

## **Fixed Structure of Load Detector for Elevator and Load Detection Unit for Elevator**

### **Technical Field**

The present invention relates to a fixed structure of a load detector for an elevator, and a load detection unit for an elevator.

### **Background**

Conventionally, it is known to use a load detector for detecting the heavy load of a car in an elevator. The fixed structure of the load detector is known as follows (see FIG. 9): using a rope hitch plate 1a and a shim plate 6a to hold the load detector 2a. Specifically, the shim plate 6a is fixed to the upper surface of a mechanical beam 11 in the machine room with the elevator therein, and the lengthwise direction of the shim plate 6a is parallel to the extension direction of the mechanical beam 11; the load detector 2a is fixed to the shim plate 6a in such a manner that the lengthwise direction is parallel to the extension direction of the mechanical beam 11 and to the lengthwise direction of the shim plate 6a, and is fixed to the center of the lower surface of the rope hitch plate 1a; the rope hitch plate 1a is fixed to the load detector 2a with a pair of bolts 102a, and the rope hitch plate 1a has five holes 101a for setting rope head rods (not shown) on the front and rear sides with respect to the mechanical beam 11; and the rope hitch plate 1a also is penetrated by a total of four jacking bolts 3a for jacking the rope hitch plate 1a. Accordingly, the rope hitch plate 1a, the load detector 2a, and the shim plate 6a are integrally fixed to the mechanical beam 11. In the use state, the load of the car is transmitted to the rope head rods on the rope hitch plate 1a, and the rope head rods use the springs thereon to transmit the pressure to the load detector 2a through the rope hitch plate 1a, whereby the load detector 2a can measure the corresponding pressure.

However, in this fixed structure, when the rope head rods are used through the holes 101a, there are hidden dangers as follows: due to the different tension of the wire ropes, the forces of the rope head rods on the front and rear sides

acting on the rope hitch plate 1a deviate from each other; then, the rope hitch plate 1a is unevenly loaded on the front and rear sides with respect to the extension direction of the mechanical beam 11, so that it sways back and forth with respect to the mechanical beam 11 taking the mechanical beam 11 as the shaft, causing poor stability.

At this time, when the rope hitch plate 1a is swayed back and forth with respect to the mechanical beam 11 by the rope head rods on the front and rear sides, the load detector 2a and the mechanical beam 11 together become the rotation center of the back and forth sway, because the load detector 2a is fixed to the center of the lower surface of the rope hitch plate 1a in such a manner that the lengthwise direction is parallel to the extension direction of the mechanical beam 11. This not only causes the stability of the rope hitch plate to deteriorate, but also has the potential for the numerical values detected by the load detector 2a to become inaccurate.

### **Contents of the Utility Model**

In view of the above problems, the object of the present invention is to provide a fixed structure of an elevator load detector, which can improve the stability of the rope hitch plate.

The invention provides a fixed structure of load detectors of an elevator, which is used to fix the load detectors that detects the load of a car, characterized in that, the fixed structure of the load detector of an elevator comprises: an I-shaped member, which is fixed across the upper surface of a mechanical beam in the machine room of the elevator, two parallel plates of the I-shaped member being perpendicular to the extension direction of the mechanical beam, and an intermediate plate of the I-shaped member being parallel to the extension direction of the mechanical beam, the two load detectors being respectively fixed to the upper surfaces of the two parallel plates in such a manner that the long sides are parallel to the two parallel plates of the I-shaped member; and a rope hitch plate for setting elevator rope head rods, the rope hitch plate being fixed to the two load detectors in such a manner that the

two load detectors are sandwiched between the two parallel plates of the I-shaped member at both ends.

Preferably, in the fixed structure of the load detector of the elevator, the length of the rope hitch plate in the direction perpendicular to the extension direction of the mechanical beam is consistent with the length of the two parallel plates of the I-shaped member in the direction perpendicular to the extension direction of the mechanical beam.

Preferably, in the fixed structure of the load detector of the elevator, it further comprises anti-tip bolts located at the corners of the rope hitch plate, the anti-tip bolt penetrating through and connecting the rope hitch plate and the parallel plates, wherein the top end of the anti-tip bolt on one side of the rope hitch plate is separated from the upper surface of the rope hitch plate by a gap, and when the rope hitch plate falls, the said top end is in contact with the upper surface of the rope hitch plate, thereby preventing the rope hitch plate from further falling.

