

ELEVATOR UNIT AND METHOD OF FABRICATING THE SAME

Background of the InventionField of the Invention

5 The invention relates to an elevator unit and a method of fabricating the same, wherein an elevating track of a counter weight (balance weight) is arranged behind an elevating track of a cage unit, and wherein a rope-guiding mechanism for guiding a rope to move up and down the cage unit and the counter weight
10 respectively is improved.

Description of the related art

 An elevator unit, wherein an elevating track of a counter weight is arranged not in a lateral area of but behind (in a rear area of) an elevating track of a cage unit, has been described
15 in Japanese Patent Laid-Open No.9-156855. Figs.3 and 4 are substantially the same as Figs.1 and 10 in the publication.

 In the elevator unit shown in Fig.3, an elevating track of a counter weight 152 is arranged behind an elevating track of a cage unit 154.

20 Similarly, in the elevator unit shown in Fig.4, an elevating track of a counter weight 152 is arranged behind an elevating track of a cage unit 154. In the case, because of sheaves 163 and 165, the cage unit 154 can be moved up and down according to a center-of-gravity manner.

25 However, in the case shown in Fig.3, beams 119 and 119a, which support a thin-type hoisting device 149, have to be provided at an upper portion of a hoistway. Thus, construction work may be increased.

 Similarly, in the case shown in Fig.4, beams 119 and 119a, which support a thin-type hoisting device 149, have to be provided
30 at an upper portion of a hoistway. In addition, in the case, the sheave 163 has to be supported by a ceiling of the hoistway, and the sheave 165 has to be fixed to a pit. Furthermore, a rope 125 has to have a length extending between the sheaves 163 and 165.

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Summary of the Invention

 The present invention has been made in view of the foregoing



circumstances. Therefore, the object of this invention is to provide an elevator unit and a method of fabricating the same, wherein an elevating track of a counter weight is arranged behind an elevating track of a cage unit, wherein a load of construction
5 work to form a hoistway or the like is not increased, and wherein a rope to move up and down the cage unit and the counter weight respectively is smoothly guided.

To achieve the above object, this invention is characterized by following features. That is, this invention is
10 an elevator unit comprising: a cage unit configured to be moved up and down in a hoistway; a flat thin-type hoisting device arranged in the hoistway in such a manner that the flat thin-type hoisting device does not interfere with an elevating track of the cage unit; a first sheave and a second sheave arranged in
15 the hoistway in such a manner that each of the first sheave and the second sheave does not interfere with the elevating track of the cage unit; a counter weight arranged behind the elevating track of the cage unit, configured to be moved up and down in the hoistway; a rope wound around the thin-type hoisting device,
20 around the first sheave and around the second sheave, said cage unit being suspended by a first end portion of said rope and said counter weight being suspended by a second end portion of said rope; and a supporting structure that supports the thin-type hoisting device, the first sheave and the second sheave, provided
25 at an upper end portion of a counter-weight guide rail for guiding the counter weight.

According to the feature, the supporting structure that supports the thin-type hoisting device, the first sheave and the second sheave, is supported by the counter-weight guide rail.
30 Thus, a load of construction work to form the hoistway or the like is not increased. In addition, the rope for controlling to move up and down the cage unit and the counter weight respectively is smoothly guided.

Preferably, the thin-type hoisting device is arranged in
35 a vertical plane, and the supporting structure supports both an upper portion and a lower portion of the thin-type hoisting device.

In addition, preferably, the first sheave and the second sheave are arranged in respective vertical planes, and the first sheave and the second sheave are substantially perpendicular to each other.

5 In addition, preferably, the first sheave and the thin-type hoisting device are arranged in a same plane.

Furthermore, preferably, the supporting structure is provided with a rope hitch that fixes the second end portion of the rope.

10 In addition, this invention is characterized by following features. That is, this invention is a method of fabricating an elevator unit comprising: a cage unit configured to be moved up and down in a hoistway; a flat thin-type hoisting device arranged in the hoistway in such a manner that the flat thin-type hoisting
15 device does not interfere with an elevating track of the cage unit; a first sheave and a second sheave arranged in the hoistway in such a manner that each of the first sheave and the second sheave does not interfere with the elevating track of the cage unit; a counter weight arranged behind the elevating track of
20 the cage unit, configured to be moved up and down in the hoistway; a rope wound around the thin-type hoisting device, around the first sheave and around the second sheave, said cage unit being suspended by a first end portion of said rope and said counter weight being suspended by a second end portion of said rope; and
25 a supporting structure that supports the thin-type hoisting device, the first sheave and the second sheave, provided at an upper end portion of a counter-weight guide rail for guiding the counter weight; the method comprising the steps of:

supporting the thin-type hoisting device, the first sheave
30 and the second sheave by means of the supporting structure to form a frame unit, and

mounting the frame unit on the upper end portion of the counter-weight guide rail.

