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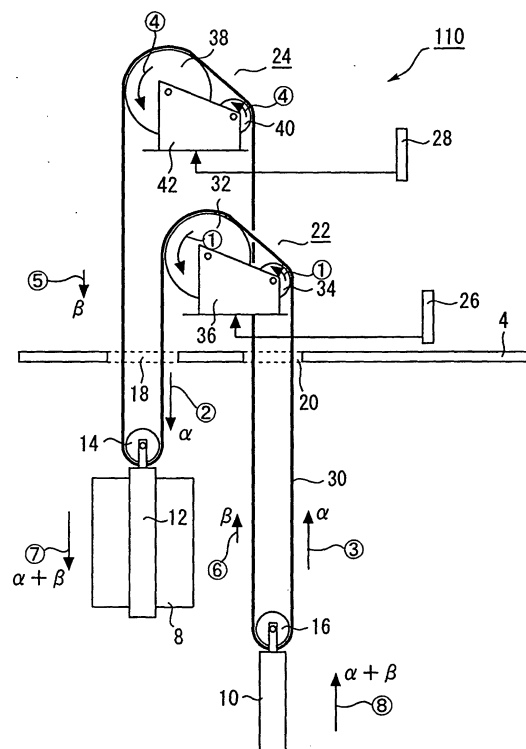
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(54) **ELEVATING/LOWERING MECHANISM AND ELEVATING/LOWERING METHOD OF ELEVATOR**

(57) An elevating mechanism for an elevator system includes two sets of hoisting machines (22, 24) for moving an elevator car (8) and a balance weight (10) up and down; control units (26, 28) for independently controlling the rotation of each of the two sets of hoisting machines (22, 24); and a loop-shaped rope (30) wound around each of the two sets of hoisting machines (22, 24). Of opposed two places held between the two sets of hoisting machines (22, 24), at one place, the rope (30) is wound around a pulley (14) for the car (8) so that the car (8) is hung, and at the other place, the rope (30) is wound around a pulley (16) for the balance weight (10) so that the balance weight (10) is hung.

Fig. 4



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Description

Technical Field

[0001] The present invention relates to an elevating mechanism and an elevating method for an elevator system. More particularly, it relates to an elevating mechanism and an elevating method which are used when an elevator car is moved up and down.

Background Art

[0002] Figure 5 is a schematic view of a conventional elevating mechanism 210 for an elevator system 200.

[0003] As shown in Figure 5, the elevator system 200 is provided with the elevating mechanism 210. Each end of a wire rope 30 of the elevating mechanism 210 is fixed to a rope fixing portion 54 provided on the backside of a machine house floor 4 above an elevator shaft 2. The wire rope 30 fixed to the fixing portion 54 is wound around a balance weight pulley 16 provided on a balance weight 10 so that the balance weight 10 is hung. The wire rope 30 wound around the balance weight pulley 16 is next wound around a hoisting machine 50 provided in a machine house 6, and hangs down again to a lower part below the machine house floor 4. The hanging wire rope 30 is wound around pulleys 14 provided at the lower part of a car 8 so that the car 8 is hung. The end of the wire rope 30 wound around the pulleys 14 of the car 8 is fixed to the fixing portion 54.

[0004] Also, the hoisting machine 50 is provided with a control panel 52. By using this control panel 52, the speed of the hoisting machine can be set, or the rotation of the hoisting machine 50 can be stopped.

[0005] In the elevator system 200 constructed as described above, when the hoisting machine 50 rotates in the direction of arrow (1) in Figure 5, the wire rope 30 moves accordingly, and the length of the wire rope 30 between the balance weight pulley 16 and the hoisting machine 50 is decreased, by which the balance weight 10 is pulled up in the direction of arrow (2). On the other hand, the length of the wire rope 30 between the hoisting machine 50 and the car pulley 14 is increased, by which the car 8 is lowered in the direction of arrow (3). When the hoisting machine 50 is rotated in the direction opposite to arrow (1) in Figure 5, the balance weight 10 is lowered, and the car 8 is pulled up. Thus, by the elevating mechanism 210, the car 8 and the balance weight 8 are moved up and down in the elevator shaft 2.

