

DESCRIPTION

Title of Invention: ELEVATOR APPARATUS

Technical Field

5 [0001]

The present invention relates to an elevator apparatus.

Background Art

[0002]

10 An elevator apparatus includes a mechanical limit switch as one safety device that detects a riding car exceeding an ordinary operation range at a terminal floor. Such a mechanical limit switch is disposed on a hoistway near a lower terminal floor and near an upper terminal
15 floor. On the riding car side, a cam is disposed having a longitudinal direction in an up/down direction of the riding car, and configured such that when the riding car enters an area exceeding the ordinary operation range, the cam of the riding car contacts the limit switch on the
20 hoistway to turn ON, and in response to this, for example, a braking device performs braking on the riding car or electric power supply to a main circuit of a power converter that supplies electric power to a hoisting machine is cut off, so as to stop the riding car.

25 [0003]

An example of the elevator apparatus that includes the mechanical limit switch is disclosed in, for example, PTL 1. PTL 1 discloses an elevator that includes an operation member disposed on a car, a position detection
5 switch, and a control panel. The position detection switch is disposed on a hoistway so as to be operated with the operation member when the car moves to a car-ridable position. The control panel is configured to perform switching between a car-riding mode and an ordinary
10 operation mode. In the car-top riding mode, a signal from the position detection switch is received after moving the car toward the car-top riding allowing position, thus stopping the car.

Citation List

15 Patent Literature

[0004]

PTL 1: Japanese Patent Application Laid-Open No. Hei
09-286575

Summary of Invention

20 Technical Problem

[0005]

However, in the above-described one disclosed in PTL 1, the cam disposed on the riding car side is required to be configured relatively large in length dimension because
25 the limit switch is required to be kept in an acting state

over a maximum distance where the riding car can further move exceeding the terminal floor, thus generating a problem such as weight increase and cost increase.

[0006]

5 In consideration of the above-described circumstances, it is an object of the present invention to provide an elevator apparatus that includes a safety device where increases in dimension in an up/down direction and weight of a riding car are suppressed.

10 Solution to Problem

[0007]

 To achieve the above-described object, the elevator apparatus according to the present invention includes a limit switch disposed near an upper and/or a lower
15 terminal floor of a hoistway, and an operation member disposed on a riding car to operate the limit switch. When the operation member contacts the limit switch, the riding car is detected to exceed an ordinary operation range, and an operation of a hoisting machine is stopped
20 to stop hoisting of the riding car. The operation member utilizes a constituting member of the riding car.

Advantageous Effects of Invention

[0008]

 The present invention can provide the elevator
25 apparatus that includes the safety device where increases

in dimension in the up/down direction and weight of the riding car are suppressed.

[0009]

Problems, configurations, and effects other than
5 ones described above will be made apparent from the following description of embodiments.

Brief Description of Drawings

[0010]

Figure 1 is a schematic diagram illustrating an
10 exemplary elevator apparatus according to the present invention.

Figure 2 is a side view illustrating a riding car 1 of Figure 1 and its periphery.

Figure 3 is a top view illustrating the riding car 1
15 of Figure 1 and its periphery.

Description of Embodiments

[0011]

The following describes an elevator apparatus according to the present invention with reference to
20 Figure 1 to Figure 3.

[0012]

Figure 1 is a schematic diagram illustrating an exemplary elevator apparatus according to the present invention. As illustrated in Figure 1, an elevator
25 apparatus 100 according to the present invention includes

a riding car 1 and a counterweight 20 disposed on a hoistway 10, a rope (main rope) 16 that couples the riding car 1 to the counterweight 20, and a hoisting machine 4 to drive the rope 16. The elevator apparatus 100 illustrated in Figure 1 is that of a traction method, and configured such that the hoisting machine 4 frictionally drives the rope 16 (traction rope) wound around a rope pulley (traction sheave) 4a, thus moving up and down the riding car 1 and the counterweight 20 via pulleys 12 and 25.