Preferably, in the fixed structure of the load detector of the elevator, the top end of the anti-tip bolt exposed from above the rope hitch plate is a bolt head, and a gasket is fixed at the bolt head, wherein the gasket is separated from the upper surface of the rope hitch plate by the said gap, and the outer diameter of the gasket is larger than the inner diameter of a mounting hole of the rope hitch plate penetrated by the anti-tip bolt.

Preferably, in the fixed structure of the load detector of the elevator, the gap is 10 mm or less.

Preferably, in the fixed structure of the load detector of the elevator, a shank of the anti-tip bolt is separated, by a second gap, from the hole wall of the mounting hole of the rope hitch plate penetrated by the anti-tip bolt.

Preferably, in the fixed structure of the load detector of the elevator, the second gap is 4mm - 6mm.

Preferably, in the fixed structure of the load detector of the elevator, a nut is installed on the shank of the anti-tip bolt exposed from below the I-shaped member, to prevent the anti-tip bolt from escaping from the I-shaped member.

Preferably, in the fixed structure of the load detector of the elevator, a second gasket is fixed on the shank of the anti-tip bolt located between the rope hitch plate and the I-shaped member, wherein there is a gap between the second gasket and the lower surface of the rope hitch plate, and the outer diameter of the second gasket is larger than the inner diameter of the mounting hole of the rope hitch plate penetrated by the anti-tip bolt.

Preferably, in the fixed structure of the load detector of the elevator, the gap between the second gasket and the lower surface of the rope hitch plate is 10 mm or less.

Preferably, in the fixed structure of the load detector of the elevator, the rope hitch plate is provided with holes on the front and back sides relative to the extension direction of the mechanical beam respectively, for mounting the elevator rope head rods in a penetrating mode.

Preferably, in the fixed structure of the load detector of the elevator, it further comprises jacking bolts penetrating the rope hitch plate, the rope hitch plate being jacked up by rotating the jacking bolts.

Preferably, in the fixed structure of the load detector of the elevator, the jacking bolt is located closer to the center of the rope hitch plate than the load detector.

The invention provides a load detection unit of an elevator, characterized by comprising the fixed structure of the load detector of the elevator, and two load detectors for detecting the heavy load of the car.

Effects of the invention:

By fixing the I-shaped member to the mechanical beam with two parallel plates perpendicular to the extension direction of the mechanical beam, and by fixing the two load detectors to the two parallel plates in such a way that the long sides are parallel to the two parallel plates, the load detectors no longer become the center of rotation of the back and forth shaking when the rope hitch plate above the load detectors is unevenly stressed on both sides and then sways forward and backward. In other words, such a structure that the load detectors and the two parallel plates are arranged across mechanical beam perpendicularly

to the mechanical beam is beneficial to prevent the pitch hitch plate from swinging back and forth with the mechanical beam as the rotation axis.

Further, by further setting the anti-tip bolts at the four corners of the rope hitch plate, when the rope hitch plate is swayed back and forth with the mechanical beam as the rotation axis, the gaskets at the bolt heads of the anti-tip bolts will serve the role of suppressing the upwarping side of the rope hitch plate. In this way, the shaking of the rope hitch plate can be further prevented.

Further, by installing the jacking bolt at a position closer to the center of the rope hitch plate than the load detector, the load detectors can be replaced, maintained, and installed more easily.

### **Description of the Drawings**

FIG. 1 is a perspective view showing a fixed structure of a load detector of an elevator of the present invention.

FIG. 2 is an exploded schematic view showing a fixed structure of a load detector of an elevator of the present invention.

FIG. 3 is a schematic diagram showing the installation step (the first) of the fixed structure of a load detector of an elevator of the present invention.

FIG. 4 is a plan view of the case of FIG. 3.

FIG. 5 is a schematic diagram showing the installation step (the second) of the fixed structure of a load detector of an elevator of the present invention.

FIG. 6 is a plan view of the case of FIG. 5.

FIG. 7 is a perspective view of the case of FIG. 5.

FIG. 8 is a perspective view of the case of FIG. 6.

FIG. 9 is a perspective view showing a fixed structure of the conventional elevator load detector.

