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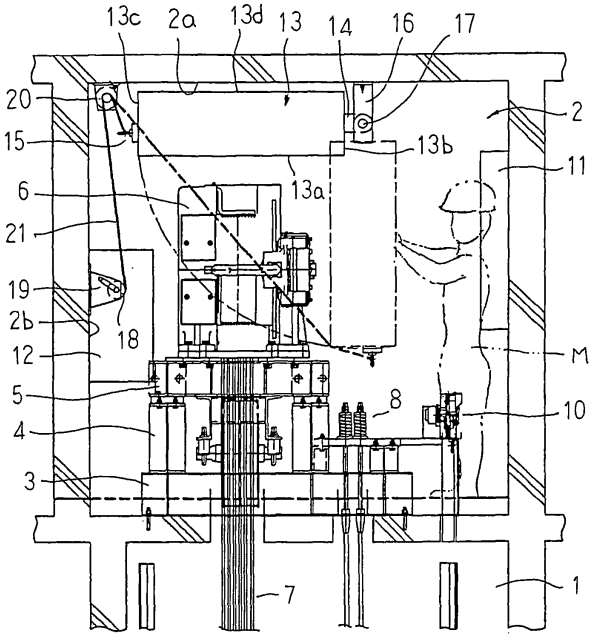
(54) **ELEVATOR EQUIPMENT**

(57) An object of the present invention is to provide an elevator apparatus enabling floor area in a machine room to be reduced.

The construction is such that a control board is constructed so as to be disposed with an upper surface thereof in close proximity to a ceiling of the machine room and be supported so as to be pivotable around a horizontal axis so as to be movable by means of a pivoting mechanism between a stored position parallel to the ceiling of the machine room and a maintenance inspection position hanging down from the ceiling of the machine room.

Thus, installation space and maintenance inspection space for machinery inside the machine room can be utilized efficiently, enabling reductions in floor area in the machine room.

FIG. 2



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Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator apparatus in which a control board for operating an elevator is installed in a machine room.

BACKGROUND ART

[0002] In conventional elevator apparatuses, as described in Japanese Patent Laid-Open No. SHO 51-37450 (Gazette), for example, machinery such as hoisting machines, speed governors, control boards, power supply equipment, etc., is mounted onto a set of bases and installed horizontally inside a machine room. However, since each of the items of machinery is installed inside the machine room so as to ensure maintenance inspection space, one disadvantage has been that the floor area required in the machine room has been large. Since this increase in the floor area of the machine room is a factor constraining the layout of a building, reductions in the floor area of the machine room have been desirable.

[0003] Thus, Japanese Utility Model Laid-Open No. SHO 60-162558 (Gazette), for example, discloses a metal anchor fitting being fixed to a side wall of a machine room, and a control board being mounted to the metal anchor fitting. The control board is constructed such that a front surface and a portion of an upper surface near the front surface thereof can be opened and closed together, and work is performed during maintenance inspections by opening the opening and closing portion of the control board. However, since the control board is mounted to a side wall of the machine room, other machinery can no longer be installed in a vicinity of the control board from the viewpoint of maintenance inspection space. Consequently, space below the control board is not utilized effectively, increasing the floor area of the machine room proportionately.

[0004] Japanese Patent Laid-Open No. SHO 61-221075 (Gazette), for example, discloses a control board being installed inside a machine room so as to be movable horizontally between a first position that is in close proximity to a hoisting machine and a second position separated from the hoisting machine. Thus, maintenance inspections of the hoisting machine are performed by moving the control board to the second position, and maintenance inspections of the control board are performed by moving the control board to the first position. However, it is necessary for space to be ensured for the control board to be positioned at the second position, and in addition, other machinery can no longer be installed in the path of the control board, preventing reductions in the floor area of the machine room.

DISCLOSURE OF INVENTION

[0005] The present invention provides an elevator apparatus enabling reductions in floor area in a machine room by installing a control board so as to adopt a stored position parallel to a ceiling of the machine room and a maintenance inspection position hanging down from the ceiling to enable installation space and maintenance inspection space for machinery inside the machine room to be utilized efficiently.