10 [0013]

Figure 2 is a side view illustrating the riding car 1 of Figure 1 and its periphery, and Figure 3 is a top view illustrating the riding car 1 of Figure 1 and its periphery. As illustrated in Figure 2 and Figure 3, the hoistway 10 further includes a car guide rail 2 to guide the riding car 1, a counterweight guide rail 3 to guide the counterweight, a control panel 5, a position detection device 6, and a governor 7. The riding car 1 has a car-top where a car-top handrail 8 is disposed.

20 [0014]

The car guide rail 2 is secured to a wall surface of the hoistway 10 via a rail bracket 11. The riding car 1 slidably engages with the car guide rail 2, and moves up and down inside the hoistway 10 while guided by the car guide rail 2.

25

[0015]

The counterweight guide rail 3 is secured to the wall surface of the hoistway 10. The counterweight 20 (not illustrated in Figure 2 and Figure 3) slidably
5 engages with the counterweight guide rail 3, and moves up and down inside the hoistway 10 while guided by the counterweight guide rail 3. The direction in which the riding car 1 and the counterweight 20 move up and down is defined as an up/down direction. That is, the guide rails
10 2 and 3 guide the riding car 1 and the counterweight 20 in the up/down direction, respectively.

[0016]

The rope 16 has an intermediate position wound around the car-bottom pulley 12 disposed on a bottom of
15 the riding car 1, and an end portion coupled to a rope end beam port 13 disposed on an upper portion of the hoistway 10, thus hanging the riding car 1.

[0017]

The hoisting machine 4 is disposed at an
20 intermediate position of the hoistway 10, and the rope 16 hanging the riding car 1 and the counterweight 20 is wound around the traction sheave 4a. This hoisting machine 4 frictionally drives the rope 16 by the rotation of the traction sheave 4a, thus moving the riding car 1 and the
25 counterweight 20 up and down.

[0018]

The control panel 5 is disposed at the intermediate position of the hoistway 10, and integrally controls the hoisting machine 4, a safety device, and the like of the
5 elevator apparatus.

[0019]

The position detection device 6 includes blocking plates 14 disposed at positions corresponding to respective floors of the hoistway 10, and a PosiTector 15
10 mounted to the riding car 1 and opposable to the blocking plates 14. The position detection device 6 is configured such that the blocking plates 14 are opposed to the PosiTector 15 to detect the position of the riding car 1.

[0020]

15 The governor 7 detects an up/down speed of the riding car 1, and makes an emergency stop of the riding car 1 when the riding car 1 exceeds a rated speed to reach a predetermined overspeed.

[0021]

20 The car-top handrail 8 is that of a fixed-type disposed along an outer periphery of a top surface of the riding car 1, and ensures safety when a maintenance personnel rides on the car top of the riding car 1 for a maintenance work. The car-top handrail 8 includes a
25 plurality of vertical frames 8a, 8b, 8c, and 8d extending

in the up/down direction of the riding car 1 and a horizontal frame 8e disposed across the plurality of vertical frames 8a to 8d.

[0022]

5 Then, the elevator apparatus 100 according to the present invention includes, as a safety device, a mechanical limit switch 21 that detects the riding car 1 exceeding an ordinary operation range at a terminal floor, and an operation member 24 that is disposed on the riding
10 car 1 and operates this limit switch 21. Figure 2 and Figure 3 illustrate the upper final limit switch 21 as the limit switch. The upper final limit switch 21 is disposed near an upper terminal floor of the hoistway 10, and configured to cut off electric power supply to a main
15 circuit of a power converter, which supplies electric power to the hoisting machine 4, corresponding to the operation so as not to allow the operation (rise) of the riding car 1.

[0023]

20 The upper final limit switch 21 is mounted to one end of a limit switch bracket 22, while the other end of the limit switch bracket 22 is fastened together with the car guide rail 2 with the rail bracket 11 and secured to the wall surface of the hoistway 10. While the
25 illustration is omitted, a lower final limit switch is

similarly disposed near a lower terminal floor of the hoistway 10. The lower final limit switch cut off electric power supply to the main circuit of the power converter, which supplies electric power to the hoisting machine 4, corresponding to the operation.