List of reference signs:

1、1a: rope hitch plate;

101、101a: holes;

102a: nut;

- 2、 2a: load detector;
- 3、 3a: jacking bolt;
- 4: anti-tip bolts;
- 41: gasket;
- 5: rope head rod;
- 51: spring;
- 52: rope clamp;
- 6: I-shaped member;
- 61: two parallel plates of I-shaped member;
- 62: intermediate plate of I-shaped member;
- 6a: shim plate;
- 11: mechanical beam

### **Embodiments**

Hereinafter, embodiments of the present invention will be described based on the drawings. In addition, in each figure, the same reference signs are used for designating the same or equivalent parts for explanation.

Hereinafter, a fixed structure of a load detector of an elevator of the invention will be described based on FIGS. 1 to 2.

FIG. 1 is a perspective view showing a fixed structure of a load detector of an elevator of the present invention. FIG. 2 is an exploded schematic view showing the fixed structure of a load detector of an elevator of the present invention.

The fixed structure of the elevator load detector is mainly formed by gripping two load detectors 2 with a rope hitch plate 1 and an I-shaped member 6.

Specifically, the I-shaped member 6 is fixed across the upper surface of the mechanical beam 11 of the machine room in the elevator by known fixing modes such as welding. Two parallel plates 61 of the I-shaped member 6 are perpendicular to the extension direction of the mechanical beam 11, and an

intermediate plate 62 of the I-shaped member 6 is parallel to the extension direction of the mechanical beam 11.

The two load detectors 2 are fixed to the two parallel plates 61 with bolts on each end in such a manner that the long sides are parallel to the two parallel plates 61, the load detectors 2 being used for detecting the heavy load of the car.

The rope hitch plate 1 is fixed to the two load detectors 2 with bolts or the like in such a manner that the two load detectors 2 are sandwiched between the two parallel plates 61 of the I-shaped member 6 at both ends. Thus, the rope hitch plate 1, the load detectors 2, and the I-shaped member 6 are integrally fixed to the mechanical beam 11.

More specifically, the rope hitch plate 1 is provided with several holes 101 on both the front and rear sides with respect to the extension direction of the mechanical beam 11 respectively, for installing the rope head rods 5 in a penetrating mode, and the number of the holes is not particularly limited. In the use state, the rope head rods 5 are provided on the rope hitch plate 1 (see FIG. 1), the load of the car is transmitted to the rope head rods 5, and the rope head rods 5 make use of springs 51 thereon to transfer the pressure to the load detectors 2 through the rope hitch plate 1. Hereby, the load detectors 2 can measure the corresponding pressure.

The rope hitch plate 1 is also provided, in a penetrating mode, with a jacking bolt 3 at a position closer to the center of the rope hitch plate 1 than the load detectors 2 at both ends. The jacking bolt 3 is used to jack up the rope hitch plate 1 by rotating downward, so as to perform replacement, maintenance and installation of the load detectors 2. As an example, two jacking bolts 3 are provided at both ends where the load detectors 2 are provided. The method of using the jacking bolts 3 is well known, and detailed description is omitted here.

Thanks to the fixed structure, the stability of the rope hitch plate 1 can be improved. Since the I-shaped member 6 is fixed to the mechanical beam 11 with the two parallel plates 61 perpendicular to the extension direction of the mechanical beam 11, and the two load detectors 2 are respectively fixed to the two parallel plates 61 with their long sides parallel to the two parallel plates 61,

the load detectors 2 no longer become the center of rotation of the back and forth shaking when the rope hitch plate 1 is swayed in a back and forth pitching mode due to the uneven force on the front and back sides of the mechanical beam 11, as compared with the conventional structure (FIG. 9) that "one load detector 2a is fixed to the shim plate 6a in such a way that its lengthwise direction is parallel to the extension direction of the mechanical beam 11 and the lengthwise direction of the shim plate 6a, and also fixed to the center of the lower surface of the rope hitch plate 1a". In other words, the structure that "the two load detectors 2 and two parallel plates 61 are integrally arranged across the mechanical beam 11 perpendicularly to the mechanical beam 11" is beneficial to prevent the upper rope hitch plate 1 from swinging back and forth with the mechanical beam as the rotation axis.

