

TITLE OF THE INVENTION

ELEVATOR APPARATUS

BACKGROUND OF THE INVENTION

5 FIELD OF INDUSTRIAL APPLICATION

The present invention relates to an elevator apparatus and, more particularly, to an elevator apparatus having a safeties device.

10 DESCRIPTION OF PRIOR ARTS

A conventional safeties device in an elevator apparatus is fixed to the bottom portion of a car frame, supporting a car, facing and projecting toward a guide rail as disclosed in Japanese Utility Model Application Laid-Open No.50-11249
15 (1975) or Japanese Utility Model Publication No.49-36192 (1974).

In the safeties device described above, since the projecting portion receives a large braking load and bears a large bending moment at emergency stop, it is required to
20 have a sufficient bending rigidity against the braking load acting on the projecting portion and to thicken the reinforcing member composing the safeties device, which leads to a problem to make the overall weight of the safeties device heavy. Especially in a large scale ultra-
25 high speed elevator apparatus, there is a problem that the ratio of the weight of a safeties device to the total weight of a car becomes large.



SUMMARY OF THE INVENTION

An object of the present invention is to provide an elevator apparatus having a light-weight safeties device.

In order to attain the above object, according to the present invention, there is provided an elevator apparatus comprising a car traveling upward and downward along a pair of guide rails installed vertically, a safeties device arranged in facing to the guide rail being fixed to a car frame supporting a cab of the car through a platform frame, wherein a reaction force supporting member is provided in the upper portion of the safeties device, the reaction force supporting member being fixed to the car frame, the safeties device being supported by the reaction force supporting member.

According to the construction described above, since the safeties device is supported by the reaction force supporting member fixed to the car frame, it is possible that most of the braking load acting at emergency stop is received with the reaction force supporting member and the braking load is dispersed to the car frame through the reaction force supporting member. As the result, the thickness of the reinforcing member composing the safeties device can be made thin and consequently the weight of the safeties device can be made light.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG.1 is a front view showing an embodiment of a

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safeties device of an elevator apparatus in accordance with the present invention.

FIG.2 is a cross-sectional view being taken on the plane of the line II-II of FIG.1.

5 FIG.3 is a plan view of FIG.1.

FIG.4 is a conceptual view showing the whole of an elevator apparatus in accordance with the present invention.

FIG.5 is a side view showing a car of an elevator apparatus in accordance with the present invention.

10 FIG.6 is a view equivalent to FIG.2 showing another embodiment of a safeties device of an elevator apparatus in accordance with the present invention.

FIG.7 is a plan view of FIG.6.

15 FIG.8 is a view equivalent to FIG.1 showing a further embodiment of a safeties device of an elevator apparatus in accordance with the present invention.

DESCRIPTION OF EMBODIMENTS

20 An embodiment of a safeties device of an elevator apparatus according to the present invention will be described below, referring to FIG.1 to FIG.5.

As shown in FIG.4 and FIG.5, a car 2 is guided so as to be capable of traveling upward and downward along a pair of guide rails 1 vertically installed. The car 2 is composed of
25 a cab 3 and a car frame 4 supporting the cab. The car frame 4 is formed in a rectangular shape with a crosshead 5 and a plank 6 vertically spacing each other and a pair of upright



frames 7A, 7B linking the crosshead 5 and the plank 6. Each of the crosshead and the plank composing the car frame 4 is composed of a pair of frame members parallel to each other. A platform frame 8 is fixed on the plank 6 composed of the pair of frame members 6A, 6B, and the cab 3 is supported on the platform frame 8 through a vibration insulator 9 such as vibration insulating rubber. On the other hand, a main rope 10 is connected to the crosshead 5 to suspend the car 2.

A governor pulley 11 is arranged in a machine room provided in the upper portion of the hoistway, and an endless governor rope 13 is stretched over the governor pulley and a tension pulley 12 installed in the bottom of the hoistway. An operating lever 14A rotatably supported with a shaft in the side of the car frame 4 is connected to the governor rope 13. A link 14B rotatably supported with a shaft to the car frame 4 is linked to the operating lever 14A. The link 14B extends almost over the length of the width of the crosshead 5, and the top end portions of lifting rods 15A, 15B hung along the upright frames 7A, 7B respectively are pivotally jointed to the both ends of the link. Safeties devices 16 are installed at positions facing each other in the lower end portions of the lifting rods 15A, 15B.

The safeties device 16, as shown in FIG.1 to FIG.3, is supported to the frame member composing the car frame 4 through a reaction force supporting member 17. The reaction force supporting member 17 has a groove 17G (FIG.3) facing to the guide rail 1, and is formed of a thick plate having a



rigidity capable of sufficiently withstanding against the large braking load. The reaction force supporting member 17 made of a thick plate is placed between the frame members 6A, 6B of the plank 6, with its top surface touched the bottom side of the platform frame 8. The both sides of the reaction force supporting member 17 are fixed to the frame members 6A, 6B using screws 21.

