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Variable-gradient speed-limited rope guiding device and method

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JP S58-56757 U
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CN 202449706 U
CN 203996232 U
CN 1489816 A
CN 102344080 A

ABSTRACT

Disclosed is a variable-gradient speed-limited rope guiding device and method, which are applicable to the guiding of a speed-limited rope of an obliquely running container affected by the shape of a building or the condition of a roadway to run along a variable
5 gradient or a variable track. The device comprises speed-limited rope holders and speed-limited rope holddowns. The speed-limited rope holders are utilized to prevent the speed-limited rope from drooping, the speed-limited rope holddowns are utilized to prevent the speed-limited rope from waving, and thereby the speed-limited rope is forcibly guided. The variable-gradient speed-limited rope guiding device of the present invention can meet
10 the requirement of gradient change, can realize the overspeed protection of the obliquely running container under the condition of gradient change, can make the speed-limited rope to be adapted to the change of gradient, and solves a major obstacle to the development of the obliquely running container toward gradient self-adaption. The variable-gradient speed-limited rope guiding device is structurally simple, reliable in operation and
15 convenient to install.

VARIABLE-GRADIENT SPEED-LIMITED ROPE GUIDING DEVICE AND METHOD

BACKGROUND

Technical Field

5 The present invention relates to the field of elevators, and in particular to a variable-gradient speed-limited rope guiding device and method, which are particularly applicable to the guiding of a speed-limited rope of an obliquely running container affected by the shape of a building or the condition of a roadway to run along a variable gradient or a variable track.

10 Related Art

 Elevators assume an important role in high-rise building transportation as a modern transportation means, and as a product of special elevator development, obliquely running containers can be applied to scenic spots, areas with residential buildings having to be built on mountain slopes due to shortage of urban areas and complex roadways and can be used by maintainers in daily maintenance and repair of towers and bridges. The variable-gradient obliquely running container can be applied to transportation on a slope with certain gradient change, and breaks through the layout concept of conventional obliquely running containers, so the variable-gradient obliquely running container has high creativeness and initiativeness. As the living level of people is improved, obliquely running containers for sightseeing and going up and down residential buildings are widely applied to oblique mountain slope areas and buildings, and the characteristics of the obliquely running containers, i.e. high transportation capability, high speed and long travel distance, also enable tourists to enjoy beautiful sceneries very well.

 At present, the use of obliquely running containers is becoming wider and wider, the gradients of the majority of existing obliquely running containers are constant, this brings great restriction to the development of oblique running containers, the development of the variable-gradient obliquely running container greatly improves the application conditions of obliquely running containers, however, the phenomena of drooping and waving of the

speed-limited rope may take place in the running process of the variable-gradient obliquely running container, so a variable-gradient speed-limited rope guiding device needs to be designed to solve the problems, so that the speed-limited rope can be adapted to the change of gradient.

5

SUMMARY

Technical problem: Aimed at the problems existing in the prior art, the purpose of the present invention is to provide a variable-gradient speed-limited rope guiding device which is structurally simple and compact, safe and reliable, only occupies a small space, and can make the whole system to run smoothly, and a variable-gradient speed-limited rope guiding
10 method.

Technical solution: The variable-gradient speed-limited rope guiding device of the present invention comprises speed-limited rope holders and speed-limited rope holddowns which are arranged on a slope, a speed-limited rope is arranged respectively upon the speed-limited rope holders and under the speed-limited rope holddowns, a speed limiter is
15 arranged at the top of the speed-limited rope, a tensioner is arranged at the bottom of the speed-limited rope, and the speed limiter is arranged on a speed limiter frame.

The speed-limited rope holddown comprises a bottom angle iron, a connecting angle iron, a supporting angle iron, an upper pinch roller, a pinch roller compression spring, a spring holder, bearings, a sliding shaft, elastic retainer rings, a fixed shaft and a lower pinch
20 roller, wherein one side of the bottom angle iron is fixed on the slope, the other side of the bottom angle iron and the connecting angle iron are fixed together through a lower bolt, a lower spring washer and a lower nut, the supporting angle iron is welded on the connecting angle iron, the sliding shaft and the fixed shaft are separately arranged on the supporting angle iron, the sliding shaft and the fixed shaft are respectively limited and fixed by an
25 upper nut and a flat washer, the upper pinch roller is arranged on the sliding shaft, the lower pinch roller is arranged on the fixed shaft, the bearings are respectively arranged in the upper pinch roller and the lower pinch roller, the elastic retainer rings for limiting are respectively arranged at the ends of the bearings, the pinch roller compression spring is arranged at the top of the upper pinch roller, the spring holder is arranged at the top of the

pinch roller compression spring, and the spring holder is welded on the supporting angle iron.

