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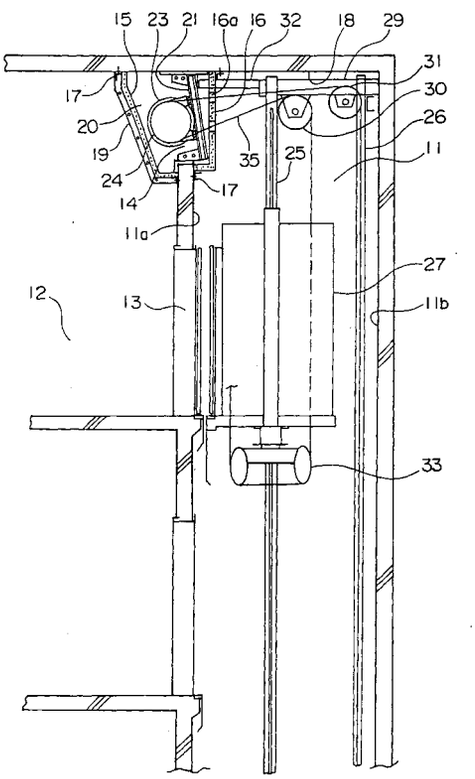
(54) **ELEVATOR DEVICE**

(57) In an elevator apparatus, a front wall of a hoistway is provided with an opening portion in which an upper portion of a landing communicates with the hoistway. A plurality of removable soundproof/fireproof covers are attached to the landing side and the hoistway side of the opening portion, respectively. A driving machine for raising/lowering a car is arranged within an installation space surrounded by the soundproof/fireproof covers.

FIG. 1



EP 1 329 411 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a machine room-less elevator not having an exclusive machine room for installing a driving machine.

BACKGROUND ART

[0002] Conventionally, in a machine room-less elevator not having a machine room, for example, as shown in Japanese Patent Application Laid-open No. Hei 7-10434, a driving machine for raising/lowering a car and a counterweight is arranged at an upper portion within a hoistway. However, when the driving machine is large, there may be a case where the driving machine can not be arranged within the hoistway. In such a case, for example, as shown in Fig. 23, part of a wall portion 1a of a hoistway 1 is overhung to the outside to thereby form a recessed portion 2. A driving machine 3 is arranged inside the recessed portion 2.

[0003] However, in the inside of the recessed portion 2, space where maintenance personnel can work at the time of maintenance and inspection and space for removing parts of the driving machine 3 must be secured in addition to the space needed for installing the driving machine 3. Also, the entrance of the recessed portion 2 needs to be large enough to allow maintenance personnel to enter. In a case where equipment such as a rail is located in front of the entrance, the recessed portion 2 needs to be still larger in order to avoid the equipment. As a result, building costs are increased. Further, since the entrance of the recessed portion is large, a machine base 4 for supporting the driving machine 3 also becomes large.

DISCLOSURE OF THE INVENTION

[0004] The present invention has been made with the view of solving the above-mentioned problem, and an object of the present invention is to provide an elevator apparatus that allows the installation space for a driving machine to be reduced and facilitates maintenance and inspection of the driving machine.

[0005] An elevator apparatus according to the present invention comprises: a hoistway including a front wall located within a landing; a car that ascends/descends inside this hoistway; a driving machine including a drive sheave for raising/lowering the car; and a main rope wound around the drive sheave for suspending the car, wherein the front wall is provided with an opening portion by which an upper portion of the landing communicates with the hoistway, the landing side and the hoistway side of the opening portion are respectively fitted with a removable soundproof/fireproof cover, and the driving machine is arranged within an installation space surrounded by the soundproof/fireproof cover.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006]

Fig. 1 is a longitudinal sectional view of an elevator apparatus according to Embodiment 1 of the present invention;
Fig. 2 is a plan view showing the elevator apparatus of Fig. 1;
Fig. 3 is an enlarged view of a main portion of Fig. 1;
Fig. 4 is a longitudinal sectional view of an elevator apparatus according to Embodiment 2 of the present invention;
Fig. 5 is a plan view showing the elevator apparatus of Fig. 4;
Fig. 6 is an enlarged view of a main portion of Fig. 4;
Fig. 7 is a longitudinal sectional view showing a main portion of an elevator apparatus according to Embodiment 3 of the present invention;
Fig. 8 is a longitudinal sectional view showing a state at the time of maintenance and inspection of a driving machine of Fig. 7;
Fig. 9 is a longitudinal sectional view showing a main portion of an elevator apparatus according to Embodiment 4 of the present invention;
Fig. 10 is a longitudinal sectional view showing a state at the time of maintenance and inspection of a driving machine of Fig. 9;
Fig. 11 is a longitudinal sectional view showing a main portion of an elevator apparatus according to Embodiment 5 of the present invention;
Fig. 12 is a longitudinal sectional view showing a state at the time of maintenance and inspection of a driving machine of Fig. 11;
Fig. 13 is a longitudinal sectional view showing a main portion of an elevator apparatus according to Embodiment 6 of the present invention;
Fig. 14 is a longitudinal sectional view showing a state at the time of maintenance and inspection of a driving machine of Fig. 13;
Fig. 15 is a side view showing a state at the time of maintenance and inspection of an elevator apparatus according to Embodiment 7 of the present invention;
Fig. 16 is a perspective view showing a main portion of Fig. 15 viewed from a landing side;
Fig. 17 is an exploded perspective view showing a scaffolding device of Fig. 15;
Fig. 18 is a longitudinal sectional view showing a main portion of an elevator apparatus according to Embodiment 8 of the present invention;
Fig. 19 is a plan view showing the elevator apparatus of Fig. 18;
Fig. 20 is a longitudinal sectional view showing a main portion of an elevator apparatus according to Embodiment 9 of the present invention;
Fig. 21 is a plan view showing the elevator apparatus of Fig. 20;

Fig. 22 is a longitudinal sectional view showing a state where a control panel of Fig. 20 is pulled out to a landing side; and

Fig. 23 is a diagram showing an example of a construction of a conventional elevator apparatus.

BEST MODE FOR CARRYING OUT THE INVENTION

[0007] Hereinafter, explanation will be made of preferred embodiments of the present invention with reference to the drawings.

Embodiment 1

[0008] Fig. 1 is a longitudinal sectional view of an elevator apparatus according to Embodiment 1 of the present invention, Fig. 2 is a plan view showing the elevator apparatus of Fig. 1, and Fig. 3 is an enlarged view of a main portion of Fig. 1.

[0009] In the figure, a hoistway 11 includes a front wall 11a located within a landing 12, a rear wall 11b opposing this front wall 11a and a pair of side walls 11c, 11d. A landing entrance 13 is provided within the front wall 11a. The front wall 11a at a landing 12 at the top floor is provided with an opening portion 14 by which the upper portion of the landing 12 communicates with the hoistway 11. The opening portion 14 is located above the landing entrance 13 in the top floor.

[0010] The landing 12 side and the hoistway 11 side of the opening portion 14 are fitted with respective removable soundproof/fireproof covers 15 and 16. These soundproof/fireproof covers 15 and 16 are fitted to a ceiling portion 18 and the front wall 11a by a plurality of mounting fittings 17. The soundproof/fireproof cover 15 on the landing 12 side is capable of being divided in half in the center, and the dividing portion is connected using a fastener 19.

[0011] A machine base 21 is fixed within an installation space 20 surrounded by the soundproof/fireproof covers 15, 16. To the machine base 21, a driving machine (hoisting machine) 23 is supported through a plurality of rubber pads 22. The driving machine 23 includes a drive sheave 24.

[0012] A pair of car guide rails 25 and a pair of counterweight guide rails 26 are installed within the hoistway 11. A car 27 is raised/lowered within the hoistway 11 guided by the car guide rails 25 by means of the driving machine 23. A counterweight 28 is also raised lowered within the hoistway 11 guided by the counterweight guide rails 26 by means of the driving machine 23.

[0013] Support beams 29 are fixed to the upper end portions of the guide rails 25 and 26. The support beams 29 abut with the rear wall 11b, and support a car-side sheave 30 and a counterweight-side sheave 31. Connection frames 32 for transmitting horizontal forces applied to the machine base 21 to the support beam 29 are connected between the support beams 29 and the machine base 21.

[0014] A pair of car suspension sheaves 33 are provided at the bottom portion of the car 27. A counterweight suspension sheave 34 is provided at the top portion of the counterweight 28. A main rope 35 for suspending the car 27 and the counterweight 28 winds around the drive sheave 24. The soundproof/fireproof cover 16 on the hoistway 11 side is provided with a plurality of holes 16a through which the main rope 35 passes.

[0015] One end portion of the main rope 35 is connected with a rope stop (not shown) at the upper portion of the hoistway 11, and then is wound around the car suspension sheave 33, the car-side sheave 30, the drive sheave 24, the counterweight-side sheave 31 and the counterweight suspension sheave 34 in this order. The other end portion thereof is connected with the rope stop (not shown) at the upper portion of the hoistway 11.

[0016] In such an elevator apparatus, the opening portion 14 is provided in the front wall 11a of the hoistway 11, the landing 12 side and the hoistway 11 side of the opening portion 14 are fitted with the removable soundproof/fireproof covers 15 and 16, and the driving machine 23 is arranged within the installation space 20 surrounded by the soundproof/fireproof covers 15 and 16. Thus, by removing the soundproof/fireproof cover 15, it becomes possible to perform maintenance and inspection of the driving machine 23 from the landing 12 side.

[0017] Therefore, there is no need for maintenance personnel to enter the installation space 20, whereby it becomes possible to make the installation space 20 for the driving machine 23 small and facilitate the maintenance and inspection of the driving machine 23. Further, since only the opening portion 14 is provided in the front wall 11a of the hoistway 11, the structure of a building side is barely affected, and conversely the elevator apparatus is less restricted by the building itself

[0018] Further, since the connection frames 32 are provided between the machine base 21 and the support beams 29, the horizontal force applied to the machine base 21 is transmitted to the wall portion of the hoistway 11, namely the rear wall 11b here, through the connection frames 32 and the support beams 29. Therefore, it becomes possible to simplify support construction of the machine base 21.

Embodiment 2

[0019] Next, Fig. 4 is a longitudinal sectional view of an elevator apparatus according to Embodiment 2 of the present invention, Fig. 5 is a plan view showing the elevator apparatus of Fig. 4, and Fig. 6 is an enlarged view of a main portion of Fig. 4.

