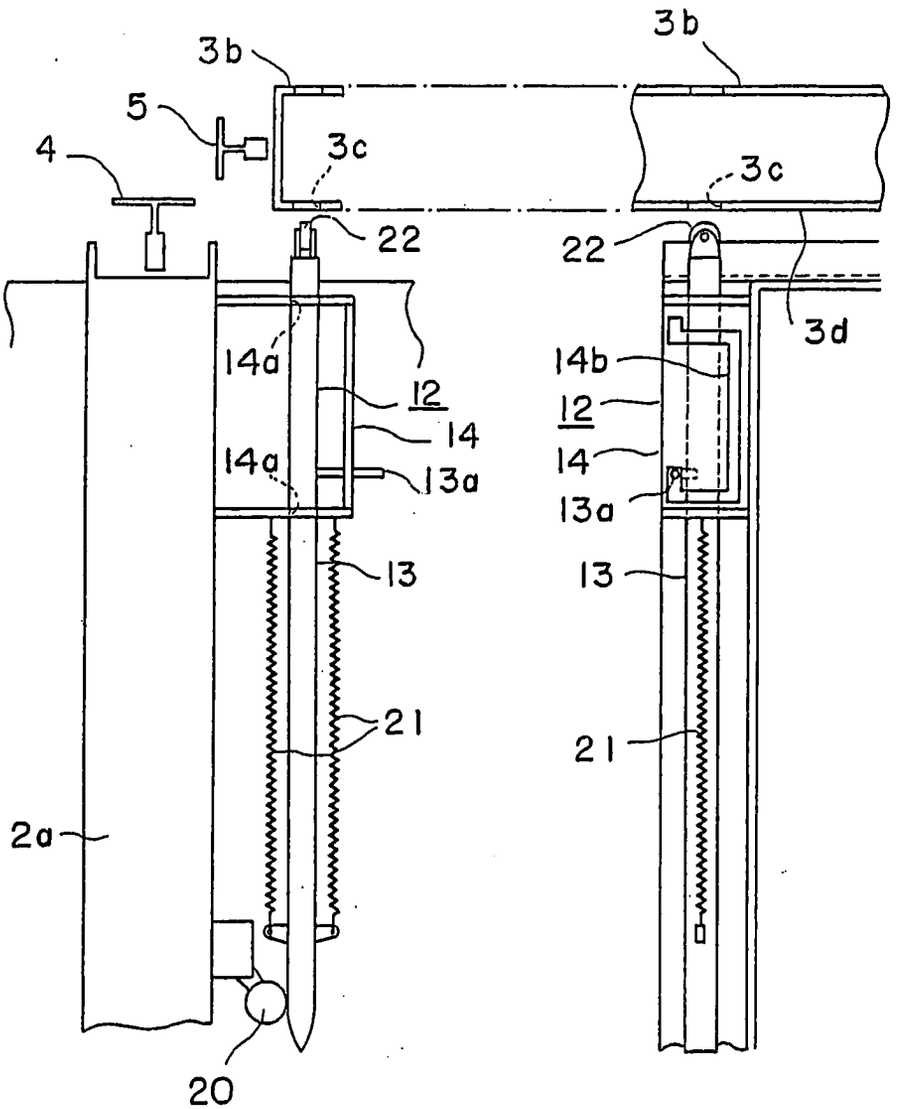


FIG.10


3b
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4
3c
3c
22
22
3d
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14b
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14
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13a
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13
21
21
2a
20

