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(54) Title: AUTOMATIC DISTRIBUTING EQUIPMENT

(57) Abstract: The present invention discloses an automatic distributing equipment for distributing a variety of components with different shapes. The automatic distributing equipment comprises: a base; a storage device mounted on the base to store the components thereon; a recognition device configured to recognize the components stored on the storage device; and a pickup device configured to pick up the recognized components based on a recognition result of the recognition device. In the present invention, the automatic distributing equipment can recognize components to be distributed and pick up the components based on the recognition result.

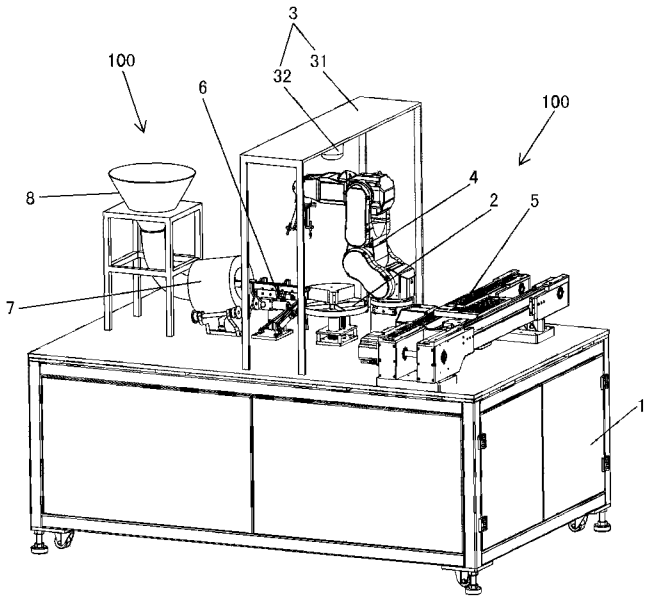


Fig. 1

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AUTOMATIC DISTRIBUTING EQUIPMENT

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an automatic distributing equipment, more particularly, relates to an automatic distributing equipment configured to place different components at different positions.

Description of the Related Art

Generally, an electronic apparatus, for example, an electrical connector, a fiber optic connector, a relay or the like, comprises a great number of components, such as, a case, a contact, a spring, a bolt, an insulation block, etc.. During manufacturing such electronic apparatus, it needs to prepare the components with different shapes and different functions in advance, then select these components manually or by a robot according to a preset program, and assemble these components into an electronic apparatus on a worktable.

SUMMARY OF THE INVENTION

According to embodiments of the present invention, there is provided an automatic distributing equipment capable of recognizing components to be distributed and picking up the components based on a recognition result.

According to an aspect of the present invention, there is provided an automatic distributing equipment for distributing a variety of components with different shapes, comprising: a base; a storage device mounted on the base to store the components thereon; a recognition device configured to recognize the components stored on the storage device; and a pickup device configured to pick up the recognized components based on a recognition result from the recognition device.

In the above automatic distributing equipment, the storage device comprises a support tray configured to place the components thereon.

In the above automatic distributing equipment, the storage device further comprises a first support seat mounted on the base, and the support tray is mounted on the first support seat.

In the above automatic distributing equipment, the support tray has a substantially circular shape, and the storage device further comprises a first motor mounted on the first support seat, and the first motor is configured to drive the support tray to rotate.

In the above automatic distributing equipment, a plurality of division plates extending

in a radial direction are provided on the support tray, so as to divide the support tray into a plurality of storage sections having a substantially fanlike shape.

In the above automatic distributing equipment, a ring-shaped blocking plate is provided on the periphery of the support tray, so as to block the components from falling out of the support tray.

In the above automatic distributing equipment, a fanlike blocking plate is provided on the support tray, so as to block the components from falling out of the support tray.

In the above automatic distributing equipment, the storage device further comprises a vibration device mounted on the base under the support tray and configured to vibrate the support tray.

In the above automatic distributing equipment, the vibration device vibrates the support tray in a manner of impulse hunting.

The above automatic distributing equipment further comprises a storage tray comprising a plurality of holding portions configured to hold components with different shapes, the pickup device is further configured to place the picked components on the respective holding portions of the storage tray.

In the above automatic distributing equipment, the recognition device comprising: a first support frame mounted on the base; and a camera mounted on the support frame to capture an image of the components stored on the storage device.

In the above automatic distributing equipment, the recognition device further comprising: a light source configured to illuminate the components stored on the storage device.