[0024]

In Figure 2, the operation member 24 includes the vertical frame 8a of the car-top handrail 8 disposed at a position opposable to the upper final limit switch 21, and a car-bottom operation cam 23 disposed on the bottom of the riding car 1. The car-bottom operation cam 23 is disposed at a position opposable to the lower final limit switch (not illustrated). The vertical frame 8a has an even flat surface along the up/down direction of the riding car 1 such that the upper final limit switch 21 can slide when the vertical frame 8a contacts the upper final limit switch 21.

[0025]

As described above, the elevator apparatus 100 according to the present invention uses a constituting member (in this embodiment, the car-top handrail) of the riding car 1 as the operation member to activate the final limit switch. This configuration can provide the elevator apparatus that includes a safety device where increases in dimension in the up/down direction and weight of the

riding car are suppressed. The shape of the limit switch is not specifically limited, but conventional shapes are applicable.

[0026]

5 Next, the behavior of the upper final limit switch 21 will be described.

[0027]

 When the riding car 1 passes (too rises from) a regular stop position of a top floor as the ordinary
10 operation range by a predetermined distance due to any abnormality, the vertical frame 8a of the car-top handrail 8 contacts the upper final limit switch 21 to turn ON, and the upper final limit switch 21 outputs a switch signal to the control panel 5. The control panel 5 that has
15 received this output cuts off the electric power supply to the main circuit of the power converter, which supplies the electric power to the hoisting machine 4, to stop the riding car 1.

[0028]

20 There is a time lag between when the vertical frame 8a of the car-top handrail 8 contacts the upper final limit switch 21 to turn ON and when the riding car 1 actually stops. Accordingly, after the vertical frame 8a contacts the upper final limit switch 21, the riding car 1
25 further rises. However, in this time period, the upper

final limit switch 21 slides the surface of the vertical frame 8a, thus keeping the ON state of the upper final limit switch 21.

[0029]

5 Meanwhile, when the riding car 1 passes (too falls from) a regular stop position of a bottom floor by a predetermined distance due to any abnormality, the car-bottom operation cam 23 contacts lower final limit switch (not illustrated) to turn ON, and the lower final limit
10 switch outputs a switch signal to the control panel 5. The control panel 5 that has received this output cuts off the electric power supply to the main circuit of the power converter, which supplies the electric power to the hoisting machine 4, to stop the riding car 1.

15 [0030]

As disclosed in above-described PTL 1, conventionally, the operation member that contacts the upper final limit switch and the operation member that contacts the lower final limit switch are integrally
20 formed and mounted to the riding car. This is because forming the operation member as one member is advantageous in fabrication and cost compared with the operation member divided into two.

[0031]

25 Meanwhile, in this embodiment, as described above,

the constituting member (the member of a part of the car-top handrail 8 for maintenance, that is, the vertical frame 8a) of the riding car 1 is used as the operation member to operate the upper final limit switch 21, and
5 this eliminates the need for disposing the operation member to operate the upper final limit switch 21. Thus, the weight reduction of the riding car is ensured compared with the case where the operation member integrally includes the operation member that contacts the upper
10 final limit switch and the operation member that contacts the lower final limit switch is disposed as disclosed in PTL 1.

[0032]

As described above, since the riding car 1 continues
15 rising/falling after the operation member contacts the final limit switch, the final limit switch is required to keep contacting the final limit switch during this period. However, the vertical frame 8a of the car-top handrail 8 is a member preliminarily having a predetermined height
20 dimension for ensuring safety in the maintenance. Thus the vertical frame 8a has a sufficient dimension for keeping the activated state of the upper final limit switch 21 over a maximum distance where the riding car 1 is allowed to further rise passing the terminal floor and.
25 This eliminates the need for disposing an operation member

further longer than the vertical frame 8a, thus ensuring reduction of an overhead dimension of the riding car 1. That is, the increase in dimension in the up/down direction of the riding car 1 can be suppressed.