The speed-limited rope holder comprises a bottom angle iron, a connecting angle iron, a supporting angle iron, a carrier roller compression spring, an upper carrier roller, elastic
5 retainer rings, a sliding shaft, bearings, a spring holder, a fixed shaft and a lower carrier roller, wherein one side of the bottom angle iron is fixed on the slope, the other side of the bottom angle iron and the connecting angle iron are fixed together through a lower bolt, a lower spring washer and a lower nut, the supporting angle iron is welded on the connecting
10 angle iron, the sliding shaft and the fixed shaft are separately arranged on the supporting angle iron, the sliding shaft and the fixed shaft are respectively limited and fixed by an upper nut and a flat washer, the upper carrier roller is arranged on the sliding shaft, the lower carrier roller is arranged on the fixed shaft, the bearings are respectively arranged in the upper carrier roller and the lower carrier roller, the elastic retainer rings for limiting are respectively arranged on the end surfaces of the bearings, the carrier roller compression
15 spring is arranged at the bottom of the upper carrier roller, the spring holder is arranged at the bottom of the carrier roller compression spring, and the spring holder is welded on the supporting angle iron.

The tensioner comprises a tensioning wheel, a tensioning oil cylinder and a fixed plate, wherein one end of the tensioning oil cylinder is connected to the tensioning wheel, and the
20 other end of the tensioning oil cylinder is connected to the fixed plate.

The variable-gradient speed-limited rope guiding method using the device: The speed-limited rope holders and the speed-limited rope holddowns are arranged on a slope; during operation, the speed-limited rope holders hold up the speed-limited rope over the upper carrier rollers and the lower carrier rollers, the speed-limited rope holddowns press
25 the speed-limited rope under the upper pinch rollers and the lower pinch rollers, and thereby the speed-limited rope is forcibly guided; and when the connecting rod fixedly connected to the speed-limited rope passes the speed-limited rope holder or the speed-limited rope holddown, by means of the carrier roller compression spring arranged at the bottom of the upper carrier roller and the pinch roller compression spring arranged at

the top of the upper pinch roller, the connecting rod can smoothly pass the upper carrier roller and the upper pinch roller.

Beneficial effect: Since the technical solution is adopted, by arranging the speed-limited rope holders and the speed-limited rope holddowns on the slope, the present invention can effectively prevent the speed-limited rope from drooping and waving as gradient fluctuates, ensuring the reliable action of the speed limiter and a safety gear, and thereby the lifting container can be effectively braked under the condition of overspeed. The variable-gradient speed-limited rope guiding device is structurally simple and compact, safe and reliable, only occupies a small space, can make the whole system to run smoothly, and has wide practicability in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a front view of the installation of a whole speed limit system of the present invention;

Figure 2 is a front view of a speed-limited rope holder of the present invention;

Figure 3 is a side view of the speed-limited rope holder of the present invention;

Figure 4 is a front view of a speed-limited rope holddown of the present invention;

Figure 5 is a side view of the speed-limited rope holddown of the present invention;

Figure 6 is a schematic relative position diagram of a connecting rod of the present invention passing the speed-limited rope holder; and

Figure 7 is a schematic relative position diagram of the connecting rod of the present invention passing the speed-limited rope holddown;

In the drawings: 1-speed limiter; 2-speed limiter frame; 3-speed-limited rope; 4-speed-limited rope holddown; 5-speed-limited rope holder; 6-tensioner; 7-connecting rod; 4-1-bottom angle iron; 4-2-lower bolt; 4-3-lower spring washer; 4-4-lower nut; 4-5-connecting angle iron; 4-6-supporting angle iron; 4-7-upper pinch roller; 4-8-pinch roller compression spring; 4-9-spring holder; 4-10-bearing, 4-11-sliding shaft; 4-12-upper nut; 4-13-flat washer; 4-14-elastic retainer ring; 4-15-fixed shaft; 4-16-lower pinch roller;

5-1-bottom angle iron; 5-2-lower bolt; 5-3-lower spring washer; 5-4-lower nut; 5-5-connecting angle iron; 5-6-supporting angle iron; 5-7-carrier roller compression spring; 5-8-upper carrier roller; 5-9-elastic retainer ring; 5-10-sliding shaft; 5-11-upper nut; 5-12-flat washer; 5-13-bearing; 5-14-spring holder; 5-15-fixed shaft; 5-16-lower carrier roller; 6-1-tensioning wheel; 6-2-tensioning oil cylinder; 6-3-fixed plate.