The above automatic distributing equipment further comprising: a first transmission device configured to transmit the components onto the storage device.

In the above automatic distributing equipment, the first transmission device comprising: a second support seat mounted on the base; a conveyer belt assembly mounted on the second support seat and comprising a receiving end for receiving the components and a releasing end for releasing the components; and a second motor mounted on the second support seat and configured to drive a conveyer belt of the conveyer belt assembly to move.

The above automatic distributing equipment further comprising: a loading device configured to load the components onto the receiving end of the conveyer belt assembly.

In the above automatic distributing equipment, the loading device comprising: a rolling drum, orientated substantially in a horizontal direction, into which the receiving end of the conveyer belt assembly is inserted in a substantially horizontal direction; a driving device configured to drive the rolling drum to rotate; and at least a scraping plate mounted on an inner wall of the rolling drum in an axial direction.

In the above automatic distributing equipment, the loading device further comprising: an input device communicated with an inner space of the rolling drum at the other end of the

rolling drum opposite to one end of the rolling drum for inserting the receiving end of the conveyer belt assembly, so as to input the components into the rolling drum.

In the above automatic distributing equipment, the input device comprising: a second support frame mounted on the base; a funnel portion supported on the second support frame and configured to receive the components; and a bending portion located under the funnel portion and communicated with the inner space of the rolling drum.

In the above automatic distributing equipment, the driving device comprising: a third support seat mounted on the base; a third motor mounted on the third support seat; and a plurality of rolling shafts mounted on the third support seat and rotatably engaged with an outer surface of the rolling drum, so as to drive the rotation of the rolling drum under the driving of the third motor.

In the above automatic distributing equipment, an angle of a surface of the conveyer belt assembly with respect to a horizontal plane is adjustable in a lateral direction perpendicular to a transmitting direction of the conveyer belt.

In the above automatic distributing equipment, the second support seat comprises at least two arcuate brackets each comprising: an arcuate groove; a plurality of through holes arranged in an arcuate shape along the periphery of the arcuate groove ; and a lateral bracket on which the conveyer belt assembly is mounted, wherein both ends of the lateral bracket are selectively engaged in two through holes of the plurality of through holes, so that the lateral bracket strides on a portion of the arcuate groove in a changeable posture.

In the above automatic distributing equipment, at least one side of the receiving end of the conveyer belt assembly in a lateral direction is provided with a blocking plate.

In the above automatic distributing equipment, a guide device is provided under the releasing end of the conveyer belt assembly, and the guide device is configured to guide the components on the conveyer belt assembly toward the storage device.

In the above automatic distributing equipment, the guide device comprising: a plurality of support rods pivotally mounted on the second support seat; and a guide plate mounted on upper ends of the support rods and obliquely extending from a lower portion of the releasing end to the storage device.

In the above automatic distributing equipment, the support rod comprises at least one telescoping rod.

In the above automatic distributing equipment, the pickup device is a robot comprising a plurality of grippers adapted to pick up the components of different shapes.

The above automatic distributing equipment further comprising a second transmission device, and the second transmission device comprising: a fourth support seat mounted on the base; and a transmission chain mounted on the fourth support seat, wherein the storage tray is placed on the transmission chain, so as to move along with the transmission chain.

In the above automatic distributing equipment, the base comprising: a plurality of

wheels mounted on a bottom of the base; and a plurality of support legs telescopically mounted on the bottom of the base.

The automatic distributing equipment, according to various exemplary embodiments of the present invention, is capable of recognizing components to be distributed, picking up the components based on a recognition result, and places the picked components on a storage tray regularly, so as to prepare components of an electronic apparatus to be assembled in advance, increasing the automation level of manufacturing the electronic apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the accompanying drawings, in which:

Fig.1 is an illustrative perspective view of an automatic distributing equipment according to an exemplary embodiment of the present invention;

Fig.2 is another illustrative perspective view of the automatic distributing equipment of Fig.1;

Fig.3 is yet another illustrative perspective view of the automatic distributing equipment of Fig.1, wherein a recognition device is not shown;

Fig.4 is an illustrative partial enlarged view of the automatic distributing equipment of Fig.1;

Fig.5 is an illustrative perspective view of a first transmission device and a storage device matched with the first transmission device in an automatic distributing equipment according to an exemplary embodiment of the present invention;

