



(11)

**EP 4 501 545 A1**

(12)

**EUROPEAN PATENT APPLICATION**  
published in accordance with Art. 153(4) EPC

(43) Date of publication:  
**05.02.2025 Bulletin 2025/06**

(51) International Patent Classification (IPC):  
**B25B 11/00 (2006.01)**

(21) Application number: **23864585.7**

(52) Cooperative Patent Classification (CPC):  
**B25B 11/00; B65G 47/90; H01M 6/00; H01M 10/04**

(22) Date of filing: **01.09.2023**

(86) International application number:  
**PCT/CN2023/116588**

(87) International publication number:  
**WO 2024/055853 (21.03.2024 Gazette 2024/12)**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA**  
Designated Validation States:  
**KH MA MD TN**

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(30) Priority: **13.09.2022 CN 202222421886 U**

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(54) **TRAY AND TRAY DEVICE**

(57) Disclosed is a pallet and a pallet device. The pallet comprises: a support plate; a first restraining block provided on the support plate; a moving assembly comprising a moving seat and a positioning member, the moving seat being slidably provided on the support plate in a first direction to cooperate with the first restraining block to clamp or release a workpiece, and the positioning member being movably provided on the moving seat in a second direction to switch between a first position and a second position relative to the moving seat; wherein the support plate is provided with at least two positioning hole groups which are spaced apart from each other in the first direction, and each positioning hole group comprises at least one positioning hole arranged in a third direction; when the positioning member is in the first position, the positioning member is capable of selectively inserting into one of the positioning hole groups, and when the positioning member is in the second position, the positioning member is detached from the positioning hole group; and the first direction, the second direction, and the third direction intersect with each other.

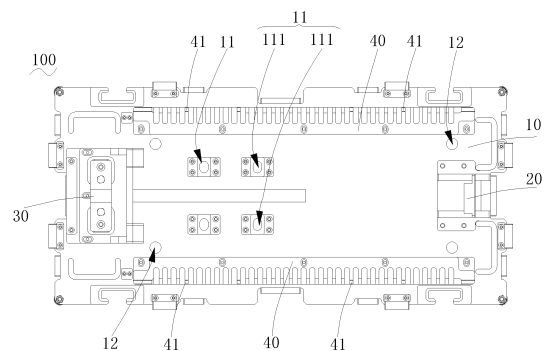


FIG. 3

**EP 4 501 545 A1**

## Description

### CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** The present disclosure claims priority to a Chinese patent application No. 202222421886.X filed with the CNIPA on September 13, 2022 and entitled "PALLET AND PALLET DEVICE", which is hereby incorporated by reference in its entirety.

### TECHNICAL FIELD

**[0002]** The present disclosure relates to the technical field of battery manufacturing equipment, and particularly to a pallet and a pallet device.

### BACKGROUND

**[0003]** A battery module includes a plurality of battery cells, and when assembling the battery module, each battery cell is placed into the pallet, and the pallet provides positioning for the battery module. The pallet is conveyed by a conveying mechanism and enters each processing station on a battery module assembly equipment in sequence to complete the assembly of the battery module.

**[0004]** The pallet generally includes a support plate, a first restraining block and a moving assembly, the first restraining block is fixed to the support plate, and the moving assembly is movable relative to the support plate. The battery module is provided between the first restraining block and the moving assembly. The moving assembly may move in a direction approaching the first restraining block so as to clamp and position the battery module.

**[0005]** In the related technologies, in order to position battery modules of different lengths, the moving assembly is provided with a screw rod and a pressing block, the pressing block is connected to one end of the screw rod, and the other end of the screw rod is provided with a cooperating hole. The positioning pin is connected to a motor, and may be inserted into the cooperating hole. The motor drives the positioning pin to rotate, and then rotation of the screw rod allows the pressing block to move in the direction approaching the first restraining block; the pressing block and the first restraining block cooperate to clamp the battery module. In this way, since the control system cannot determine how many degrees by which the motor has rotated when the positioning pin is inserted into the cooperating hole, it is impossible to accurately calculate how many more degrees the motor needs to rotate to move the pressing block to a preset position so as to clamp the battery module together with the first restraining block, resulting in poor positioning accuracy.

### SUMMARY

**[0006]** The present disclosure is intended to alleviate or solve, at least in part, at least one of the above-men-

tioned problems.

**[0007]** According to an aspect of the present disclosure, the present disclosure proposes a pallet, including: a support plate; a first restraining block provided on the support plate; a moving assembly including a moving seat and a positioning member, the moving seat being slidably provided on the support plate in a first direction and being capable of approaching or moving away from the first restraining block to cooperate with the first restraining block to clamp or release a workpiece, and the positioning member being movably provided on the moving seat in a second direction to switch between a first position and a second position relative to the moving seat; wherein the support plate is provided with at least two positioning hole groups which are spaced apart from each other in the first direction, and each positioning hole group includes at least one positioning hole arranged in a third direction; when the positioning member is in the first position, the positioning member is capable of selectively inserting into one of the positioning hole groups, and when the positioning member is in the second position, the positioning member is detached from the positioning hole group; and the first direction, the second direction, and the third direction intersect with each other.

**[0008]** Optionally, the moving assembly further includes: an elastic member provided between the moving seat and the positioning member for providing a preload force to the positioning member so that the positioning member is inserted into the positioning hole group.

**[0009]** Optionally, the positioning member includes: a connecting seat and a positioning pin, the positioning pin being connected to the connecting seat and being capable of inserting through the moving seat; the moving assembly further includes a connecting rod which includes a rod body and a head connected to each other, the rod body extends in the second direction, and one end of the rod body distal to the head passes through the connecting seat to be fixedly connected to the moving seat; the elastic member is sleeved onto the rod body and abuts between the head of the connecting rod and the connecting seat.

**[0010]** Optionally, the positioning member has a cooperating hole opened in the third direction, and the cooperating hole is configured to allow insertion of an external equipment, so as to enable the positioning member to switch between the first position and the second position.

**[0011]** Optionally, the positioning hole is a waist-shaped hole extending in the third direction.

**[0012]** Optionally, the moving seat includes: a seat body slidably connected to the support plate; a pressing block provided on the seat body; an abutting block connected to the pressing block and cooperating with the first restraining block to clamp or release the workpiece.

**[0013]** Optionally, the moving assembly further includes: a fixing member and an adjusting member, the fixing member fixing the pressing block to the seat body, and the adjusting member abutting against a side of the

pressing block that is distal to the first restraining block;

**[0014]** when the fixing member releases the pressing block, the adjusting member is turned to adjust a spacing between the pressing block and the first restraining block.

**[0015]** Optionally, the pallet further includes: two supporting blocks, which are spaced apart from each other in the third direction, and are provided on the same surface of the support plate as the first restraining block and the moving assembly, each of the supporting blocks includes at least two second restraining blocks spaced apart from each other in the first direction, and the second restraining blocks included in the two supporting blocks are in one-to-one opposition in the third direction.

**[0016]** According to another aspect of the present disclosure, the present disclosure proposes a pallet device, including: the pallet and the adjusting mechanism according to any one of the above, the adjusting mechanism is capable of cooperating with the positioning member to enable the positioning member to switch between the first position and the second position, and is capable of driving the moving assembly to move in the first direction relative to the support plate.

**[0017]** Optionally, the positioning member has a cooperating hole opened in the third direction; the adjusting mechanism includes: a first driving member, and a second driving member connected to the first driving member; a third driving member connected to the second driving member, and an insertion pin connected to the third driving member;

**[0018]** the first driving member is capable of driving the second driving member, the third driving member and the insertion pin to move in the first direction, the second driving member is capable of driving the third driving member and the insertion pin to move in the second direction, and the third driving member is capable of driving the insertion pin to move in the third direction to insert into or detach from the cooperating hole.