[0006] In order to achieve the above object, according to one aspect of the present invention, there is provided an elevator apparatus including a control board constructed so as to be disposed with an upper surface thereof in close proximity to a ceiling of a machine room and be supported so as to be pivotable around a horizontal axis so as to be movable by means of a pivoting mechanism between a stored position parallel to the ceiling of the machine room and a maintenance inspection position hanging down from the ceiling of the machine room.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

Figure 1 is a plan schematically showing a machine room of an elevator apparatus according to Embodiment 1 of the present invention;

Figure 2 is a longitudinal section schematically showing the machine room of the elevator apparatus according to Embodiment 1 of the present invention;

Figure 3 is a partial perspective showing a vicinity of a driving portion of a pivoting mechanism in an elevator apparatus according to Embodiment 2 according to the present invention; and

Figure 4 is a longitudinal section schematically showing a machine room of an elevator apparatus according to Embodiment 3 of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0008] Preferred embodiments of the present invention will now be explained with reference to the drawings.

Embodiment 1

[0009] Figure 1 is a plan schematically showing a machine room of an elevator apparatus according to Embodiment 1 of the present invention, and Figure 2 is a longitudinal section schematically showing the machine room of the elevator apparatus according to Embodiment 1 of the present invention.

[0010] In Figures 1 and 2, a machine room 2 is disposed in an upper portion of a hoistway 1 in which a car (not shown) ascends and descends. A machine base beam 4 is installed on a floor of the machine room 2 by means of a supporting platform 3. In addition, a hoisting machine base 5 is mounted onto the machine base beam

4, and a hoisting machine 6 is installed on the hoisting machine base 5.

[0011] Main ropes 7 are wound around a sheave of the hoisting machine 6, and suspended inside the hoistway 1. First ends of the main ropes 7 suspended inside the hoistway 1 are hooked onto a suspension sheave (not shown) on the car and turned around, end portions thereof being secured to a rope fastener 8. Second ends of the main ropes 7 suspended inside the hoistway 1 are hooked onto a suspension sheave on a counterweight (not shown) and turned around, end portions thereof being secured to a rope fastener 9.

[0012] A speed governor 10, power supply equipment 11, ancillary electrical equipment 12, etc., are additionally installed inside the machine room 2.

[0013] A control board 13 is a box body having a rectangular parallelepiped shape (height > width > depth) having machinery for operating an elevator housed in an interior portion. A front surface 13a of the control board 13 is constructed so as to be openable and closable by a hinge, etc., constituting a maintenance surface. A pair of metal mounting fittings 14 are disposed upright at a central portion in the depth direction on an upper surface 13b of the control board 13 so as to be separated in a width direction of the control board 13. In addition, a hook 15 is mounted to a central portion in a width direction on a lower surface 13c of the control board 13.

[0014] A pair of metal anchor fittings 16 is secured to a ceiling 2a of the machine room 2 so as to be separated by a predetermined distance, a pivoting shaft 17 functioning as a horizontal shaft being disposed so as to span between the pair of metal anchor fittings 16 such that a central axis thereof is horizontal. The metal mounting fittings 14 are pivotably mounted to the pivoting shaft 17. In this manner, the control board 13 is mounted to the ceiling 2a so as to be supported so as to be pivotable around the pivoting shaft 17. Thus, the control board 13 adopts a stored position in which a back surface 13d thereof is parallel to the ceiling 2a of the machine room 2 (position indicated by solid lines in Figure 2), and a maintenance inspection position hanging down from the ceiling 2a of the machine room 2 (portion indicated by oblique lines in Figure 1; position indicated by broken lines in Figure 2) by pivoting around the pivoting shaft 17.

[0015] Here, positional relationships among the metal mounting fittings 14, the metal anchor fittings 16, and the pivoting shaft 17 are set such that the back surface 13d of the control board 13 does not collide with the ceiling 2a of the machine room 2 when the control board 13 is in the stored position. The control board 13 is disposed so as not to interfere with the hoisting machine 6 when the control board 13 is in the maintenance inspection position. In addition, an axial direction of the pivoting shaft 17 is made parallel to a direction of disposal of the machine base beam 4 such that the control board 13 does not vertically overlap with the hoisting machine 6. In other words, the control board 13 is disposed so as to avoid being vertically above a region of installation of the hoisting machine 6.

