

## AUTOMATIC CONTROL TYPE LIFTING DEVICE OF ELECTRICAL AUTOMATION EQUIPMENT

### **Field of the Invention**

5 The present invention relates to the field of lifting device technology, particularly to automatic control type lifting device of electrical automation equipment.

### **Background to the Invention**

10 Automation technology is widely used in industry, agriculture, military, scientific research, transportation, commerce, healthcare, services, and households. The use of automation technology can not only relieve people from heavy physical labor, some mental labor, and harsh and dangerous working environments, but also greatly improve labor productivity. Large complete sets of equipment in automation systems, also known as automation devices, electrical automation equipment is a structurally precise processing instrument.

15 At present, forklifts or cranes are commonly used in the process of lifting and transporting electrical automation equipment. However, when using these devices for lifting and transporting electrical automation equipment,

20 It is often difficult to effectively limit and protect electrical automation equipment, which can cause significant vibrations during transportation and movement, resulting in equipment damage, poor safety performance, and poor convenience of existing lifting and transportation equipment. The overall operation process is cumbersome and inconvenient.

Therefore, we propose an automatic control type lifting device of electrical automation equipment.

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### **Statement of Invention**

The present invention proposes an automatic control type lifting device of electrical automation equipment, which can achieve fast, safe, and convenient lifting and movement of the equipment to solve the shortcomings of the existing technology.

30 The technical solution of the present invention is: an automatic control type lifting device of electrical automation equipment, comprising a box body, wherein two pairs of transverse strip-shaped holes are symmetrically provided on the front and rear side walls of the box body, and further comprising:

A clamping mechanism comprising: two pairs of clamping rods, two sliding rods, and two pairs of pull rods. The two pairs of clamping rods are hinged on the front and rear side walls of the box near the ends on both sides, and the free ends of the two pairs of clamping rods are hinged with clamping plates. The two sliding rods are horizontally  
5 connected to each pair of strip-shaped holes, and both sliding rods pass through the strip-shaped holes. The two pairs of pull rods are hinged on the exit ends of the two sliding rods, and the free ends of the two pairs of pull rods are hinged at the middle positions of the two pairs of clamping rods;

The X-shaped lifting mechanism is located at the bottom of the box body, and is  
10 connected to two sliding rods. The bottom of the X-shaped lifting mechanism is equipped with walking wheels;

The driving mechanism is installed inside the box body and connected to two sliding rods; The driving mechanism is used to drive two sliding rods to slide laterally within the strip-shaped hole.

In at least one embodiment disclosed herein, the X-shaped lifting mechanism comprises:  
15 two push rods, two X-shaped hinge frames, and a lifting plate. The two push rods pass through two pairs of strip-shaped holes, and the two push rods are arranged on opposite sides of the two sliding rods. The two X-shaped hinge frames are hinged at the ends of the two push rods on the same side, and the lifting plate is arranged below the box body.  
20 The bottoms of the two X-shaped hinge frames are respectively connected to the lifting plate by sliding, and the bottom of the lifting plate is provided with a walking wheel.

In at least one embodiment of the present disclosure, the driving mechanism comprises:  
25 two installation frames and a telescopic cylinder. The two installation frames are horizontally slidably connected inside the box body, and a connecting rod is provided on the opposite side of the two installation frames. The connecting rod passes through the push rod and is fixedly connected to the sliding rod. The telescopic cylinder is arranged between the two installation frames, and the cylinder body and movable rod of the telescopic cylinder are respectively connected to the two installation frames.

In at least one embodiment of the present disclosure, two pairs of strip-shaped holes in  
30 the box are respectively provided with installation rods, and the two installation rods are arranged on one side of the two sliding rods away from the two push rods. The two pairs of clamping rods are hinged at the ends of the two installation rods, and the two pairs of pull rods are spring rods. Below the two pairs of clamping rods on both sides of the box body, there are stoppers, and above the stoppers, there are inclined surfaces inclined  
35 upward towards one side of the box body. Below the two pairs of clamping rods, there are inclined surfaces that are in contact with the top of the stoppers. The side walls of the box

body are equipped with limiting components connected to the installation rods. The sentence is:

5 In at least one embodiment of the present disclosure, the limiting components are provided with two pairs, which are symmetrically arranged on the front and rear side walls of the box near the two sides of the box body. The limiting components include: an installation body and a first slider, the installation body is fixedly connected to the box body, the installation body is provided with an arc-shaped sliding groove, the first slider is slidably connected in the arc-shaped sliding groove, a spring connected to the first slider is provided in the arc-shaped sliding groove, a stopper is provided on the first slider, and a pressure bar cooperating with the stopper is provided on the installation rod.