DETAILED DESCRIPTION

The embodiment of the present invention is further described below in reference to the drawings:

As shown in Figure 1, Figure 6 and Figure 7, a variable-gradient speed-limited rope guiding device mainly comprises a speed limiter 1, a speed-limited rope 3, speed-limited rope holddowns 4, speed-limited rope holders 5 and a tensioner 6. The speed-limited rope holders 5 and the speed-limited rope holddowns 4 are arranged on a slope, a speed-limited rope 3 is arranged respectively upon the speed-limited rope holders 5 and under the speed-limited rope holddowns 4, the speed limiter 1 is connected to the top of the speed-limited rope 3, the tensioner 6 is connected to the bottom of the speed-limited rope 3, the tensioner 6 comprises a tensioning wheel 6-1, a tensioning oil cylinder 6-2 and a fixed plate 6-3, and the tensioning oil cylinder 6-2 is respectively fixedly connected to the tensioning wheel 6-1 and the fixed plate 6-3. The bottom of the speed limiter 1 is fixedly connected to a speed limiter frame 2.

As shown in Figure 4 and Figure 5, the speed-limited rope holddown 4 comprises a bottom angle iron 4-1, a connecting angle iron 4-5, a supporting angle iron 4-6, an upper pinch roller 4-7, a pinch roller compression spring 4-8, a spring holder 4-9, bearings 4-10, a sliding shaft 4-11, elastic retainer rings 4-14, a fixed shaft 4-15 and a lower pinch roller 4-16, wherein one side of the bottom angle iron 4-1 is fixed to the slope, the other side of the bottom angle iron 4-1 and the connecting angle iron 4-5 are fixed together through a lower bolt 4-2, a lower spring washer 4-3 and a lower nut 4-4, the supporting angle iron 4-6 is welded on the connecting angle iron 4-5, the sliding shaft 4-11 and the fixed shaft 4-15 are separately arranged on the supporting angle iron 4-6, the sliding shaft 4-11 and the fixed shaft 4-15 are respectively limited and fixed by an upper nut 4-12 and a flat washer 4-13,

the upper pinch roller 4-7 is arranged on the sliding shaft 4-11, the lower pinch roller 4-16 is arranged on the fixed shaft 4-15, the bearings 4-10 are respectively arranged in the upper pinch roller 4-7 and the lower pinch roller 4-16, the elastic retainer rings 4-14 for limiting are respectively arranged at the ends of the bearings 4-10, the pinch roller compression spring 4-8 is arranged at the top of the upper pinch roller 4-7, the spring holder 4-9 is arranged at the top of the pinch roller compression spring 4-8, and the spring holder 4-9 is welded on the supporting angle iron 4-6.

As shown in Figure 2 and Figure 3, the speed-limited rope holder 5 comprises a bottom angle iron 5-1, a connecting angle iron 5-5, a supporting angle iron 5-6, a carrier roller compression spring 5-7, an upper carrier roller 5-8, elastic retainer rings 5-9, a sliding shaft 5-10, bearings 5-13, a spring holder 5-14, a fixed shaft 5-15 and a lower carrier roller 5-16, wherein one side of the bottom angle iron 5-1 is fixed to the slope, the other side of the bottom angle iron 5-1 and the connecting angle iron 5-5 are fixed together through a lower bolt 5-2, a lower spring washer 5-3 and a lower nut 5-4, the supporting angle iron 5-6 is welded on the connecting angle iron 5-5, the sliding shaft 5-10 and the fixed shaft 5-15 are separately arranged on the supporting angle iron 5-6, the sliding shaft 5-10 and the fixed shaft 5-15 are respectively limited and fixed by an upper nut 5-11 and a flat washer 5-12, the upper carrier roller 5-8 is arranged on the sliding shaft 5-10, the lower carrier roller 5-16 is arranged on the fixed shaft 5-15, the bearings 5-13 are respectively arranged in the upper carrier roller 5-8 and the lower carrier roller 5-16, the elastic retainer rings 5-9 for limiting are respectively arranged on the end surfaces of the bearings 5-13, the carrier roller compression spring 5-7 is arranged at the bottom of the upper carrier roller 5-8, the spring holder 5-14 is arranged at the bottom of the carrier roller compression spring 5-7, and the spring holder 5-14 is welded on the supporting angle iron 5-6.