[0020] In the figure, a machine base 41 is fixed within an installation space 20. With the machine base 41, a thin type driving machine 42 is horizontally mounted through a plurality of rubber pads 22. The driving machine 42 includes a drive sheave 43. The drive sheave

43 rotates about a vertical rotational axis. The remaining constructions are the same as that in Embodiment 1.

[0021] By using such a thin type driving machine 42, it becomes possible to make the installation space 20 for the driving machine 42 still smaller, thereby saving space.

Embodiment 3

[0022] Next, Fig. 7 is a longitudinal sectional view showing a main portion of an elevator apparatus according to Embodiment 3 of the present invention. In this example, a machine base 44 for supporting a driving machine 23 is capable of rotating about a shaft pin 45. A screw receiver 46 is fixed to the machine base 44, and a screw bar 47 is bolted and fitted in the screw receiver 46. A bracket with an angular aperture 48 is provided at the end portion of the screw bar 47.

[0023] The machine base 44 is rotated about the shaft pin 45 by rotating the screw bar 47. In this way, the driving machine 23 is moved from a normal installation position to a landing 12 side. The remaining constructions are the same as that in Embodiment 1.

[0024] Fig. 8 is a longitudinal sectional view showing a state at the time of maintenance and inspection of the driving machine 23 shown in Fig. 7. At the time of maintenance and inspection, soundproof/fireproof covers 15, 16 are removed (it is also possible to only remove the soundproof/fireproof cover 15), and the screw bar 47 is rotated by means of a handle 49. In this way, the driving machine 23 is moved to a position where work can be easily performed. Thus, it becomes possible to enhance workability during the maintenance and inspection operations.

Embodiment 4

[0025] Fig. 9 is a longitudinal sectional view showing a main portion of an elevator apparatus according to Embodiment 4 of the present invention. In the figure, a machine base 44 is supported by a slide member 51 through a shaft pin 45. The slide member 51 is slidably supported from the ceiling portion 18 along a slide guide 52. A screw bar 53 is bolted and fitted in the slide member 52. A bracket with an angular aperture 54 is provided at the end portion of the screw bar 53.

[0026] The slide member 52 is moved along the slide guide 52 by rotating the screw bar 53. In this way, a driving machine 23 is moved from a normal installation position to a landing 12 side. The remaining constructions are the same as that in Embodiment 3.

[0027] Fig. 10 is a longitudinal sectional view showing a state at the time of maintenance and inspection of the driving machine 23 shown in Fig. 9. At the time of maintenance and inspection, soundproof/fireproof covers 15, 16 are removed, and the screw bars 47, 53 are rotated by means of a handle 49. In this way, the driving machine 23 is moved to a position where work can be easily performed. Thus, it becomes possible to enhance workability during the maintenance and inspection operations.

Embodiment 5

[0028] Next, Fig. 11 is a longitudinal sectional view showing a main portion of an elevator apparatus according to Embodiment 5 of the present invention. In this example, a machine base 55 for supporting a thin type driving machine 42 is fitted on a front wall 11a, being rotatable about a shaft pin 56. To the front wall 11a, there is provided a screw receiver 57 in which a screw bar 58 is bolted and fitted. The end portion of the screw bar 58 is provided with a bracket with an angular aperture 59. The machine base 55 is fitted with a guide pipe 60 serving as a rope jump prevention means for preventing changes in the approach angle of main rope 35 to drive sheave 43 due to displacement of the driving machine 42.

[0029] The machine base 55 is rotated about the shaft pin 56 by rotating the screw bar 58. In this way, the driving machine 42 moves from a normal installation position to a landing 12 side. The remaining constructions are the same as that in Embodiment 2.

[0030] Fig. 12 is a longitudinal sectional view showing a state at the time of maintenance and inspection of the driving machine 42 shown in Fig. 11. At the time of maintenance and inspection, soundproof/fireproof covers 15, 16 are removed, and the screw bar 58 is rotated by means of a handle 49. In this way, the driving machine 42 is moved to a position where work can be easily performed. Thus, it becomes possible to enhance workability during the maintenance and inspection operations.

[0031] Further, since the machine base 55 is provided with the guide pipe 60, changes in the approach angle of the main rope 35 to the drive sheave 43 due to the displacement of the driving machine 42 are prevented, thereby preventing the main rope 35 from jumping off the drive sheave 43.

Embodiment 6

[0032] Fig. 13 is a longitudinal sectional view showing a main portion of an elevator apparatus according to Embodiment 6 of the present invention. In the figure, a machine base 61 for supporting a driving machine 42 is capable of moving diagonally along a slide guide 62 to a landing 12 side. A screw bar 63 is bolted and fitted in the machine base 61. The end portion of the screw bar 63 is provided with a bracket with an angular aperture 64.

[0033] The machine base 61 is fitted with a guide pipe 65 serving as a rope jump prevention means for preventing changes in the approach angle of main rope 35 to drive sheave 43 due to displacement of the driving machine 42. The remaining constructions are the same as that in Embodiment 5.

[0034] Fig. 14 is a longitudinal sectional view showing

a state at the time of maintenance and inspection of the driving machine 42 shown in Fig. 13. At the time of maintenance and inspection, soundproof/fireproof covers 15 and 16 are removed, and the screw bar is 63 rotated by means of a handle 49. In this way, the driving machine 42 is moved to a position where work can be easily performed. Thus, it becomes possible to enhance workability during the maintenance and inspection operations.

[0035] Further, since the machine base 61 is provided with the guide pipe 65, changes in the approach angle of the main rope 35 to the drive sheave 43 due to the displacement of the driving machine 42 are prevented, thereby preventing the main rope 35 from jumping off the drive sheave 43.

[0036] Note that, in Embodiments 3 - 6, rope tension is acting on the driving machines 23 and 42. Thus, particularly in an elevator apparatus having a large live load, a large amount of force is applied to the screw bars 47, 53, 58 and 63, and thus it is difficult to move the driving machines 23 and 42. In contrast, the car 27 and the counterweight 28 are supported at a position of a certain height within the hoistway 11 and the screw bars 47, 53, 58 and 63 are rotated after reducing the rope tension, whereby it becomes easy to displace the driving machines 23, 42.

[0037] Further, at the time of normal operation, the positions of the driving machines 23, 42 are fixed by fixtures (not shown) such as fixing bolts, and then the fixtures are released at the time of the maintenance and inspection to thereby displace the driving machines 23, 42.

Embodiment 7

[0038] Next, Fig. 15 is a side view showing a state at the time of maintenance and inspection of an elevator apparatus according to Embodiment 7 of the present invention, Fig. 16 is a perspective view showing a main portion of Fig. 15 viewed from a landing side and Fig. 17 is an exploded perspective view showing a scaffolding device of Fig. 15.

[0039] In the figure, a scaffolding hanging frame 71 is fixed to a landing 12 side of a front wall 11a. A scaffolding device 72 onto which maintenance personnel stand at the time of maintenance and inspection of driving machine 42 is hung on the scaffolding hanging frame 71 to be supported. The scaffolding device 72 includes a folding scaffolding frame 73 and a plurality of scaffolding panels 74.

[0040] The scaffolding frame 73 includes: a pair of lower frames 75; a linkage link 76 for linking the lower frames 75; a pair of longitudinal frames 77; a pair of first handrail links 78; a pair of second handrail links 79; a pair of first handrail support links 80 which are linked between the lower frame 75 and the first handrail link 78; a pair of second handrail support links 81 which are linked between the lower frame 75 and the second handrail link 79; a linkage handrail 82 which is linked between the second handrail support links 81; a pair of first slant links 83 which are linked between the longitudinal frame 77 and the first handrail link 78; and a pair of second slant links 84 which are linked between the first handrail link 78 and the lower frame 75.

[0041] A stopper for the handrail support link 85 is provided at the tip end portion of each lower frame 75. A hanging fitting 86 which is hung on the scaffolding hanging frame 71 is fixed to the upper end portion of each longitudinal frame 77. A plurality of hooks 74a engaging with the lower frame 75 are provided in each scaffolding panel 74. A ladder 87 reaches between the floor of the landing 12 and the scaffolding device 72.

[0042] In such an elevator apparatus, as the scaffolding device 72 is fitted in the vicinity of the opening portion 14, workability and safety of the maintenance and inspection operations are enhanced. Further, the scaffolding device 72 is capable of being divided into the folding scaffolding frame 73 and the plurality of scaffolding panels 74. Therefore, it is easy to store and convey the scaffolding device 72.

Embodiment 8

[0043] Next, Fig. 18 is a longitudinal sectional view showing a main portion of an elevator apparatus according to Embodiment 8 of the present invention, and Fig. 19 is a plan view showing the elevator apparatus of Fig. 18. In this example, a control panel 91 for controlling operation of the elevator apparatus is fixed to an outer peripheral portion of a soundproof/fireproof cover 15 on a landing 12 side. By sliding a cover 92 of the control panel 91, the control panel 91 opens from the landing 12 side. The other constructions are the same as that in Embodiment 2.

[0044] In such an elevator apparatus, the control panel 91 is fixed to the outer peripheral portion of the soundproof/fireproof cover 15. Thus, it is possible to partially thin the soundproof/fireproof cover 15. Also, maintenance and inspection operation of the control panel 91 can be easily performed on the landing 12 side.

Embodiment 9

[0045] Next, Fig. 20 is a longitudinal sectional view showing a main portion of an elevator apparatus according to Embodiment 9 of the present invention, and Fig. 21 is a plan view showing the elevator apparatus of Fig. 20. In this example, a control panel 91 is accommodated within an installation space 20 of a driving machine 42. The control panel 91 is, as shown in Fig. 22, capable of being pulled out to a landing 12 side along a slide guide 93.

[0046] In such an elevator apparatus, since the driving machine 42 and the control panel 91 are accommodated within the installation space 20, space is efficiently used, thereby saving space. Further, maintenance and inspection of the control panel 91 can be easily per-

formed on the landing 12 side.

Claims

1. An elevator apparatus comprising:

a hoistway including a front wall located within a landing;
a car that ascends/descends inside the hoistway;
a driving machine including a drive sheave for raising/lowering the car; and
a main rope wound around the drive sheave for suspending the car,

wherein the front wall is provided with an opening portion by which an upper portion of the landing communicates with the hoistway, the landing side and the hoistway side of the opening portion are respectively fitted with a removable soundproof/fireproof cover, and the driving machine is arranged within an installation space surrounded by the soundproof/fireproof cover.