Fig.6 is another illustrative perspective view of the first transmission device and the storage device matched with the first transmission device in an automatic distributing equipment according to an exemplary embodiment of the present invention, in which a vibration device and a light source are shown;

Fig.7 is an illustrative perspective view of a first transmission device in an automatic distributing equipment according to an exemplary embodiment of the present invention;

Fig.8 is an illustrative cross section view of a second support seat and a horizontal conveyer belt assembly of the first transmission device;

Fig.9 is an illustrative cross section view of a second support seat and an oblique conveyer belt assembly of the first transmission device;

Fig.10 is an illustrative perspective view of a loading device in an automatic distributing equipment according to an exemplary embodiment of the present invention;

Fig.11 is an illustrative perspective view of a robot in an automatic distributing equipment according to an exemplary embodiment of the present invention;

Fig.12 is an illustrative perspective view of a second transmission device and a storage

tray in an automatic distributing equipment according to an exemplary embodiment of the present invention; and

Fig.13 is an illustrative perspective view of a storage tray in an automatic distributing equipment according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE IVENTION

Exemplary embodiments of the present disclosure will be described hereinafter in detail with reference to the attached drawings, wherein the like reference numerals refer to the like elements. The present disclosure may, however, be embodied in many different forms and should not be construed as being limited to the embodiment set forth herein; rather, these embodiments are provided so that the present disclosure will be thorough and complete, and will fully convey the concept of the disclosure to those skilled in the art.

According to a general concept of the present invention, there is provided an automatic distributing equipment for distributing a variety of components with different shapes, comprising: a base; a storage device mounted on the base to store the components thereon; a recognition device configured to recognize the components stored on the storage device; and a pickup device configured to pick up the recognized components based on a recognition result from the recognition device.

In the following detailed description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosed embodiments. It will be apparent, however, that one or more embodiments may be practiced without these specific details. In other instances, well-known structures and devices are schematically shown in order to simplify the drawing.

Fig.1 is an illustrative perspective view of an automatic distributing equipment according to an exemplary embodiment of the present invention; Fig.2 is another illustrative perspective view of the automatic distributing equipment of Fig.1; Fig.3 is yet another illustrative perspective view of the automatic distributing equipment of Fig.1, in which a recognition device is not shown.

As shown in Figs.1-3, according to an exemplary embodiment of the present invention, there is disclosed an automatic distributing equipment 100 for distributing a variety of components 200 with different shapes. The automatic distributing equipment 100 comprises a base 1 having, for example, a box shape, a storage device 2, a recognition device 3 and a pickup device 4. The storage device 2 is mounted on the base 1 and configured to store a plurality of components 200(Fig. 5). The recognition device 3 is configured to recognize the components 200 stored in the storage device 2, for example, recognize parameters such as the shapes, the sizes or the weights of the components 200. The pickup device 4 is configured to pick up the recognized components 200 based on a recognition result from the

recognition device 3, so as to place the picked components 200 on another preset location.

As shown in Fig.5, in an exemplary embodiment, these components 200, as objects to be distributed, are adapted to be assembled into an electronic apparatus, for example, an electrical connector, a fiber optic connector, a relay or the like, in a subsequent operation process. These components 200 include but not limited to a case, a contact, a spring, a bolt, an insulation block, a wire and the like mixed together. It should be appreciated that these different types of components have different shapes, sizes, flexibilities and functions.

Fig.4 is an illustrative partial enlarged view of the automatic distributing equipment of Fig.1; Fig.5 is an illustrative perspective view of a first transmission device and a storage device matched with the first transmission device in an automatic distributing equipment according to an exemplary embodiment of the present invention; Fig.6 is another illustrative perspective view of the first transmission device and the storage device matched with the first transmission device in an automatic distributing equipment according to an exemplary embodiment of the present invention, in which a vibration device and a light source are shown.

As shown in Figs.4-6, in an automatic distributing equipment 100 according to another exemplary embodiment of the present invention, the storage device 2 comprises a support tray 21 configured to place the components 200 thereon and a first support seat 22 mounted on the base 1. The support tray 21 is mounted on the first support seat 22. In an embodiment, the support tray 21 has a substantially circular shape, and an axis of the support tray 21 is perpendicular to a horizontal plane.