[0016] A winding sheave 18 provided with a manual winding handle 19 functioning as a driving portion is mounted to a side wall 2b of the machine room 2 facing the lower surface 13c of the control board 13 in the stored position, and an inverting sheave 20 is mounted to the ceiling 2a of the machine room 2 so as to be positioned between the winding sheave 18 and the hook 15. The hook 15, the winding sheave 18, and the inverting sheave 20 are positioned in a common vertical plane, and central axes of the pivoting shaft 17, the winding sheave18, and the inverting sheave 20 are parallel to each other. A wire 21 functioning as a traction member wound onto the winding sheave 18 is paid out and wound over the inverting sheave 20, and a leading end is fixed to the hook 15. In addition, although not shown, a ratchet wheel is mounted integrally to the winding sheave 18, and a feed pawl is mounted to the metal mounting fittings of the winding sheave 18, being constructed such that rotation of the winding sheave 18 in a direction of wire pay out is prevented by engagement of the feed pawl with the ratchet wheel. This feed pawl and ratchet wheel constitute a one-way clutch. Here, the winding sheave 18, the manual winding handle 19, the inverting sheave 20, and the wire 21 constitute a pivoting mechanism.

[0017] Moreover, in the figures, the numeral 22 indicates an entrance to the machine room 2, and M indicates a worker.

[0018] In an elevator apparatus constructed in this manner, during normal operation, the wire 21 is wound onto the winding sheave 18, and the control board 13 is positioned in the stored position parallel to the ceiling 2a of the machine room 2. Rotation of the winding sheave 18 in the direction of wire pay out is prevented by the feed pawl engaging with the ratchet wheel of the winding sheave 18, maintaining the control board 13 in the stored position. The control board 13 in this stored position adopts an attitude in which the front surface 13a is horizontal, opening up space under the control board 13. Thus, the worker M can enter the machine room 2 from the entrance 22, and perform inspection work on other machinery without being affected by the control board 13.

[0019] During maintenance inspections on the control board 13, the worker M releases the engaged state between the ratchet wheel and the feed pawl of the winding sheave 18, and pays the wire 21 out by operating the manual winding handle 19. Thus, the control board 13 pivots around the pivoting shaft 17, and moves to the maintenance inspection position hanging down from the ceiling 2a of the machine room 2. The control board 13 positioned in this maintenance inspection position adopts a vertical attitude in which the longitudinal direction (height direction) of the front surface 13a is vertical. Thus, the worker M can perform maintenance inspection work by opening the front surface 13a of the control board 13. Then, when the maintenance inspection is completed, the front surface 13a of the control board 13 is closed, and the wire 21 is wound onto the winding sheave 18 by

operating the manual winding handle 19. Here, the winding sheave 18 rotates smoothly in the direction of wire wind up, and rotation in the direction of wire pay out is prevented by the engagement between the feed pawl and the ratchet wheel of the winding sheave 18, preventing the control board 13 from unexpectedly swinging down. Thus, the control board 13 pivots around the pivoting shaft 17, and returns to the stored position with the back surface 13d parallel to the ceiling 2a of the machine room 2.

[0020] Thus, according to Embodiment 1, because the control board 13 is constructed so as to be movable between a stored position with a back surface 13a thereof placed parallel to the ceiling 2a of the machine room 2, and a maintenance inspection position hanging down from the ceiling 2a of the machine room 2, installation space and maintenance inspection space for machinery in the machine room 2 can be utilized efficiently, enabling the floor area of the machine room 2 to be reduced. Thus, the degree freedom in the layout of a building can be increased.

[0021] Because the height direction of the control board 13 positioned in the maintenance inspection position is in a vertical direction, the control board 13 can be inspected and maintained in a normal vertical state, preventing deterioration in maintenance inspection workability.

[0022] Because the control board 13 is disposed so as to avoid being vertically above the installation region of the hoisting machine 6 raised above the floor surface, increases in ceiling height resulting from the control board 13 being installed on the ceiling 2a are suppressed, enabling increases in building height to be suppressed.

[0023] Moreover, in Embodiment 1 above, the hook 15, the winding sheave 18, and the inverting sheave 20 are disposed so as to be positioned in a common vertical plane, but the mounting position of the winding sheave 18 may also be offset from the vertical plane by installing an inverting sheave in the path of the wire 21 between the winding sheave 18 and the inverting sheave 20. In that case, the degree of freedom in the mounting position of the winding sheave 28 can be increased.