2. The elevator apparatus according to claim 1, further comprising: a machine base fixed within the installation space for supporting the driving machine; and a connection frame provided between a wall portion of the hoistway and the machine base for transmitting to the wall portion a horizontal force applied to the machine base.

3. The elevator apparatus according to claim 1, wherein the driving machine is capable of being displaced from a normal installation position to the landing side.

4. The elevator apparatus according to claim 3, further comprising a rope jump prevention means for preventing changes in an approach angle of the main rope to the drive sheave due to displacement of the driving machine.

5. The elevator apparatus according to claim 4, wherein the driving machine is supported by a machine base capable of being displaced, and the a rope jump prevention means is fitted on the machine base and restricts displacement of the main rope to the machine base when the machine base is displaced.

6. The elevator apparatus according to claim 1, further comprising a scaffolding device fitted at a vicinity of the opening portion during maintenance and inspection.

7. The elevator apparatus according to claim 1, wherein a control panel is fixed to an outer peripheral portion of the soundproof/fireproof cover on the landing side.

8. The elevator apparatus according to claim 1, wherein a control panel is accommodated within the installation space, and the control panel is capable of being displaced to the landing side.

FIG. 1

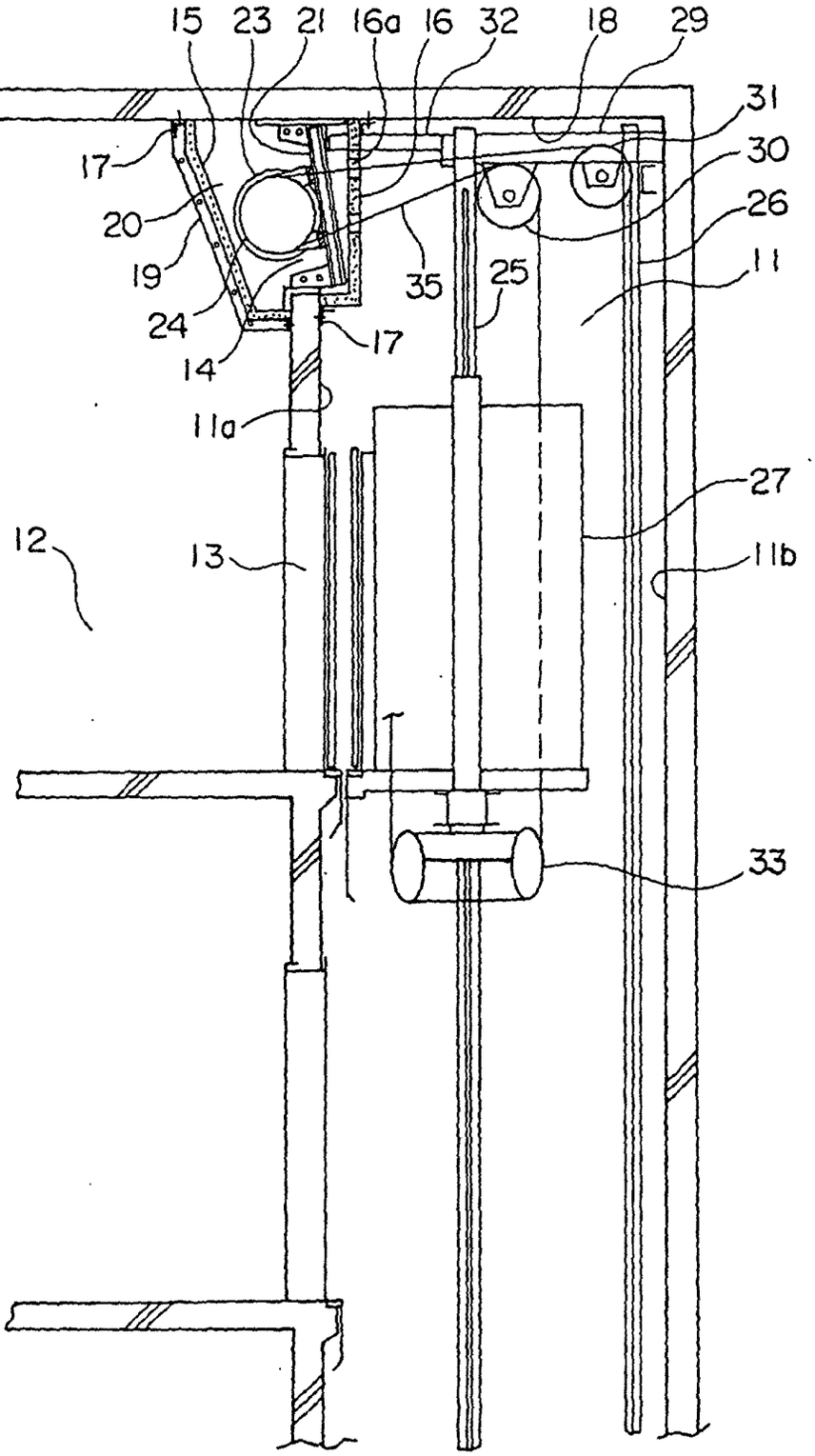

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FIG. 2

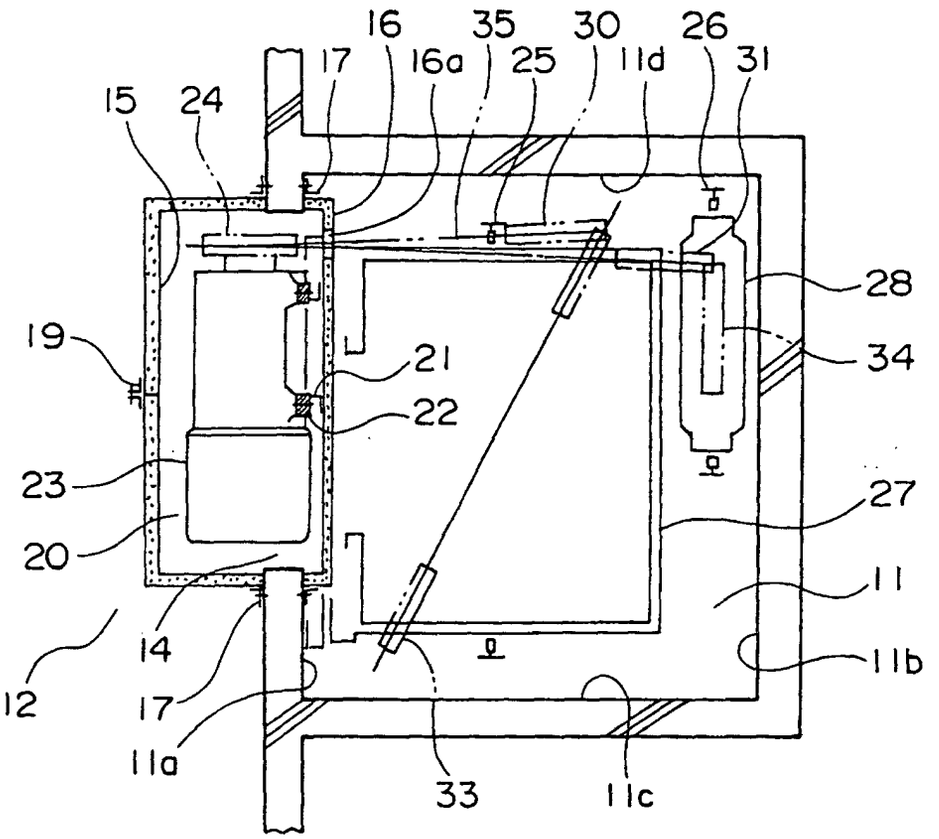
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FIG. 3

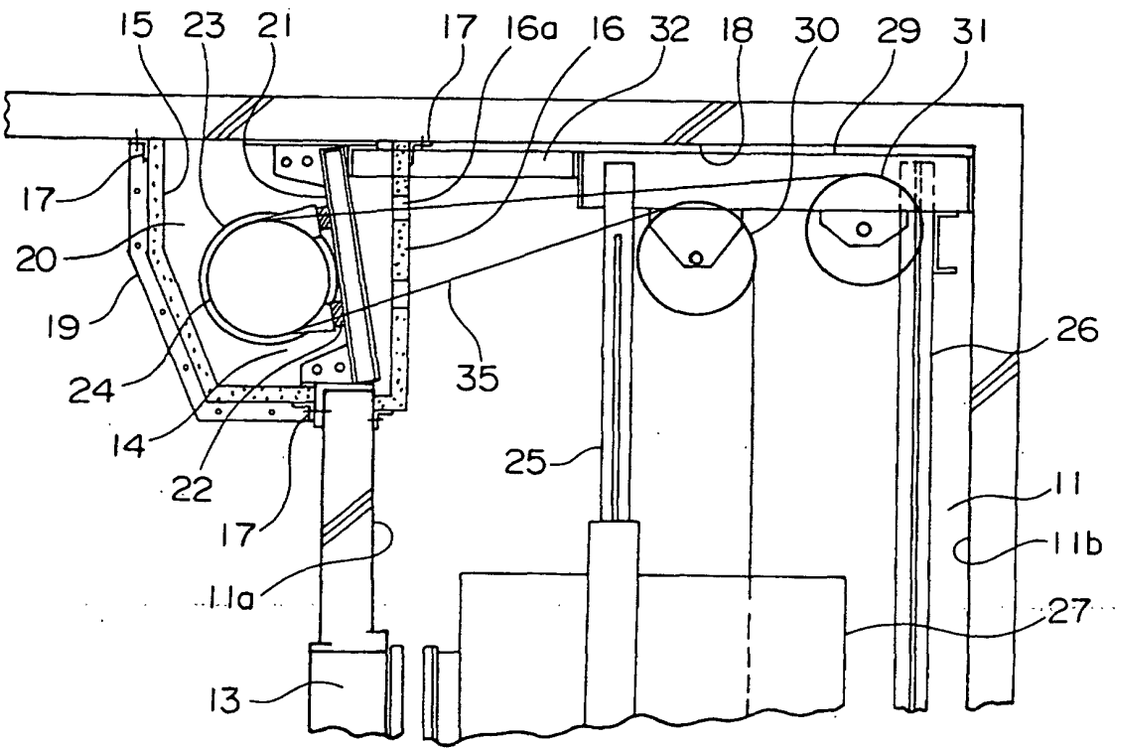
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FIG. 4