**[0019]** Therefore, in the pallet and the pallet device proposed by the present disclosure, by locking the position of the moving seat by inserting the positioning member into the positioning hole group, it is possible to allow the moving seat to move accurately to the preset position so as to cooperate with the first restraining block to clamp the battery module, which improves the positioning accuracy compared with the prior art.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0020]** The foregoing and/or additional aspects and advantages of the present disclosure will become apparent and understandable from the description of the embodiment in conjunction with the accompanying drawings below, wherein:

FIG. 1 shows a top view of a pallet device according to one embodiment of the present disclosure;

FIG. 2 shows a front view of a pallet of the pallet device according to one embodiment of the present

disclosure;

FIG. 3 shows a top view of the pallet of the pallet device according to one embodiment of the present disclosure;

FIG. 4 shows the left view of the pallet of the pallet device according to one embodiment of the present disclosure;

FIG. 5 shows a front view of a partial structure of the pallet device according to one embodiment of the present disclosure;

FIG. 6 shows a left view of the partial structure of the pallet of the pallet device according to one embodiment of the present disclosure;

FIG. 7 shows a top view of the partial structure of the pallet of the pallet device according to one embodiment of the present disclosure;

FIG. 8 shows a structural diagram of a positioning member of a moving assembly of the pallet according to one embodiment of the present disclosure;

FIG. 9 shows a top view of an adjusting mechanism of the pallet device according to one embodiment of the present disclosure;

FIG. 10 shows a left view of the adjusting mechanism of the pallet device according to one embodiment of the present disclosure.

Description of reference signs:

## [0021]

pallet device 1000;  
pallet 100;  
support plate 10; positioning hole group 11; positioning hole 111; elevation hole 12;  
first restraining block 20; moving assembly 30;  
moving seat 31; seat body 311; body 3111; connecting block 3112; pressing block 312; abutting block 313;  
positioning member 32; connecting seat 321; positioning pin 322; cooperating part 323; cooperating hole 3231;  
fixing member 33; adjusting member 34; elastic member 35;  
connecting rod 36; head 361; rod body 362;  
supporting block 40; second restraining block 41;  
first slider 50; first guide rail 60;  
conveying mechanism 200; blocking cylinder 201; adjusting mechanism 300;  
first driving member 301; second driving member 302; third driving member 303; insertion pin 304; first mounting seat 305; second mounting seat 306; third mounting seat 307; first restraining member 308; second restraining member 309.

## DETAILED DESCRIPTION

**[0022]** In order to make the above objects, features and advantages of the present disclosure more clearly under-

stood, specific embodiments of the present disclosure will be described in detail below with reference to the accompanying drawings. In a following description, numerous specific details are set forth in order to provide a thorough understanding of the present disclosure. However, the present disclosure can be implemented in many other ways different from those described here, and those skilled in the art can make similar improvements without violating a connotation of the present disclosure. Therefore, the present disclosure is not limited by the specific embodiments disclosed below.

**[0023]** In the description of the present disclosure, it should be understood that, an orientation or positional relationship indicated by terms "center", "longitudinal", "lateral", "length", "width", "thickness", "upper", "lower", "front", "back", "left", "right", "vertical", "horizontal", "top", "bottom", "inner", "outer", "clockwise", "counterclockwise", "axial", "radial", "circumferential" is based on the orientation or positional relationship shown in the accompanying drawings, and is only for convenience of describing the present disclosure and simplifying the description, rather than indicating or implying that a device or element referred to must be provided with a particular orientation, be constructed and operate in a particular orientation, and therefore should not be understood as a limitation to the present disclosure.

**[0024]** In addition, terms "first" and "second" are only used for descriptive purposes and should not be understood as indicating or implying relative importance or implying a number of indicated technical features. Therefore, a feature delimited with "first", "second" may expressly or implicitly include at least one of those features. In a description of the present disclosure, "a plurality" means at least two, such as two, three, etc., unless expressly and specifically defined otherwise.

**[0025]** In the present disclosure, unless expressly specified and limited otherwise, terms "installed", "communicated", "connected", "fixed" and other terms should be interpreted in a broad sense, for example, it can be a fixed connection, a detachable connection, or an integrated connection; it can be a mechanical connection or an electrical connection; it can be directly connected, or indirectly connected through an intermediate medium, and it can be an internal communication between two elements or an interaction relationship between the two elements, unless otherwise explicitly defined. For those of ordinary skill in the art, specific meanings of the above terms in the present disclosure can be understood according to specific situations.

**[0026]** In the present disclosure, unless expressly stated and defined otherwise, a first feature "on" or "under" a second feature may be that the first feature is in direct contact with the second feature, or the first feature and the second feature are indirectly contacted through an intermediary. In addition, the first feature being "above", "over" and "on" the second feature may mean that the first feature is directly above or obliquely above the second feature, or simply means that the first feature is on a

higher horizontal level than the second feature. The first feature being "below", "under" and "beneath" the second feature may mean that the first feature is directly below or obliquely below the second feature, or simply means that the first feature is on a lower horizontal level than the second feature.

**[0027]** It should be noted that when an element is referred to as being "fixed to" or "provided on" another element, it can be directly on another element, or there may be an intervening element therebetween. When an element is referred to as being "connected" to another element, it can be directly connected to another element or intervening elements may also be present. Terms "vertical", "horizontal", "upper", "lower", "left", "right" and similar expressions used here are only for illustration purposes rather than indicating the only implementation.

**[0028]** Referring to FIG. 1, an embodiment of the present disclosure provides a pallet device 1000, including a pallet 100 configured for positioning a workpiece. Further, the pallet device 1000 further includes a conveying mechanism 200 configured for conveying the pallet 100 to convey the workpiece located on the pallet 100 to a corresponding station for performing a corresponding operation.

**[0029]** Specifically, the conveying mechanism 200 is provided with a blocking cylinder 201, which is configured for blocking the pallet 100 to keep it stationary at a preset position.

**[0030]** Below, the pallet device 1000 of the present disclosure will be described in detail by taking the pallet device 1000 applied to positioning and conveying the battery module as an example. However, this description does not limit the protection scope of the present disclosure, i.e., in other embodiments, it is possible that the workpiece is not a battery module, and may be determined depending on needs.

**[0031]** In an embodiment, referring to FIGs. 2-4, the pallet 100 includes a support plate 10, a first restraining block 20, and a moving assembly 30. The first restraining block 20 is fixedly provided on the support plate 10, and the moving assembly 30 is slidably provided on the support plate 10 in a first direction and is capable of approaching or moving away from the first restraining block 20 so as to cooperate with the first restraining block 20 to clamp or release the battery module. That is, when it is necessary to clamp and position the battery module, the battery module is placed between the first restraining block 20 and the moving assembly 30, and the moving assembly 30 approaches the first restraining block 20 in the first direction to clamp the battery module. The first direction may be the X direction in FIG. 1. When it is necessary to release the battery module, the moving assembly 30 moves away from the first restraining block 20 in the first direction to release the battery module, so as to facilitate removal of the battery module from the support plate 10.

**[0032]** Referring to FIGs. 5 to 7, the moving assembly 30 includes a moving seat 31 and a positioning member

32. The moving seat 31 is slidably connected to the support plate 10 in the first direction and cooperates with the first restraining block 20 to clamp or release the battery module. The positioning member 32 is movably provided on the moving seat 31 in a second direction to switch between a first position and a second position relative to the moving seat 31. The first direction may be the Z direction in FIG. 2.