Further, it is preferable that the length of the rope hitch plate 1 in the direction perpendicular to the extension direction of the mechanical beam 11 is set to be consistent with the length of the two parallel plates 61 in the direction perpendicular to the extension direction of the mechanical beam 11. Moreover, more preferably, anti-tip bolts 4, which penetrate through the rope hitch plate 1 and the I-shaped member 6 and connect them, are further provided at the four corners of the rope hitch plate 1. The shank of the anti-tip bolt 4 exposed from below the I-shaped member 6 is provided with a nut to prevent the anti-tip bolt 4 from escaping from the I-shaped member 6. The top end of the anti-tip bolt 4 exposed from above the rope hitch plate 1 is separated from the upper surface of the rope hitch plate 1 by a gap, and this top end is used to block the lifting of the rope hitch plate. When the rope hitch plate 1 topples, the top end is brought into contact with the upper surface of the rope hitch plate 1, thereby preventing the rope hitch plate 1 from further toppling. As a specific example, it is preferable that a gasket 41 is fixed to the bolt head as the top end, wherein the outer diameter of the gasket 41 is larger than the inner diameter of the mounting hole of the rope hitch plate 1 penetrated by the anti-tip bolt 4, and the gasket 41 is separated from the rope hitch plate 1 or I-shaped member 6 by a gap of preferably 10 mm. When the rope hitch plate 1 is swayed back and forth with

the mechanical beam 11 as the rotation axis, the gaskets 41 will serve the role of suppressing the upwarping side of the rope hitch plate 1. In this way, the shaking of the rope hitch plate 1 can be further prevented.

Here, the outer diameter of the shank of the anti-tip bolt 4 is less than the inner diameter of the mounting hole of the rope hitch plate 1 penetrated by the anti-tip bolt 4. And, in the case where the anti-tip bolts 4 are standard parts (*for example, anti-tip bolts specifications: M12 or M16*), it is more preferable that the outer diameter of the bolt head of anti-tip bolt 4 corresponds to the inner diameter of the mounting hole of the rope hitch plate 1 penetrated by the anti-tip bolt 4. At this time, the gap between the shank of the anti-tip bolt 4 and the mounting hole is 4mm - 6mm, which size is the best in terms of installation error and adjustment amount.

Although not shown, a second gasket may be fixed on the shank of the anti-tip bolt 4 located between the rope hitch plate 1 and the I-shaped member 6. The second gasket is separated from the lower surface of the rope hitch plate 1 by a gap of preferably 10 mm or less, and the outer diameter of the second gasket is larger than the inner diameter of the mounting hole of the rope hitch plate 1 penetrated by the anti-tip bolt 4. The second gasket functions in the same way as the gasket 41.

Next, referring to FIGS. 3 to 8, the assembly steps of the fixed structure of the load detector of the elevator of the present invention will be described. The rope head rods are not shown in FIGS. 3 to 8.

First, as shown in FIG. 3 and FIG. 4 as its top view, the I-shaped member 6, on the upper surface of which the load detectors 2 are fixed, is secured to the mechanical beam 11 of the machine room in the elevator by known fixing modes such as welding, in such a way that the two parallel plates 61 are perpendicular to the extension direction of the mechanical beam 11, and the long sides of the two load detectors 2 are parallel to the two parallel plates 61. The load detectors 2 and the I-shaped member 6 can be fastened by bolts, for example.

Next, as shown in FIG. 5 and FIG. 6 as its top view, and in FIGS. 7 to 8 as their perspective views, the rope hitch plate 1 is secured to the load detectors 2 at both ends using bolts, and by using the anti-tip bolts 4 at the four corners of rope hitch plate 1, the rope hitch plate 1 and the I-shaped member 6 are connected to each other. Here, as an example, the anti-tip bolts 4 are installed with the bolt heads facing upward, i.e., the bolt heads are exposed from the upper surface of the rope hitch plate 1. Gaskets 41 are secured at the bolt heads, and the outer diameter of the shanks of the anti-tip bolts 4 is less than the aperture of the rope hitch plate 1 used to install the anti-tip bolts 4, and the outer diameter of the gaskets 41 is larger than the aperture of the anti-tip bolts 4.

Hereby, the rope hitch plate 1, the load detectors 2, and the I-shaped member 6 are integrally mounted on the mechanical beam 11.

Above, the preferred embodiments are described in such a manner that the fixed structure of the elevator load detector according to the invention is implemented. In addition, various omissions, substitutions, and changes can be made without departing from the gist of the present invention. The scope of the claims and their equivalents is intended to be described in the scope of the gist of the invention. However, the above-mentioned embodiments are only given as examples and are not intended to limit the scope of the invention. Of course, the device of the invention described in the description can be improved in the various manners covering the above embodiments.