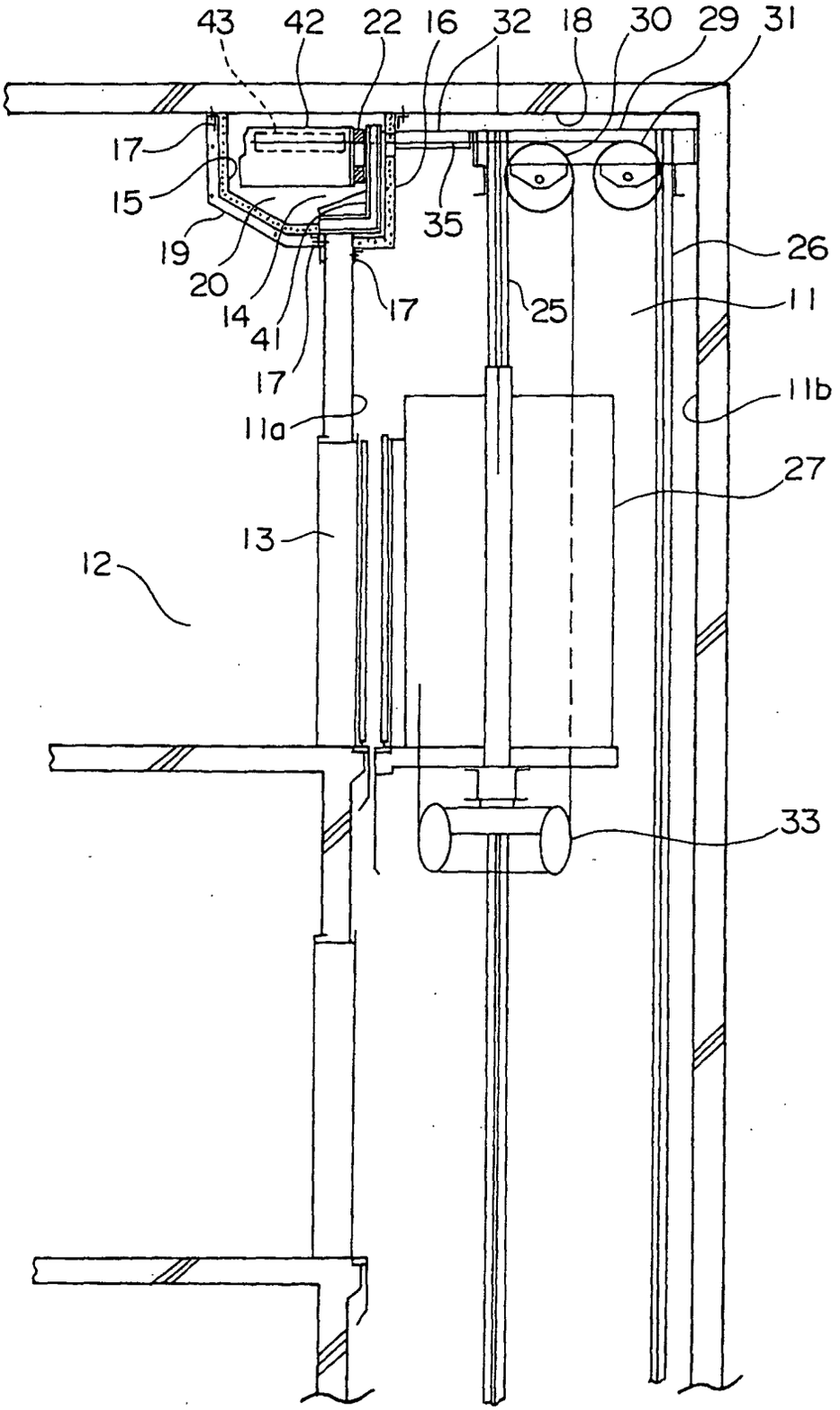
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FIG. 5

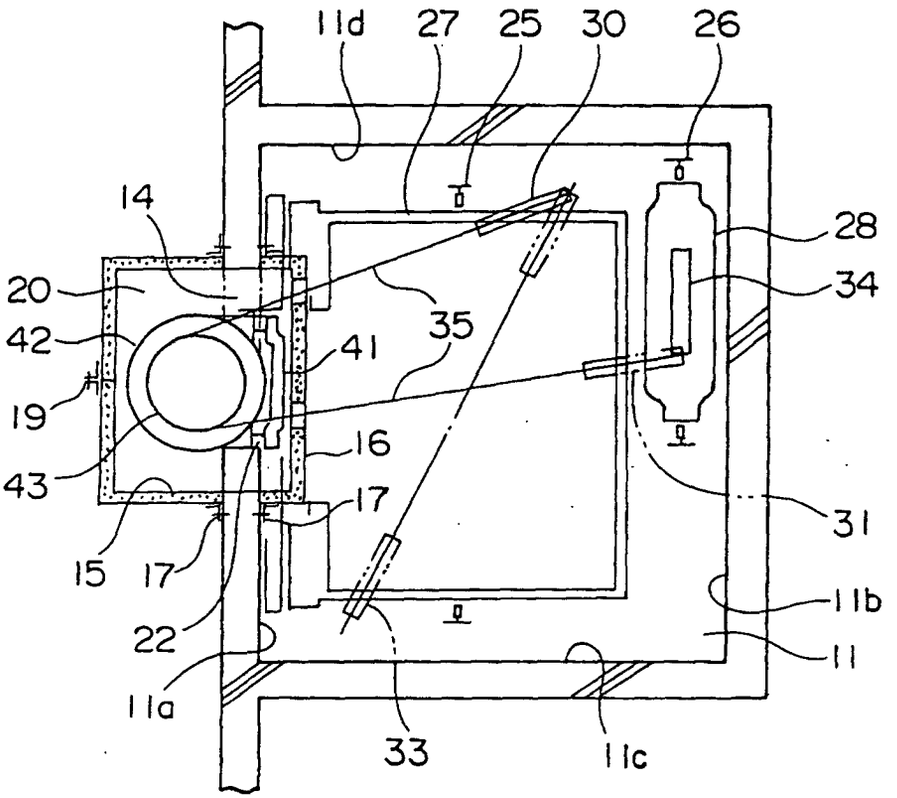
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FIG. 6

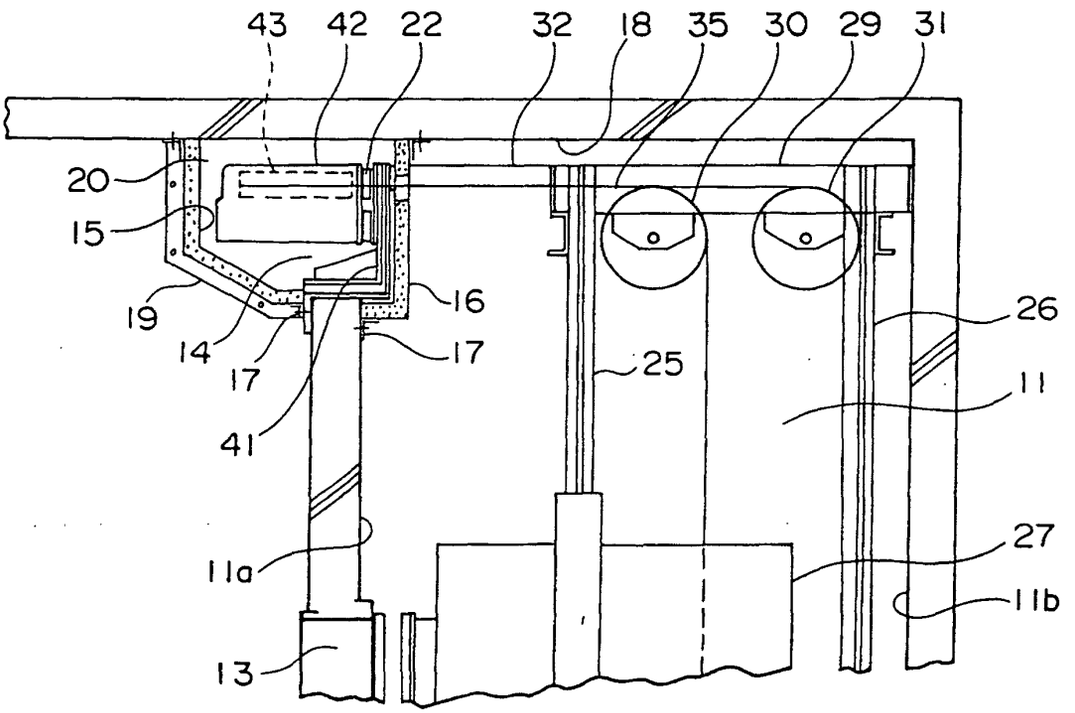
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FIG. 7

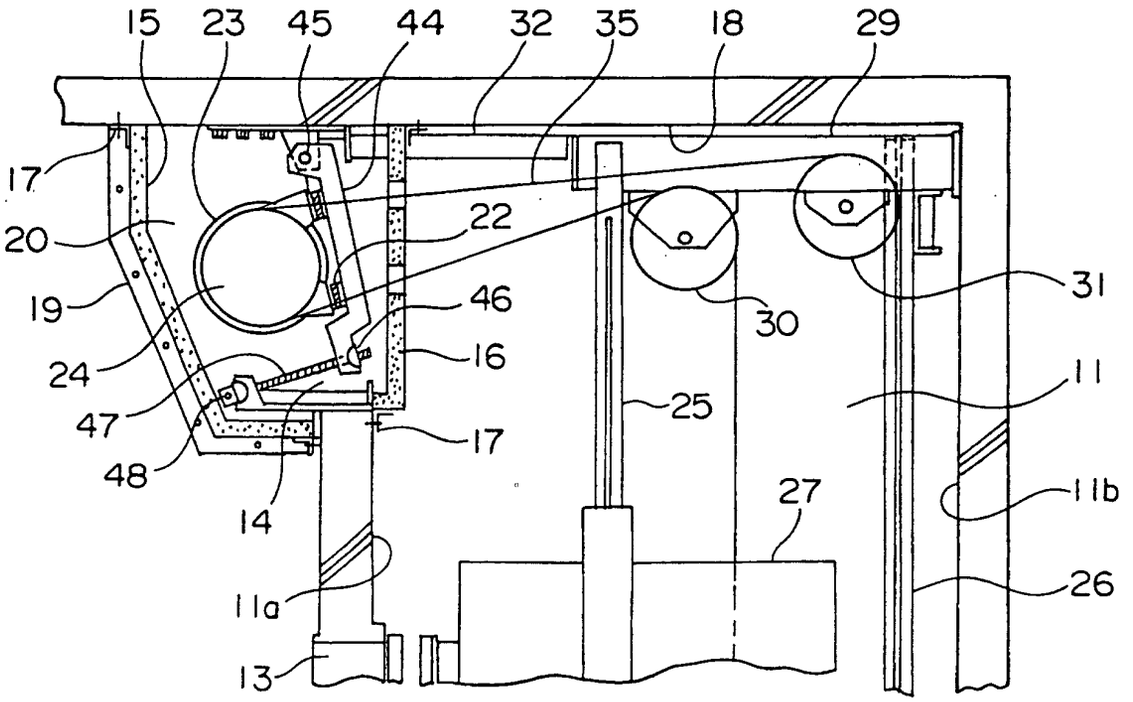
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FIG. 8

