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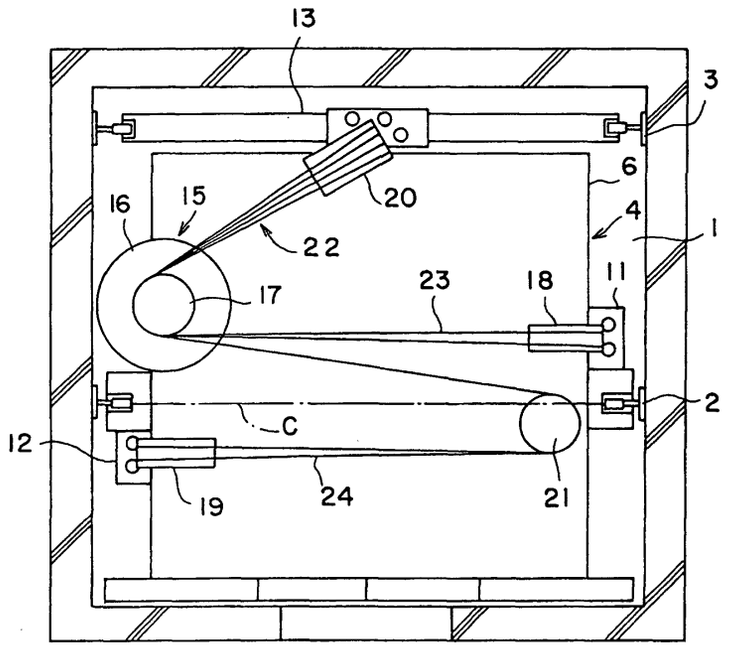
(54) **ELEVALTOR APPARATUS**

(57) An elevator apparatus has first and second main rope connecting portions provided on a car. First and second car side return pulleys are arranged in an upper portion of a hoistway and above the first and second main rope connecting portions. A main rope group has a first main rope wrapped around the first car side return pulley and connected to the first main rope connecting portion and a second main rope wrapped around the second car side return pulley and connectedtothesecondmainropeconnectingportion. Adrivemachine and the first and second car side return pulleys are arranged above the car so as to overlap the car in a vertical plane of projection.

FIG. 3



EP 1 481 935 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator apparatus having a drive machine arranged in the upper portion of in a hoistway.

BACKGROUND ART

[0002] In conventional machine-room-less type elevators, a drive machine and a control panel are arranged, for example, between a hoistway wall and a car. JP 10-139321 A, for example, discloses a machine-room-less type elevator in which a thin drive machine is arranged in the upper portion in the hoistway.

[0003] In the conventional machine-room-less type elevators as described above, sheaves around which main ropes are wrapped have a large diameter; further, to arrange a plurality of main ropes, it is necessary for the distance between the drive machine and the sheaves to be large, resulting in a large planar area of the hoistway. Further, to suppress the overhead dimension, it is necessary to mount a running block to the lower portion of the car to realize 2:1 roping, resulting in a rather complicated construction and high cost. Further, the dimension of the lower portion of the hoistway has to be rather large. Thus, there is a demand for a further reduction in the size of the hoistway.

DISCLOSURE OF THE INVENTION

[0004] The present invention has been made in viewof the above problems. Therefore, it is an object of the present invention to provide an elevator apparatus simplified in construction and allowing a reduction in the hoistway size.

[0005] In an elevator apparatus

To this end, according to one aspect of the present invention, there is provided an elevator apparatus comprising: a hoistway; a drive machine arranged in an upper portion of the hoistway and having a drive machine main body and a driving sheave rotated by the drive machine main body about a rotation shaft extending in a vertical direction; a main rope group wrapped around the driving sheave; and a car and a counterweight suspended in the hoistway by the main rope group and caused to ascend and descend in the hoistway by the drive machine, wherein the car is equipped with first and second main rope connecting portions arranged so as to be on either side of the car in a vertical plane of projection, and wherein there are arranged first and second car side return pulleys in the upper portion of the hoistway and above the first and second main rope connecting portions, the main rope group having a first main rope wrapped around the first car side return pulley and connected to the first main rope connecting portion and a second main rope wrapped around the second car side return pulley and connected to the second main rope connecting portion, the drive machine and the first and second car side return pulleys being arranged above the car so as to overlap the car in the vertical plane of projection.

[0006] According to another aspect of the present invention, there is provided an elevator apparatus comprising: a hoistway; a drive machine arranged in an upper portion of the hoistway and having a drive machine main body and a driving sheave rotated by the drive machine main body about a rotation shaft extending in a vertical direction; a main rope group wrapped around the driving sheave; and a car and a counterweight suspended in the hoistway by the main rope group and caused to ascend and descend in the hoistway by the drive machine, wherein first and second counterweight side return pulleys are arranged in the upper portion of the hoistway and above the counterweight, and wherein the main rope group has a first main rope wrapped around the first counterweight side return pulley and connected to the counterweight and a second main rope wrapped around the second counterweight side return pulley and connected to the second main rope connecting portion, the installation heights of the first and second counterweight side return pulleys being different from each other in correspondence with the heights of the first and second main ropes drawn out of the driving sheave.

[0007] According to a still further aspect of the present invention, there is provided an elevator apparatus comprising: a hoistway; a drive machine arranged in an upper portion of the hoistway and having a drive machine main body and a driving sheave rotated by the drive machine main body about a rotation shaft extending in a vertical direction; a main rope group wrapped around the driving sheave; and a car and a counterweight suspended in the hoistway by the main rope group and caused to ascend and descend in the hoistway by the drive machine, wherein first and second counterweight side return pulleys are arranged in the upper portion of the hoistway and above the counterweight, and wherein the main rope group has a first main rope wrapped around the first counterweight side return pulley and connected to the counterweight and a second main rope wrapped around the second counterweight side return pulley and connected to the second main rope connecting portion, the diameters of the first and second counterweight side return pulleys being different from each other in correspondence with the heights of the first and second main ropes drawn out of the driving sheave.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 is a front view of an elevator apparatus according to Embodiment 1 of the present invention.

Fig. 2 is a plan view of a structure in the upper por-

tion of the hoistway in Fig. 1.