The variable-gradient speed-limited rope guiding method of the present invention comprises: the speed-limited rope holders 5 and the speed-limited rope holddowns 4 are arranged on the slope; during operation, the speed-limited rope holders 5 hold up the speed-limited rope 3 over the upper carrier rollers 5-8 and the lower carrier rollers 5-16, the speed-limited rope holddowns 4 press the speed-limited rope 3 under the upper pinch

rollers 4-7 and the lower pinch rollers 4-16, and thereby the speed-limited rope 3 is forcibly guided; and when the connecting rod 7 fixedly connected to the speed-limited rope 3 passes the speed-limited rope holder 5 or the speed-limited rope holddown 4, by means of the carrier roller compression spring 5-7 arranged at the bottom of the upper carrier roller 5-8 and the pinch roller compression spring 4-8 arranged at the top of the upper pinch roller 4-7 the connecting rod 7 can smoothly pass the upper carrier roller 5-8 and the upper pinch roller 4-7.

A detailed description of one or more preferred embodiments of the invention is provided above along with accompanying figures that illustrate by way of example the principles of the invention. While the invention is described in connection with such embodiments, it should be understood that the invention is not limited to any embodiment. On the contrary, the scope of the invention is limited only by the appended claims and the invention encompasses numerous alternatives, modifications, and equivalents. For the purpose of example, numerous specific details are set forth in the description above in order to provide a thorough understanding of the present invention. The present invention may be practised according to the claims without some or all of these specific details. For the purpose of clarity, technical material that is known in the technical fields related to the invention has not been described in detail so that the present invention is not unnecessarily obscured.

Throughout this specification and the claims that follow unless the context requires otherwise, the words 'comprise' and 'include' and variations such as 'comprising' and 'including' will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that such prior art forms part of the common general knowledge of the technical field.

CLAIMS

What is claimed is:

1. A variable-gradient speed-limited rope guiding device, characterized in that the variable-gradient speed-limited rope guiding device comprises speed-limited rope holders (5) and speed-limited rope holddowns (4), which are arranged on a slope, a speed-limited rope (3) is arranged respectively upon the speed-limited rope holders (5) and under the speed-limited rope holddowns (4), a speed limiter (1) is arranged at the top of the speed-limited rope (3), a tensioner (6) is arranged at the bottom of the speed-limited rope (3), and the speed limiter (1) is arranged on a speed limiter frame (2);

the speed-limited rope holddown (4) comprises a bottom angle iron (4-1), a connecting angle iron (4-5), a supporting angle iron (4-6), an upper pinch roller (4-7), a pinch roller compression spring (4-8), a spring holder (4-9), bearings (4-10), a sliding shaft (4-11), elastic retainer rings (4-14), a fixed shaft (4-15) and a lower pinch roller (4-16), wherein one side of the bottom angle iron (4-1) is fixed on the slope, the other side of the bottom angle iron (4-1) and the connecting angle iron (4-5) are fixed together through a lower bolt (4-2), a lower spring washer (4-3) and a lower nut (4-4), the supporting angle iron (4-6) is welded on the connecting angle iron (4-5), the sliding shaft (4-11) and the fixed shaft (4-15) are separately arranged on the supporting angle iron (4-6), the sliding shaft (4-11) and the fixed shaft (4-15) are respectively limited and fixed by an upper nut (4-12) and a flat washer (4-13), the upper pinch roller (4-7) is arranged on the sliding shaft (4-11), the lower pinch roller (4-16) is arranged on the fixed shaft (4-15), the bearings (4-10) are respectively arranged in the upper pinch roller (4-7) and the lower pinch roller (4-16), the elastic retainer rings (4-14) for limiting are respectively arranged at the ends of the bearings (4-10), the pinch roller compression spring (4-8) is arranged at the top of the upper pinch roller (4-7), the spring holder (4-9) is arranged at the top of the pinch roller compression spring (4-8), and the spring holder (4-9) is welded on the supporting angle iron (4-6);

the speed-limited rope holder (5) comprises a bottom angle iron (5-1), a connecting angle iron (5-5), a supporting angle iron (5-6), a carrier roller compression spring (5-7), an upper carrier roller (5-8), elastic retainer rings (5-9), a sliding shaft (5-10), bearings (5-13), a spring holder (5-14), a fixed shaft (5-15) and a lower carrier roller (5-16),