In a further embodiment, the storage device 2 further comprises a first motor 27 mounted on the first support seat 22. The first motor 27 is configured to drive the support tray 21 to rotate. A plurality of division plates 26 extending in a radial direction are provided on the support tray 21, so as to divide the support tray 21 into a plurality of storage sections, for example, four storage sections, having a substantially fanlike shape. In this way, one of the storage sections at a position may be used to receive components, and after the one storage section is rotated by a predetermined angle, for example, 90 degrees, the recognition device 3 recognizes the components, and the pickup device 4 picks up the recognized components.

In another embodiment, a ring-shaped blocking plate 25 is provided on the periphery of the support tray 21, so as to block the components 200 from falling out from an edge of the support tray 21. A fanlike blocking plate 24 is provided on the support tray 21, the fanlike blocking plate 24 is arranged to block the components 200 from bouncing out of the support tray 21 after the components 200 have dropped onto the support seat 21. It should be appreciated that the fanlike blocking plate 24 does not cover the storage section which is receiving the components.

As shown in Fig.6, in an automatic distributing equipment according to an exemplary

embodiment of the present invention, the storage device 2 further comprises a vibration device 23 mounted on the base 1 under the support tray 21 and configured to vibrate the support tray 21. In another embodiment, the vibration device 23 vibrates the support tray 21 in a manner of impulse hunting. In an exemplary embodiment, the vibration device 23 comprises a vibration head 231, and an electromagnetic excitation mechanism is provided in the vibration device 23. Upon an impulse voltage is exerted, the vibration head 231 may be quickly stretched out or withdrawn, and hit the bottom of the support tray 21 in the stretched state to vibrate the support tray 21, so as to change the posture of the components 200 on the support tray 21, for example, turning over or rotating the components 200 for facilitating the recognition device 3 to recognize the components 200.

It should be appreciated that the support tray is not limited to have a circular shape. It may have an oval shape, a square shape, a rectangle shape or any other polygon shape, and the support tray may be configured to be unable to rotate.

As shown in Figs.1 and 6, in an automatic distributing equipment according to an exemplary embodiment of the present invention, the recognition device 3 comprises: a first support frame 31 mounted on the base 1; and a camera 32, for example, a CCD camera 32, mounted on the support frame 31 and pointed at one storage section on the support tray 21, so as to capture an image of the components 200 stored on the storage device 21. The recognition device 3 further comprises a light source 33 configured to illuminate the components 200 stored on the storage device 21. In an exemplary embodiment, the support tray 21 may be made of transparent material, the camera 32 is mounted above the support tray 21, and the light source 33 is mounted below the support tray 21. In this way, it may increase the definition of the components 200, so as to obtain a clear image of the components 200. The image signal of the components 200 obtained by the camera 32 is transferred to a controller (not shown), and the controller analyses and compares the image signal to recognize a position and a type of a certain component 200, and controls the pickup device 4 to pick up the recognized component 200.

In an alternative exemplary embodiment, the camera may be mounted below the support tray, and the light source may be mounted above the support tray. In another embodiment, the camera and the light source may be mounted above or below the support tray.

As shown in Figs.1, 5-9, in a further exemplary embodiment of the present invention, the automatic distributing equipment 100 may further comprises a first transmission device 6 configured to transmit the components 200 onto the storage device 2. Further, the first transmission device 6 comprises: a second support seat 63 mounted on the base 1; a conveyer belt assembly 61 mounted on the second support seat 63 in a longitudinal direction and comprising a receiving end 611 for receiving the components 200 and a releasing end 612 for releasing the components 200; and a second motor 62 mounted on the second

support seat 63 and configured to drive a conveyer belt 614 of the conveyer belt assembly 61 to move. In this way, the conveyer belt assembly 61 transmits the components 200 received on the receiving end 611 to the releasing end 612, and drops the components 200 onto the support tray 21.

Although it has been described the embodiments of the first transmission device comprising the conveyer belt assembly, but the present invention is not limited to this. In an alternative embodiment, the first transmission device may comprise a conveyer guide rail consisting of a plurality of rolling shafts.

As shown in Figs.1-4 and 10, in a further exemplary embodiment of the present invention, the automatic distributing equipment 100 may further comprise a loading device 7 configured to load the components 200 onto the receiving end 611 of the conveyer belt assembly 61. Particularly, the loading device 7 comprises: a rolling drum 71, orientated substantially horizontal, into which the receiving end 611 of the conveyer belt assembly 61 is inserted in a substantially horizontal direction; a driving device 73 configured to drive the rolling drum 71 to rotate; and at least a scraping plate 72 mounted on an inner wall of the rolling drum 71 in an axial direction.