10 In at least one embodiment of the present disclosure, the clamping plate is a rectangular plate, and there are two clamping plates provided. The two clamping plates are respectively arranged on the left and right sides of the box and are hinged to the corresponding two clamping rods.

15 In at least one embodiment of the present disclosure, the top of the lifting plate is provided with two pairs of sliding grooves, and the bottom of the X-shaped hinge frame is hinged with a second slider, which is set inside the sliding groove and is equipped with an elastic component connected to the second slider; The elastic component is used to drive the second slider on the same X-shaped hinge frame to move towards the opposite side.

20 In at least one embodiment disclosed herein, when the clamping plate is not in use, the surface of the clamping plate is flush with the upper surface of the box body, and the hinge point between the clamping rod and the clamping plate is located at the middle position of the clamping plate offset from the box body.

25 In at least one embodiment disclosed herein, a rubber pad is provided at the top of the box, and rubber pads are provided on opposite sides of the two clamping plates.

Compared with the existing technology, the beneficial effects of the present invention are:

30 1. The present invention provides a clamping rod with a clamping plate, a sliding rod driven by a driving mechanism, and a pull rod. During the use of the equipment, the sliding rod can drive the clamping rod to clamp the electrical equipment, ensuring the stability of the equipment during lifting and transportation, avoiding equipment damage caused by significant shaking. In addition, the sliding rod can also drive the X-shaped lifting mechanism to lift the box during the clamping process by pulling the clamping plate. The entire clamping and lifting process does not require the assistance of personnel, and the operation is convenient,

35 2. The overall design of the present invention is reasonable, and the folding of the

clamping mechanism can be achieved. The overall height of the device is small, and it can adapt to various electrical automation equipment. When the equipment is not in use, it can be placed at the bottom of the electrical automation equipment, and the equipment does not occupy storage space and can be used at any time;

5 3. The overall structure of the present invention is simple, and the clamping and lifting movements can be controlled by a single driving mechanism. The equipment control is simple and convenient, the overall cost is low, and it has strong market application prospects.

### 10 **Brief Description of the Drawings**

FIG 1 is a schematic diagram of the front view structure of the present invention;

FIG 2 is the second schematic diagram of the main view structure of the present invention;

FIG 3 is a schematic diagram of the top sectional structure of the present invention;

15 FIG 4 is a schematic diagram of the partial structure in front view of the present invention;

FIG 5 is a schematic diagram of the main partial cross-sectional structure of the present invention.

Annotations on the accompanying drawings:

1. Box body; 11. Strip-shaped hole; 2. Clamping mechanism; 21. Clamping rod; 211. Clamping plate; 212. Guide block; 22. Sliding rod; 23. Pull rod; 24. Installation pole; 25. Stopper; 3. Driving mechanism; 31. Installation bracket; 311. Connecting rod; 32. Telescopic cylinder; 4. X-shaped lifting mechanism; 41. Push rod; 42. X-shaped hinge frame; 421. Second slider; 43. Lifting plate; 44. Walking wheels; 432. Sliding groove; 433. Elastic component; 5. Limiting components; 51. Installation body; 511. Arc-shaped sliding; 25 52. First slider; 521. Spring.

### **Detailed Description**

The figures in this disclosure are not strictly drawn to scale, and the specific dimensions and quantities of each structure can be determined according to actual needs. The figures described in this disclosure are only schematic diagrams of the structure.

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In order to clarify the purpose, technical solution, and advantages of the embodiments of the present invention, the following will provide a clear and complete description of the technical solution of the embodiments of the present invention in conjunction with the

5 accompanying drawings. Obviously, the described embodiments are a part of the embodiments of the present invention, not all embodiments. Based on the described embodiments of the present invention, all other embodiments obtained by ordinary skilled persons in the art without the need for creative labor are within the scope of protection of the present invention.

10 Unless otherwise defined, the technical or scientific terms used herein shall have the usual meanings as understood by those skilled in the art to which the present invention belongs. The use of "first", "second" and similar words in the specification and claims of the present invention patent application does not indicate any order, quantity or importance, but is only used to distinguish different components. Words such as 'including 'or' containing 'refer to the elements or objects that appear before the word, including those listed after the word and their equivalents, without excluding other elements or objects. The terms 'inside ', 'outside ', 'up ', 'down ', 'far ', 'near ', 'front ', 'back ', etc. are only used to represent relative positional relationships. When the absolute position of the described object changes, the relative positional relationship may also change accordingly.