**[0033]** The first direction intersects with the second direction. Specifically, the first direction is perpendicular to the second direction. The first direction is the X direction in FIG. 1. The second direction is the direction perpendicular to the paper surface in FIG. 1, and is also the Z direction in FIG. 2.

**[0034]** Further, continuing to refer to FIG. 3, the support plate 10 is provided with at least two positioning hole groups 11 spaced apart from each other in the first direction, and each positioning hole group 11 includes one positioning hole 111 arranged in a third direction. The first direction, the second direction, and the third direction intersect with each other. Specifically, the first direction, the second direction, and the third direction are mutually perpendicular. The third direction is the Y direction in FIG. 1.

**[0035]** When the positioning member 32 is in the first position, the positioning member 32 is capable of selectively inserting into one of the positioning hole groups 11; when the positioning member 32 is in the second position, the positioning member 32 is detached from the positioning hole group 11. Thus, the moving assembly 30 is controlled to move in the first direction to a positioning hole group 11 matching the length of the battery module, the positioning member 32 is inserted into the positioning hole group 11, and the moving seat 31 cooperates with the first restraining block 20 to position the battery module, thereby accommodating battery modules of different lengths. When there is no need to position the battery module, the positioning member 32 only needs to be detached from the positioning hole group 11.

**[0036]** In the pallet device 100 provided by the present disclosure, by locking the position of the moving seat 31 by inserting the positioning member 32 into the positioning hole group 11, it is possible to allow the moving seat 31 to move accurately to the preset position so as to cooperate with the first restraining block 20 to clamp the battery module, which improves the positioning accuracy compared with the prior art.

**[0037]** In an embodiment, the moving assembly 30 is directly opposite to the first restraining block 20 in the first direction, and when they clamp the battery module, it is possible to ensure balanced force application on the battery module, preventing damage to the battery module.

**[0038]** Continuing to refer to FIG. 5, the moving seat 31 includes a seat body 311, a pressing block 312, and an abutting block 313. The seat body 311 is slidably connected to the support plate 10. The pressing block 312 is provided on the seat body 311, and the abutting block 313

is connected to the pressing block 312 and cooperates with the first restraining block 20 to clamp or release the battery module. The seat body 311 is provided with a first slider 50, while the support plate 10 is provided with a first guide rail 60. The seat body 311 is slidably connected to the support plate 10 through the cooperation of the first slider 50 with the first guide rail 60.

**[0039]** Further, continuing to refer to FIG. 7, the moving seat 31 includes at least two abutting blocks 313 spaced apart from each other in the third direction.

**[0040]** It should be noted that in some other embodiments, the moving seat 31 could include only one abutting block 313, which is not limited herein.

**[0041]** Continuing to refer to FIG. 7, the moving assembly 30 further includes a fixing member 33 and an adjusting member 34. The fixing member 33 fixes the pressing block 312 to the seat body 311, and the adjusting member 34 abuts against a side of the pressing block 312 that is distal to the first restraining block 20. When the fixing member 33 releases the pressing block 312, the adjusting member 34 is turned to adjust a spacing between the pressing block 312 and the first restraining block 20. By adjusting the spacing between the pressing block 312 and the first restraining block 20 via the adjusting member 34 so as to fine-tune the spacing between the abutting block 313 and the first restraining block 20, it is thus possible to ensure that the abutting block 313 cooperates with the first restraining block 20 to clamp the battery module.

**[0042]** Specifically, the pressing block 312 is provided with a waist-shaped hole extending in the first direction. The fixing member 33 is a fastening screw that passes through the waist-shaped hole and the seat body 311 to fix the two. When it is necessary to adjust the relative positions of the pressing block 312 and the seat body 311, the fastening screw is loosened; the adjusting member 34 is an adjusting screw, and it is possible to adjust the relative position of the pressing block 312 and the seat body 311 by turning the adjusting screw.

**[0043]** Further, continuing to refer to FIGs. 5 and 7, to facilitate the assembly of the adjusting member 34, the seat body 311 includes a body 3111 and a connecting block 3112. The connecting block 3112 is provided on the seat body 311, and the adjusting member 34 is mounted on the connecting block 3112. Of course, in some other embodiments, the adjusting member 34 may be directly mounted on the body 3111 with the connecting block 3112 omitted.

**[0044]** In an embodiment, the support plate 10 is provided with three positioning hole groups 11. When the positioning member 32 is in the first position, it is capable of selectively inserting into one of the three positioning hole groups 11. By providing the support plate 10 with three positioning hole groups 11, it is possible to clamp battery modules of three different lengths. It should be understood that, in some other embodiments, there is no restriction to the number of the positioning hole groups 11 opened on the support plate 10. For example, two, or

more than three positioning hole groups 11 may be opened in the support plate 10.

**[0045]** The positioning hole 111 is a waist-shaped hole extending in the third direction to allow the insertion of the positioning member 32 into the positioning holes 111. Referring to FIG. 8, the positioning member 32 includes a connecting seat 321 and a positioning pin 322 connected to the connecting seat 321. The connecting seat 321 is provided on the pressing block 312, and the positioning pin 322 pass through the pressing block 312 and the seat body 311 and is provided in them. When the positioning member 32 is in the first position, the positioning pin 322 may protrude from the seat body 311 and insert into the positioning hole 111.

**[0046]** The number of the positioning pins 322 equals to the number of the positioning holes 111 included in each positioning hole group 11 so as to allow each positioning pin 322 to insert into one positioning hole 111, thereby ensuring the positioning effect. To further ensure the positioning effect, each positioning hole group 11 is provided to include at least two positioning holes 111 spaced apart from each other in the third direction, and the number of the positioning pins 322 is also at least two.

**[0047]** Further, the seat body 311 is fixedly provided with a linear bearing therein, and the positioning pin 322 is provided in the linear bearing and slidably connected thereto so as to improve the positioning accuracy.

**[0048]** It should be noted herein that although the positioning pin 322 is inserted into the pressing block 312 and the seat body 311, it does not interfere with the relative positions of the pressing block 312 and the seat body 311 when adjusting the relative position.

**[0049]** In an embodiment, continuing to refer to FIGs. 5 and 6, the moving assembly 30 further includes an elastic member 35, which is provided on the moving seat 31 and is configured for providing a preloading force to the positioning member 32 to enable the positioning member 32 to be inserted into the positioning hole group 11. Specifically, the moving assembly 30 further includes a connecting rod 36 which includes a rod body 362 and a head 361 connected to each other, the rod body 362 extends in the second direction, and one end of the rod body 362 distal to the head 361 passes through the connecting seat 321 and the pressing block 312 to be fixedly connected to the seat body 311. The elastic member 35 is sleeved onto the rod body 362 and abuts between the head 361 of the connecting rod 36 and the connecting seat 321. In this way, when an external force causes the positioning member 32 to switch from the first position to the second position, the elastic member 35 accumulates energy, and when the external force disappears, the positioning member 32 switches from the second position to the first position and stays there under the action of the elastic member 35. At the same time, since the rod body 362 passes through the connecting seat 321, it also serves to guide the movement of the connecting seat 321.

**[0050]** In a specific embodiment, there are provided a

plurality of the connecting rods 36 and the elastic members 35, with the elastic members 35 being springs, where each spring is sleeved onto one connecting rod 36. Of course, in some other specific embodiments, the number of connecting rods 36 and elastic members 35 is not limited, and the type of elastic member 35 is also not limited.