FIG.11

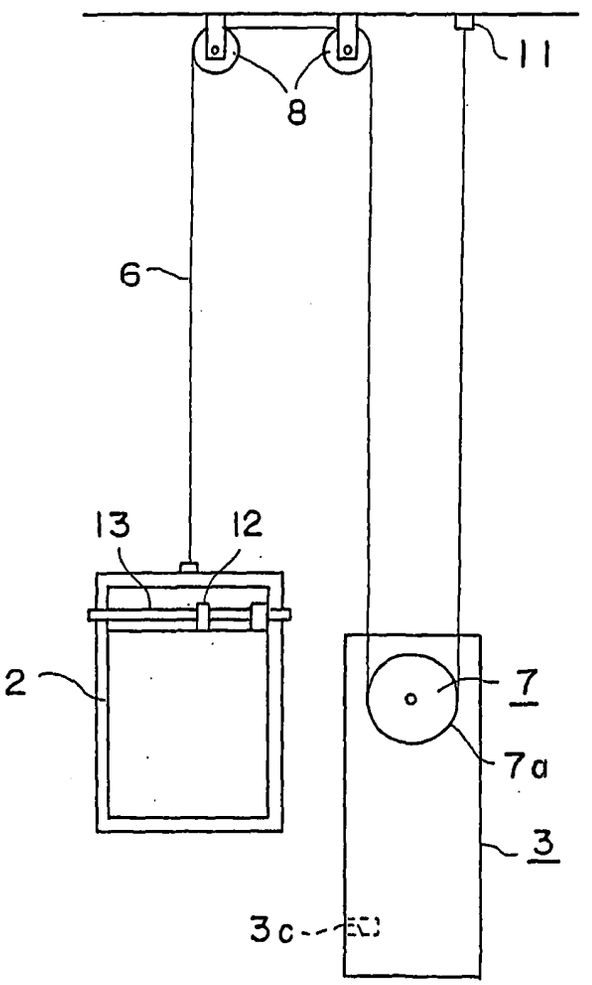


FIG.12

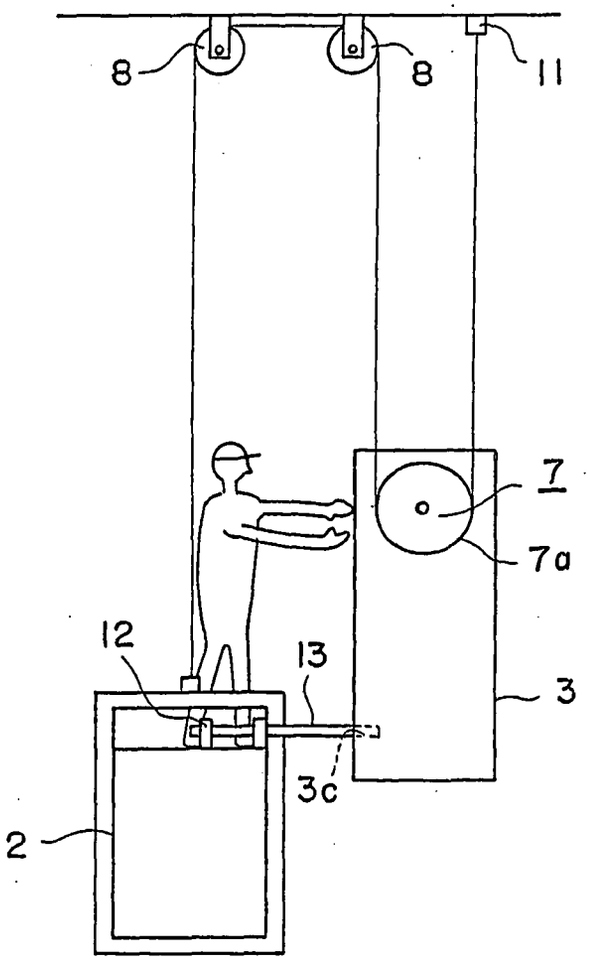


FIG.13

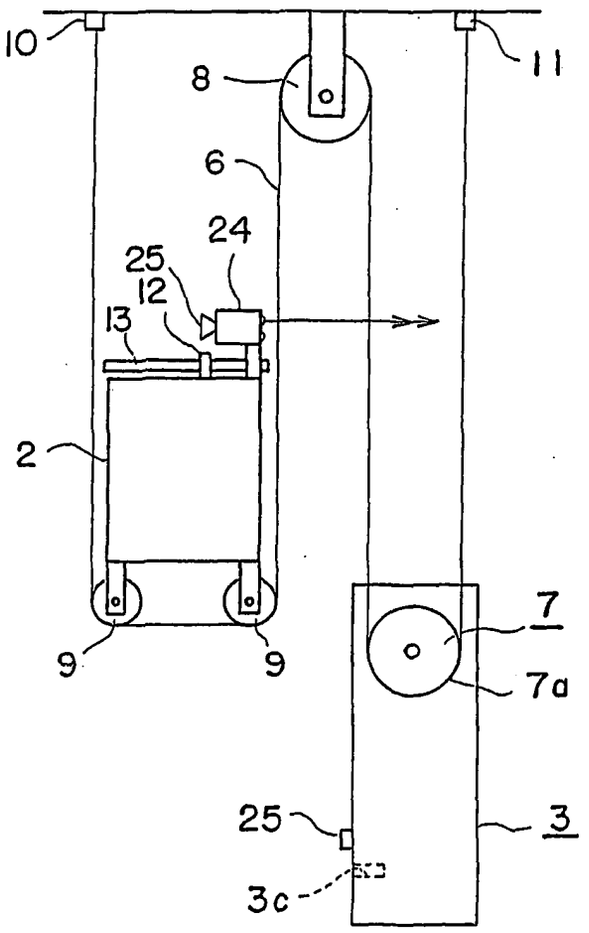


FIG. 14

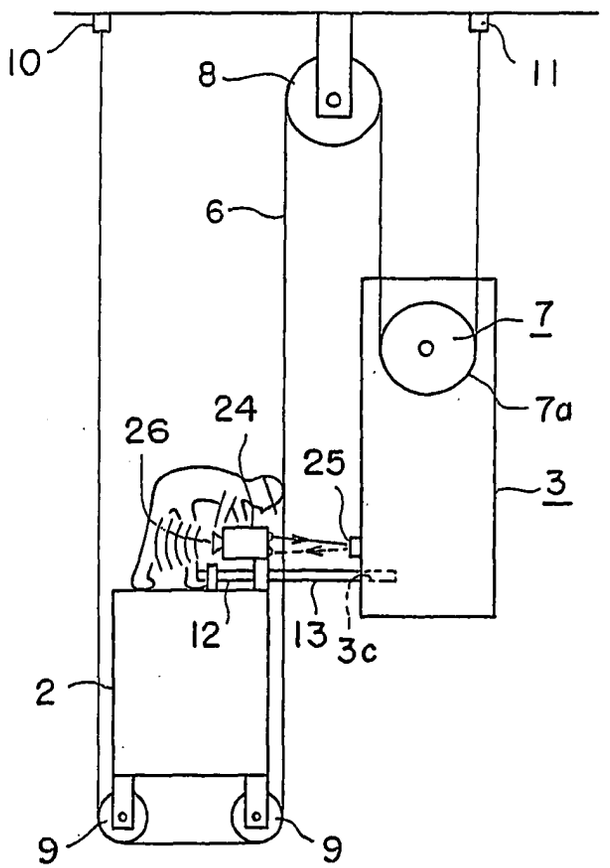


FIG.15

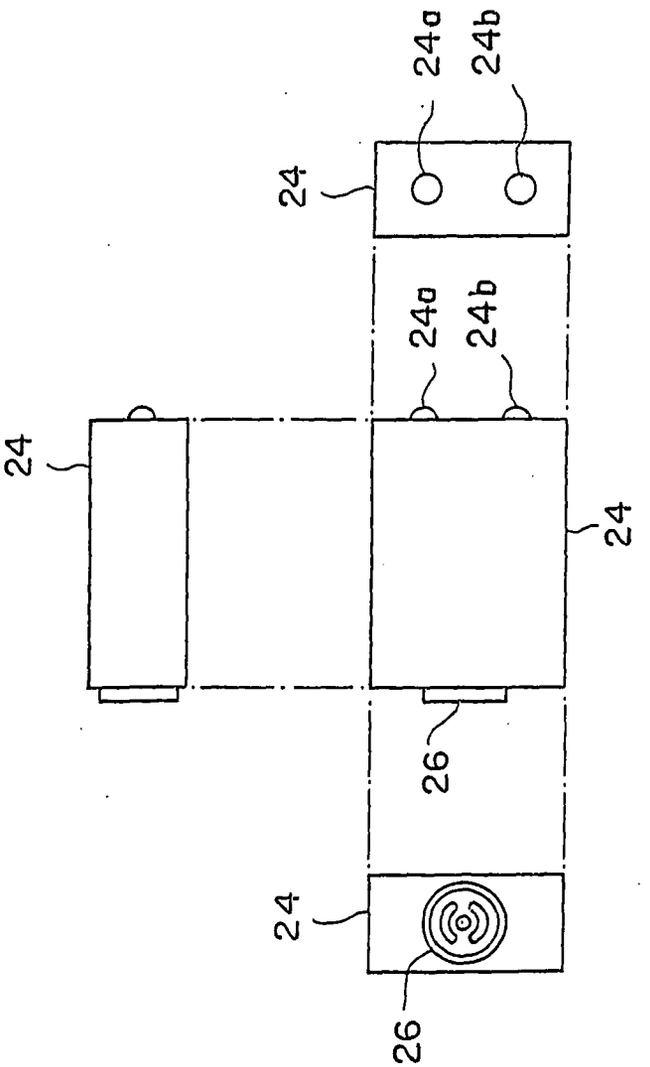


FIG.16

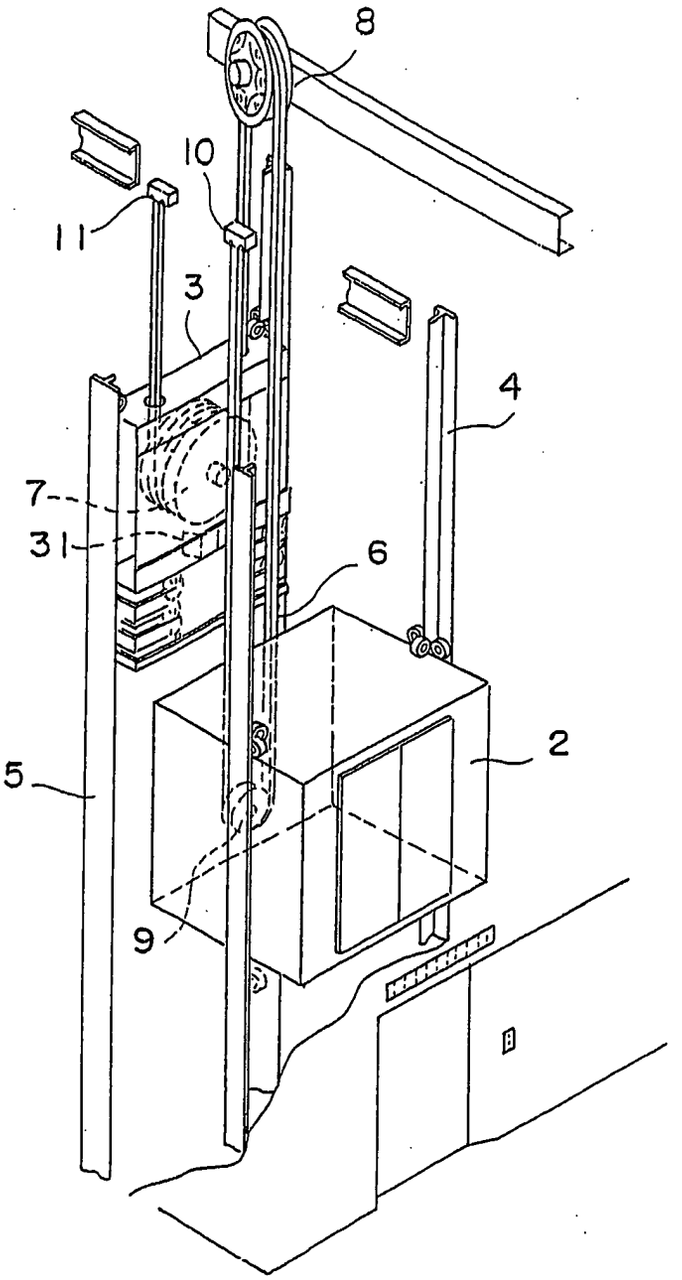