[0024] In Embodiment 1 above, the inverting sheave 20 is mounted to the ceiling 2a of the hoistway 2, but the inverting sheave 20 may also be mounted to a side wall 2b in a vicinity of the ceiling 2a facing the lower surface 13c of the control board 13 when positioned in the stored position.

Embodiment 2

[0025] Figure 3 is a partial perspective showing a vicinity of a driving portion of a pivoting mechanism in an elevator apparatus according to Embodiment 2 according to the present invention.

[0026] In Figure 3, an electric motor 25 is mounted to a mounting plate 26 mounted to a side wall 2b of a machine room 2 such that rotational torque from the electric motor 25 is transmitted to a rotating shaft 28 by means of a speed reduction mechanism portion 27. A winding sheave 18 is fixed to the rotating shaft 28. Here, the winding sheave 18, the electric motor 25, the speed reduction mechanism portion 27, and the rotating shaft 28 constitute a driving portion of a pivoting mechanism.

[0027] Moreover, Embodiment 2 is constructed in a similar manner to Embodiment 1 above except for the fact that the electric motor 25, the speed reduction mechanism portion 27, and the rotating shaft 28 are used instead of the manual winding handle 19.

[0028] In Embodiment 2, by driving the electric motor 25 to rotate, rotational torque from the electric motor 25 is transmitted to the winding sheave 18 by means of the speed reduction mechanism portion 27 and the rotating shaft 28, driving the winding sheave 18 to rotate.

[0029] Thus, by driving the electric motor 25 so as to rotate in a forward direction, the wire 21 is wound onto the winding sheave 18, moving the control board 13 from the maintenance inspection position to the stored position. Furthermore, by driving the electric motor 25 so as to rotate in a reverse direction, the wire 21 is paid out from the winding sheave 18, moving the control board 13 from the stored position to the maintenance inspection position.

[0030] Consequently, similar effects to those in Embodiment 1 above are also exhibited in Embodiment 2.

[0031] In Embodiment 2, because an electric motor 25 is used as a driving portion, the work load on the worker M when moving the control board 13 is significantly reduced.

Embodiment 3

[0032] Figure 4 is a longitudinal section schematically showing a machine room of an elevator apparatus according to Embodiment 3 of the present invention.

[0033] In Figure 4, a winding sheave 18 provided with a manual winding handle 19 functioning as a driving portion is mounted to a side wall 2c of a machine room 2 facing an upper surface 13b of a control board 13 in a stored position, an inverting sheave 20A is mounted to a ceiling 2a of the machine room 2 so as to be positioned between the side wall 2c of the machine room 2 and a hook 15, and an inverting sheave 20B is mounted to the ceiling 2a of the machine room 2 so as to be positioned above the winding sheave 18. The hook 15, the winding sheave 18, and the inverting sheaves 20A and 20B are positioned in a common vertical plane, and central axes of the pivoting shaft 17, the winding sheave18, and the inverting sheaves 20A and 20B are parallel to each other. A wire 21 functioning as a traction member wound onto the winding sheave 18 is paid out and wound over the inverting sheaves 20A and 20B, and a leading end is fixed to the hook 15. Here, the winding sheave 18, the manual winding handle 19, the inverting sheaves 20A and 20B, and the wire 21 constitute a pivoting mechanism.

[0034] Moreover, the rest of this embodiment is constructed in a similar manner to Embodiment 1 above.

[0035] In an elevator apparatus constructed in this manner, the control board 13 can also be positioned in the stored position parallel to the ceiling 2a of the machine room 2 by operating the manual winding handle 19 to wind the wire 21 onto the winding sheave 18. Furthermore, the operating panel 13 can be positioned in the maintenance inspection position hanging down from the ceiling 2a of the machine room 2 by operating the manual winding handle 19 to pay the wire 21 out from the winding sheave 18.

[0036] Consequently, similar effects to those in Embodiment 1 above can also be achieved in Embodiment 3.

[0037] In Embodiment 3, it goes without saying that an electric motor 25, a speed reduction mechanism portion 27, and a rotating shaft 28 may also be used instead of the manual winding handle 19.