**[0051]** In an embodiment, continuing to refer to FIG. 8, the positioning member 32 further includes a cooperating part 323, which is connected to the connecting seat 321 and has a cooperating hole 3231 opened in the third direction. The cooperating hole 3231 is configured to allow insertion of an external equipment, so as to enable the positioning member 32 to switch between the first position and the second position. Specifically, the cooperating hole 3231 penetrates through the cooperating part 323 in the third direction and is opened therein.

**[0052]** Further, the cooperating hole 3231 is provided as a waist-shaped hole extending in the second direction to facilitate the insertion of an external device.

**[0053]** In an embodiment, continuing to refer to FIG. 3, the pallet 100 further includes two supporting blocks 40, which are spaced apart from each other in the third direction, and are provided on the same surface of the support plate 10 as the first restraining block 20 and the moving assembly 30. Each of the supporting blocks 40 includes at least two second restraining blocks 41 spaced apart from each other in the first direction, and the second restraining blocks 41 included by the two support plates 10 are in one-to-one opposition in the third direction. In this way, the battery module is placed between the two supporting blocks 40, and the second restraining blocks 41 in one-to-one opposition in the third direction may position the battery module from two sides thereof.

**[0054]** Continuing to refer to FIG. 1, the pallet device 1000 further includes an adjusting mechanism 300, which is capable of cooperating with the positioning member 32 to enable the positioning member 32 to switch between the first position and the second position, and is capable of driving the moving assembly 30 to move in the first direction relative to the support plate 10.

**[0055]** Referring to FIGs. 9 and 10, the adjusting mechanism 300 includes a first driving member 301, a second driving member 302, a third driving member 303, and an insertion pin 304. The second driving member 302 is mounted on the first driving member 301, the third driving member 303 is connected to the second driving member 302, and the insertion pin 304 is connected to the third driving member 303. The first driving member 301 may drive the second driving member 302, the third driving member 303, and the insertion pin 304 to move in the first direction. The second driving member 302 may drive the third driving member 303 and the insertion pin 304 to move in the second direction. The third driving member 303 may drive the insertion pin 304 to move in the third direction to insert into or detach from the cooperating hole 3231.

**[0056]** When it is necessary for the positioning member

32 to detach from one positioning hole group 11 to insert into another positioning hole group 11, the third driving member 303 acts to drive the insertion pin 304 to perform forward movement in the third direction to insert into the cooperating hole 3231. The second driving member 302 acts to drive the third driving member 303 and the insertion pin 304 to perform forward movement in the second direction, causing the positioning pin 322 to detach from the positioning hole group 11. The first driving member 301 acts to drive the second driving member 302, the third driving member 303, and the insertion pin 304 to move in the first direction, causing the moving assembly 30 to move relative to the support plate 10. When the moving assembly 30 moves to the preset position, the second driving member 302 acts to drive the third driving member 303 and the insertion pin 304 to perform reverse movement in the second direction, causing the positioning pin 322 to insert into another positioning hole group 11. The third driving member 303 acts to drive the insertion pin 304 to perform reverse movement in the third direction to detach from the cooperating hole 3231. At this point, the positioning member 32 remains in the first position due to the action of the elastic member 35.

**[0057]** The first driving member 301 uses a servo-driven component, which ensures the movement precision of the moving assembly 30.

**[0058]** Further, the adjusting mechanism 300 further includes a first mounting seat 305, a second mounting seat 306, and a third mounting seat 307. The first mounting seat 305 is connected to a first drive end of the first driving member 301, the second driving member 302 is fixedly provided on the first mounting seat 305, the second mounting seat 306 is connected to a second drive end of the second driving member 302, the third driving member 303 is fixedly provided on the second mounting seat 306, the third mounting seat 307 is connected to a third drive end of the third driving member 303, and the insertion pin 304 is fixedly provided on the third mounting seat 307. In this way, it is possible to facilitate the assembly of each component of the adjusting mechanism 300.

**[0059]** Preferably, the adjusting mechanism 300 further includes a second slider and a second guide rail. The second guide rail is provided on the first mounting seat 305, the second slider is provided on the second mounting seat 306, and the second mounting seat 306 is slidably connected to the first mounting seat 305 via the cooperation of the second slider and the second guide rail. The adjusting mechanism 300 further includes a third slider and a third guide rail. The third slider is provided on the third mounting seat 307, the third guide rail is provided on the second mounting seat 306, and the third mounting seat 307 is slidably connected to the second mounting seat 306 via the cooperation of the third slider and the third guide rail.

**[0060]** The adjusting mechanism 300 further includes a first restraining member 308 and a second restraining member 309. The first restraining member 308 is con-

figured for restraining the position of the insertion pin 304 to move in the second direction, and the second restraining member 309 is configured for restraining the position of the insertion pin 304 to move in the third direction.

**[0061]** In an embodiment, to facilitate the reliable insertion of the insertion pin 304 into the cooperating hole 3231, the support plate 10 of the pallet 100 is further opened with a elevation hole 12. Before inserting the insertion pin 304 into the cooperating hole 3231, a jacking pin from the jacking mechanism is inserted into this elevation hole 12 to drive the pallet 100 to detach from the conveying mechanism 200, ensuring the repeatable positioning accuracy of the pallet 100. This jacking mechanism may be driven by a pneumatic cylinder.

**[0062]** Another embodiment of the present disclosure also provides a pallet 100 included in the above pallet device 1000.

**[0063]** The working principle of the pallet device 1000 provided by the embodiments of the present disclosure is as follows:

In an initial state, the positioning pin 322 is inserted into one of the positioning hole groups 11.

**[0064]** When it is necessary to clamp and position the battery module, the first driving member 301 acts to drive the second driving member 302, the third driving member 303 and the insertion pin 304 to move in the first direction to reach the preset position. The third driving member 303 acts to drive the insertion pin 304 to perform forward movement in the third direction to insert into the cooperating hole 3231. The second driving member 302 acts to drive the third driving member 303 and the insertion pin 304 to perform forward movement in the second direction, causing the positioning pin 322 to detach from the positioning hole group 11 and the elastic member 35 to accumulate energy. The first driving member 301 acts again to drive the second driving member 302, the third driving member 303 and the insertion pin 304 to move in the first direction, thereby driving the moving assembly 30 to move to an appropriate position and thus avoiding interfering with the placement of the battery module on the support plate 10. Once the battery module is placed on the support plate 10, the first driving member 301 acts again to drive the moving assembly 30 by means of the insertion pin 304 to move to the preset position. The second driving member 302 acts to drive the third driving member 303 and the insertion pin 304 to perform reverse movement in the second direction, causing the insertion pin 304 to insert into the positioning hole group 11. The third driving member 303 acts to drive the insertion pin 304 to perform reverse movement in the third direction to detach from the cooperating hole 3231, and the positioning member 32 remains in the first position due to the action of the elastic member 35.

**[0065]** It should be noted herein that when it is necessary to position battery modules of different lengths, the above steps may be repeated. Additionally, by operating the adjusting member 34, it is possible to fine-tune the abutting block 313 so as to facilitate clamping the battery

module.

**[0066]** The technical features of the above embodiments can be combined arbitrarily. In order to simplify the description, all possible combinations of the technical features in the above embodiments are not described. However, as long as there is no contradiction in the combination of these technical features, it should be considered as a scope of this description.

**[0067]** The above embodiments only express several embodiments of the present application, and the description is more specific and detailed, but it cannot be understood as a limitation on the scope of the present application. It should be noted that for those skilled in the art, several modifications and improvements can be made without departing from a concept of the present application, which belong to a protective scope of the present application. Therefore, the protective scope of the present application shall be subject to the appended claims.