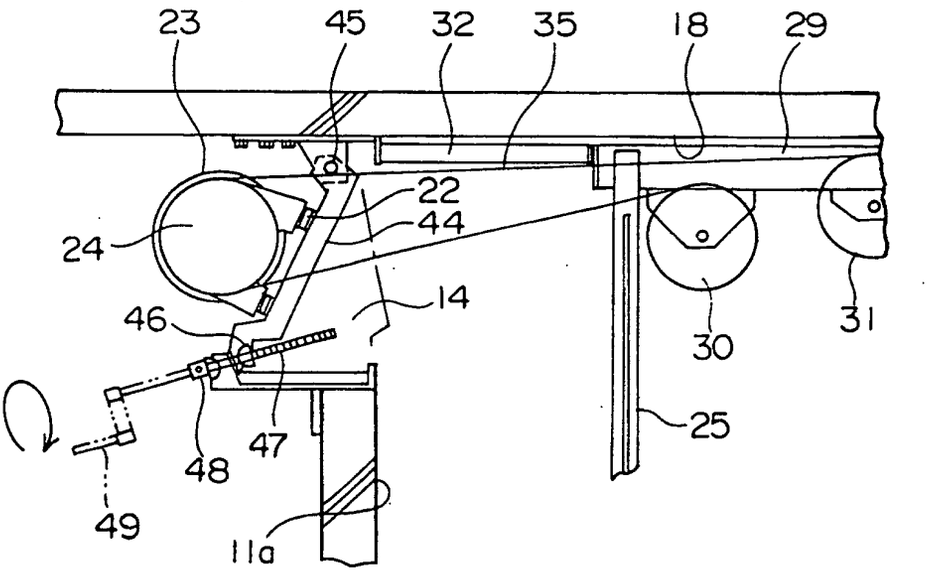
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FIG. 9

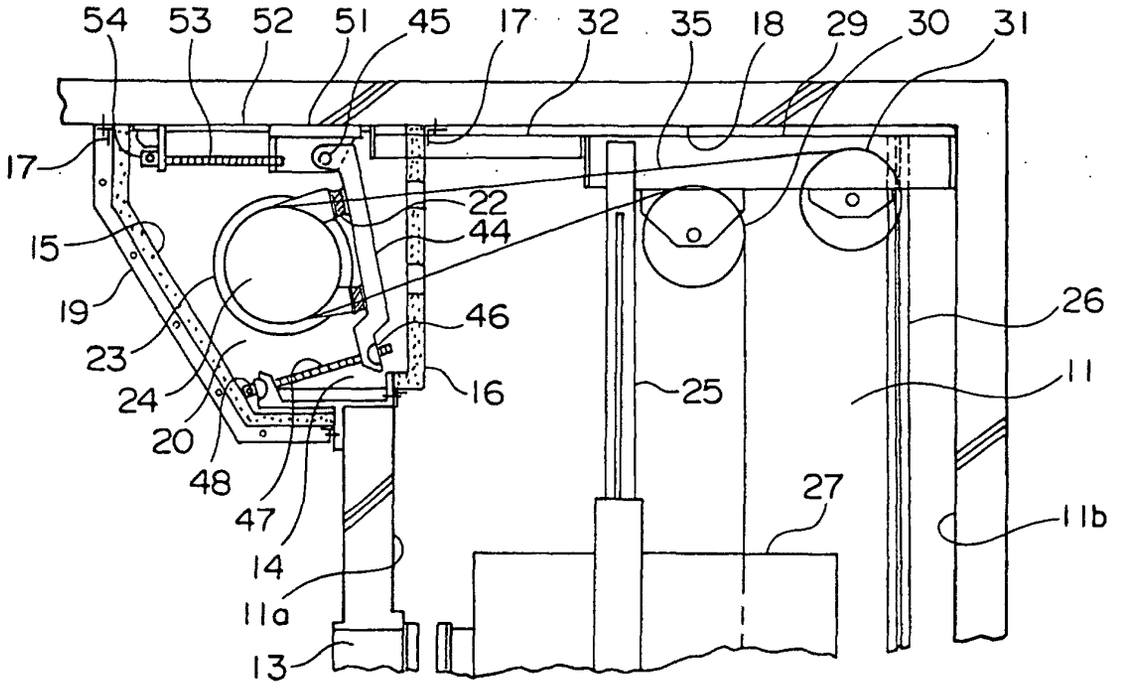
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FIG. 10

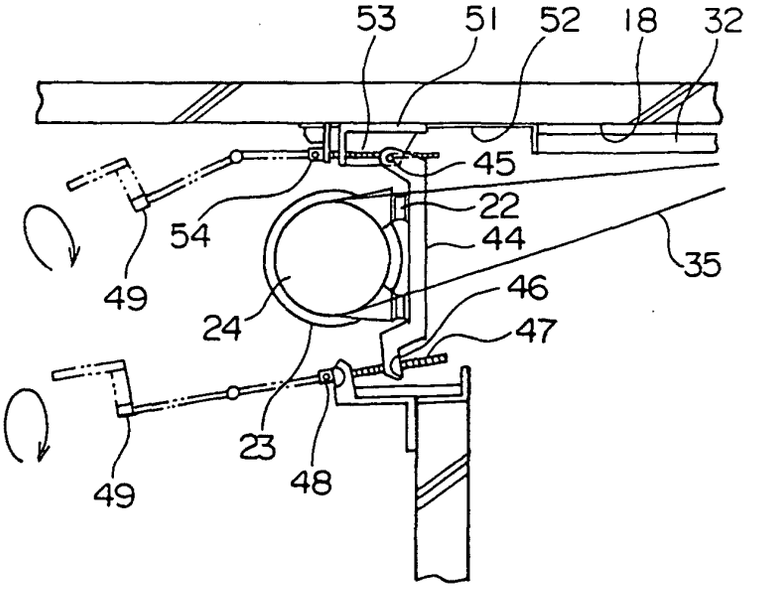
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FIG. 11

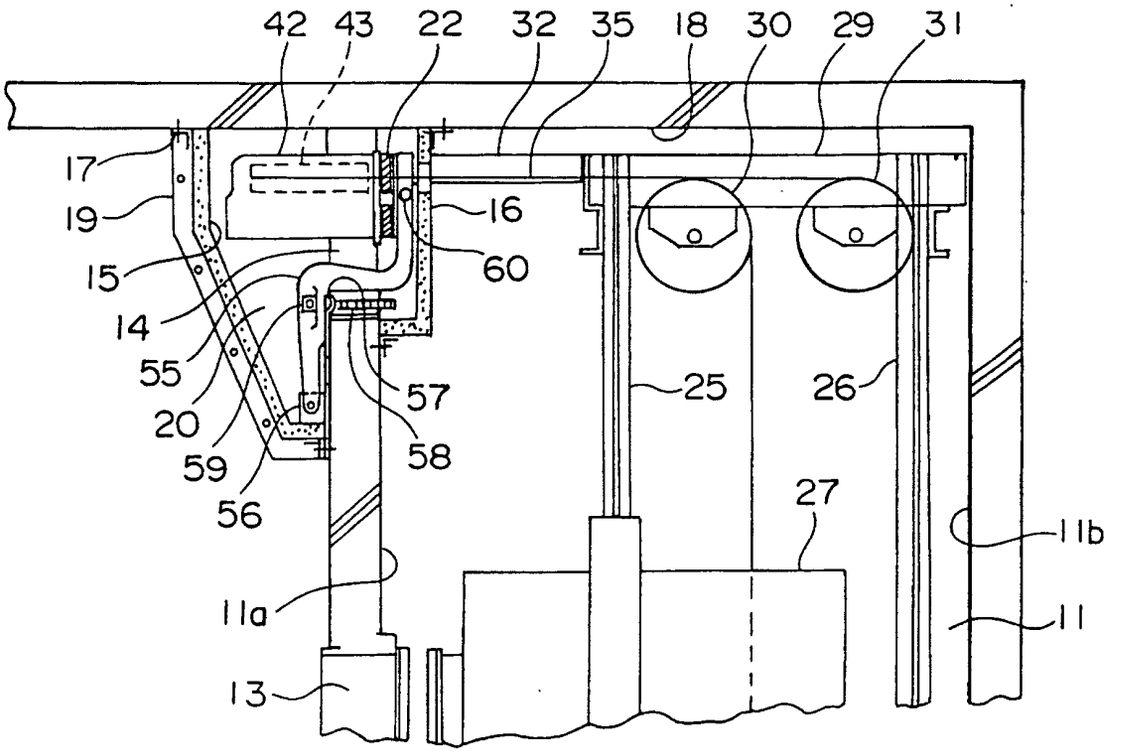
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FIG. 12