## CLAIMS

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1. A fixed structure of load detectors of an elevator, for fixing the load detectors that detects the load of a car, characterized in that, the fixed structure of the load detectors of an elevator comprises:

an I-shaped member, which is fixed across the upper surface of a mechanical beam in a machine room of the elevator, two parallel plates of the I-shaped member being perpendicular to the extension direction of the mechanical beam, and an intermediate plate of the I-shaped member being parallel to the extension direction of the mechanical beam, the two load detectors being respectively fixed to the upper surfaces of the two parallel plates in such a manner that the long sides are parallel to the two parallel plates of the I-shaped member; and

a rope hitch plate for setting elevator rope head rods, the rope hitch plate being fixed to the two load detectors in such a manner that the two load detectors are sandwiched between the two parallel plates of the I-shaped member at both ends and the rope hitch plate.

2. The fixed structure of the load detectors of an elevator as claimed in claim 1, characterized in that,

the length of the rope hitch plate in the direction perpendicular to the extension direction of the mechanical beam is consistent with the length of the two parallel plates of the I-shaped member in the direction perpendicular to the extension direction of the mechanical beam.

3. The fixed structure of the load detectors of an elevator as claimed in claim 1, characterized by further comprising,

anti-tip bolts located at the corners of the rope hitch plate, the anti-tip bolts penetrating through and connecting the rope hitch plate and the parallel plates, wherein the top end of the anti-tip bolt on one side of the rope hitch plate is separated from the upper surface of the rope hitch plate by a gap, and when the

rope hitch plate falls, the said top end is in contact with the upper surface of the rope hitch plate, thereby preventing the rope hitch plate from further falling.

4. The fixed structure of the load detectors of an elevator as claimed in claim 3, characterized in that,

the top end of the anti-tip bolt exposed from above the rope hitch plate is a bolt head, and a gasket is fixed at the bolt head, wherein the gasket is separated from the upper surface of the rope hitch plate by the said gap, and the outer diameter of the gasket is larger than the inner diameter of a mounting hole of the rope hitch plate penetrated by the anti-tip bolt.

5. The fixed structure of the load detectors of an elevator as claimed in claim 3 or 4, characterized in that,

the gap is 10 mm or less.

6. The fixed structure of the load detectors of an elevator as claimed in claim 3 or 4, characterized in that,

a shank of the anti-tip bolt is separated, by a second gap, from the hole wall of the mounting hole of the rope hitch plate penetrated by the anti-tip bolt.

7. The fixed structure of the load detectors of an elevator as claimed in claim 6, characterized in that,

the second gap is in the range of 4mm - 6mm.

8. The fixed structure of the load detectors of an elevator as claimed in claim 3 or 4, characterized in that,

a nut is installed on the shank of the anti-tip bolt exposed from below the I-shaped member, to prevent the anti-tip bolt from escaping from the I-shaped member.

9. The fixed structure of the load detectors of an elevator as claimed in claim 3 or 4, characterized in that,

a second gasket is fixed on the shank of the anti-tip bolt located between the rope hitch plate and the I-shaped member, wherein there is a gap between the second gasket and the lower surface of the rope hitch plate, and the outer diameter of the second gasket is larger than the inner diameter of the mounting hole of the rope hitch plate penetrated by the anti-tip bolt.

10. The fixed structure of the load detectors of an elevator as claimed in claim 9, characterized in that,

the gap between the second gasket and the lower surface of the rope hitch plate is 10 mm or less.

11. The fixed structure of the load detectors of an elevator as claimed in claim 1 or 2, characterized in that,

the rope hitch plate is provided with holes on the front and back sides relative to the extension direction of the mechanical beam respectively, for mounting the elevator rope head rods in a penetrating mode.

12. The fixed structure of the load detectors of an elevator as claimed in claim 1 or 2, characterized by further comprising,

jacking bolts penetrating the rope hitch plate, the rope hitch plate being jacked up by rotating the jacking bolts.

13. The fixed structure of the load detectors of an elevator as claimed in claim 12, characterized in that,

the jacking bolts are located closer to the center of the rope hitch plate than the load detectors.

14. A load detection unit of an elevator, characterized by comprising:

the fixed structure of load detectors of an elevator as claimed in any one of claims 1 to 13; and

two load detectors for detecting the heavy load of the car.