Fig. 3 is a plan view of a main portion of the elevator apparatus in Fig. 1.

Fig. 4 is a plan view of an elevator apparatus according to Embodiment 2 of the present invention.

Fig. 5 is a front view of first and second counterweight side return pulleys in Fig. 4.

Fig. 6 is a plan view of an elevator apparatus according to Embodiment 3 of the present invention.

Fig. 7 is a front view of the first and second counterweight side return pulleys in Fig. 6.

BEST MODE FOR CARRYING OUT THE INVENTION

[0009] Preferred embodiments of the present invention will now be described with reference to the drawings.

Embodiment 1

[0010] Fig. 1 is a front view of an elevator apparatus according to Embodiment 1 of the present invention, Fig. 2 is a plan view showing a structure in the upper portion of the hoistway in Fig. 1, and Fig. 3 is a plan view of a main portion of the elevator apparatus in Fig. 1.

[0011] In the drawings, installed in a hoistway 1 are a pair of car guide rails 2 and a pair of counterweight guide rails 3. A car 4 is guided by the car guide rails 2 to ascend and descend in the hoistway 1. The car 4 has a car frame 5 and a cage 6 supported by the car frame 5. The car frame 5 has a pair of vertical frames 7, a lower frame 8 secured between the lower ends of the vertical frames 7 and supporting the cage 6, and an upper frame 9 secured between the upper ends of the vertical frames 7.

[0012] The lower frame 8 is equipped with first and second main rope connecting portions 11 and 12. The first and second main rope connecting portions 11 and 12 are arranged symmetrically with respect to the center of gravity of the car 4. That is, as shown in Fig. 3, the first main rope connecting portion 11 is arranged behind the straight line C connecting the centers of the pair of car guide rails 2, and the second main rope connecting portion 12 is arranged in front of the straight line C.

[0013] A counterweight 13 is guided by the counterweight guide rails 3 to ascend and descend in the hoistway 1. Further, the counterweight 13 is arranged behind the car 4 as seen from the landing side.

[0014] A mounting frame 14 is arranged in the upper portion of the hoistway 1. The mounting frame 14 is fixed to the upper end portions of the car guide rails 2 and the counterweight guide rails 3. Mounted on the mounting frame 14 is a drive machine (hoisting machine) for causing the car 4 and the counterweight 13 to ascend and descend.

[0015] The drive machine 15 has a drive machine main body 16 and a driving sheave 17 rotated by the drive machine main body 16. Further, the drive machine 15 is arranged horizontally so that the rotation shaft of the driving sheave 17 may extend vertically. The drive machine main body 16 has a thin motor whose axial dimension is smaller than the diameter thereof.

[0016] Mounted on the mounting frame 14 are first and second car side return pulleys 18 and 19, a counterweight side return pulley 20, and a direction change pulley 21. The first car side return pulley 18 is arranged above the first main rope connecting portion 11 such that its rotation shaft extends horizontally in the depth direction of the car 4 (the vertical direction in Fig. 3). The second car side return pulley 19 is arranged above the second main rope connecting portion 12 such that its rotation shaft extends horizontally in the depth direction of the car 4 (the vertical direction in Fig. 3).

[0017] The counterweight side return pulley 20 is arranged above the counterweight 13 such that its rotation shaft extends horizontally. Further, the drive machine 15, the first and second car side return pulleys 18 and 19, the counterweight side return pulley 20, and the direction change pulley 21 are arranged above the car 4 so as to overlap the car 4 in a vertical plane of projection.

[0018] Wrapped around the driving sheave 17 is a main rope group 22 for suspending the car 4 and the counterweight 13 in the hoistway 1. The main rope group 22 has a plurality of first main ropes 23 and a plurality of second main ropes 24. Here, the number of first main ropes 23 is the same as the number of second main ropes 24.

[0019] Further, the first and second main ropes 23 and 24 consist, for example, of highly flexible composite material ropes with resin coating, whereby it is possible to achieve a reduction in diameter for the driving sheave 17, the first and second car side return pulleys 18 and 19, the counterweight side return pulley 20, and the direction change pulley 21.

[0020] The first main ropes 23 have first end portions connected to the first main rope connecting portion 11 and second end portions connected to the upper portion of the counterweight 13. The second main ropes 24 have first end portions connected to the main rope connecting portion 12 and second end portions connected to the upper portion of the counterweight 13.

[0021] Starting with their first ends, the first main ropes 23 are successively wrapped around the first car side return pulley 18, the driving sheave 17, and the counterweight side return pulley 20 in that order to end in their second end portions. Starting with their first ends, the second main ropes 24 are successively wrapped around the second car side return pulley 19, the direction change pulley 21, the driving sheave 17, and the counterweight side return pulley 20 in that order to end in their second end portions.

[0022] That is, the first main ropes 23 and the second main ropes 24 connected to the counterweight 13 bifurcated in two directions by the driving sheave 17 before being connected to the car 4.

[0023] Further, mounted on the mounting frame 14 is a control panel 25 for controlling the apparatuses such

as the drive machine 15. The drive machine 15, the first and second car side return pulleys 18 and 19, the counterweight side return pulley 20, the direction change pulley 21, and the control panel 25 are mounted on the common mounting frame 14 to form an integral unit.

[0024] The direction change pulley 21, which is arranged substantially horizontally, has its rotation shaft somewhat inclined with respect to the vertical direction so as to make the approach angle of the second main ropes 24 as small as possible.

[0025] In this elevator apparatus, the main rope group 22 is divided into the first and second main ropes 23 and 24, and the first and second main rope connecting portions 11 and 12 arranged symmetrically with respect to the center of gravity of the car 4 are used for suspension, so that it is possible to suspend the car 4 in a stabilized fashion utilizing its center of gravity, whereby it is possible to prevent reaction force due to offset load from being applied to the guide rails 2, thereby improving the elevator in terms of riding comfort.

[0026] Further, since the first and second main rope connecting portions 11 and 12 are arranged on the lower frame 8 of the car 4, there is no need to provide a connecting portion for the main rope group 22 on the upper portion of the car 4. Thus, it is possible to reduce the dimension of the upper portion of the car 4, making it possible to restrain an increase in the height dimension of the hoistway 1 while arranging the drive machine 15 in the upper portion of the hoistway 1.