wherein one side of the bottom angle iron (5-1) is fixed on the slope, the other side of the bottom angle iron (5-1) and the connecting angle iron (5-5) are fixed together through a lower bolt (5-2), a lower spring washer (5-3) and a lower nut (5-4), the supporting angle iron (5-6) is welded on the connecting angle iron (5-5), the sliding shaft (5-10) and the fixed shaft (5-15) are separately arranged on the supporting angle iron (5-6), the sliding shaft (5-10) and the fixed shaft (5-15) are respectively limited and fixed by an upper nut (5-11) and a flat washer (5-12), the upper carrier roller (5-8) is arranged on the sliding shaft (5-10), the lower carrier roller (5-16) is arranged on the fixed shaft (5-15), the bearings (5-13) are respectively arranged in the upper carrier roller (5-8) and the lower carrier roller (5-16), the elastic retainer rings (5-9) for limiting are respectively arranged on the end surfaces of the bearings (5-13), the carrier roller compression spring (5-7) is arranged at the bottom of the upper carrier roller (5-8), the spring holder (5-14) is arranged at the bottom of the carrier roller compression spring (5-7), and the spring holder (5-14) is welded on the supporting angle iron (5-6).

2. The variable-gradient speed-limited rope guiding device according to claim 1, characterized in that the tensioner (6) comprises a tensioning wheel (6-1), a tensioning oil cylinder (6-2) and a fixed plate (6-3), wherein one end of the tensioning oil cylinder (6-2) is connected to the tensioning wheel (6-1), and the other end of the tensioning oil cylinder (6-2) is connected to the fixed plate (6-3).

3. A variable-gradient speed-limited rope guiding method using the device in claim 1, characterized in that speed-limited rope holders (5) and speed-limited rope holddowns (4) are arranged on a slope; during operation, the speed-limited rope holders (5) hold up a speed-limited rope (3) over an upper carrier roller (5-8) and a lower carrier roller (5-16), the speed-limited rope holddowns (4) press the speed-limited rope (3) under an upper pinch roller (4-7) and a lower pinch roller (4-16), and thereby the speed-limited rope (3) is forcibly guided; when a connecting rod (7) fixedly connected to the speed-limited rope (3) passes the speed-limited rope holder (5) or the speed-limited rope holddown (4), by means of a carrier roller compression spring (5-7) arranged at the bottom of the upper carrier roller (5-8) and a pinch roller compression spring (4-8) arranged at the top of the upper pinch roller (4-7), the connecting rod (7) can smoothly pass the upper carrier roller (5-8) and the upper pinch roller (4-7).