[0006] In the elevating mechanism 210, it is sometimes necessary to make safety check, periodic check, or the like in the state in which the hoisting machine 50 or the control panel 52 is stopped and the rotation of the hoisting machine 50 is temporarily stopped. In such a case, the car 8 cannot be moved up and down, so that the elevator itself must be stopped during the work. Also, in the case where the rotation of the hoisting machine must inevitably be stopped due to failure etc., similarly,

the elevator itself is stopped. If the elevator itself is stopped by check, failure, or the like in this manner, inconvenience is given to the elevator users.

[0007] Also, in the elevator system 200, in order to secure necessary transportation capability, the speed and capacity of the elevator is set depending on the environment of a building in which the elevator system is provided and other factors. and the rotation of the hoisting machine 50 is controlled so as to have a setting speed by the control panel 52 in accordance with the set speed and capacity of the elevator. However, the transportation capability of the elevator is usually set in accordance with the time when waiting user gather, i.e., the time when the load is highest in the up/down motion of the car 8, so that the transportation capability is sometimes excessive in some time zone, and hence energy is consumed wastefully.

Disclosure of the Invention

[0008] Accordingly, the present invention proposes an improved elevating mechanism for an elevator system, in which the elevator can be operated even when the rotation of a hoisting machine is stopped by an inspection such as safety check or a failure. Also, the present invention proposes an improved elevating mechanism for an elevator system, in which the transportation capability can be adjusted in accordance with the load of elevator system in up/down motion.

[0009] In the present invention, an elevating mechanism for an elevator system comprises two sets of hoisting machines for moving an elevator car and a balance weight up and down; a control unit for independently controlling the rotation of each of the two sets of hoisting machines; and a loop-shaped rope wound around the two sets of hoisting machines. Of opposed two places held between the two sets of hoisting machines, at one place, the rope is wound around a pulley for the car so that the car is hung, and at the other place, the rope is wound around a pulley for the balance weight so that the balance weight is hung.

[0010] According to this elevating mechanism, even in a state in which the rotation of one hoisting machine is stopped, the up-and-down movement of the car can be continued by driving the other hoisting machine, and hence the elevator service can be improved. Also, according to this elevating mechanism, the elevating capability of the elevator can be adjusted by selectively rotating or stopping one hoisting machine, so that the elevator can be operated while wasteful energy consumption is reduced.

[0011] Also, in the present invention, an elevating method for an elevator system, characterized in that in an elevating mechanism for an elevator system having two sets of hoisting machines provided in an elevator shaft of the elevator system, and a loop-shaped rope wound around the hoisting machines to move an elevator car up and down. Of opposed two places held be-

tween the two sets of hoisting machines, at one place, the rope is wound around a pulley for the car so that the car is hung, and at the other place, the rope is wound around a pulley for the balance weight so that the balance weight is hung, and the two sets of hoisting machines are rotated or stopped selectively, whereby the car and the balance weight are moved up and down.

[0012] According to this method, the elevating capability of the elevator can be adjusted by selectively rotating or stopping each of the hoisting machines, so that the elevator can be operated while wasteful energy consumption is reduced.

Brief Description of the Drawings

[0013]

Figure 1 is a perspective view of an elevator system in accordance with an embodiment of the present invention;

Figure 2 is a schematic view of hoisting pulleys used for an elevating mechanism for an elevator system in accordance with an embodiment of the present invention;

Figure 3 is a schematic view for illustrating the arranging relationship of a wire rope, hoisting pulleys, and running pulleys in an elevating mechanism for an elevator system in accordance with an embodiment of the present invention;

Figure 4 is a schematic view for illustrating a case where a car is moved up and down by an elevating mechanism for an elevator system in accordance with an embodiment of the present invention; and

Figure 5 is a schematic view of a conventional elevating mechanism for an elevator system.

Best Mode for implementing the Invention

[0014] An embodiment of the present invention will now be described with reference to the accompanying drawings. In the figures, the same reference numerals are applied to the same or corresponding elements, and the explanation thereof is simplified or omitted.

[0015] Figure 1 is a perspective view of an elevator system 100 in accordance with an embodiment of the present invention. Figure 2 is a schematic view of hoisting pulleys 22 and 24 in an elevating mechanism 110 for the elevator system 100.

[0016] As shown in Figure 1, the elevator system 100 is provided with an elevator shaft 2. The upper part of the elevator shaft 2 is partitioned by a machine house floor 4, and a machine house 6 is provided.

[0017] In the elevator shaft 2, a car 8 and a balance weight 10 are hung. The car 8 is provided with a car frame 12, and a car pulley 14 is provided above the car frame 12. Also, a balance weight pulley 16 is provided above a balance weight 10.