[0027] Further, since the car 4 is suspended directly in 1:1 roping, the elevator system is simplified in construction, and it is possible to restrain the rotating speed of the drive machine 15 at a low level. Thus, it is possible to provide a quiet elevator apparatus of low vibration and low noise despite the arrangement of the drive machine 15 in the hoistway 1.

[0028] Furthermore, since sufficient distances are ensured between the driving sheave 17 and the first car side return pulley 18, between the driving sheave 17 and the direction change pulley 21, and between the direction change pulley 21 and the second car side return pulley 19, it is possible to prevent uneven wear of the driving sheave 17 and to elongate the service life of the main rope group 22, thus achieving a reduction in maintenance cost.

[0029] Further, since the drive machine 15, the first and second car side return pulleys 18 and 19, the counterweight side return pulley 20, and the direction change pulley 21 are arranged above the car 4 so as to overlap the car 4 in a vertical plane of projection, it is possible to reduce the planar area of the hoistway 1, thereby making the hoistway 1 more compact.

[0030] Further, since the first and second car side return pulleys 18 and 19 are arranged parallel to each other on either side of the straight line C connecting the pair of car guide rails 2, it is possible to apply load uniformly to the mounting frame 14 and the guide rails 2 and 3, thus realizing a stabilized structure.

[0031] Furthermore, since the first and second car side return pulleys 18 and 19 are arranged such that their rotation shafts extend horizontally in the depth direction of the car 4 (the vertical direction in Fig. 3), it is possible to simplify the construction and facilitate the assembly.

Embodiment 2

[0032] Next, Fig. 4 is a plan view showing a main portion of an elevator apparatus according to Embodiment 2 of the present invention. In the drawing, the car 4 has first and second side surfaces 4a and 4b opposed to each other. Further, the car 4 has first and second corner portions 4c and 4d diagonally arranged.

[0033] In the hoistway 1, there are installed first and second car guide rails 31 and 32 for guiding the car 4 in its ascent and descent. The first car guide rail 31 is opposed to the first corner portion 4c and fixed to a first hoistway wall 1a of the hoistway 1. The second car guide rail 32 is opposed to the second corner portion 4d and fixed to a second hoistway wall 1b opposed to the first hoistway wall 1a. Thus, the portions (guide shoes) of the car 4 engaged with the car guide rails 31 and 32 are arranged in the first and second corner portions 4c and 4d.

[0034] The lower frame 8 of the car 4 is equipped with first and second main rope connecting portions 33 and 34. The first and second main rope connecting portions 33 and 34 are arranged symmetrically with respect to the center of gravity of the car 4. That is, the first main rope connecting portion 33 is arranged in the first corner portion 4c, and the second main rope connecting portion 34 is arranged in the second corner portion 4d.

[0035] Mounted on the mounting frame 14 (Fig. 1) arranged in the upper portion of the hoistway 1 are first and second car side return pulleys 35 and 36, first and second counterweight side return pulleys 37 and 38, and a direction change pulley 39. The first car side return pulley 35 is arranged above the first main rope connecting portion 33 such that its rotation shaft extends horizontally. The second car side return pulley 36 is arranged above secondmain rope connecting portion 34 such that its rotation shaft extends horizontally.

[0036] The first and second counterweight return pulleys 37 and 38 are arranged above the counterweight 13 such that their rotation shafts extend horizontally. Further, the drive machine 15, the first and second car side return pulleys 35 and 36, the first and second counterweight side return pulleys 37 and 38, and the direction change pulley 39 are arranged above the car 4 such that they overlap the car 4 in a vertical plane of projection.

[0037] Wrapped around the driving sheave 17 is a main rope group 22 for suspending the car 4 and the counterweight 13 in the hoistway 1. The main rope group 22 has a plurality of first main ropes 23 and a plurality of second main ropes 24. Here, the number of the first main ropes 23 is the same as the number of the

second main ropes 24.

[0038] The first main rope 23 has a first end portion connected to the first main rope connecting portion 33 and a second end portion connected to the upper portion of the counterweight 13. The second main rope 24 has a first end portion connected to the second main rope connecting portion 34 and a second end portion connected to the upper portion of the counterweight 13.

[0039] Starting with their first ends, the first main ropes 23 are successively wrapped around the first car side return pulley 35, the driving sheave 17, and the first counterweight side return pulley 37 in that order to end in their second end portions. Starting with their first ends, the second main ropes 24 are successively wrapped around the second car side return pulley 36, the direction change pulley 39, the driving sheave 17, and the second counterweight side return pulley 38 in that order to end in their second end portions.

[0040] The direction change pulley 39, which is arranged substantially horizontally, has its rotation shaft somewhat inclined with respect to the vertical direction so as to make the approach angle of the second main ropes 24 as small as possible.

[0041] Next, Fig. 5 is a front viewof the first and second counterweight side return pulleys 37 and 38 in Fig. 4. The installation heights of the first and second counterweight side return pulleys 37 and 38 differ from each other in correspondence with the heights of the first and second main ropes 23 and 24 drawn out of the driving sheave 17.

[0042] In this elevator apparatus, the main rope group 22 is divided into the first and second main ropes 23 and 24, and the first and second main rope connecting portions 33 and 34 arranged symmetrically with respect to the center of gravity of the car 4 are used for suspension, so that it is possible to suspend the car 4 in a stabilized fashion utilizing its center of gravity, whereby it is possible to prevent reaction force due to offset load from being applied to the guide rails 31 and 32, thereby improving the elevator in terms of riding comfort.

[0043] Further, since the first and second main rope connecting portions 33 and 34 are arranged on the lower frame 8 of the car 4, there is no need to provide a connecting portion for the main rope group 22 on the upper portion of the car 4. Thus, it is possible to reduce the dimension of the upper portion of the car 4, making it possible to restrain an increase in the height dimension of the hoistway 1 while arranging the drive machine 15 in the upper portion of the hoistway 1.