The safeties device 16 is supported in the lower portion of the reaction force supporting member 17 fixed as described above. The structure of supporting is as follows. That is, a link member 18 formed of a thin plate is fixed to, using bolt 19, and hung from the bottom surface of the reaction force supporting member 17. A supporting member 20A formed of a thin plate is connected to the hung end of the link member 18 using a bolt 20Ab. The plate thicknesses of the link member 18 and the supporting member 20A are thin because it is sufficient that they have function to support the various parts of the safeties device 16 to be described later.

A member 20B is for protecting a bend portion 15E in the lower portions of the lifting rods 15A, 15B to be described later and a pair of wedges 22 as brake elements, or for use in attaching other members, but not for directly composing the safeties device 16.

The lower ends of the lifting rods 15A, 15B hung are placed between the connecting member 18 and supporting member 20A and the guide rail 1, and in the lower end the bend



portion 15E bending in right angle toward the side of the guide rail 1 is formed. The bend portion 15E has a groove 15G facing to the guide rail 1, and has the pair of wedges 22 in the positions facing to each other in both sides to the guide rail.

The wedge 22 in the side facing to the guide rail is formed parallel to the rail surface, and the wedge in the opposite side is a smooth inclining surface such that its upper portion is inclining to the side of the guide rail 1.

On the inclining surfaces of the pair of wedges 22, 22 there are contacted plural connected rollers 23, 23 which are held with a guide member 24, 24, respectively. The guide members 24, 24 are mounted on the supporting member 20A, and contact to the plural rollers 23 and has an inclining surface parallel to the inclining surface of the wedge 22. The guide member 24 in the opposite side to the roller contact surface is an upright surface. A guide plate 24 for restricting a moving direction of the wedge 22 is provided in the guide member 24.

In the vertical surface side of the guide member 24, 24, there are provided a cover plate 27 and a liner 26 for adjusting the gap between the brake element 22 and the guide rail 1, and the liner 26 and the cover plate 27 are placed inside the portion of both legs of U-shaped elastic object 28. The guide member 24, 24 and the both legs of U-shaped elastic object 28 are jointed with bolts 29, and the both legs of U-shaped elastic object 28 and the cover plate 27



are loosely engaged to the bolts 29. An elastic object 30 such as a spring is mounted between the head portion of the bolt 29 and the both legs of U-shaped elastic object 28 to pull the guide members 24, 24 to the inside direction of the both legs of U-shaped elastic object 28. A concave surface is formed on one of the contact surfaces of the inside of the both legs of U-shaped elastic object 28 and the cover plate, and a convex surface having the same curvature as the concave surface is formed on the other of the contact surfaces so that the surfaces of the wedges 22, 22 facing to the rail surface always become parallel to each other even if the gap between the both legs of U-shaped elastic object 28 is displaced.

Guide pins 31 are projected at the upper end and the lower end of the guide member 24, 24 upward and downward, respectively. At the positions facing to the guide pins 31, there are placed the bending portions 18E formed by bending the upper end and the lower end of the connecting member 18 toward the side of the guide rail 1, and the extension portion extending the supporting member 20A toward the side of the guide rail 1. In the bend portion 18E there is a long hole 32 having a long side in the direction sandwiching the guide rail 1 to be penetrated by the guide pin 31.

A moment supporting member 33 is fixed to the upper portion of the reaction force supporting member 17 in the opposite side of the guide rail 1 with bolts 34, and the both



end portions of the moment supporting member 33 is fixed across to the pair of frame members 6A, 6B of the plank 6 with bolts 35.

5 The operation of the safeties device having the above construction will be described below. When the car 2 runs downward with an abnormal speed above the normal speed by any reason, the governor pulley 11 stops to rotate with detecting the abnormal speed to stop movement of the governor rope 13. As the car 2 continues to run downward after the movement of
10 the governor rope 13 stops, the operating lever 14A is lifted to rotate the link 14B. With rotation of the link 14B, the lifting rods 15A, 15B connected to the link are lifted to move upward the wedges 22 held in the bend portion 15E of the lower end of the lifting rods 15A, 15B. By the movement
15 of the wedges 22, the wedges 22 are pushed between the rail surface of the guide rail 1 and the guide members 24, 24 to forcibly stop the car 2 running downward further.

By the forcible stop of the car 2, as shown in FIG.2, the brake load W_b acts on the reaction force supporting
20 member in the side of the guide rail 1 which receives a large bending moment to the platform frame 8 contacting to the top surface of the reaction force supporting member 17 as a fulcrum P. However, the reaction force supporting member 17 is not deformed since it is constructed with a
25 thick plate having a large bending rigidity and the both sides are fixed to the pair of frame members 6A, 6B. Further, the end of the reaction force supporting member in

the opposite side of the guide rail 1 is placed at a position from the fulcrum P farther than the acting position of the brake load W_b , and the position is fixed to the pair of frame members 6A, 6B through the moment supporting member 33. Therefore, the deformation of the reaction force supporting member 17 can be suppressed by a small reaction force W_r .