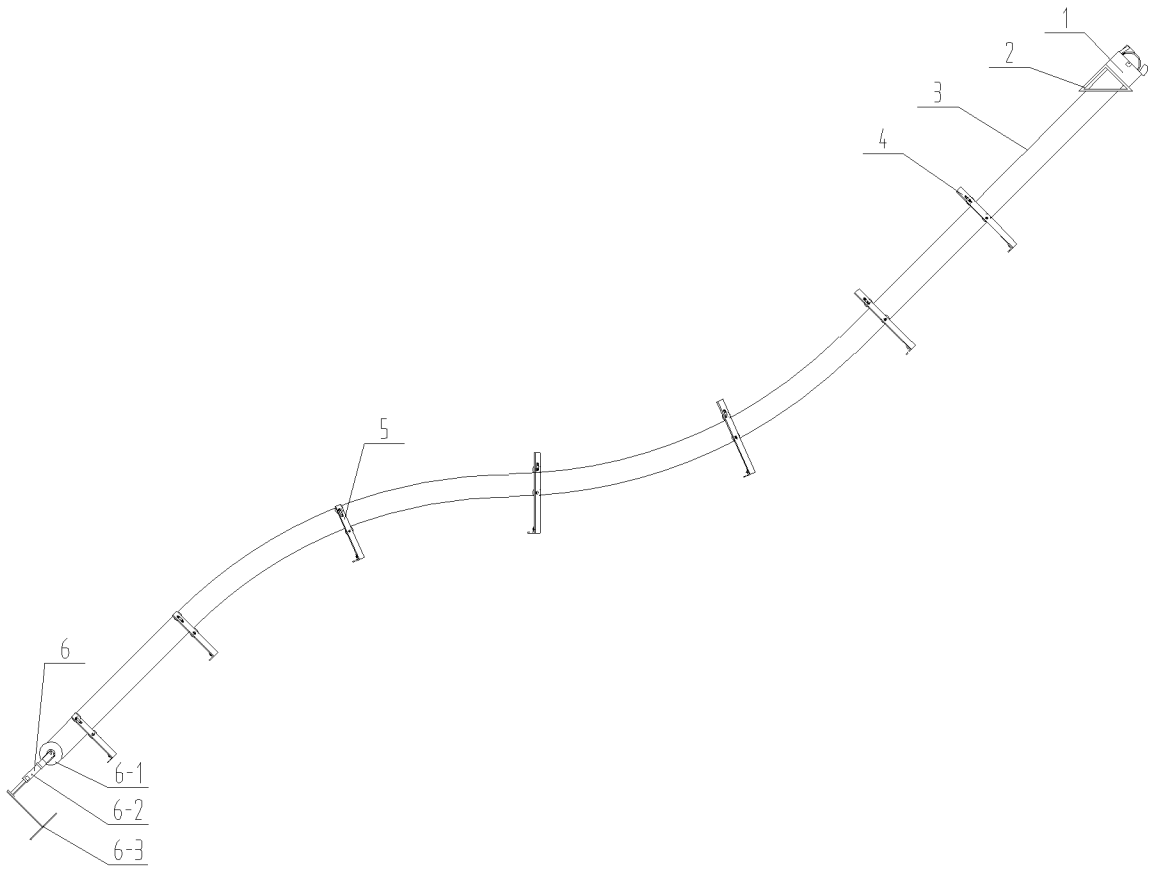


FIG. 1

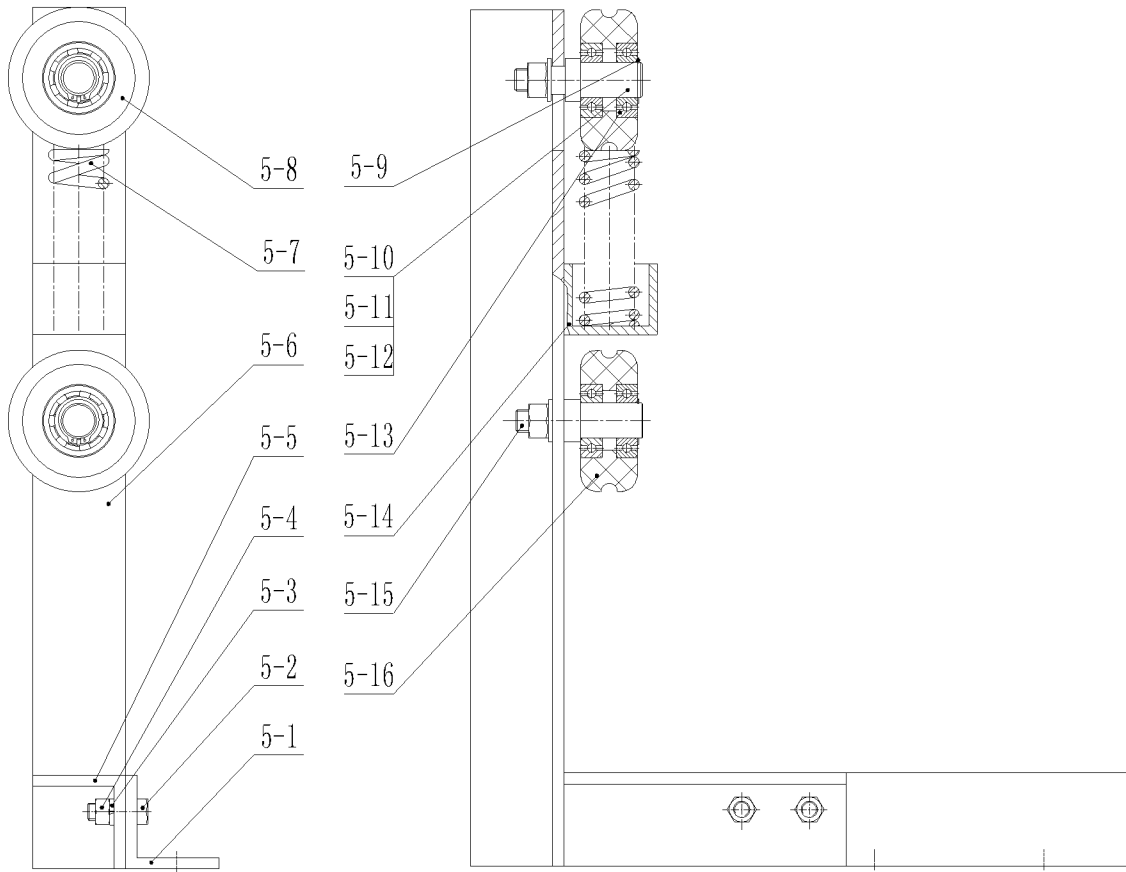


FIG. 2