## Claims

### 1. A pallet, **characterized by** comprising:

a support plate (10);  
 a first restraining block (20) provided on the support plate (10);  
 a moving assembly (30) comprising a moving seat (31) and a positioning member (32), the moving seat (31) being slidably provided on the support plate (10) in a first direction and being capable of approaching or moving away from the first restraining block (20) to cooperate with the first restraining block (20) to clamp or release a workpiece, and the positioning member (32) being movably provided on the moving seat (31) in a second direction to switch between a first position and a second position relative to the moving seat (31);  
 wherein the support plate (10) is provided with at least two positioning hole groups (11) which are spaced apart from each other in the first direction, and each positioning hole group (11) comprises at least one positioning hole (111) arranged in a third direction; when the positioning member (32) is in the first position, the positioning member (32) is capable of selectively inserting into one of the positioning hole groups (11), and when the positioning member (32) is in the second position, the positioning member (32) is detached from the positioning hole group (11); and the first direction, the second direction, and the third direction intersect with each other.

### 2. The pallet according to claim 1, **characterized in that** the moving assembly (30) further comprises: an elastic member (35) provided between the moving seat (31) and the positioning member (32) for

providing a preloading force to the positioning member (32) so that the positioning member (32) is inserted into the positioning hole group (11).

### 3. The pallet according to claim 2, **characterized in that** the positioning member (32) comprises:

a connecting seat (321) and a positioning pin (322), the positioning pin (322) being connected to the connecting seat (321) and being capable of inserting through the moving seat (31);  
 the moving assembly (30) further comprises a connecting rod (36) which comprises a rod body (362) and a head (361) connected to each other, the rod body (362) extends in the second direction, and one end of the rod body (362) distal to the head (361) passes through the connecting seat (321) to be fixedly connected to the moving seat (31);  
 the elastic member (35) is sleeved onto the rod body (362) and abuts between the head (361) of the connecting rod (36) and the connecting seat (321).

### 4. The pallet according to any one of claims 1 to 3, **characterized in that** the positioning member (32) has a cooperating hole (3231) opened in the third direction, and the cooperating hole (3231) is configured to allow insertion of an external equipment, so as to enable the positioning member (32) to switch between the first position and the second position.

### 5. The pallet according to any one of claims 1 to 4, **characterized in that** the positioning hole (111) is a waist-shaped hole extending in the third direction.

### 6. The pallet according to any one of claims 1 to 5, **characterized in that** the moving seat (31) comprises:

a seat body (311) slidably connected to the support plate (10);  
 a pressing block (312) provided on the seat body (311);  
 an abutting block (313) connected to the pressing block (312) and cooperating with the first restraining block (20) to clamp or release the workpiece.

### 7. The pallet according to claim 6, **characterized in that** the moving assembly (30) further comprises:

a fixing member (33) and an adjusting member (34), the fixing member (33) fixing the pressing block (312) to the seat body (311), and the adjusting member (34) abutting against a side of the pressing block (312) that is distal to the first restraining block (20);



when the fixing member (33) releases the pressing block (312), the adjusting member (34) is turned to adjust a spacing between the pressing block (312) and the first restraining block (20).

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8. The pallet according to any one of claims 1 to 7, **characterized in that** the pallet further comprises:

two supporting blocks (40), which are spaced apart from each other in the third direction, and are provided on the same surface of the support plate (10) as the first restraining block (20) and the moving assembly (30),  
each of the supporting blocks (40) comprises at least two second restraining blocks (20) spaced apart from each other in the first direction, and the second restraining blocks (20) included in the two supporting blocks (40) are in one-to-one opposition in the third direction.

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9. A pallet device, **characterized by** comprising:

the pallet according to any one of claims 1 to 8; and  
an adjusting mechanism (300), which is capable of cooperating with the positioning member (32) to enable the positioning member (32) to switch between the first position and the second position, and is capable of driving the moving assembly (30) to move in the first direction relative to the support plate (10).

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10. The pallet device according to claim 9, **characterized in that** the positioning member (32) has a cooperating hole (3231) opened in the third direction; the adjusting mechanism (300) comprises:

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a first driving member (301), and a second driving member (302) connected to the first driving member (301);

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a third driving member (303) connected to the second driving member (302), and an insertion pin (304) connected to the third driving member (303);

the first driving member (301) is capable of driving the second driving member (302), the third driving member (303) and the insertion pin (304) to move in the first direction, the second driving member (302) is capable of driving the third driving member (303) and the insertion pin (304) to move in the second direction, and the third driving member (303) is capable of driving the insertion pin (304) to move in the third direction to insert into or detach from the cooperating hole (3231).

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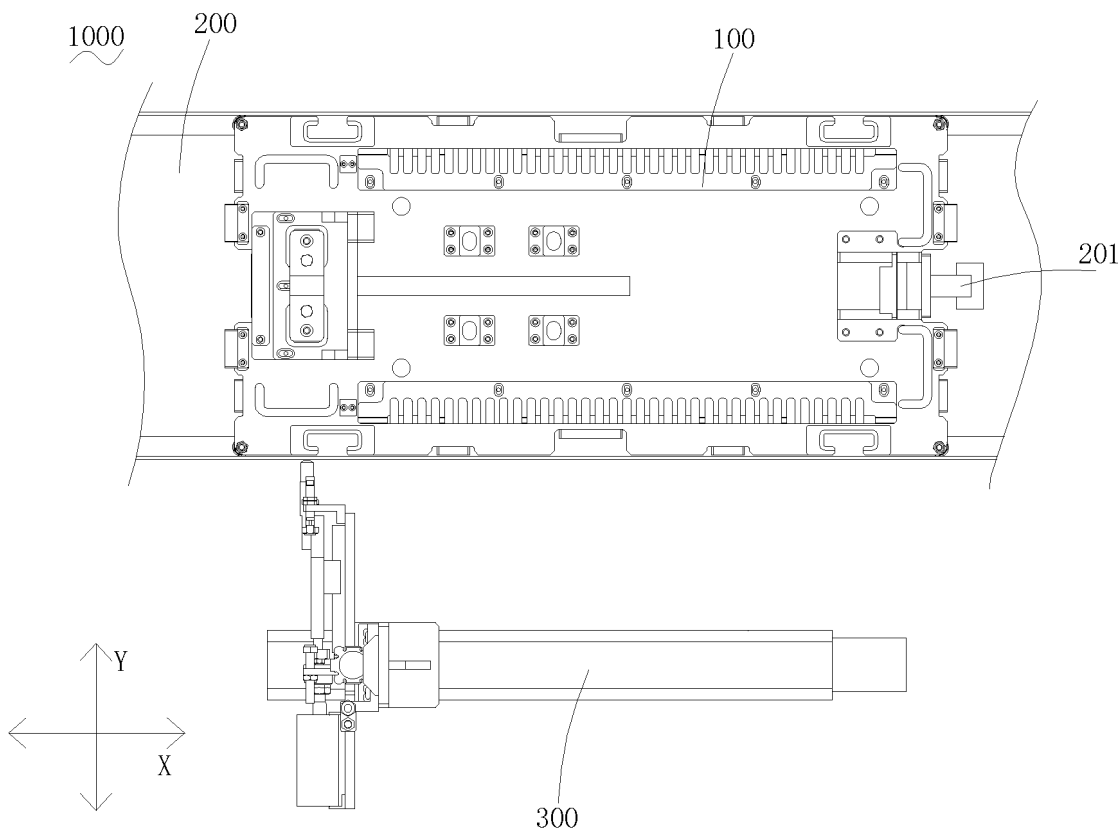