15 At present, forklifts or cranes are commonly used in the process of lifting and transporting electrical automation equipment. However, the use of these equipment often makes it difficult to effectively limit and protect the electrical automation equipment during the lifting and transportation process, which can easily cause significant vibration and damage to the equipment, resulting in poor safety performance. In addition, the convenience of existing lifting and transportation equipment is poor, and the overall operation process is cumbersome and inconvenient. In view of this, we propose an automatic control type lifting device of electrical automation equipment.

25 An automatic control type lifting device of electrical automation equipment, as shown in FIGS 1 to 3, comprising a box body 1; The box body 1 is a flat box body 1, and two pairs of transverse strip-shaped holes 12 are symmetrically provided on the front and rear side walls of the box body 1. It also includes:

30 The clamping mechanism 2 comprises: two pairs of clamping rods 21, two sliding rods 22, and two pairs of pull rods 23. The two pairs of clamping rods 21 are hinged on the front and rear side walls of the box body 1 near the ends on both sides. The free ends of the two pairs of clamping rods 21 are hinged with clamping plates 211. The two sliding rods 22 are horizontally connected to each pair of strip-shaped holes 12, and both sliding rods 22 pass through the strip-shaped holes 12. The two pairs of pull rods 23 are hinged on the exit ends of the two sliding rods 22, and the free ends of the two pairs of pull rods 23 are hinged at the middle position of the two pairs of clamping rods 21;

The X-shaped lifting mechanism 4 is located at the bottom of the box body 1, and is connected to two sliding rods 22. The bottom of the X-shaped lifting mechanism 4 is equipped with a walking wheel 44; The walking wheel 44 is used for transferring equipment;

5 Driving mechanism 3, located inside box body 1, is connected to two sliding rods 22; The driving mechanism 3 is used to drive two sliding rods 22 to slide laterally within the strip-shaped hole 12.

10 As an alternative embodiment, the X-shaped lifting mechanism 4 comprises: two push rods 41, two X-shaped hinge frames 42, and a lifting plate 43. The two push rods 41 pass through two pairs of strip-shaped holes 12 respectively, and the two push rods 41 are arranged on opposite sides of the two sliding rods 22. The two X-shaped hinge frames 42 are hinged at the ends of the two push rods 41 on the same side, and the lifting plate 43 is arranged below the box body 1. The bottoms of the two X-shaped hinge frames 42 are respectively connected to the lifting plate 43 by sliding, and the bottom of the lifting plate 15 43 is provided with a walking wheel 44.

20 As an alternative embodiment, the driving mechanism 3 comprises: two installation frames 31 and a telescopic cylinder 32. The two installation frames 31 are horizontally slidably connected inside the box body 1, and a connecting rod 311 is provided on the opposite side of the two installation frames 31. The connecting rod 311 passes through the push rod 41 and is fixedly connected to the sliding rod 22. The telescopic cylinder 32 is arranged between the two installation frames 31, and the cylinder body and movable rod of the telescopic cylinder 32 are respectively connected to the two installation frames 31; The telescopic cylinder 32 can be a pneumatic telescopic cylinder or a hydraulic cylinder.

25 As an alternative embodiment, two pairs of strip-shaped holes 12 are respectively provided with installation rods 24 in the box body 1. The two installation rods 24 are arranged on one side of the two sliding rods 22 away from the two push rods 41. The two pairs of clamping rods 21 are hinged at the ends of the two installation rods 24, and the two pairs of pull rods 23 are spring rods; The limitation of the spring rod can make the clamping plate 211 less tightly clamped when it first comes into contact with the electrical automation equipment. The clamping plate 211 can slide on the side wall of the electrical automation equipment to a certain extent, thereby making the box body 1 and the clamping plate 211 fit more tightly with the electrical automation equipment during the complete clamping process, fully ensuring the safety of the transfer of the electrical automation equipment. There are two pairs of clamping rods 21 on both sides of the box 30 body 1, and there are stoppers 25 below them. Above the stoppers 25, there is an inclined upward slope facing the side of the box body 1. The side wall of the box body 1 is 35

equipped with a limiting component 5 connected to the installation rod 24, which is used to limit the clamping rod 21. During the process of deflection clamping, the installation rod 24 is restricted from sliding in the strip-shaped hole 12.