[0018] The machine house floor 4 is formed with two

wire rope through holes 18 and 20.

[0019] The machine house 6 is provided with the elevating mechanism 110.

[0020] The elevating mechanism 110 includes a main hoisting machine 22 and an auxiliary hoisting machine 24. Also, a main control panel 26 is provided so as to correspond to the main hoisting machine 22, and an auxiliary control panel 28 is provided so as to correspond to the auxiliary hoisting machine 24.

[0021] As shown in Figure 2, the main hoisting machine 22 is constructed by rotatably installing a large pulley 32 and a small pulley 34 on a fixing member 36. Similarly, the auxiliary hoisting machine 24 is constructed by rotatably installing a large pulley 38 and a small pulley 40 on a rotating member 42.

[0022] Referring to Figures 1 and 2, a wire rope 30 is formed into a loop shape, and, of the opposed two places, one place is wound around the large and small pulleys 32 and 34 of the main hoisting machine 22, and the other place is wound around the large and small pulleys 38 and 40 of the auxiliary hoisting machine 24. The wire rope 30 has a sufficiently high strength.

[0023] In the wire rope 30 connected in a loop shape, of two places held between the main hoisting machine 22 and the auxiliary hoisting machine 24, one place hangs down in the elevator shaft 2 through the wire rope through hole 18 in the machine house floor 4, and the other place hangs down in the elevator shaft 2 through the wire rope through hole 20.

[0024] A portion of the wire rope 30 hanging down in the elevator shaft 2 through the wire rope through hole 18 is wound around the car pulley 14 so that the car 8 is hung and supported. On the other hand, a portion hanging down through the wire rope through hole 20 is wound around the balance weight pulley 16 so that the balance weight 10 is hung and supported.

[0025] Figure 3 is a schematic view for illustrating the arranging relationship of the wire rope 30, the hoisting pulleys 22 and 24, and the pulleys 14 and 16.

[0026] As shown in Figure 2, the wire rope 30, which is formed into a loop shape, is wound around the small pulley 34 and the large pulley 32 of the main hoisting machine 22, the car pulley 14, the large pulley 38 and the small pulley 40 of the auxiliary hoisting machine 24, and the balance weight pulley 16 in that order, and returns to the small pulley 34 of the main hoisting machine 22.

[0027] Thus, for the wire rope 30 of the elevating mechanism 110, the ends thereof are not fixed unlike the conventional elevating mechanism for the elevator system, and the wire rope 30 is configured so as to be formed into a loop shape and wound around the hoisting machines and pulleys.

[0028] As described above, the elevating mechanism 110 of this embodiment is configured so as to include the main hoisting machine 22, the auxiliary hoisting machine 24, the main control panel 26, the auxiliary control panel 28, and the wire rope 30.

[0029] Figure 4 is a schematic view for illustrating a case where the car 8 is moved up and down by the elevating mechanism 110.

[0030] For example, it is assumed that when the large and small pulleys 32 and 34 of the main hoisting machine 22 are rotated at a predetermined speed in the direction of arrow ① in Figure 4, the wire rope 30 between the large pulley 32 and the car pulley 14 is lowered through a distance α in the direction of arrow ② in a unit length of time, and the wire rope 30 between the small pulley 34 and the balance weight pulley 16 is raised through a distance α in the direction of arrow ③ in a unit length of time. On the other hand, it is assumed that when the pulleys of the auxiliary hoisting machine 24 are rotated at a predetermined speed in the direction of arrow ④ in Figure 4, the wire rope 30 between the large pulley 38 and the car pulley 14 is lowered through a distance β in the direction of arrow ⑤ in a unit length of time, and the wire rope 30 between the small pulley 40 and the balance weight pulley 16 is raised through a distance β in the direction of arrow ⑥ in a unit length of time.

[0031] In this case, the car 8 is pulled down through a distance $\alpha+\beta$ in total in the direction of arrow ⑦ in a unit length of time, and the balance weight 10 is pulled up through a distance $\alpha+\beta$ in total in the direction of arrow ⑧.

[0032] Also, when the car 8 is pulled up, by rotating the pulleys 32, 34, 38 and 40 in the same manner in the opposite direction, the car 8 can be pulled up through a distance $\alpha+\beta$ in a unit length of time.