According to the feature, after forming the frame unit,
35 the frame unit may be mounted on the upper end portion of the counter-weight guide rail. Thus, the thin-type hoisting device, the first sheave and the second sheave may be installed in the

hoistway extremely easily.

Brief Description of the Drawings

Fig.1 is a schematic perspective view of an embodiment of
5 an elevator unit according to the invention;

Fig.2 is an enlarged perspective view of the elevator unit
shown in Fig.1;

Fig.3 is a schematic perspective view of a conventional
elevator unit; and

10 Fig.4 is a schematic perspective view of another
conventional elevator unit.

Best Mode for Carrying out the Invention

An embodiment of the invention is explained in more detail
15 with reference to the drawings.

Fig.1 schematically shows a perspective view of an
embodiment of an elevator unit according to the invention. Fig.2
shows an enlarged perspective view of a main part of the elevator
unit. As shown in Figs.1 and 2, a pair of cage-unit guide rails
20 2a, 2b is provided in a hoistway. A cage unit 4 is adapted to
be moved up and down along the pair of cage-unit guide rails 2a,
2b. A pair of counter-weight guide rails 1a, 1b is provided behind
the cage unit 4, that is, behind an elevating track of the cage
unit 4. A counter weight 3 is adapted to be moved up and down
25 along the pair of counter-weight guide rails 1a, 1b. A rope 5
is wound around a flat thin-type hoisting device 11. The cage
unit 4 is suspended by one end portion of the rope 5, and the
counter weight 3 is suspended by the other end portion of the
rope 5. Thus, when the thin-type hoisting device 11 is driven
30 to rotate, the cage unit 4 and the counter weight 3 are vertically
moved in opposite directions via the rope 5, respectively. A
driving system including the thin-type hoisting device 11 is
incorporated in a frame unit 30. The frame unit 30 has a
supporting structure 20, which is mounted on an upper end portion
35 of the pair of counter-weight guide rails 1a, 1b.

The supporting structure 20 supports the flat thin-type
hoisting device 11, a first sheave 12 and a second sheave 13 in

such a manner that each of the components 11, 12 and 13 does not interfere with the elevating track of the cage unit 4 and that each of the components 11, 12 and 13 is disposed between the elevating track of the cage unit 4 and a wall of the hoistway.

5 In the case, the supporting structure 20 includes: bracket members 21a, 21b mounted on upper ends of the counter-weight guide rails 1a, 1b respectively; two piled lateral beams 22u, 22d (22) placed on the bracket members 21a, 21b; vertical members 23a, 23b mounted on the two piled lateral beams 22u, 22d and extending
10 in the same directions as the counter-weight guide rails 1a, 1b, respectively; and a substantially horizontal top beam 24 mounted on the vertical members 23a, 23b.

 A substantially horizontal beam 25 links the top beam 24 to a bracket member 2k mounted on one cage-unit guide rail 2a.
15 The other cage-unit guide rail 2b is disposed in a substantially symmetric position of the one cage-unit guide rail 2a with respect to the elevating track of the cage unit 4.

 The thin-type hoisting device 11 of the embodiment is arranged in a vertical plane, so that a rotational axis of the
20 thin-type hoisting device 11 is horizontal. An upper portion of the thin-type hoisting device 11 is fixed to the top beam 24. A lower portion of the thin-type hoisting device 11 is fixed to the upper lateral beam 22u.

 The first sheave 12 is supported vertically, that is, in
25 a vertical plane, by a sheave bracket 26 that is fixed between the upper lateral beam 22u and the lower lateral beam 22d, so that a rotational axis of the first sheave 12 is horizontal.

 As shown in Fig.2, each of the upper lateral beam 22u and the lower lateral beam 22d is mainly formed by two opposite
30 C-shaped beam members in order to form a hollow space in which the first sheave 12 is rotatably contained and through which the rope 5 can pass. Thus, the first sheave 12 may be removed easily by taking off the sheave bracket 26.