FIG. 3

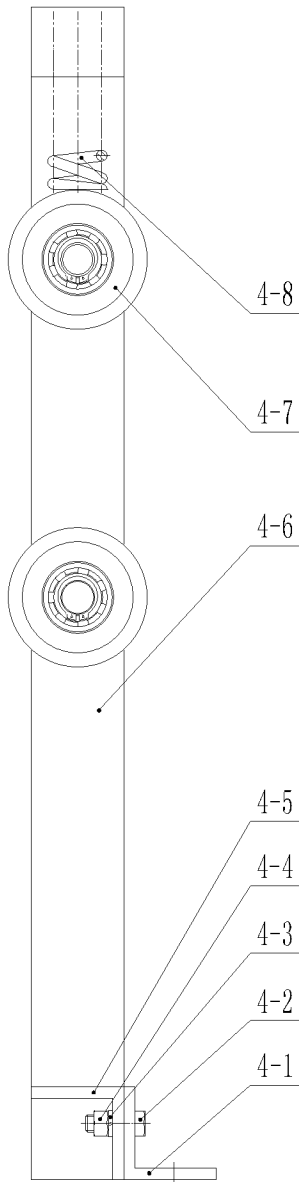


FIG. 4

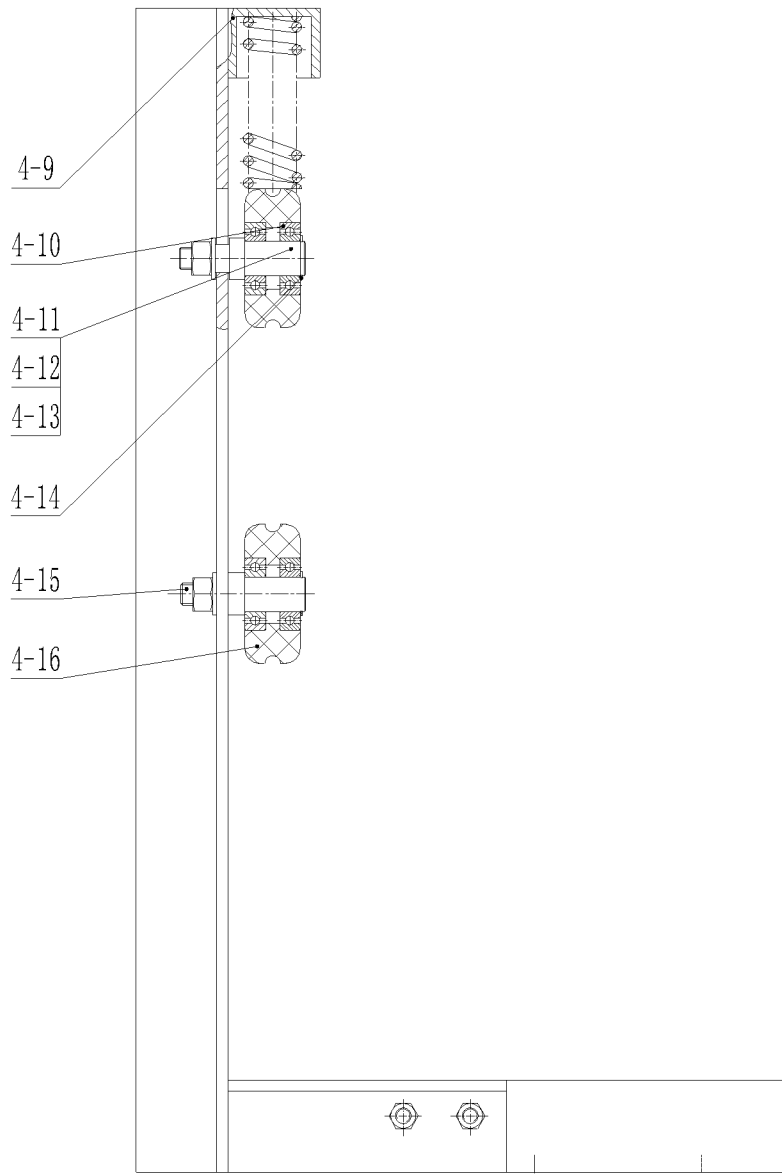