[0033] In this embodiment, the predetermined rotational speed of the main hoisting machine 22 is set so as to be high by the control panel 26, and the predetermined rotational speed of the auxiliary hoisting machine 24 is set so as to be low by the control panel 28. Therefore, the travel distance α in a unit length of time is set so as to be large to some degree, and the travel distance β is set so as to be small to some degree.

[0034] Therefore, at the time of elevator operation, when waiting user gather especially, the main hoisting machine 22 and the auxiliary hoisting machine 24 are driven at the same time. Thereby, the elevator can be operated at a speed such that the car 8 moves through a distance $\alpha+\beta$ in a unit length of time.

[0035] At the normal time, the rotation of the auxiliary hoisting machine 24 is stopped, and only the main hoisting machine 22 is driven. In this case, β is equal to 0, and the car 8 can be moved up or down through a distance α in a unit length of time by the rotation of the main hoisting machine 22 only. In this case, there is established a state in which the elevator is operated by one set of the hoisting machine 22 and the control panel 26 as if the wire rope 30 is fixed to the auxiliary hoisting machine 24.

[0036] On the other hand, when the number of waiting user is especially small, only the auxiliary hoisting machine 24 is driven, and the main hoisting machine 22 is

stopped. In this case, α is equal to 0, and the car 8 can be moved up or down through a distance β in a unit length of time by the rotation of the auxiliary hoisting machine 24 only.

[0037] By doing this, the elevating capability of the elevator can be set in accordance with the crowded condition of the elevator, so that wasteful energy consumption can be reduced.

[0038] Also, at the time of inspection including safety check, check is made in a state in which only the rotation of the hoisting machine to be checked is stopped and the other hoisting machine is rotated. Thereby, even at the time of check, the operation of the elevator can be secured at least at a speed such that the car 8 moves through a distance α or β in a unit length of time, so that inconvenience to elevator users can be mitigated.

[0039] Also, even when one hoisting machine 22 or 24 cannot be rotated due to failure, as at the time of check, the operation of elevator can be secured at least at a speed such that the car 8 moves through a distance α or β in a unit length of time by the rotation of the other hoisting machine, so that inconvenience to elevator users can be mitigated.

[0040] In this embodiment, the main hoisting machine and the auxiliary hoisting machine, which have a different rated speed, are provided. However, the configuration is not limited to this, and two hoisting machines having the same speed may be provided. In this case, even in the case where one hoisting machine is stopped by check or failure, an operating speed that is one-half of the highest operating speed can be secured.

[0041] Also, in this embodiment, the case where the hoisting machines 22 and 24 and the control panels 26 and 28 are arranged in the machine house 6 has been described. However, the arrangement position is not limited to this. The hoisting machines may be located at another place; for example, the hoisting machines 22 and 24 and the control panels 26 and 28 may be arranged directly in the elevator shaft 2.

[0042] Further, in the present invention, the control panels are provided so as to correspond to the two hoisting machines. However, one control panel may be used to control the two hoisting machines if the control panel can control the hoisting machines independently.

[0043] The arrangement positions and constructions of the car, car pulley, balance weight, and balance weight pulley are not limited to those described in this embodiment.

[0044] In the present invention, two sets of hoisting machines correspond, for example, to the main hoisting machine 22 and the auxiliary hoisting machine 24 in this embodiment, and a loop-shaped rope corresponds, for example, to the wire rope 30. Also, in the present invention, a control unit corresponds, for example, to the control panels 26 and 28 in this embodiment. Further, in the present invention, a pulley corresponds, for example, to the car pulley 14 and the balance weight pulley 16.

Industrial Applicability

[0045] As described above, according to the present invention, the elevating mechanism for the elevator system has two sets of hoisting machine and control units, and these can be operated independently. 5

[0046] Therefore, even in a state in which one hoisting machine is stopped at the time of checking work or by a failure, the up-and-down movement of the car can be continued, and hence the elevator service can be improved. 10

[0047] Also, according to the present invention, two hoisting machines can be operated or stopped selectively. Therefore, the elevating speed can be adjusted in accordance with the crowded condition of the elevator, so that excessive energy consumption can be reduced, and economical elevator operation can be achieved. 15

[0048] Further, according to the present invention, since two sets of hoisting machines are provided independently, intricate and highly accurate control, such as agreement of drive start/stop time and driving speed between the hoisting machines, is unnecessary. Therefore, a convenient elevator can be provided more easily. 20