 In the case, the first sheave 12 and the thin-type hoisting
35 device 11 are arranged in substantially the same plane. In addition, a circumferential surface of the first sheave 12 on a side of the second cage-unit guide rail 2b is disposed

substantially just below a circumferential surface of the thin-type hoisting device 11 on a side of the beam 25 (on a side of the first cage-unit guide rail 2a).

The second sheave 13 is supported vertically, that is, in a vertical plane, by a sheave bracket 27 that is fixed to the beam 25, so that a rotational axis of the second sheave 13 is horizontal. A circumferential surface of the second sheave 13 on a side of the counter-weight is disposed substantially just above a circumferential surface of the first sheave 12 on a side of the beam 25. In the case, the vertical member 23a is arranged substantially just above the circumferential surface the first sheave 12 on the side of the beam 25. Thus, the vertical member 23a is mainly formed by two opposite C-shaped beam members in order to form a hollow space in which a rearmost portion of the second sheave 13 is rotatably contained and through which the rope 5 can pass. In addition, the first sheave 12 and the second sheave 13 are perpendicular to each other.

The vertical member 23a may be formed by hat-shaped beam members, instead of the C-shaped beam members. On the other hand, the vertical member 23b may be formed by any easy manner through the wall of the hoistway. For example, the vertical member 23b may be formed by an H-shaped member.

A rope hitch 28 is mounted below the thin-type hoisting device 11 and between the upper lateral beam 22u and the lower lateral beam 22d, in order to fix the other end portion of the rope 5 suspending the counter weight 3.

The counter weight 3, which can be moved up and down along the pair of counter-weight guide rails 1a and 1b, has a counter-weight sheave 3a at an upper central portion thereof.

Base sheaves 4a and 4b are provided at a base portion of the cage unit 4. A line linking the base sheaves 4a and 4b passes just below a center of gravity of the cage unit 4.

A rope hitch 2h is attached to a portion of the cage-unit guide rail 2b at substantially the same height as the thin-type hoisting device 11, in order to fix the one end portion of the rope 5 suspending the cage unit 4. Herein, the rope hitch 2h could be attached to any other suitable portion.

Then, when the above frame unit 30 is employed, the rope 5 for controlling to move up and down the cage unit 4 and the counter weight 3 respectively runs from the rope hitch 28, around the counter-weight sheave 3a, around the thin-type hoisting device 11, around the first sheave 12, then twisted through about 90 degree, around the second sheave 13, more twisted, around the base sheaves 4a and 4b of the cage unit 4, and to the rope hitch 2h.

Then, an operation of the embodiment is explained.

10 The thin-type hoisting device 11 is driven to roll up the rope 5 in a predetermined direction. For example, when the rope 5 is moved in a direction A shown in Fig.2, the cage-unit 4 is moved up and the counter weight 3 is moved down. When the rope 5 is moved in the opposite direction B shown in Fig.2, the cage-unit 4 is moved down and the counter weight 3 is moved up. Herein, since the line linking the base sheaves 4a and 4b passes just below the center of gravity of the cage unit 4, the center-of-gravity hoisting for the cage unit 4 is achieved. Thus, the cage unit 4 can be moved up and down stably.

20 According to the above embodiment, the supporting structure 20 that supports the thin-type hoisting device 11, the first sheave 12 and the second sheave 13, is supported by the pair of counter-weight guide rails 1a and 1b. Thus, a load of construction work to form the hoistway or the like is not increased. In addition, the rope 5 for controlling to move up and down the cage unit 4 and the counter weight 3 respectively can be smoothly guided.

In addition, a length of the rope 5 is not so long. Thus, no measures are necessary to prevent the rope 5 from swinging.

30 Furthermore, the above embodiment is a roping-type of 2:1. Then, the thin-type hoisting device 11 has only small capacity and occupies only small space in the hoistway.

In addition, since the rope hitch 28 is disposed below the hoisting device 11, arrangement balance of the rope 5 through the counter-weight sheave 3a is superior. The full width of the counter weight 3 can be also used effectively. However, the rope hitch 28 may be supported by the counter-weight guide rail 1b.