FIG. 5

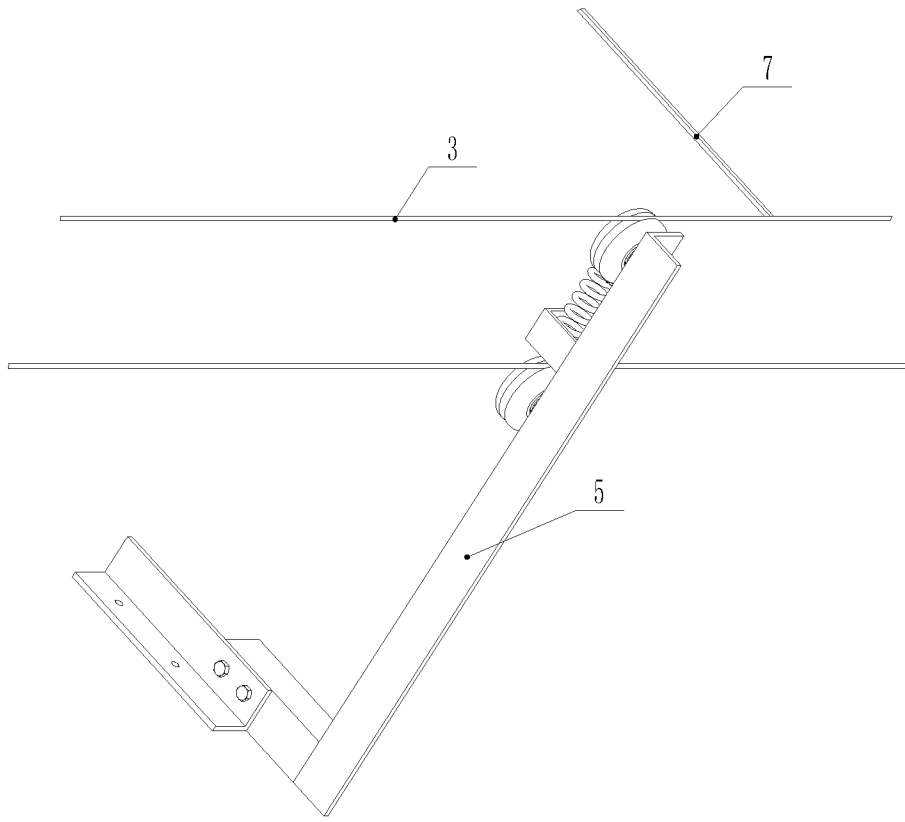


FIG. 6

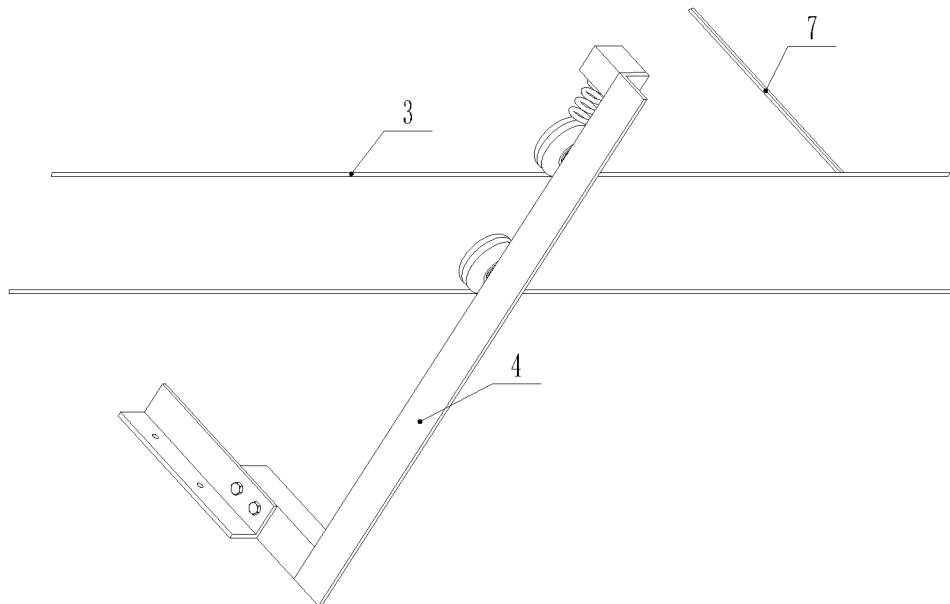


FIG. 7