FIG. 1

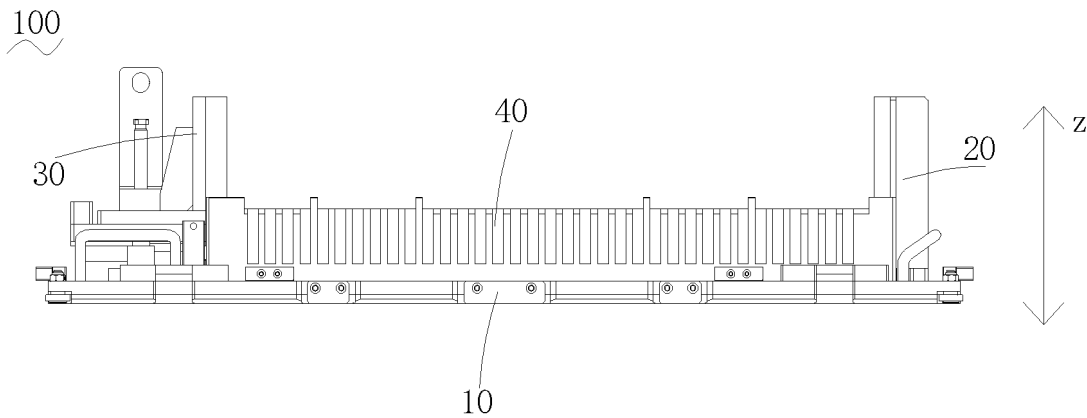


FIG. 2

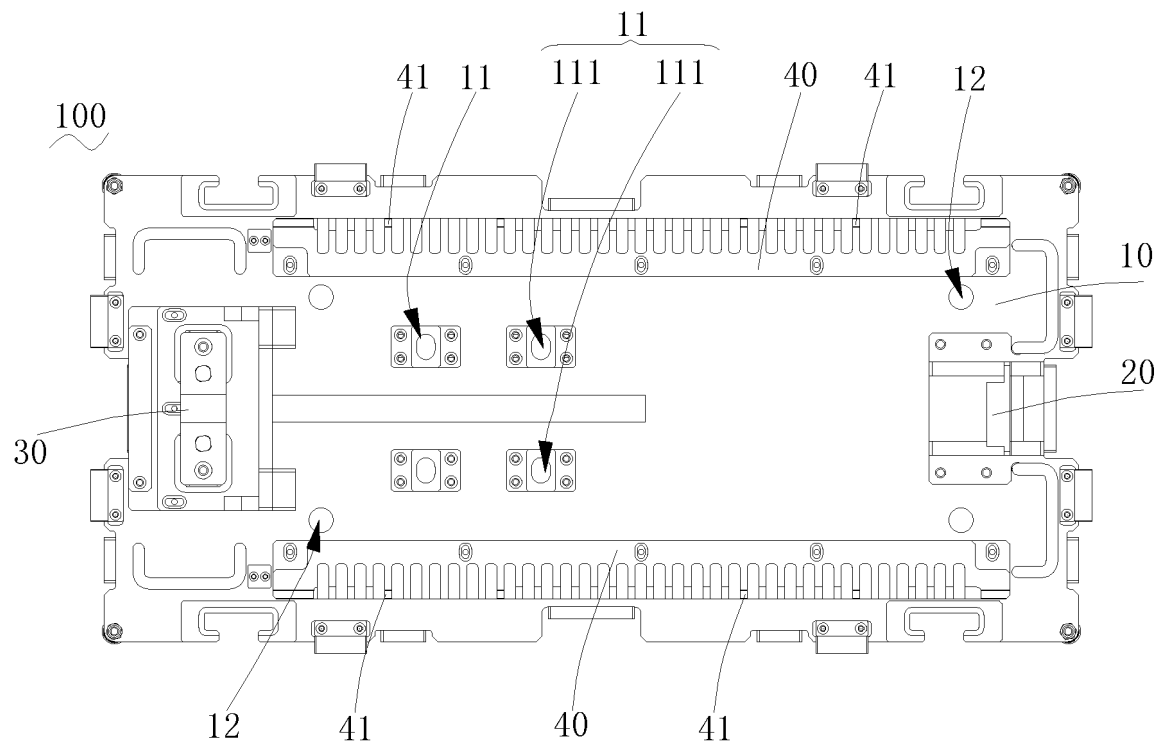


FIG. 3

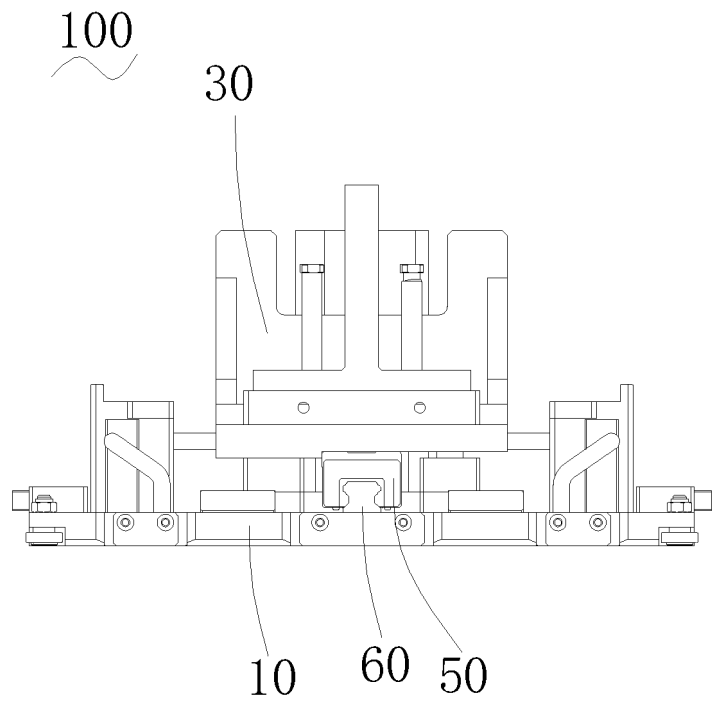


FIG. 4

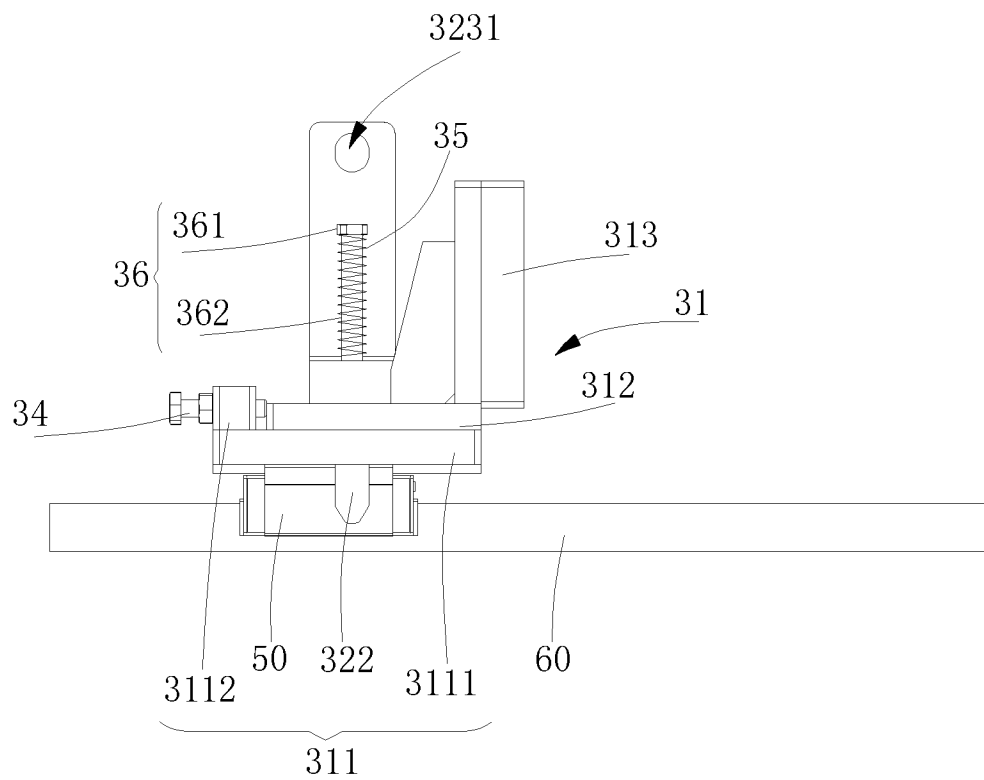


FIG. 5

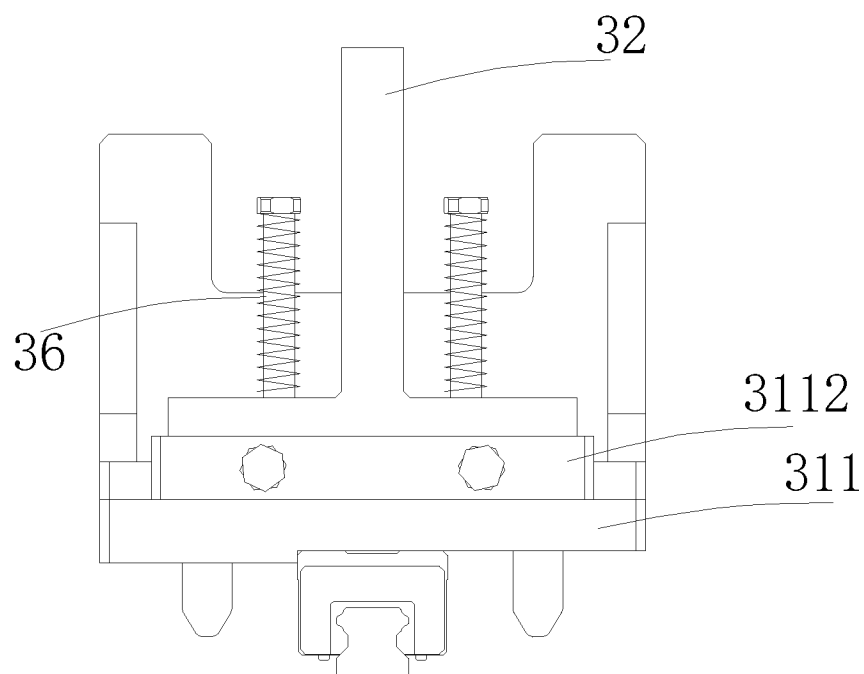


FIG. 6

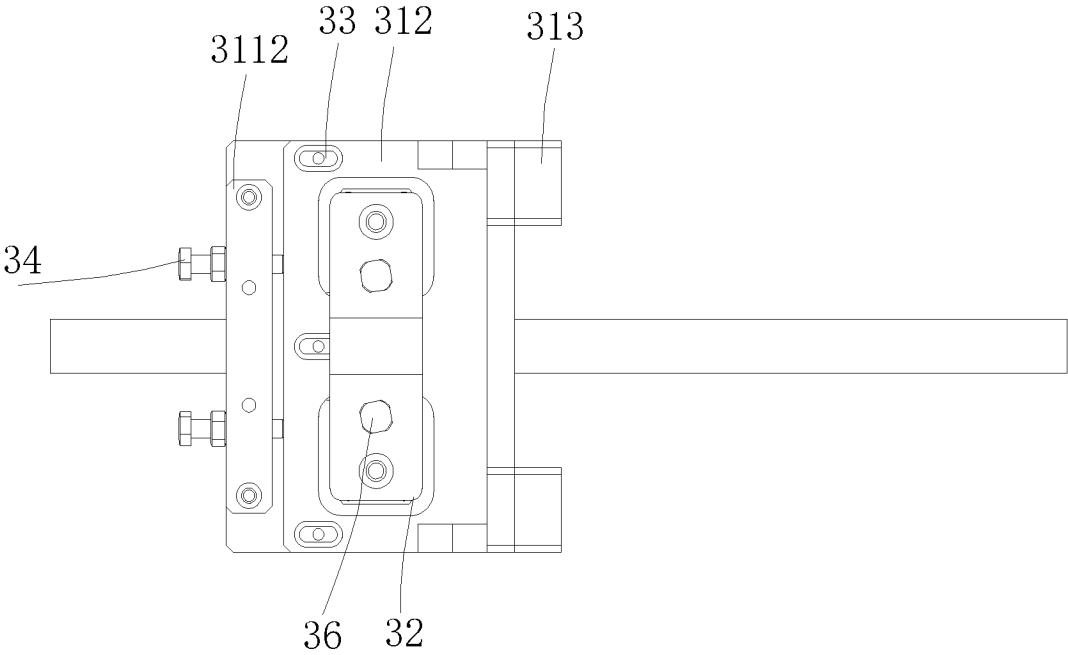


FIG. 7

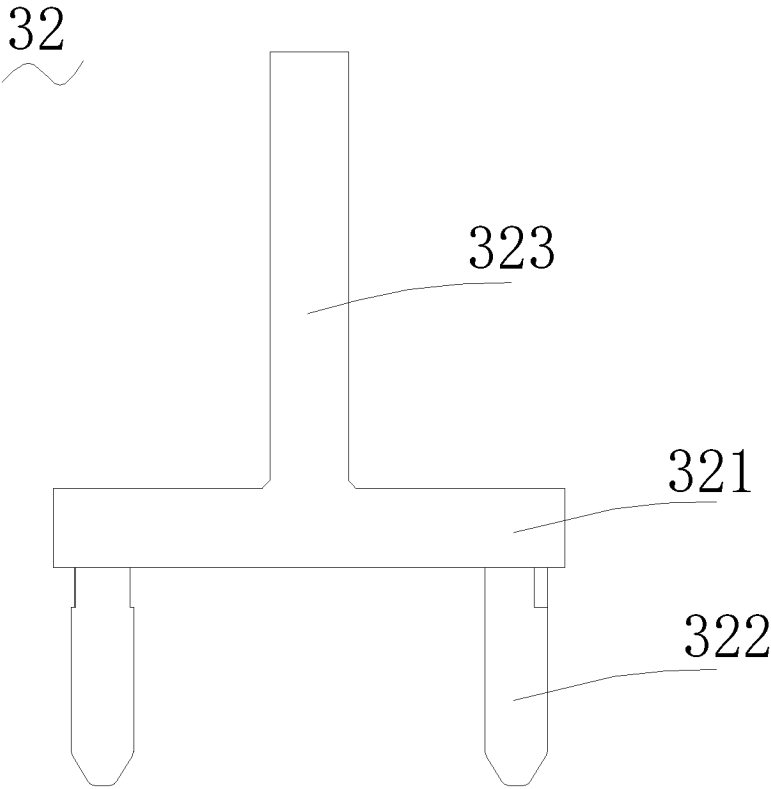


FIG. 8

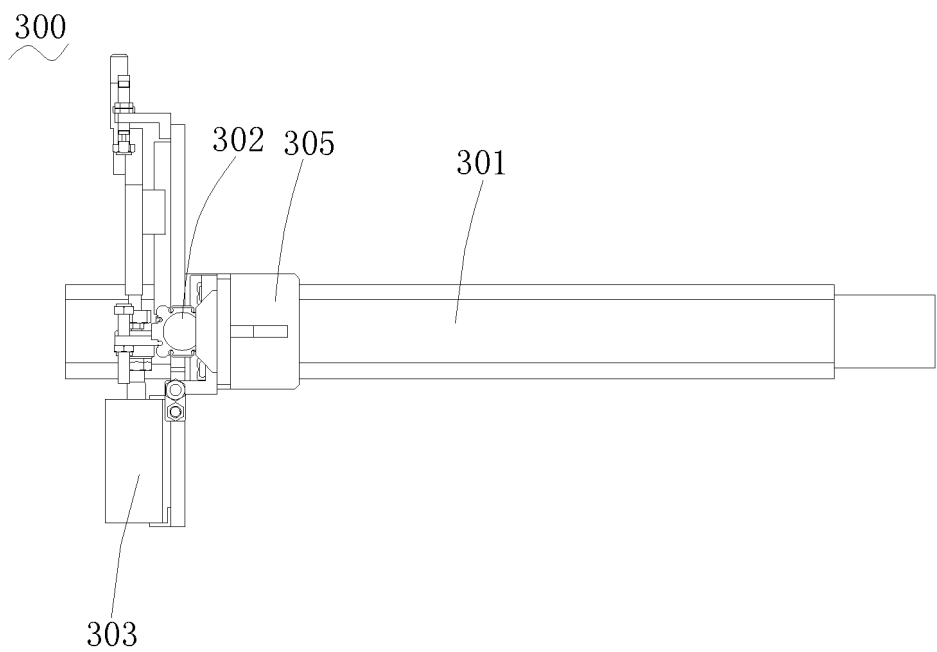


FIG. 9

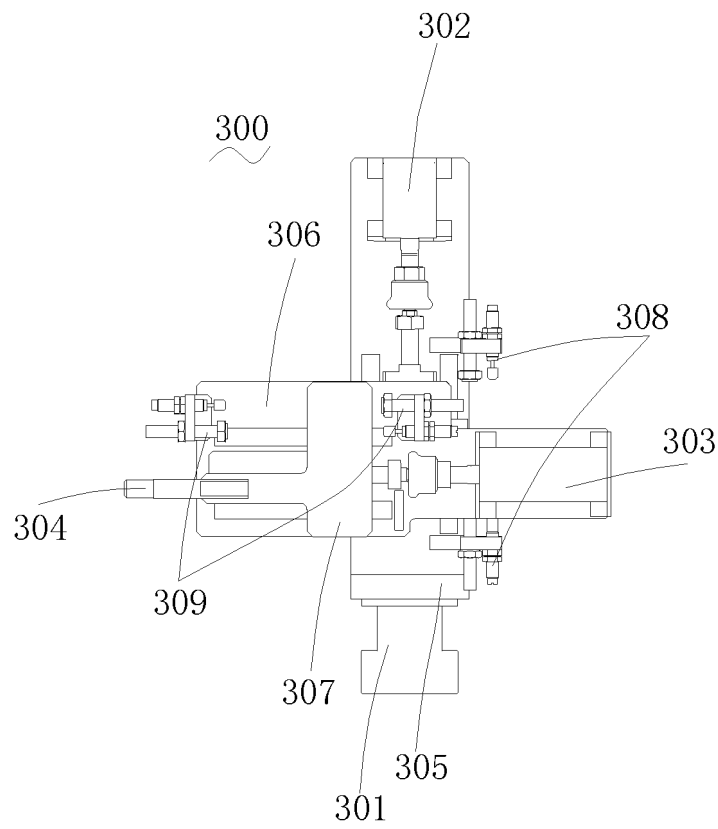


FIG. 10

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/116588

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> B25B11/00(2006.01)i  According to International Patent Classification (IPC) or to both national classification and IPC																		
<b>B. FIELDS SEARCHED</b>  Minimum documentation searched (classification system followed by classification symbols) IPC: B25B  Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNTXT, WPABS, WPABSC, CNKI: 无锡先导智能装备, 托盘, 电池, 销, 轴, 孔, 槽, 定位, 限位, 导轨, 滑轨, 滑槽, 导槽, 滑块, 轨道, 弹簧, 插入, tray, battery, pin, axis, hole, aperture, groove, slot, orient, locate, limit, guide, slide, rail, lead, spring, insert																		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>PX</td> <td>CN 218504300 U (WUXI LEAD INTELLIGENT EQUIPMENT CO., LTD.) 21 February 2023 (2023-02-21) entire document</td> <td>1-10</td> </tr> <tr> <td>X</td> <td>CN 114976443 A (GUANGZHOU MINO EQUIPMENT CO., LTD.) 30 August 