5 As an alternative embodiment, the limiting component 5 is provided with two pairs, which are symmetrically arranged on the front and rear side walls of the box body 1 near the positions on both sides of the box body 1. The limiting component 5 includes an installation body 51 and a first slider 52. The installation body 51 is fixedly connected to the box body 1, and the installation body 51 is provided with an arc-shaped sliding groove 511. The first slider 52 is slidably connected in the arc-shaped sliding groove 511, and a 10 spring 521 connected to the first slider 52 is provided in the arc-shaped sliding groove 511. The first slider 52 is provided with a stop bar, and the installation rod 24 is provided with a pressure bar that cooperates with the stop bar.

As an alternative embodiment, the clamping plate 211 is a rectangular plate, which is provided with two clamping plates 211. The two clamping plates 211 are respectively 15 arranged on the left and right sides of the box 1, and are hinged to the corresponding two clamping rods 21; The setting of two integral clamping plates 211 can make the contact area between the clamping plate 211 and the electrical automatic equipment larger, and the clamping more stable.

As an alternative embodiment, the top of the lifting plate 43 is provided with two pairs of 20 sliding grooves 432, and the bottom of the X-shaped hinge frame 42 is hinged with a second slider 421. The second slider 421 is arranged inside the sliding groove 432, and an elastic member 433 connected to the second sliding block 421 is arranged inside the sliding groove 432; The elastic member 433 is used to drive the second slider 421 on the same X-shaped hinge frame 42 to move towards the opposite side.

25 As an alternative embodiment, when the clamping plate 211 is not in use, the surface of the clamping plate 211 is flush with the upper surface of the box body 1, and the hinge point between the clamping rod 21 and the clamping plate 211 is located at the middle position of the clamping plate 211, offset from the box body 1; The limitation of the hinge position at this location enables the clamping rod 21 to be perpendicular to the box body 1 30 under the action of gravity after the flipping is completed, thereby facilitating the fitting of the clamping plate 211 with the electrical automation equipment.

As an alternative embodiment, the top of the box body 1 is equipped with a rubber pad, which can protect the bottom of the electrical automation equipment and allow the 35 equipment to slide on the box body 1. The two clamping plates 211 on opposite sides are equipped with rubber pads, which can protect the contact surface between the electrical automation equipment and the clamping plate 211, avoiding damage to the equipment.

The working principle and usage method of this embodiment:

The utility model provides an automatic control type lifting device of electrical automation equipment. In the unused state, the clamping plate of the automatic control lifting device is flush with the upper surface of the box. When the equipment is in use, the device is first  
5 moved to the bottom of the equipment to be lifted, and then the telescopic cylinder is started. The movable rod of the telescopic rod first extends, and then pushes the two sliding rods to move towards the opposite side, so that the sliding rod drives the clamping rod to move in a direction away from the box. During the movement of the clamping rod, the clamping rod is flipped upwards under the action of the stopper. After the clamping rod  
10 completes the flipping, the telescopic cylinder is started for contraction, and the sliding rod moves towards the opposite direction. Move, the sliding rod drives the pull rod to apply tension to the clamping rod, and clamp the automation equipment, As the sliding rod moves towards the opposite side, it also drives the X-shaped hinge frame to move, thereby lifting the box body and the electrical automation equipment located on the box  
15 body. The walking wheels set on the lifting plate can be used to transfer and transport the electrical automation equipment. After transporting the electrical automation equipment to the designated position, the telescopic cylinder can be started again for extension movement to lower the electrical automation equipment and relax the clamping of the equipment. The entire transportation process is simple and efficient, and ensures the  
20 safety of the automation equipment.

The above embodiments are only specific implementation methods of the present invention patent, used to illustrate the technical solution of the present invention patent, and not to limit it. The scope of protection of the present invention patent is not limited to this. Although the present invention patent has been described in detail with reference to  
25 the above embodiments, ordinary technical personnel in this field should understand that any technical personnel familiar with this technical field can still modify or easily think of changes to the technical solution described in the above embodiments, or equivalently replace some of the technical features within the technical scope disclosed in the present invention; And these modifications, changes, or substitutions do not deviate from the  
30 essence and scope of the technical solution implemented by the present invention patent, and should be covered within the scope of protection of the present invention. Therefore, the scope of protection of the present invention patent should be based on the scope of protection of the claims.