FIG.17

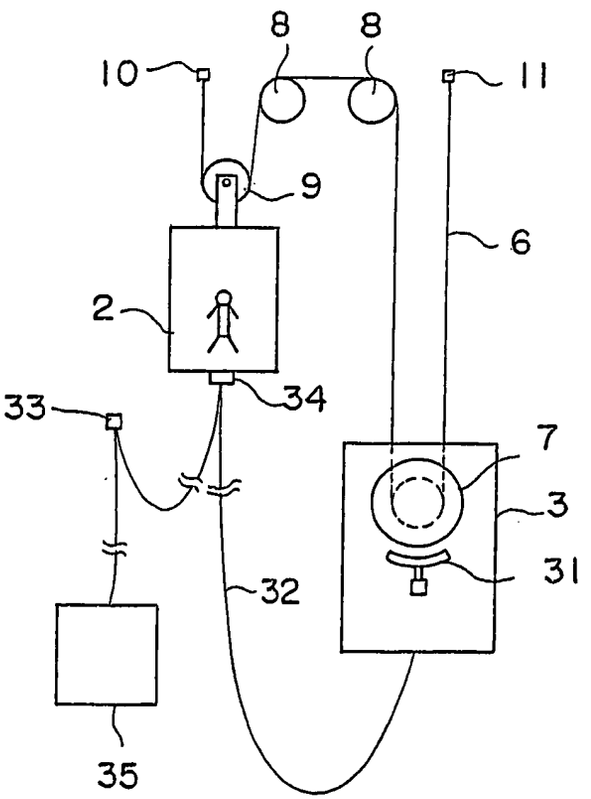
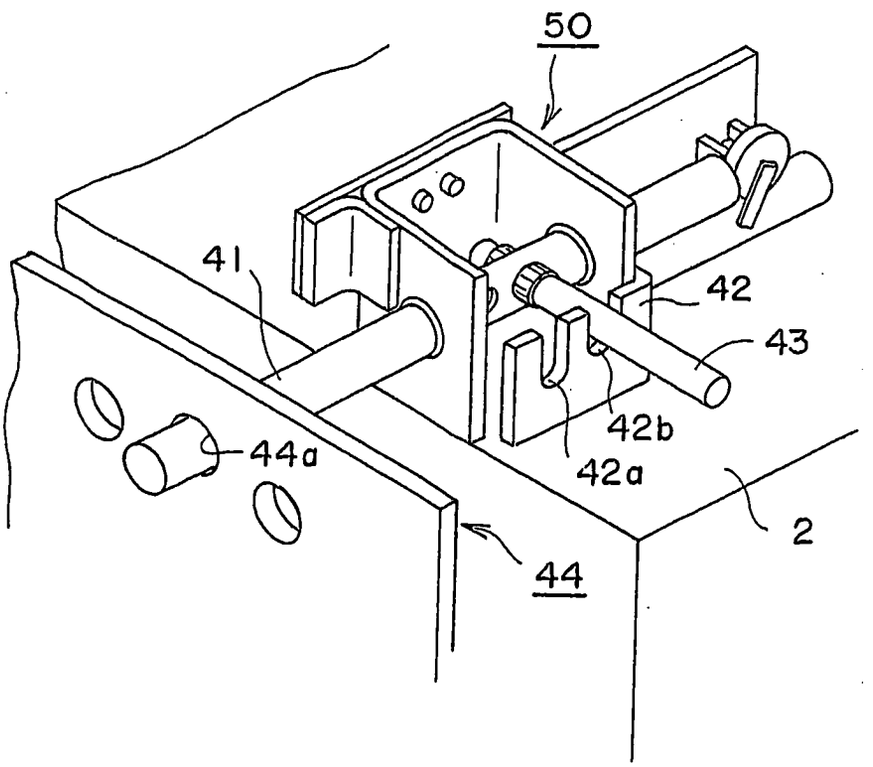


FIG.18



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/09462

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] B66B5/00, 7/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2002
Kokai Jitsuyo Shinan Koho 1971-2002 Toroku Jitsuyo Shinan Koho 1994-2002

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 9-124259 A (Mitsubishi Electric Corp.), 13 May, 1997 (13.05.97), & CN 1149549 A & KR 187399 B	1-12
A	JP 2000-203774 A (Toshiba Corp.), 25 July, 2000 (25.07.00), (Family: none)	1-12
A	JP 2509072 Y2 (Hitachi Building System Eng.& Service Co., Ltd.), 11 June, 1996 (11.06.96), (Family: none)	8-12

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 December, 2002 (20.12.02)	14 January, 2003 (14.01.03)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)