2022 (2022-08-30) description, paragraphs 88-188, and figures 1-8</td> <td>1-2, 5-8</td> </tr> <tr> <td>A</td> <td>CN 110340826 A (KUNSHAN HUAYU AUTOMATION TECHNOLOGY CO., LTD.) 18 October 2019 (2019-10-18) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 110364765 A (HEFEI GUOXUAN HIGH-TECH POWER ENERGY CO., LTD.) 22 October 2019 (2019-10-22) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 200977607 Y (BYD CO., LTD.) 21 November 2007 (2007-11-21) entire document</td> <td>1-10</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	PX	CN 218504300 U (WUXI LEAD INTELLIGENT EQUIPMENT CO., LTD.) 21 February 2023 (2023-02-21) entire document	1-10	X	CN 114976443 A (GUANGZHOU MINO EQUIPMENT CO., LTD.) 30 August 2022 (2022-08-30) description, paragraphs 88-188, and figures 1-8	1-2, 5-8	A	CN 110340826 A (KUNSHAN HUAYU AUTOMATION TECHNOLOGY CO., LTD.) 18 October 2019 (2019-10-18) entire document	1-10	A	CN 110364765 A (HEFEI GUOXUAN HIGH-TECH POWER ENERGY CO., LTD.) 22 October 2019 (2019-10-22) entire document	1-10	A	CN 200977607 Y (BYD CO., LTD.) 21 November 2007 (2007-11-21) entire document	1-10
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<table border="1"> <tr> <td>Name and mailing address of the ISA/CN <b>China National Intellectual Property Administration (ISA/CN) China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088</b></td> <td>Authorized officer    Telephone No.