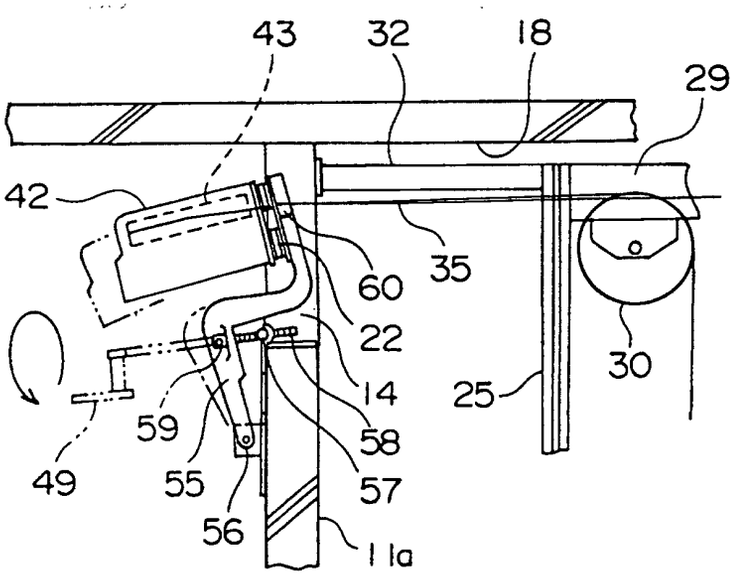
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FIG. 13

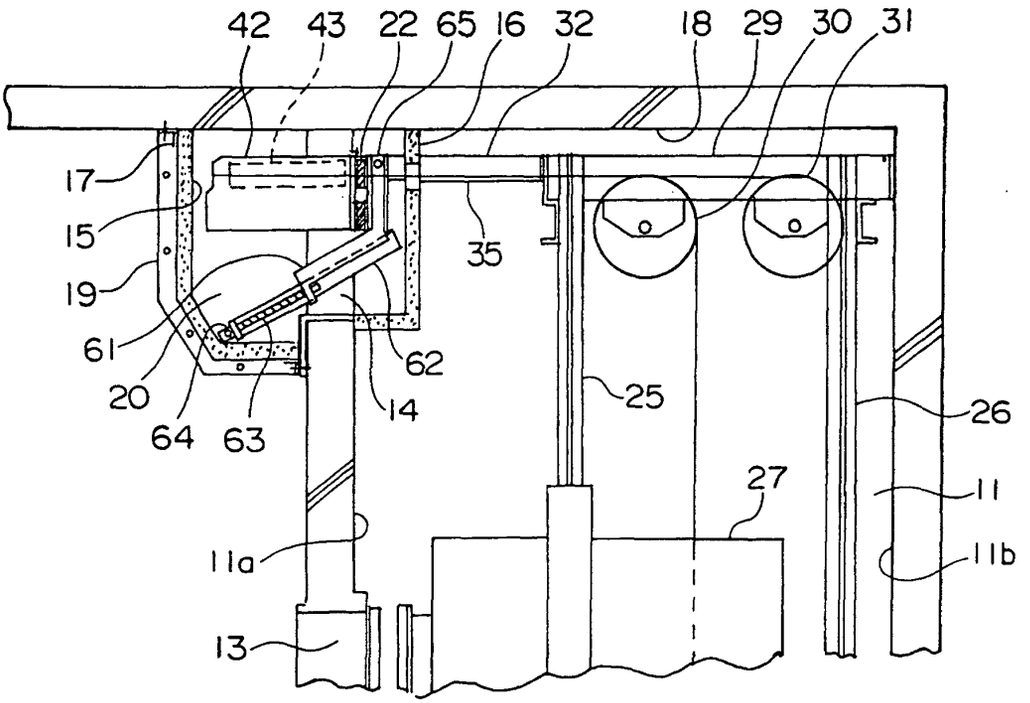
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FIG. 14

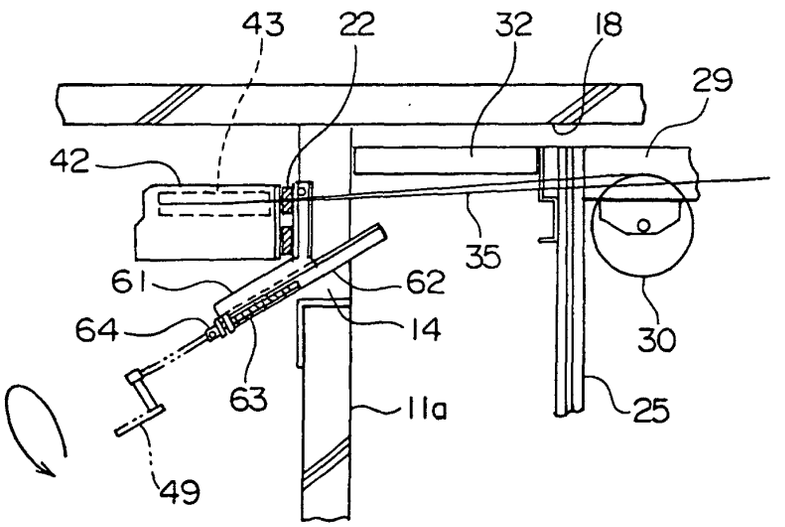
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FIG. 15

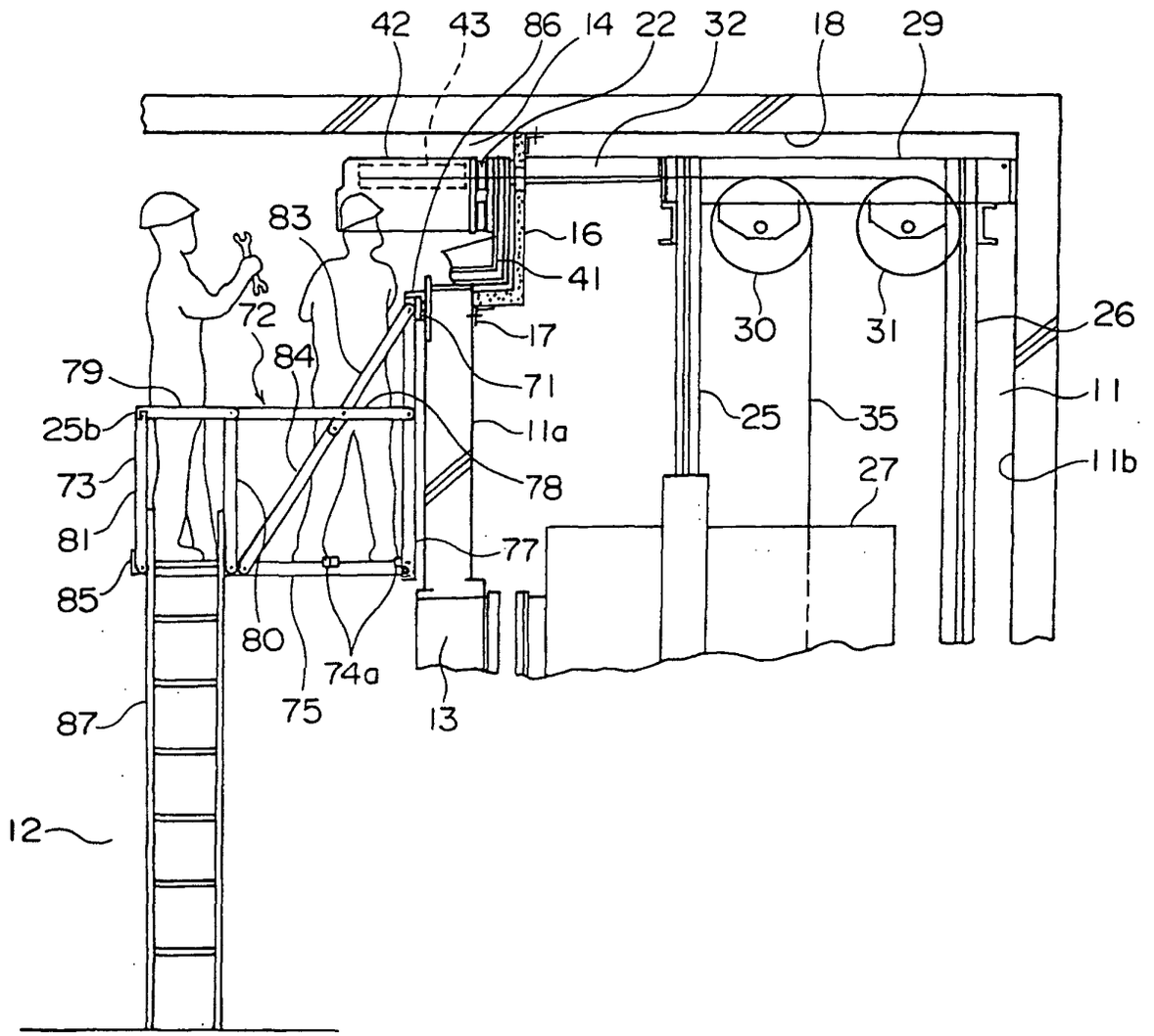
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FIG. 16