[0038] Moreover, in each of the above embodiments, a wire 21 is explained as being used for the traction member, but the traction member is not limited to the wire 21, and a chain, for example, may also be used. In that case, toothed portions meshing with the chain are formed on outer circumferential portions of the winding sheave 18 and the inverting sheave 20.

[0039] In each of the above embodiments, the control board 13 positioned in the stored position is disposed such that the back surface 13d thereof faces the ceiling 2a, but the control board 13 may also be disposed such that the front surface 13a faces the ceiling 2a.

INDUSTRIAL APPLICABILITY

[0040] As explained above, an elevator apparatus according to the present invention can be used as an elevator apparatus enabling floor area in a machine room to be reduced, and also enabling the degree of freedom in the layout of a building to be increased.

Claims

1. An elevator apparatus comprising a hoisting machine and a control board installed inside a machine room, wherein:

said control board is constructed so as to be disposed with an upper surface thereof in close proximity to a ceiling of said machine room and be supported so as to be pivotable around a horizontal axis so as to be movable by means of a pivoting mechanism between a stored position parallel to said ceiling of said machine room and a maintenance inspection position hanging down from said ceiling of said machine room.

2. The elevator apparatus according to Claim 1, wherein:

said control board is disposed so as to avoid being vertically above a region of installation of said hoisting machine.

3. The elevator apparatus according to either Claim 1 or Claim 2, wherein:

said pivoting mechanism comprises:

a driving portion mounted to a side wall of said hoistway; and

a traction member wound over an inverting sheave, having a first end fixed to a bottom surface of said control board and a second end portion wound onto said driving portion, said pivoting mechanism being constructed such that said control board is moved by said driving portion to said stored position by winding up said traction member and said control board is moved to said maintenance inspection position by paying out said traction member.