[0044] Further, since the car 4 is suspended directly in 1:1 roping, the elevator system is simplified in construction, and it is possible to restrain the rotating speed of the drive machine 15 at a low level. Thus, it is possible to provide a quiet elevator apparatus of low vibration and low noise despite the arrangement of the drive machine 15 in the hoistway 1.

[0045] Further, since the drive machine 15, the first and second car side return pulleys 35 and 36, the first and second counterweight side return pulleys 37 and 38, and the direction change pulley 39 are arranged above the car 4 so as to overlap the car 4 in a vertical plane of projection, it is possible to reduce the planar area of the hoistway 1, thereby making the hoistway 1 more compact.

[0046] Further, since the first main rope connecting portion 33 is arranged at the first corner portion 4c, and the second main rope connecting portion 34 is arranged at the second corner portion 4d, it is possible to arrange the first and second main rope connecting portions 33 and 34 within the exterior dimensions of the car 4, thereby making it possible to reduce the planar area of the hoistway 1. Similarly, since the portions of the car 4 engaged with the guide rails 31 and 32 are also arranged at the first and second corner portions 4c and 4d, the engaged portions do not protrude from the car 4, thereby making it possible to reduce the planar area of the hoistway 1.

[0047] Furthermore, since the installation heights of the first and second counterweight side return pulleys 37 and 38 differ from each other in correspondence with the heights of the first and second main ropes 23 and 24 drawn out of the driving sheave 17, it is possible to diminish the approach angles of the main ropes 23 and 24 with respect to the driving sheave 17, making it possible to prevent uneven wear of the driving sheave 17 and wear of the main ropes 23 and 24.

[0048] Here, when each of the main ropes 23 and 24 consists of one rope, the difference in height between the first and second counterweight side return pulleys 37 and 38 may correspond to the distance between the centers of the main ropes 23 and 24. When each of the main ropes 23 and 24 consists of two ropes, it may be double the distance between the centers of the adjacent main ropes 23 and 24. That is, the maximum values of the approach angles of the plurality of main ropes are made as small as possible. Further, it is desirable for the approach angles of the main ropes 23 and 24 with respect to the sheaves 17 and 35 through 39 to be set to a value not larger than 1.5 degrees.

[0049] While two counterweight side return pulleys 37 and 38 are used in Embodiment 2, it is also possible to use three or more of them.

Embodiment 3

[0050] Next, Fig. 6 is a plan view of a main portion of an elevator apparatus according to Embodiment 3 of the present invention. In the drawing, the counterweight 13 is arranged by the side of the car 4 so as to be opposed to the first side surface 4a of the car 4. Further, conversely to Embodiment 2, the first main rope connecting portion 33 is arranged at the second corner portion 4d, and the second main rope connecting portion 34 is arranged at the first corner portion 4c.

[0051] The first car side return pulley 35 is arranged above the first main rope connecting portion 33. The

second car side return pulley 36 is arranged above the second main rope connecting portion 34. Arranged above the counterweight 13 are first and second counterweight side return pulleys 41 and 42.

[0052] Further, the drive machine 15, the first and second car side return pulleys 35 and 36, the first and second counterweight side return pulleys 41 and 42, and the direction change pulley 39 are arranged above the car 4 so as to overlap the car 4 in a vertical plane of projection.

[0053] Fig. 7 is a sectional view of the first and second counterweight side return pulleys 41 and 42. The first and second counterweight side return pulleys 41 and 42 are rotated independently about a common rotation shaft 43 arranged horizontally. The diameters of the first and second counterweight side return pulleys 41 and 42 differ from each other in correspondence with the heights of the first and second main ropes 23 and 24 drawn out of the driving sheave 17.

[0054] In this way, even in an elevator apparatus in which the counterweight 13 is arranged by the side of the car 4, it is possible to obtain the same effect as that of Embodiment 2 by dividing the main rope group 22 into first and second main ropes 23 and 24.

[0055] Further, since the diameters of the first and second counterweight side return pulleys 41 and 42 differ from each other in correspondence with the heights of the first and second main ropes 23 and 24 drawn out of the driving sheave 17, it is possible to diminish the approach angles of the main ropes 23 and 24 with respect to the driving sheave 17. Further, the use of the common rotation shaft 34 helps to simplify the construction.

[0056] While in Embodiment 3 two counterweight side return pulleys 41 and 42 are used, it is also possible to use three or more of them.

Claims

1. An elevator apparatus comprising:

a hoistway;
a drive machine arranged in an upper portion of the hoistway and having a drive machine main body and a driving sheave rotated by the drive machine main body about a rotation shaft extending in a vertical direction;
a main rope group wrapped around the driving sheave; and
a car and a counterweight suspended in the hoistway by the main rope group and caused to ascend and descend in the hoistway by the drive machine,

wherein the car is equipped with first and second main rope connecting portions arranged so as to be on either side of the car in a vertical plane of projection, and wherein there are arranged first and second car side return pulleys in the upper portion of the hoistway and above the first and second main rope connecting portions, the main rope group having a first main rope wrapped around the first car side return pulley and connected to the first main rope connecting portion and a second main rope wrapped around the second car side return pulley and connected to the second main rope connecting portion, the drive machine and the first and second car side return pulleys being arranged above the car so as to overlap the car in the vertical plane of projection.

2. An elevator apparatus according to Claim 1, wherein the car has a car frame including a lower frame and a cage supported on the lower frame, the first and second main rope connecting portions being provided on the lower frame.

3. An elevator apparatus according to Claim 1, wherein the first and second main rope connecting portions are arranged symmetrically with respect to the center of gravity of the car.

4. An elevator apparatus according to Claim 1, further comprising a direction change pulley which is arranged substantially horizontally in the upper portion of the hoistway and around which the second main rope is wrapped between the driving sheave and the second car side return pulley.

5. An elevator apparatus according to Claim 4, wherein a rotation shaft of the direction change pulley is inclined with respect to the vertical direction so that the approach angle of the second main rope is small.

6. An elevator apparatus according to Claim 1, further comprising a mounting frame secured in position in the upper portion of the hoistway, the drive machine and the first and second car side return pulleys being mounted on the mounting frame to form an integral unit.