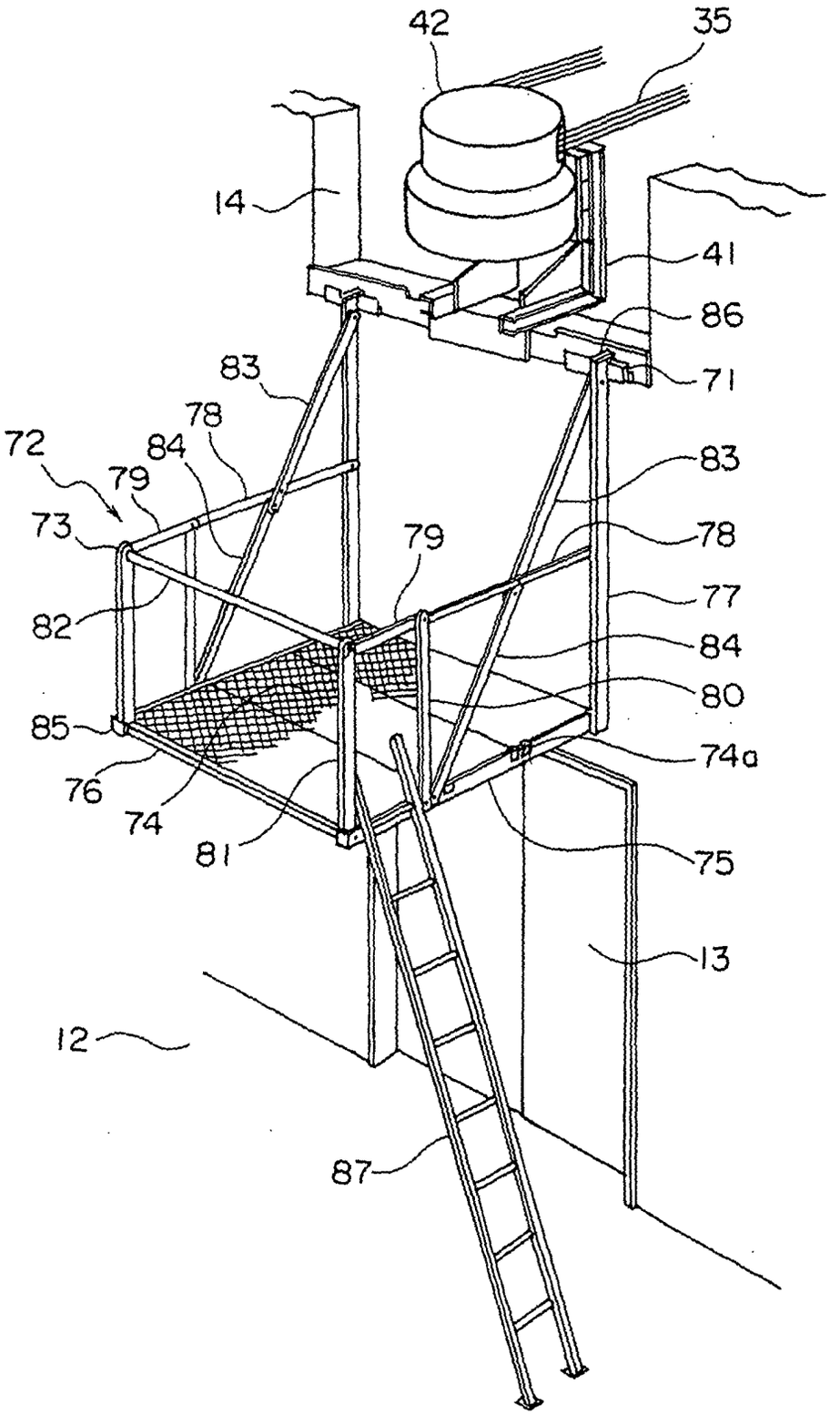
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FIG. 17

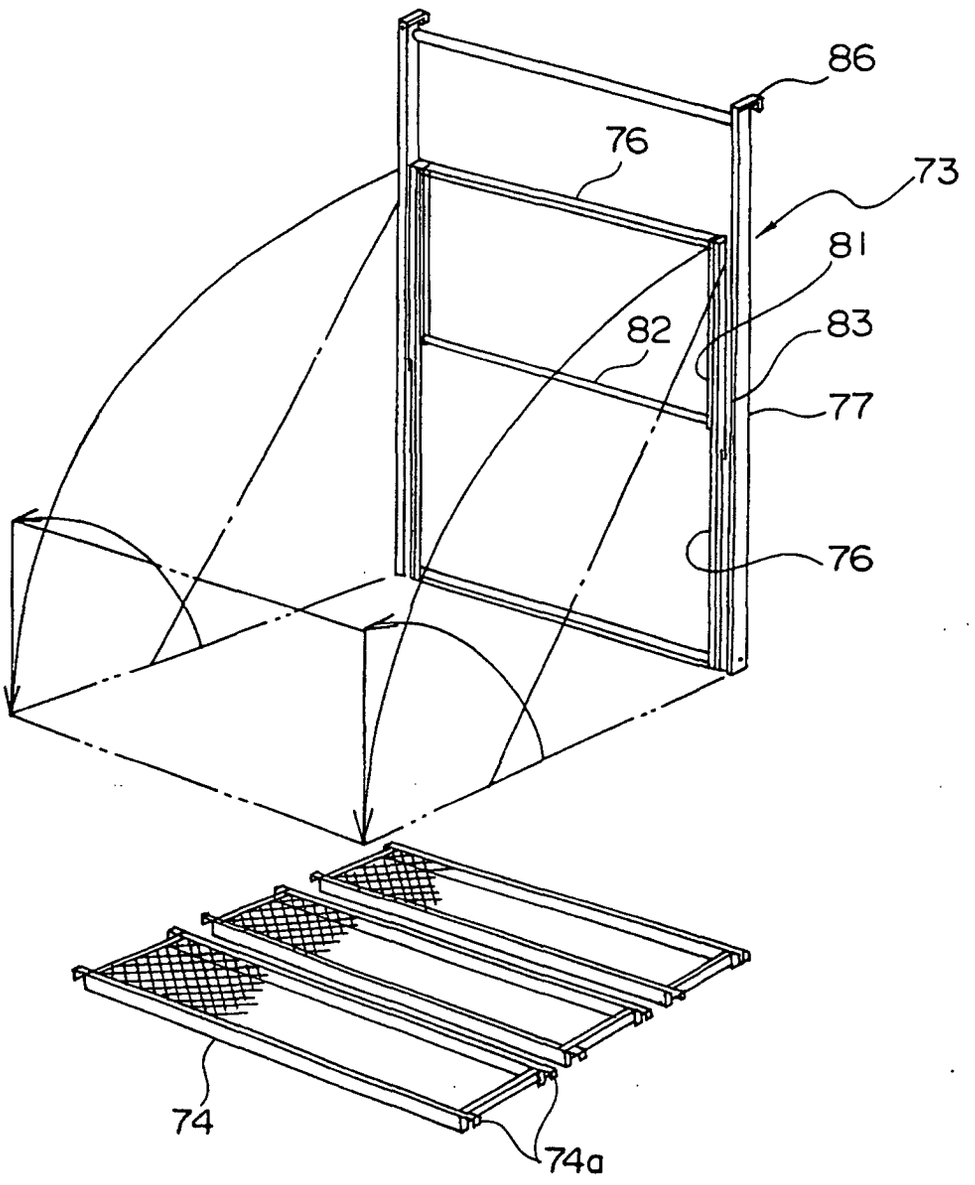

FIG. 18

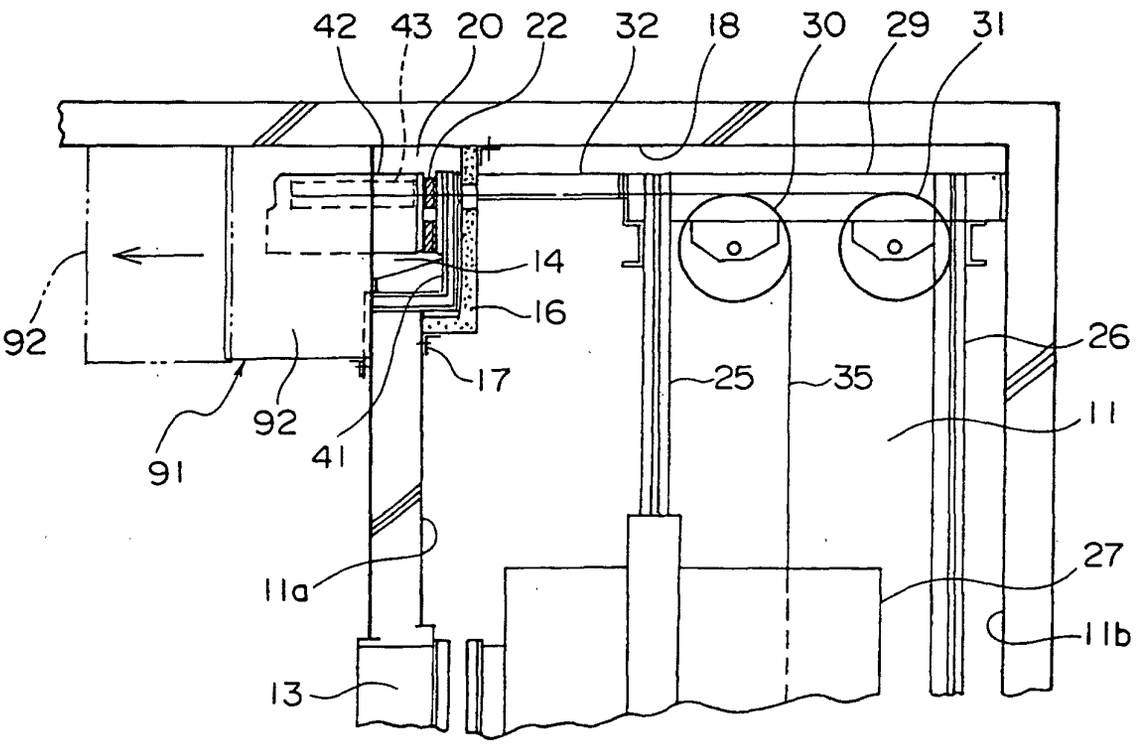
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FIG. 19

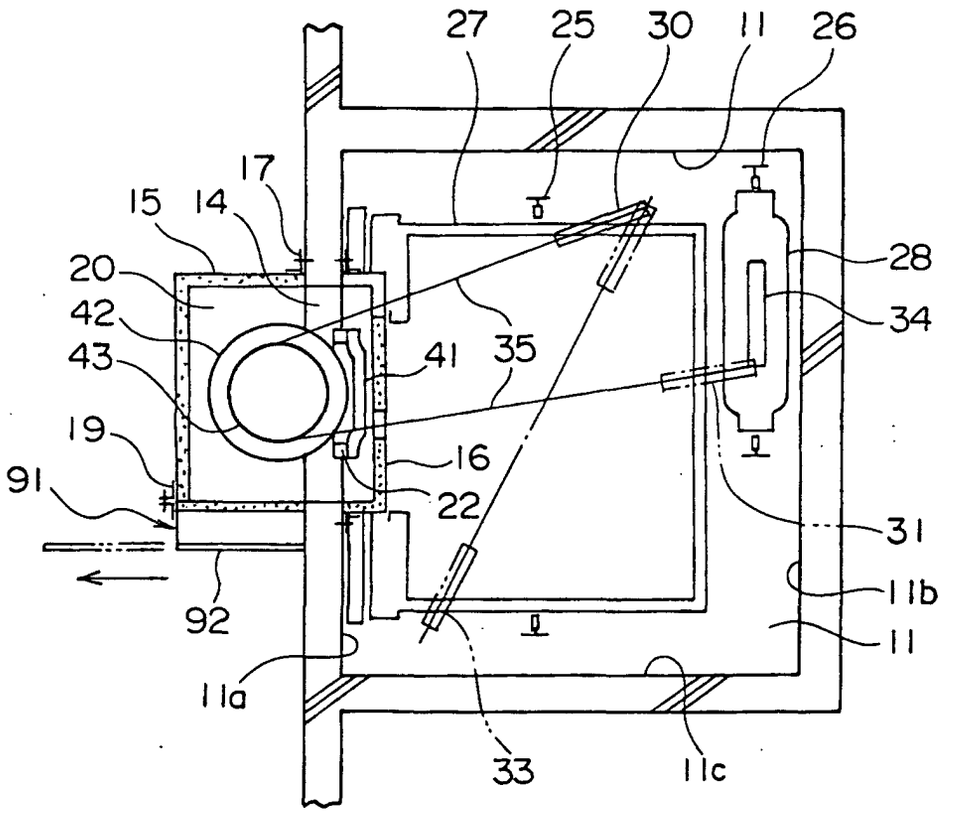
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FIG. 20