FIG. 1

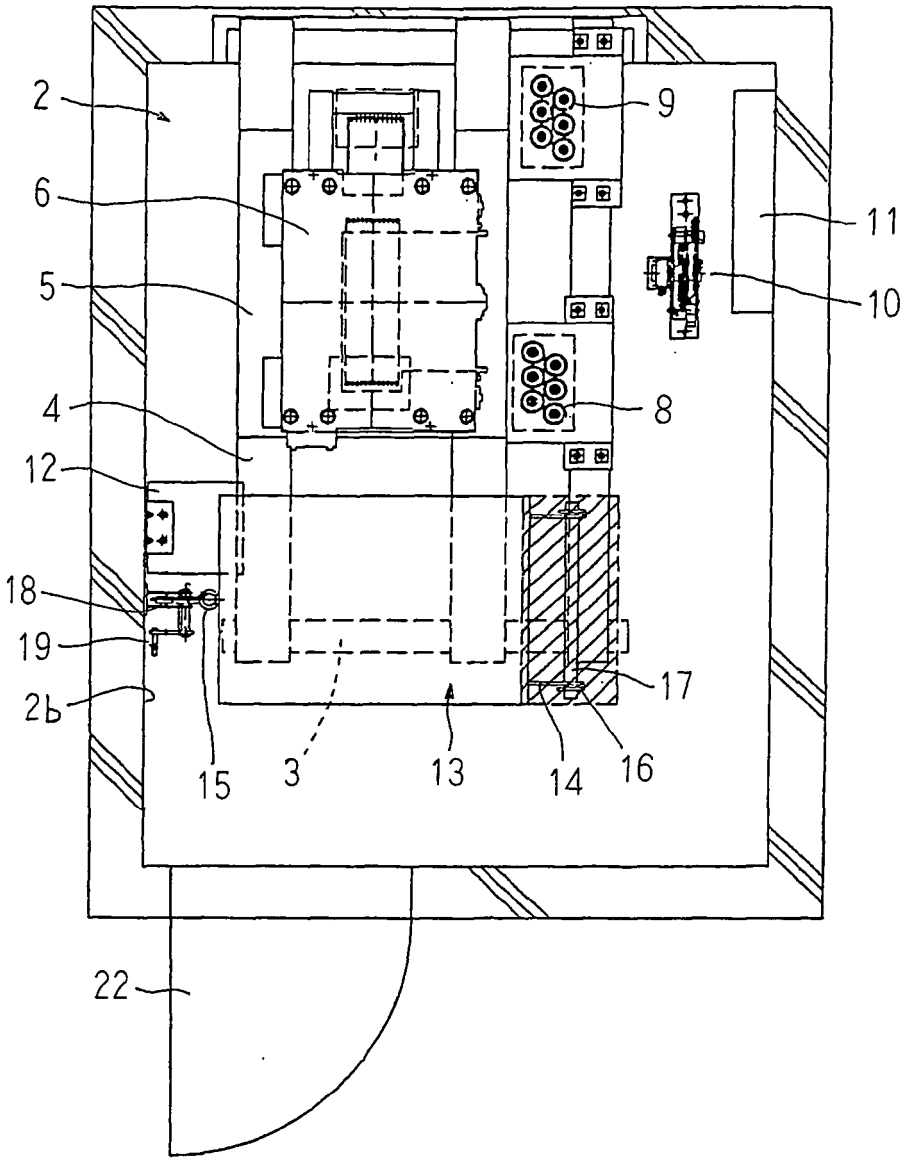

FIG. 2

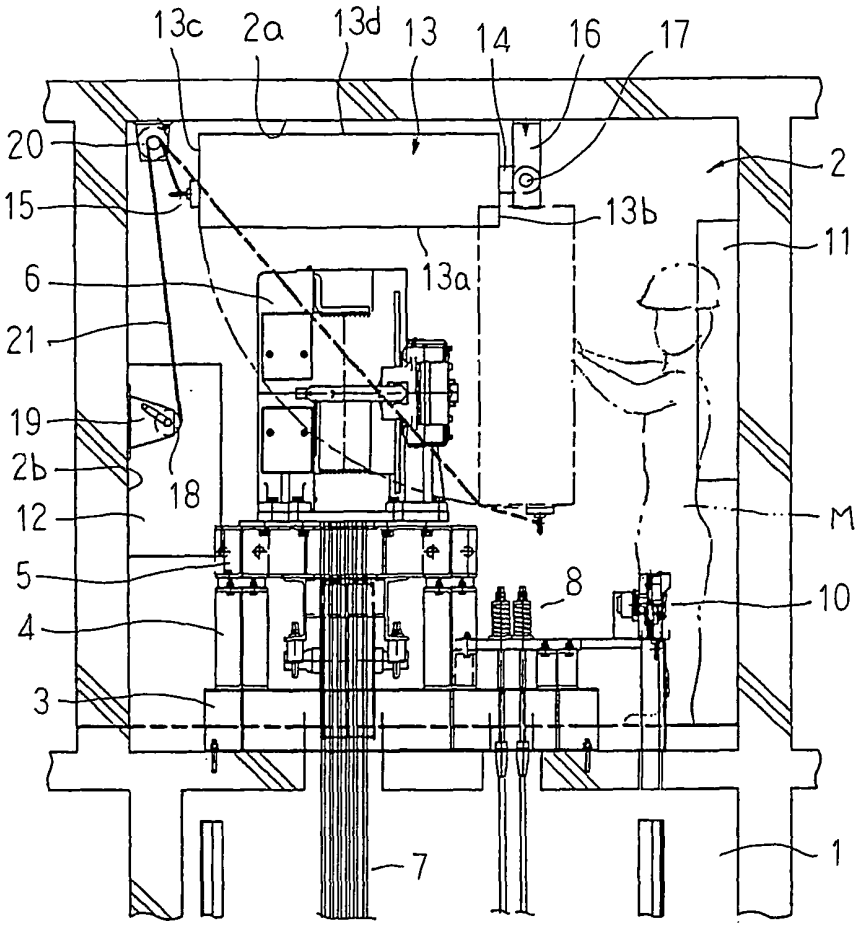
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FIG. 3