5 [0033]

While the vertical frame 8a of the car-top handrail 8 is used as the constituting member of the riding car 1 that serves as the operation member to operate the upper final limit switch 21 in the above-described embodiment, 10 the configuration is not limited to this. The constituting member of the riding car 1 is only necessary to have a configuration where the constituting member contacts the final limit switch 21 and is slidable in the rise direction of the riding car 1. Not limited to the 15 operation member to operate the upper final limit switch 21, the car-bottom operation cam 23 of Figure 2 may be configured using the constituting member of the riding car 1.

[0034]

20 As described above, it has been found that, with the elevator apparatus according to the present invention, the elevator apparatus that includes the safety device where increases in dimension in the up/down direction and weight of the riding car are suppressed can be provided.

25 [0035]

The elevator apparatus according to the present invention is not limited to the above-described embodiment. Various modifications can be made without departing from the scope of the gist of the present invention described
5 in claims.

[0036]

For example, in the above-described embodiment, the limit switch operated by the vertical frame 8a of the car-top handrail 8 is only the upper final limit switch 21
10 that is disposed near the upper terminal floor of the hoistway 10 and cuts off the electric power supply to the main circuit of the power converter, which supplies the electric power to the hoisting machine 4, corresponding to the operation. However, the present invention is not
15 limited to this but applicable to one that includes a plurality of limit switches near the terminal floor.

[0037]

That is, in an elevator apparatus that includes a limit switch that operates when the riding car 1 passes
20 the regular stop position of the terminal floor by the predetermined distance and a final limit switch that operates when the riding car 1 further exceeds this predetermined distance by a certain distance, the limit switch and the final limit switch may be each operation by
25 the vertical frame 8a of the car-top handrail 8.

[0038]

The present invention is not limited to the elevator apparatus of a machine room less type. Since an elevator apparatus with a machine room has the identical
5 configuration, the present invention is applicable to the elevator apparatus with the machine room similarly to the elevator apparatus of the machine room less type.

Reference Signs List

[0039]

- 10 1...riding car,
- 2...car guide rail,
- 3...counterweight guide rail,
- 4...hoisting machine,
- 4a...rope pulley (traction sheave),
- 15 5...control panel,
- 6...position detection device,
- 7...governor,
- 8...car-top handrail,
- 8a, 8b, 8c, 8d...vertical frame,
- 20 8e...horizontal frame,
- 10...hoistway,
- 11...rail bracket,
- 12...car-bottom pulley,
- 13...rope end beam port,
- 25 14...blocking plate,

15...PosiTector,
16...rope,
20...counterweight,
21...upper final limit switch,
5 22...limit switch bracket,
23...car-bottom operation cam,
24...operation member,
25...counterweight pulley,
100...elevator apparatus

CLAIMS

[Claim 1]

An elevator apparatus comprising:

a riding car disposed on a hoistway;

5 a counterweight;

a rope coupled to the riding car and the
counterweight;

a hoisting machine that drives the rope;

a limit switch disposed near an upper and/or a lower
10 terminal floor of the hoistway; and

an operation member disposed on the riding car to
operate the limit switch,

wherein when the operation member contacts the limit
switch, the riding car is detected to exceed an ordinary
15 operation range, and an operation of the hoisting machine
is stopped to stop hoisting of the riding car, and

the operation member utilizes a constituting member
of the riding car, wherein the constituting member of the
riding car is a car-top handrail disposed on a top portion
20 of the riding car,

the car-top handrail includes a plurality of
vertical frames extending in an up/down direction of the
riding car and a horizontal frame disposed across the
plurality of vertical frames, and

25 among the plurality of vertical frames, a vertical

frame disposed at a position opposing the limit switch constitutes the operation member.

[Claim 2]

5 The elevator apparatus according to claim 1,
 wherein the vertical frame constituting the
operation member has a flat surface along the up/down
direction of the riding car, and the surface contacts the
limit switch.

[Claim 3]

10 The elevator apparatus according to claim 1,
 wherein the limit switch is disposed near the upper
terminal floor of the hoistway.