7. An elevator apparatus according to Claim 1, wherein the car has first and second corner portions diagonally arranged with respect to each other, the first and second main rope connecting portions being arranged at the first and second corner portions.

8. An elevator apparatus according to Claim 7, further comprising first and second car guide rails installed in the hoistway so as to be opposed to the first and second corner portions and adapted to guide the car in its ascent and descent.

9. An elevator apparatus comprising:

a hoistway;
a drive machine arranged in an upper portion of the hoistway and having a drive machine main body and a driving sheave rotated by the drive machine main body about a rotation shaft extending in a vertical direction;
a main rope group wrapped around the driving sheave; and
a car and a counterweight suspended in the hoistway by the main rope group and caused to ascend and descend in the hoistway by the drive machine,

wherein first and second counterweight side return pulleys are arranged in the upper portion of the hoistway and above the counterweight, and wherein the main rope group has a first main rope wrapped around the first counterweight side return pulley and connected to the counterweight and a second main rope wrapped around the second counterweight side return pulley and connected to the second main rope connecting portion, the installation heights of the first and second counterweight side return pulleys being different from each other in correspondence with the heights of the first and second main ropes drawn out of the driving sheave.

10. An elevator apparatus comprising:

a hoistway;
a drive machine arranged in an upper portion of the hoistway and having a drive machine main body and a driving sheave rotated by the drive machine main body about a rotation shaft extending in a vertical direction;
a main rope group wrapped around the driving sheave; and
a car and a counterweight suspended in the hoistway by the main rope group and caused to ascend and descend in the hoistway by the drive machine,

wherein first and second counterweight side return pulleys are arranged in the upper portion of the hoistway and above the counterweight, and wherein the main rope group has a first main rope wrapped around the first counterweight side return pulley and connected to the counterweight and a second main rope wrapped around the second counterweight side return pulley and connected to the second main rope connecting portion, the diameters of the first and second counterweight side return pulleys being different from each other in correspondence with the heights of the first and second main ropes drawn out of the driving sheave.

11. An elevator apparatus according to Claim 10, wherein the first and second counterweight side return pulleys are rotated about a common rotation shaft.