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Claims

1. An elevating mechanism for an elevator system, comprising: 30

two sets of hoisting machines for moving an elevator car and a balance weight up and down; a control unit for independently controlling the rotation of each of said two sets of hoisting machines; and 35

a loop-shaped rope wound around said two sets of hoisting machines, wherein, of opposed two places held between said two sets of hoisting machines, at one place, said rope is wound around a pulley for said car so that said car is hung, and 40

at the other place, said rope is wound around a pulley for said balance weight so that said balance weight is hung. 45

2. The elevating mechanism for an elevator system according to claim 1, wherein, of said two sets of hoisting machines, one is used as a main hoisting machine, and the other is used as an auxiliary hoisting machine, said main hoisting machine having higher elevating capability than said auxiliary hoisting machine. 50

3. An elevating method for an elevator system, **characterized in that** in an elevating mechanism for an elevator system having two sets of hoisting machines provided in an elevator shaft of the elevator 55

system, and a loop-shaped rope wound around said hoisting machines to move an elevator car up and down,

of opposed two places held between said two sets of hoisting machines, at one place, said rope is wound around a pulley for said car so that said car is hung, and

at the other place, said rope is wound around a pulley for said balance weight so that said balance weight is hung, and

said each set of hoisting machines is rotated or stopped selectively, whereby said car and said balance weight are moved up and down.