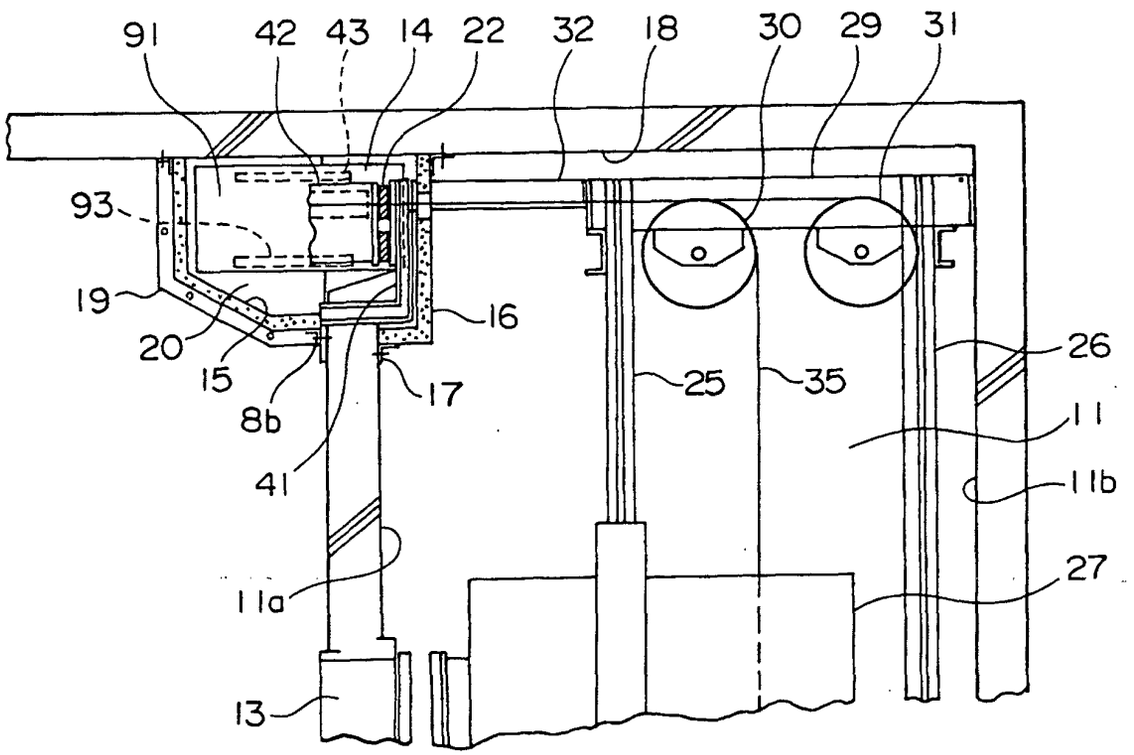
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FIG. 21

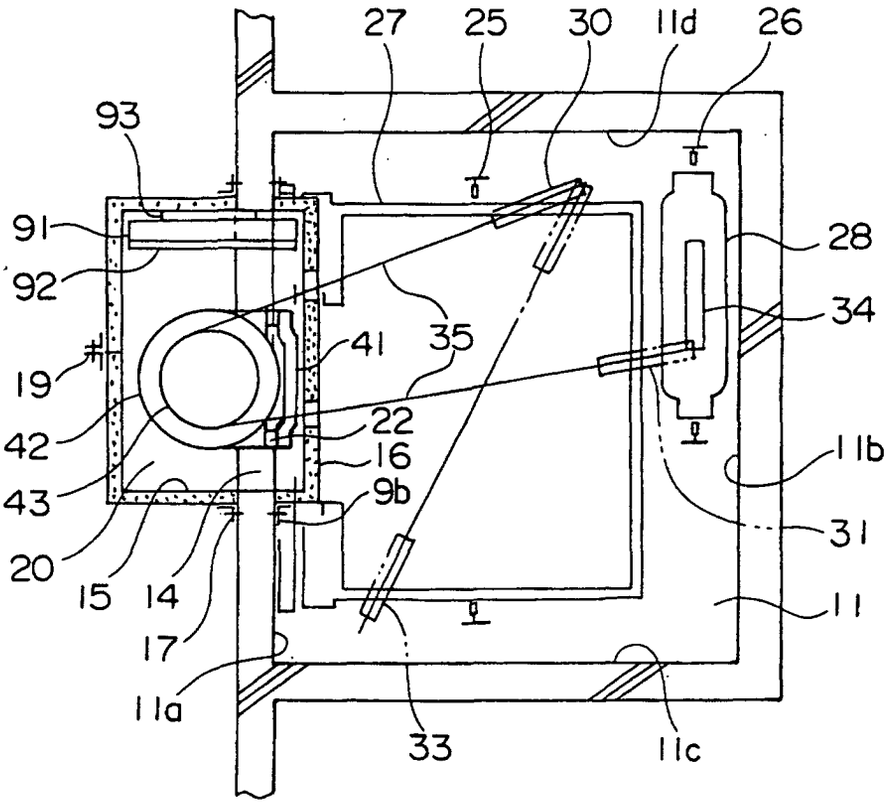
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FIG. 22

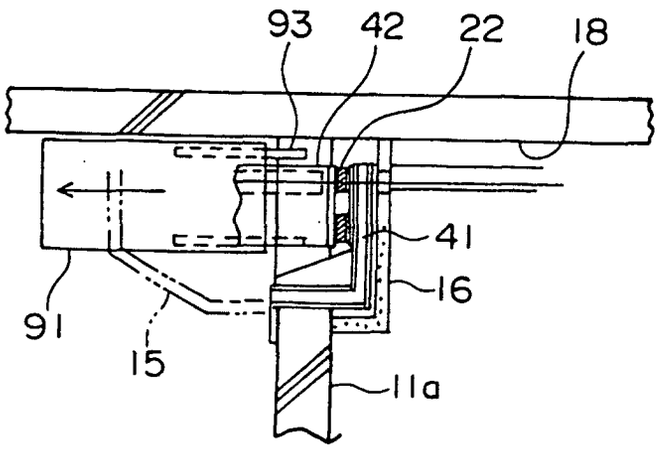
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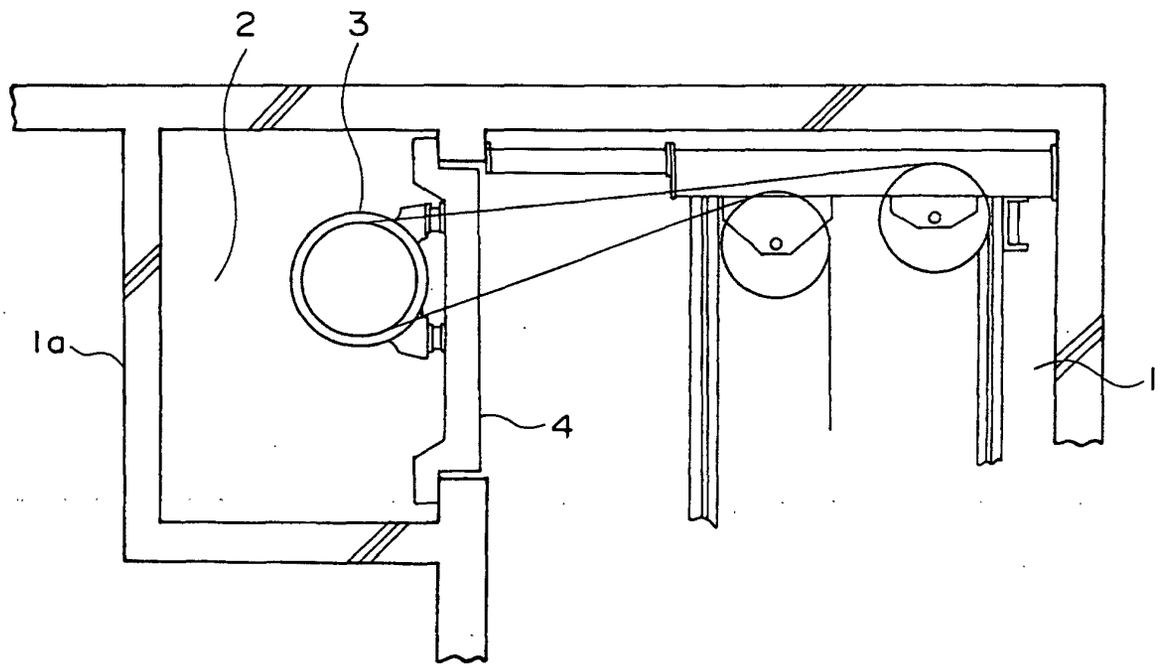
FIG. 23



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP00/06322

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B 7/00, 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] B66B 7/00-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 Jistuyo Shinan Toroku Koho 1996-2001
Kokai Jitsuyo Shinan Koho 1971-2001 Toroku Jitsuyo Shinan Koho 1994-2001

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, 62-230587, A (Mitsubishi Electric Corporation), 09 October, 1987 (09.10.87), (Family: none)	1-8
A	JP, 1-30466, Y2, (Mitsubishi Electric Corporation), 18 September, 1989 (18.09.89), (Family: none)	1-8
A	EP, 0680920, A2 (Kone Oy), 04 May, 1995 (04.05.95), & AU, 1784495, A & AU, 693521, A & BR, 9501920, A & CA, 2148423, A & CN, 1118763, A & FI, 942062, A & JP, 8-40675, A & SG, 40006, A	1
EA	JP, 2001-72352, A (Iventio AG), 21 March, 2001 (21.03.01), & EP, 1081086, A1	1

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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
29 May, 2001 (29.05.01)	05 June, 2001 (05.06.01)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)