FIG. 1

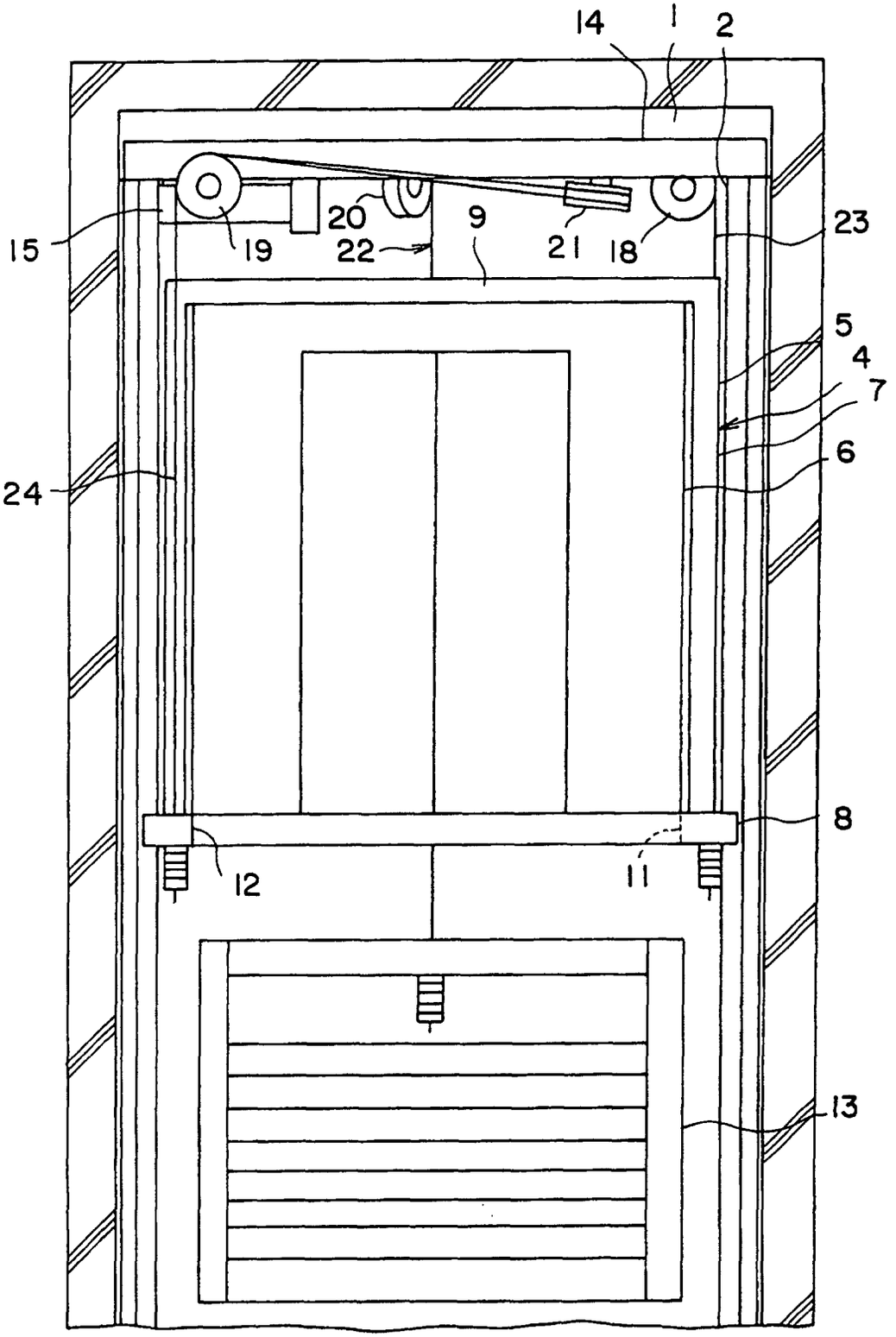


FIG. 2

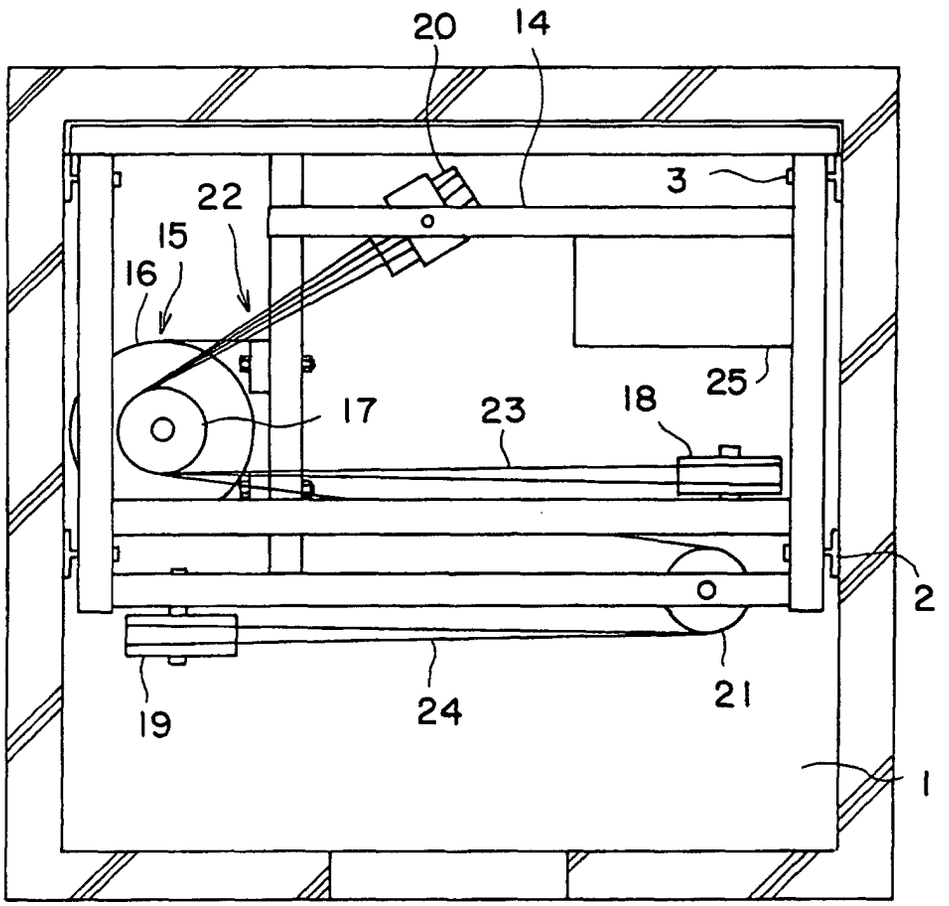


FIG. 3

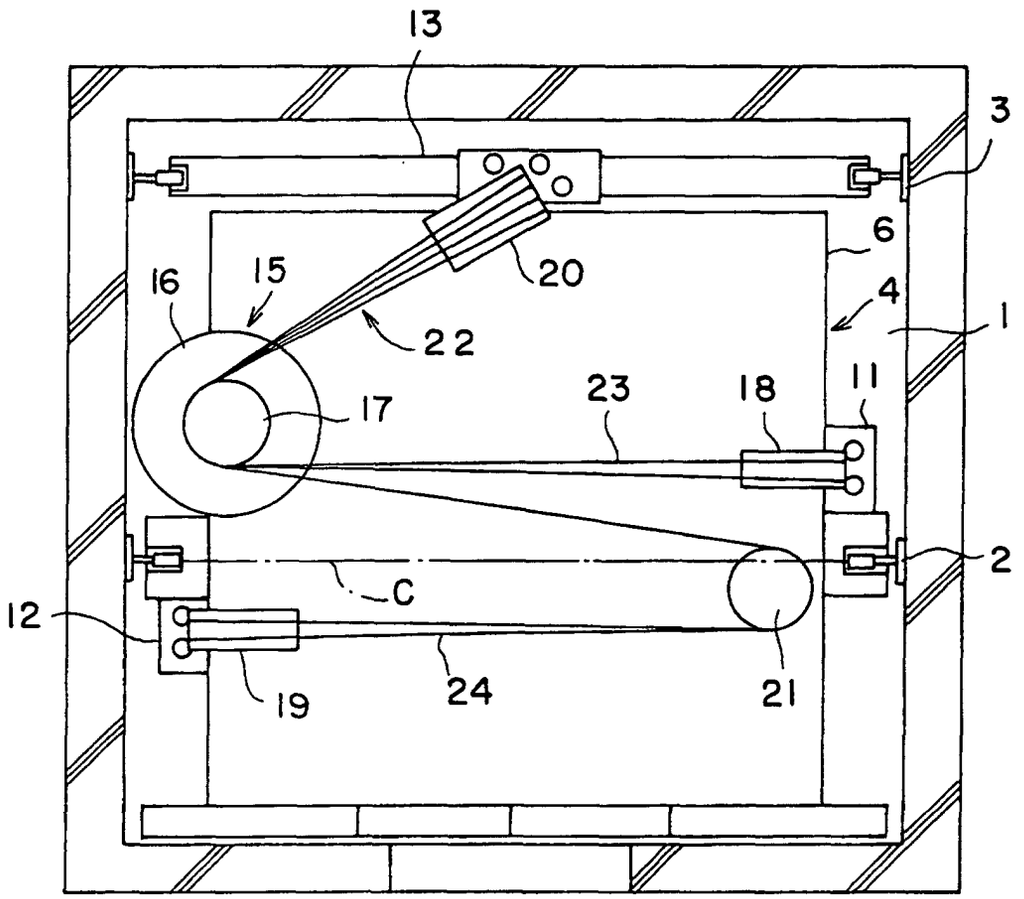
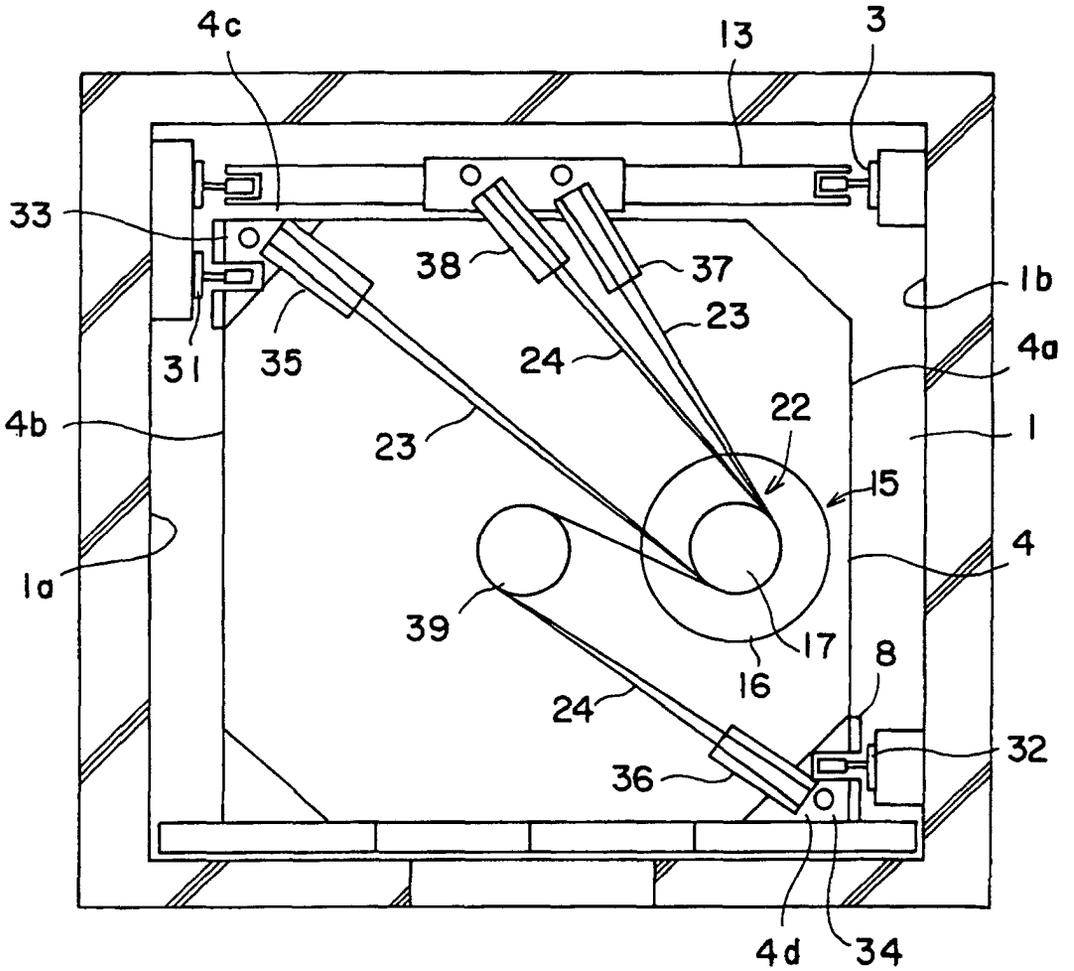