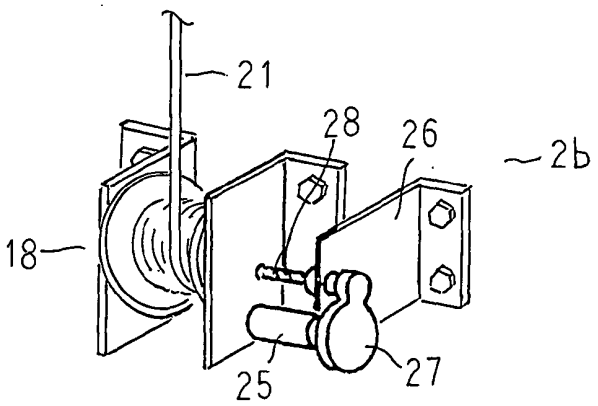
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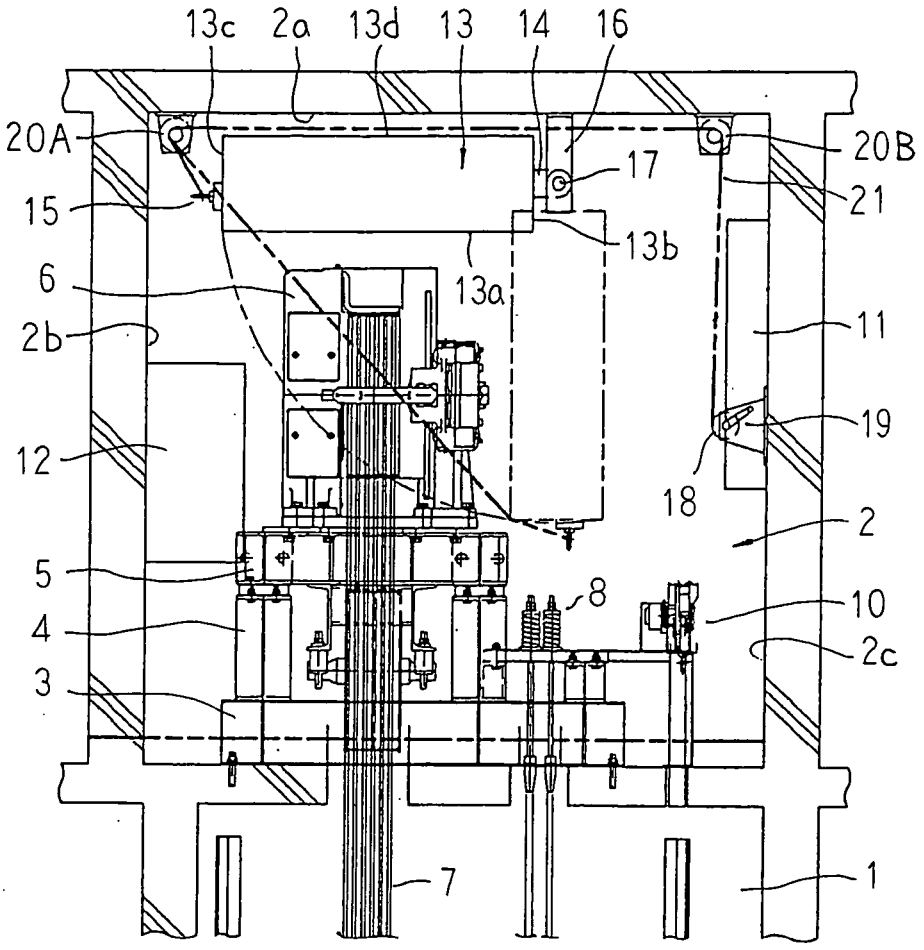
FIG. 4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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/01871

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B1/34, B66B5/00, B66B11/04

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] B66B1/00-B66B11/08

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	1996-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Toroku Jitsuyo Shinan Koho	1994-2003

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.
Y	JP 2001-58778 A (Hitachi Building Systems Co., Ltd.), 06 March, 2001 (06.03.01), Par. No. [0017]; Figs. 5 to 6 (Family: none)	1-3
Y	JP 2575806 B2 (Toshiba Corp.), 29 January, 1997 (29.01.97), Page 3, left column, lines 3 to 17; Figs. 1 to 2 & JP 1-303283 A	1-3
Y	WO 00/03941 A1 (Mitsubishi Electric Corp.), 27 January, 2000 (27.01.00), Figs. 5, 9 & EP 1016614 A1 & US 6230845 B1	1-3

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

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Date of the actual completion of the international search	Date of mailing of the international search report
11 November, 2003 (11.11.03)	25 November, 2003 (25.11.03)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/01871

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 6-286960 A (Mitsubishi Electric Corp.), 11 October, 1994 (11.10.94), Par. No. [0040]; Fig. 12 (Family: none)	3

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