In an exemplary embodiment, a surface of the scraping plate 72 extends in a radial direction of the rolling drum 71. In another embodiment, a surface of the scraping plate 72 defines an angle with respect to the radial direction of the rolling drum 71. In this way, when the scraping plate 72 is located at the lowest position, the components is located at the lowest position of the rolling drum 71 under the weight. During the rotation of the rolling drum 71, some of the components are held on the inner wall of the rolling drum 71 under the push of the scraping plate 72 and rotate with the rolling drum 71. After the rolling drum 71 is rotated by a predetermined angle, for example, an angle larger than 90 degree, the components drop from the scraping plate 72 onto the receiving end 611 of the conveyer belt assembly 61 under the weight, and are transmitted to the releasing end 612 by the conveyer belt of the conveyer belt assembly 61. With the rotating of the rolling drum 71, the components repeatedly rise and fall in the rolling drum, thus it may prevent the components from being entangled with each other.

As shown in Figs.1-5 and 10, in an automatic distributing equipment 100 according to an exemplary embodiment of the present invention, the loading device 7 further comprises an input device 74 communicated with an inner space of the rolling drum 71 at the other end of the rolling drum 71 opposite to one end of the rolling drum 71 for inserting the receiving end 611 of the conveyer belt assembly 61, so as to input the components into the rolling drum 71. Particularly, the input device 74 comprises: a second support frame 741 mounted on the base 1; a funnel portion 742 supported on the second support frame 741 and configured to receive the components; and a bending portion 743 located under the funnel portion 742 and communicated with the inner space of the rolling drum 71. In this way, the

components input into the funnel portion 742 may slide down and enter the rolling drum 71 through the bending portion 743 under the weight.

In another embodiment, the driving device 73 comprises: a third support seat 731 mounted on the base 1; a third motor (not shown) mounted on the third support seat 731; and a plurality of rolling shafts 732 mounted on the third support seat and rotatably engaged with an outer surface of the rolling drum 71, so as to rotate the rolling drum 71 under the driving of the third motor. During rotating the rolling drum 71, some of the components are raised by the scraping plate 72 and fall down onto the conveyer belt 614 of the conveyer belt assembly 61.

As shown in Figs.7-9, in an automatic distributing equipment 100 according to an exemplary embodiment of the present invention, an angle of a surface of the conveyer belt assembly 61 with respect to a horizontal plane is adjustable in a lateral direction (left and right direction as shown in Figs. 8 and 9) perpendicular to a transmitting direction of the conveyer belt. Particularly, the second support seat 63 comprises at least two arcuate brackets 631 each comprising: an arcuate groove 634; a plurality of through holes 633 arranged in an arcuate shape along the periphery of the arcuate groove 634; and a lateral bracket 632 on which the conveyer belt assembly 61 is mounted. Both ends of the lateral bracket 632 are selectively engaged in two through holes of the plurality of through holes 633 by, for example, bolts, so that the lateral bracket 632 strides on a portion of the arcuate groove 634 in a changeable posture. In order to facilitate the operation, the through holes comprise slots 635 formed at both ends of the arcuate groove 634.

As shown in Fig.8, both ends of the lateral bracket 632 are mounted in two slots 635 in a horizontal plane by means of bolts 636, so that the lateral bracket 632 is orientated in the horizontal direction. As shown in Fig.9, one end (left end) of the lateral bracket 632 is mounted in the slot 635 by a bolt 636, and the other end (right end) of the lateral bracket 632 is mounted in the through hole 633 by a bolt 636, so that the surface of the lateral bracket 632 is oblique with respect to the horizontal plane in the lateral direction perpendicular to the transmitting direction of the conveyer belt. It should be appreciated that the posture of the lateral bracket 632 is changeable by mounting the two ends of the lateral bracket 632 in different through holes. In this way, by obliquely mounting the lateral bracket 632, it may prevent the components dropped on the conveyer belt assembly 61 from being stacked on the receiving end 611, and prevent the components from falling out of the rolling drum 71 from the conveyer belt 614 during transmitting the components by the conveyer belt 614. It may be also possible to adjust the number of the components transmitted from the rolling drum 71 to the storage device 5 by changing the obliquity of the lateral bracket 632.

In addition, at least one side of the receiving end 611 of the conveyer belt assembly 61 in a lateral direction is provided with a blocking plate 613, so as to prevent the components, falling onto the receiving end 611 from the scraping plate 72, from bouncing into the rolling

drum 71.