FIG. 4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32
36
4d
34

FIG. 5

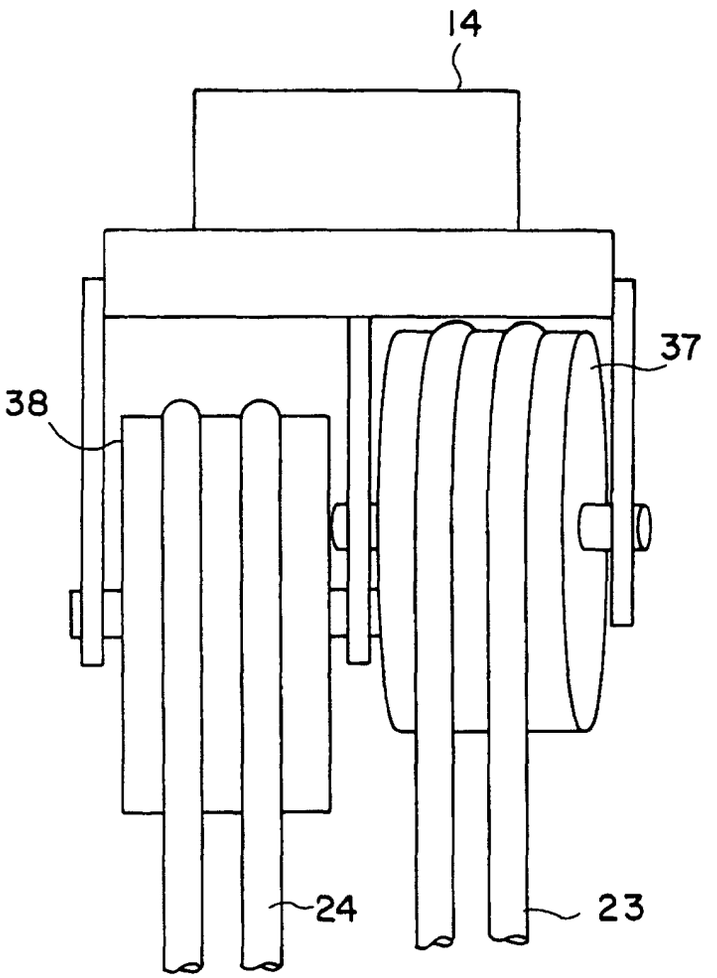
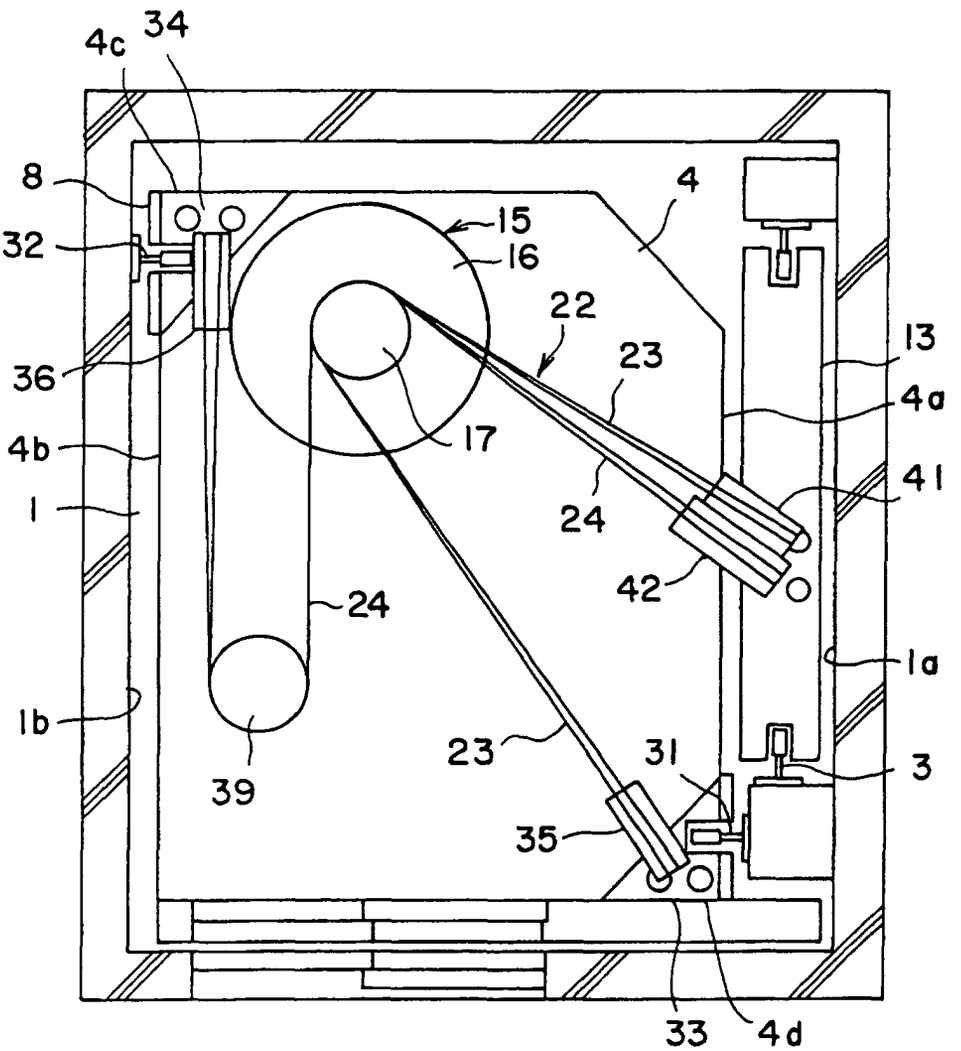