Fig. 1

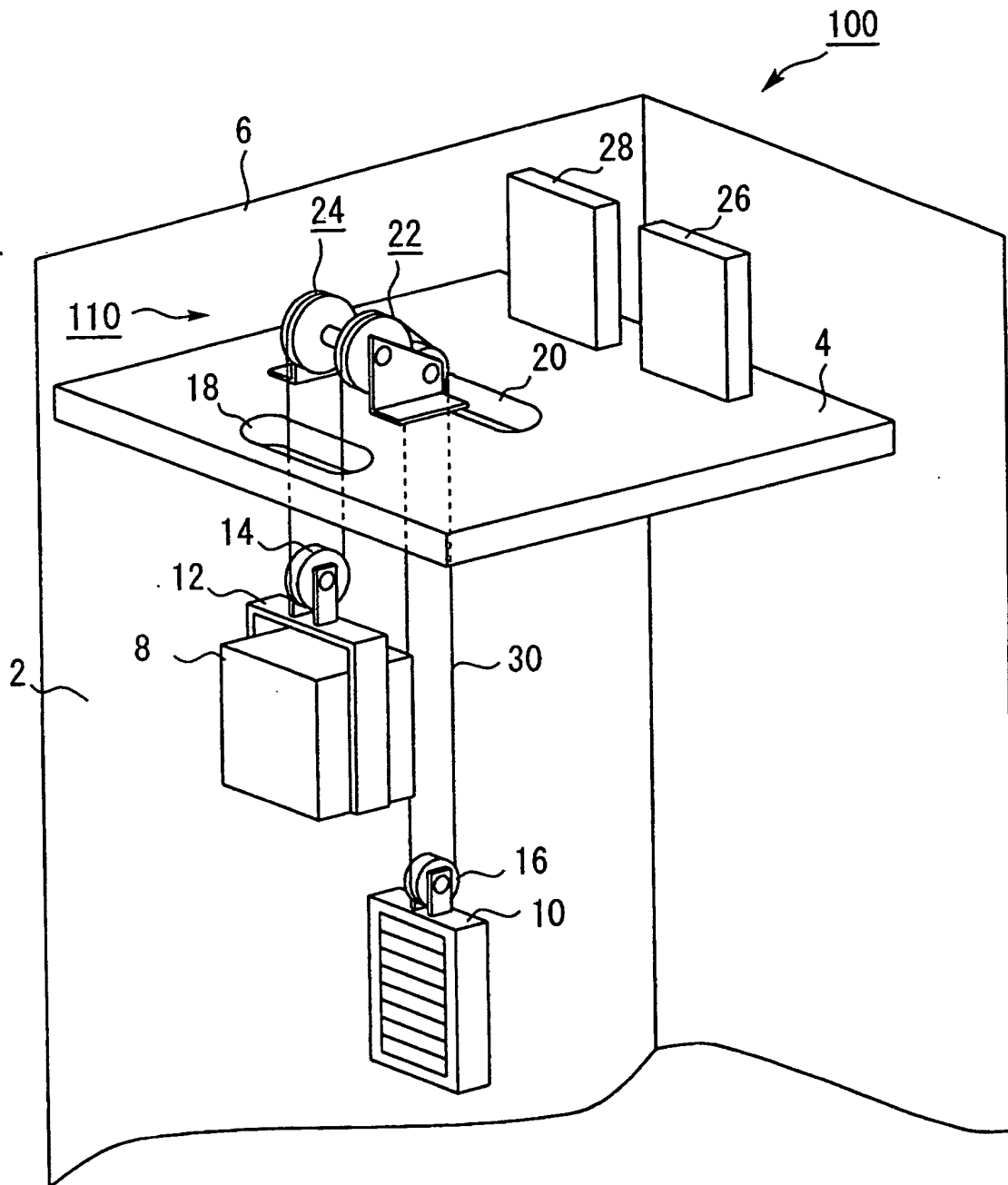


Fig. 2

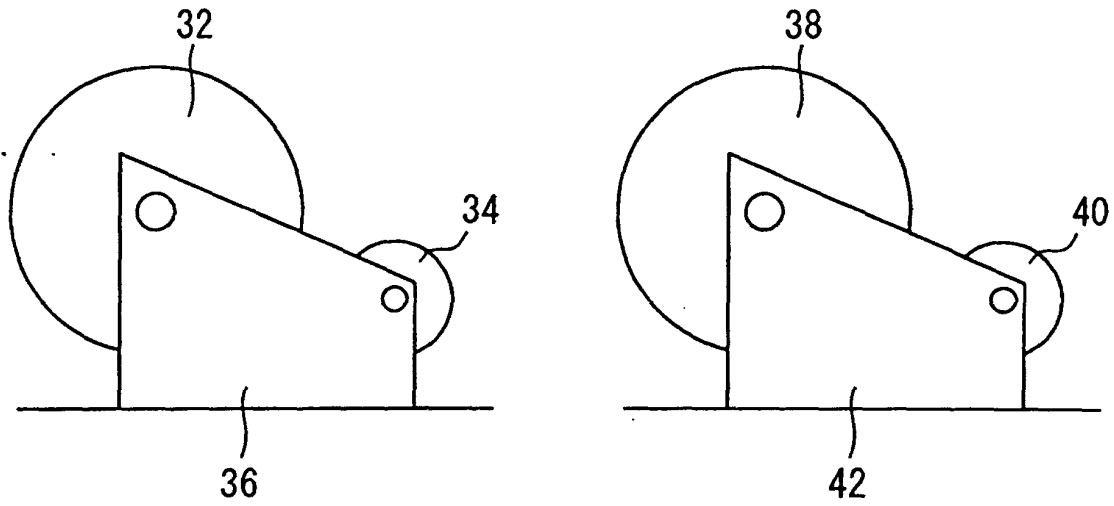


Fig. 3

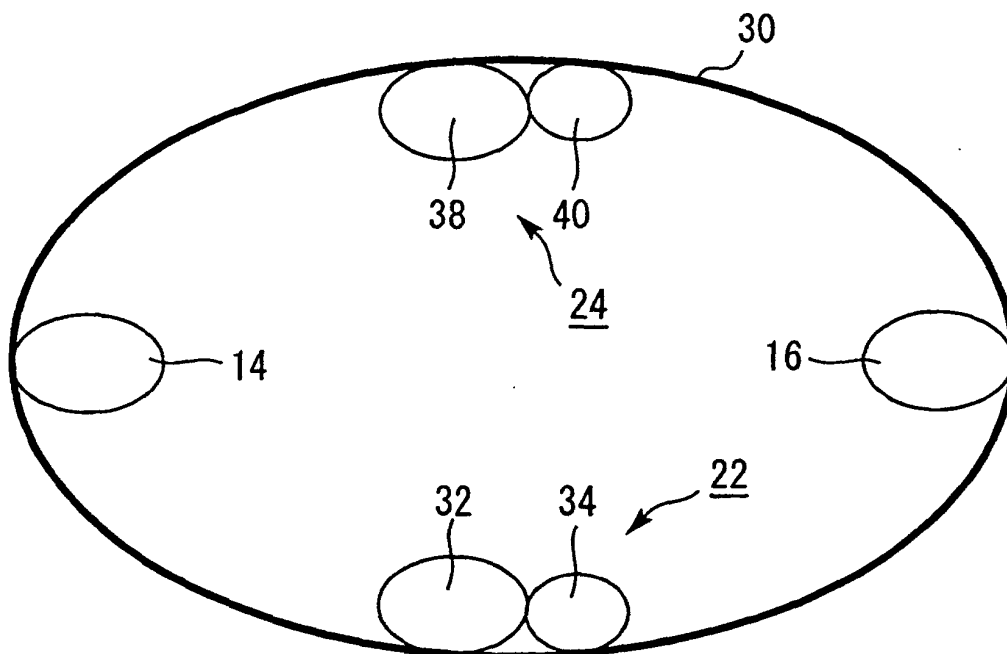


Fig. 4

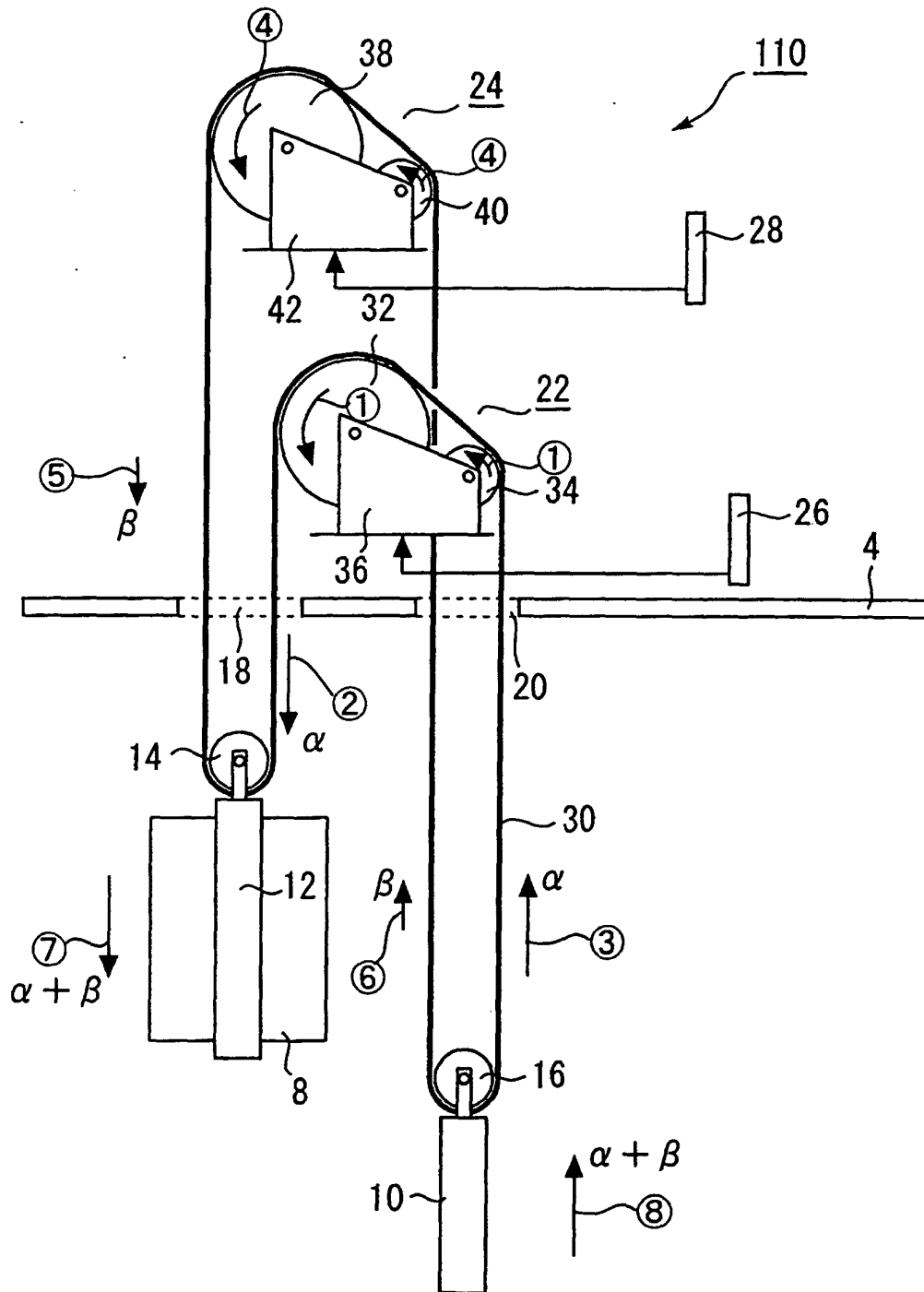
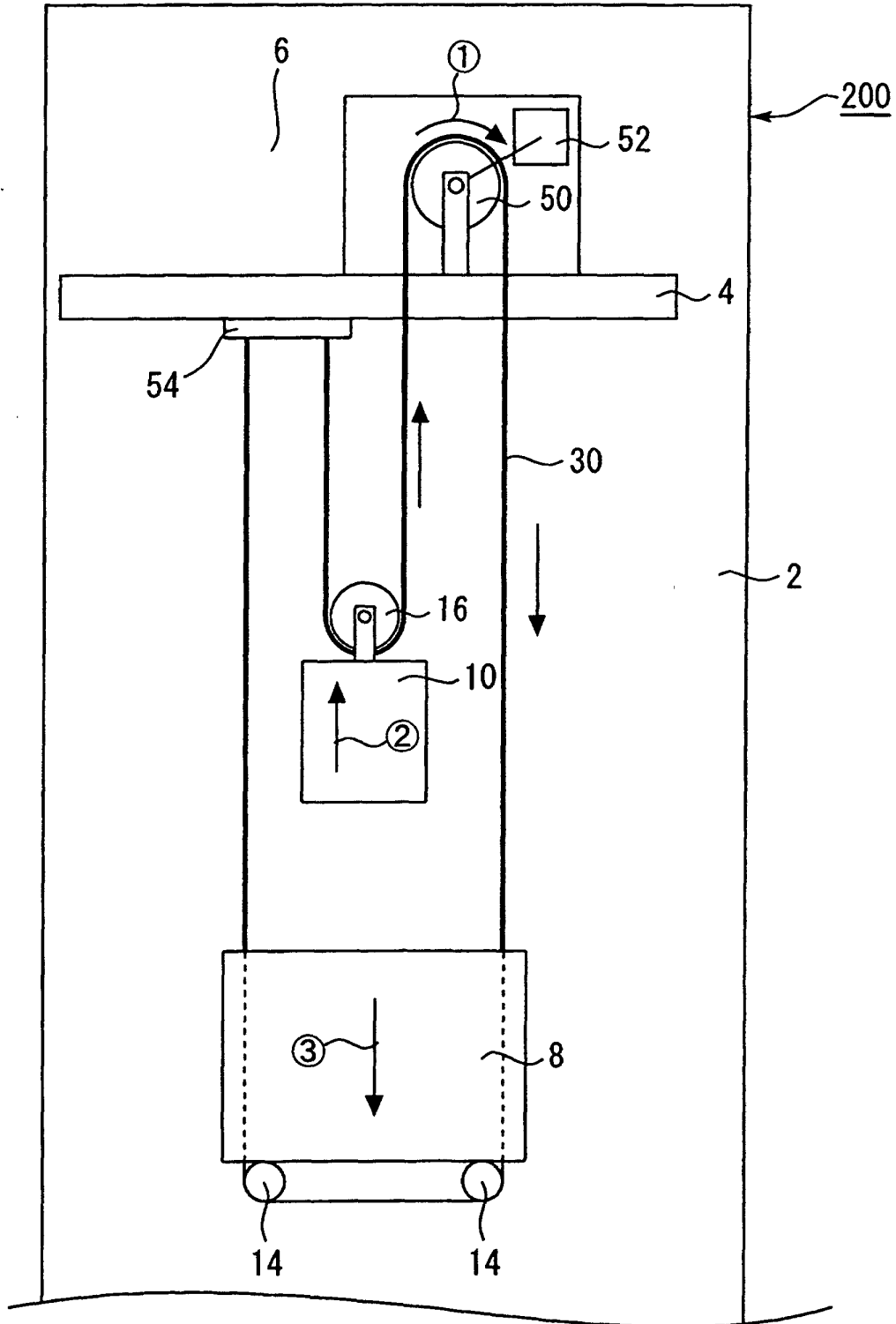


Fig. 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP02/04360

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 1996-2003 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.
X A	JP 84029 C (Nippon Erebeta Seizo Kabushiki Kaisha), 07 November, 1929 (07.11.29), (Family: none)	1-2 3
X A	JP 7-42063 B2 (Mitsubishi Electric Corp.), 10 May, 1995 (10.05.95), & JP 6-64863 A	1-2 3
A	JP 10-324476 A (Toshiba Corp.), 08 December, 1998 (08.12.98), (Family: none)	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 29 January, 2003 (29.01.03)		Date of mailing of the international search report 12 February, 2003 (12.02.03)
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