As is described above, according to the embodiment, since the brake load W_b acting on the reaction force supporting member 17 can be received by dispersing to the car frame 4, there is no need to form the whole safeties device with thick plates and consequently the weight of the safeties device can be decreased.

On the other hand, with the upward movement of the brake elements 22 with the forcible stop of the car 2, the guide members 24, 24 are displaced in the directions apart from the guide rail 1 by spreading out the both legs of the U-shaped elastic object 28. At that time, the guide members 24, 24 are prevented from falling from the supporting member 20A by the guide pins 31 projected upward and downward and the long holes 32.

Although the moment supporting member 33 in the above embodiment is a rod body having a rectangular cross-section, a member having L-shaped cross-section or U-shaped cross-section formed through bending a plate or of a standard material may be employed since the reaction force acting on the moment supporting member is small as described above.



.FIG.6 and FIG.7 show another embodiment wherein a moment supporting member 37 is connected to the bottom surface of a reaction force supporting member 17 in the opposite side of the guide rail 1 to hang downward, and the hung portion of the moment supporting member 37 is fixed to a pair of frame members 6A, 6B using bolts 38. The other construction is the same as that in the above embodiment, and like parts in the figures are indicated by the same reference characters. With this construction, the same effect as the above embodiment can be attained.

FIG.8 shows a further embodiment wherein a reaction force supporting member 39 is formed by folding a steel plate, and reinforcing members 40 formed by folding a steel plate are properly provided in portions which the brake load or the moment acts on. The other construction is the same as that in the above embodiment, and like parts in the figures are indicated by the same reference characters.

With the construction where rigidity of the reaction force supporting member 39 is kept by folding a steel plate as described above, the weight of the safety device can be further decreased, compared with the aforementioned embodiment in which a thick plate is used for the reaction force supporting member 17.

As having been described above, since the reaction force supporting member is fixed to the member composing the car frame to support the safety device, the braking load acting on the safety device can be received by the reaction force



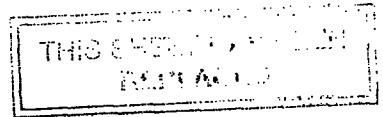
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supporting member and then can be dispersed to the car frame.
As the result, the thickness of the reinforcing member
composing the safeties device can be made thin and
consequently the weight of the safeties device can be made
5 light.

As having been described above, according to the present
invention, it is possible to obtain an elevator apparatus
having a light-weight safeties device.

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CLAIMS

1. An elevator apparatus comprising a car traveling upward
5 and downward along a pair of guide rails installed
vertically, a safeties device arranged in facing to said
guide rail being fixed to a car frame supporting a cab of
the car through a platform frame, wherein
a reaction force supporting member is provided in the
10 upper portion of said safeties device, the reaction force
supporting member being fixed to said car frame, said
safeties device being supported by the reaction force
supporting member.
- 15 2. An elevator apparatus comprising a car traveling upward
and downward along a pair of guide rails installed
vertically, a safeties device arranged in facing to said
guide rail being fixed to a car frame supporting a cab of
the car through a platform frame, wherein
20 a reaction force supporting member is provided in the
upper portion of said safeties device, the side portion of
the reaction force supporting member being fixed to the
plank of said car frame, said safeties device being
supported by the reaction force supporting member.
- 25 3. An elevator apparatus according to claim 2, wherein the
top surface of said reaction force supporting member is
attached to the bottom surface of said platform frame.





4. An elevator apparatus according to claim 2, wherein said plank is constructed of a pair of frame members facing to each other with a spacing.

5 5. An elevator apparatus according to claim 2, wherein said reaction force supporting member is arranged between said pair of frame members and fixed to both of the frame members.

6. An elevator apparatus according to any one of claim 2,
10 claim 3, claim 4 and claim 5, wherein said reaction force supporting member is formed of a plate having a thickness thicker than the thickness of said car frame.

7. An elevator apparatus comprising a car traveling upward
15 and downward along a pair of guide rails installed vertically, a safeties device arranged in facing to said guide rail being fixed to a car frame supporting a cab of the car through a platform frame, wherein

a reaction force supporting member is integrally
20 provided in the upper portion of said safeties device, the side portion of the reaction force supporting member being fixed to the plank of said car frame, said reaction force supporting member in the opposite side to the guide rail being fixed to said plank through a moment supporting member.

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8. An elevator apparatus according to claim 7, wherein the top surface of said reaction force supporting member is attached to the bottom surface of said platform frame.



9. An elevator apparatus according to any one of claim 7
and claim 8, wherein said safeties device comprises a device
supporting member for supporting a brake component for
emergency stop and a connecting member for connecting said
5 reaction force supporting member and said device supporting
member, said device supporting member and said connecting
member being formed of flat steel plates.

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