FIG. 6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22
23
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41
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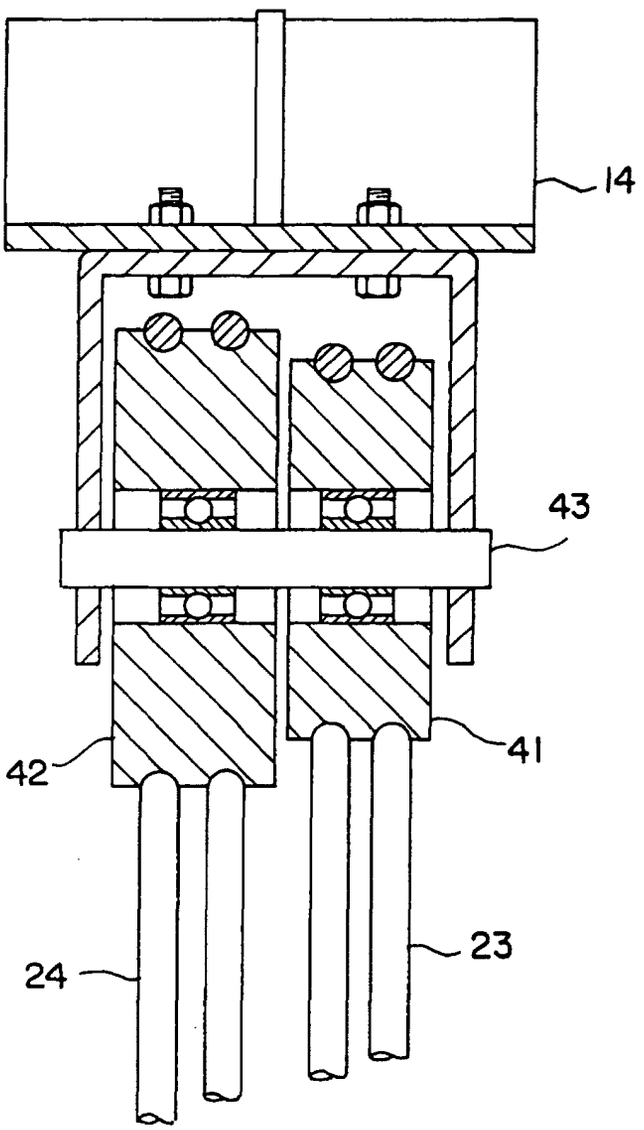
42
1a
23
31
3
35
33
4d

FIG. 7



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/01927

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B7/06

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] B66B7/00-11/08

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 1996-2002
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 10-139321 A (Inventio AG), 26 May, 1998 (26.05.98), & CA 2220582 A & EP 0841283 A1 & US 6006865 A	1-11
A	JP 2001-80842 A (Mitsubishi Electric Corp.), 27 March, 2001 (27.03.01), (Family: none)	1-11
A	JP 2000-153975 A (Kone Corp.), 06 June, 2000 (06.06.00), & FI 982403 A & WO 00/27739 A1 & AU 1163200 A & NO 20012217 A & BR 9915046 A & EP 1127024 A1 & US 2002/0000348 A1	1-11

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

* Special categories of cited documents:
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 November, 2002 (22.11.02)	03 December, 2002 (03.12.02)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/01927

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 84196/1986 (Laid-open No. 197672/1987) (Mitsubishi Electric Corp.), 16 December, 1987 (16.12.87), (Family: none)	1-11
A	JP 2000-255934 A (Otis Elevator Co.), 19 September, 2000 (19.09.00), & FR 2791048 A	1-11
A	JP 1-261189 A (Mitsubishi Electric Corp.), 18 October, 1989 (18.10.89), (Family: none)	1-11

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