</td> </tr> </table>	Name and mailing address of the ISA/CN <b>China National Intellectual Property Administration (ISA/CN) China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088</b>	Authorized officer    Telephone No.																
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International application No.

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 212217562 U (HAN'S LASER TECHNOLOGY INDUSTRY GROUP CO., LTD.) 25 December 2020 (2020-12-25) entire document	1-10
A	CN 213595358 U (WUXI LEAD INTELLIGENT EQUIPMENT CO., LTD.) 02 July 2021 (2021-07-02) entire document	1-10
A	CN 216084990 U (NINGDE CONTEMPORARY AMPEREX TECHNOLOGY CO., LTD.) 18 March 2022 (2022-03-18) entire document	1-10
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INTERNATIONAL SEARCH REPORT  
Information on patent family members

International application No.  
**PCT/CN2023/116588**

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 218504300 U	21 February 2023	None	
CN 114976443 A	30 August 2022	None	
CN 110340826 A	18 October 2019	None	
CN 110364765 A	22 October 2019	None	
CN 200977607 Y	21 November 2007	None	
CN 212217562 U	25 December 2020	None	
CN 213595358 U	02 July 2021	None	
CN 216084990 U	18 March 2022	None	
CN 216943359 U	12 July 2022	None	
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**Patent documents cited in the description**

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