Herein, when the elevator unit shown in Figs.1 and 2 is fabricated, at first, the frame unit 30 is formed by supporting the thin-type hoisting device 11, the first sheave 12 and the second shave 13 by means of the supporting structure 20. Then,
5 the frame unit 30 is mounted on the upper end portion of the pair of counter-weight guide rails 1a and 1b. In the case, preferably, the frame unit 30 is just on the pair of counter-weight guide rails 1a and 1b. Therefore, the thin-type hoisting device 11, the first sheave 12 and the second shave 13 may be installed in
10 the hoistway extremely easily and efficiently.

However, the supporting structure 20, the hoisting device 11 or the like can be mounted in turn on the upper end portion of the pair of counter-weight guide rails 1a and 1b. Such a fabricating method of the elevator unit is explained.

15 At first, the bracket members 21a and 21b are mounted on the top portion of the pair of counter-weight guide rails 1a and 1b. Then, the two piled lateral beams 22 in which the first sheave 12 and the rope hitch 28 have been incorporated is placed on the bracket members 21a and 21b.

20 After that, the vertical members 23a and 23b and the thin-type hoisting device 11 are installed on the two piled lateral beams 22. Then, the top beam 24 is installed to fix the vertical members 23a and 23b and the thin-type hoisting device 11.

25 Then, the bracket 2k is mounted on the upper portion of the cage-unit guide rail 2a, and the beam 25 is installed. Finally, the second sheave 13 is supported by means of the sheave bracket 27.

30 According to the invention, the supporting structure that supports the thin-type hoisting device, the first sheave and the second sheave, is supported by the counter-weight guide rail. Thus, a load of construction work to form the hoistway or the like is not increased. In addition, the rope for controlling to
35 move up and down the cage unit and the counter weight respectively is smoothly guided.

In addition, according to the invention, after forming the

frame unit, the frame unit may be mounted on the upper end portion of the counter-weight guide rail. Thus, the thin-type hoisting device, the first sheave and the second shave may be installed in the hoistway extremely easily.

What is claimed is:

1. An elevator unit comprising;
a cage unit configured to be moved up and down in a hoistway,
a flat thin-type hoisting device arranged in the hoistway
in such a manner that the flat thin-type hoisting device does
not interfere with an elevating track of the cage unit,
a first sheave and a second sheave arranged in the hoistway
in such a manner that each of the first sheave and the second
sheave does not interfere with the elevating track of the cage
unit,
a counter weight arranged behind the elevating track of
the cage unit, configured to be moved up and down in the hoistway,
a rope wound around the thin-type hoisting device, around
the first sheave and around the second sheave, said cage unit
being suspended by a first end portion of said rope and said
counter weight being suspended by a second end portion of said
rope, and
a supporting structure that supports the thin-type
hoisting device, the first sheave and the second sheave, provided
at an upper end portion of a counter-weight guide rail for guiding
the counter weight.
2. An elevator unit according to claim 1, wherein:
the thin-type hoisting device is arranged in a vertical
plane, and
the supporting structure supports both an upper portion
and a lower portion of the thin-type hoisting device.
3. An elevator unit according to claim 2, wherein:
the first sheave and the second sheave are arranged in
respective vertical planes, and
the first sheave and the second sheave are substantially
perpendicular to each other.
4. An elevator unit according to claim 3, wherein:--

the first sheave and the thin-type hoisting device are arranged in a same plane.

5. An elevator unit according to claim 4, wherein:
the supporting structure is provided with a rope hitch that fixes the second end portion of the rope.

6. A method of fabricating an elevator unit comprising: a cage unit configured to be moved up and down in a hoistway; a flat thin-type hoisting device arranged in the hoistway in such a manner that the flat thin-type hoisting device does not interfere with an elevating track of the cage unit; a first sheave and a second sheave arranged in the hoistway in such a manner that each of the first sheave and the second sheave does not interfere with the elevating track of the cage unit; a counter weight arranged behind the elevating track of the cage unit, configured to be moved up and down in the hoistway; a rope wound around the thin-type hoisting device, around the first sheave and around the second sheave, said cage unit being suspended by a first end portion of said rope and said counter weight being suspended by a second end portion of said rope; and a supporting structure that supports the thin-type hoisting device, the first sheave and the second sheave, provided at an upper end portion of a counter-weight guide rail for guiding the counter weight; the method comprising the steps of:

supporting the thin-type hoisting device, the first sheave and the second sheave by means of the supporting structure to form a frame unit, and

mounting the frame unit on the upper end portion of the counter-weight guide rail.