As shown in Fig.4, a guide device is provided under the releasing end 612 of the conveyer belt assembly 61, and the guide device is configured to guide the components from the conveyer belt assembly 61 toward the support tray 21 of the storage device 2. Particularly, the guide device comprises: a plurality of support rods 64 pivotally mounted on the second support seat 63; and a guide plate 65 mounted on upper ends of the support rods 64 and obliquely extending from the lower portion of the releasing end 612 to the storage device 2, so as to guide the components to slide from the releasing end 612 toward the storage device 2, decreasing the tendency that the components fall out of the storage device due to bounce. In another embodiment, the support rod comprises at least one telescoping rod 66.

As shown in Figs.1-3 and 11, in an automatic distributing equipment 100 according to an exemplary embodiment of the present invention, the pickup device 4 is a robot and comprises a plurality of grippers 41-43 adapted to pick up the components with different shapes. In an embodiment, the robot includes but not limited to four-axis robot, six-axis robot or any other type of robot with multiple degrees of freedom. The robot may recognize the image of the components captured by the camera 32 according to preset program, so as to control the grippers 41-43 to grip the respective components.

For instance, as shown in Fig.11, the gripper 41 has a large sucking disc adapted to grip a contact, the gripper 42 has a small sucking disc adapted to grip a wire, the gripper 43 has a plurality of arms adapted to grip a large component, for example, a case of the electrical connector. One or more different types of grippers may be mounted on the robot according to actual requirements.

As shown in Figs.12 and 13, according to an exemplary embodiment of the present invention, the automatic distributing equipment 100 further comprises a storage tray 5. The storage tray 5 comprises a plurality of holding portions 51-53 configured to hold components with different shapes. For example, the holding portion 51 is configured to hold a contact, the holding portion 52 is configured to hold a connector case, and the holding portion 53 is configured to hold a spring. For example, the holding portion is formed with a recess, and the recess is shaped to match with the external contour of the respective component, so that the component held in the holding portion 51 unlikely moves and falls out due to vibration. The robot, as the pickup device 4, is further configured to place the picked components 200 on the respective holding portions of the storage tray 5 according to a preset program. For example, a group or a plurality of groups of components for assembling one or more electrical connectors are placed on each storage tray 5, so as to assemble these components into the electrical connector in a subsequent operation process.

According to an exemplary embodiment of the present invention, the automatic distributing equipment 100 further comprises a second transmission device. The second

transmission device comprises: a fourth support seat 54 mounted on the base 1; and a transmission chain 541 mounted on the fourth support seat 54. The storage tray 5 is placed on the transmission chain 541, and is moved onto next worktable with the transmission chain 541.

As shown in Figs.1-3, in an exemplary embodiment, the base 1 comprises: a plurality of wheels 11 mounted on a bottom of the base 1; and a plurality of support legs 12 telescopically mounted on the bottom of the base 1. The storage device 2, the recognition device 3, the pickup device 4, the support tray 5, the first transmission device 6, the second transmission device 54 and the loading device 7 may be all mounted on the base 1. The base 1 can be pushed to move by the wheels 11, so as to move the automatic distributing equipment 100 according to embodiments of the present invention to a right position. When the automatic distributing equipment 100 is moved to the right position, the support legs 12 may be stretched out to suspend the wheels 11, increasing the support strength of the base, and preventing the base 1 from being moved. According to actual requirements, it may be possible to mount one or more of the storage device 2, the recognition device 3, the pickup device 4, the support tray 5, the first transmission device 6, the second transmission device 54 and the loading device 7 on the base 1.

The automatic distributing equipment, according to above various exemplary embodiments of the present invention, is capable of recognizing components to be distributed, picking up the components based on a recognition result, and regularly placing the picked components on a storage tray, so as to prepare components of an electronic apparatus to be assembled in advance, increasing the automation level of manufacturing the electronic apparatus. From the funnel portion to the storage device, the above respective devices continuously operate, which will not cause the entire assembling line stopped due to lack of the initially supplied components.

It should be appreciated by those skilled in this art that the above embodiments are intended to be illustrated, and not restrictive. For example, many modifications may be made to the above embodiments by those skilled in this art, and various features described in different embodiments may be freely combined with each other without conflicting in configuration or principle, so that various kinds of automatic distributing equipments can be obtained to solve the technical problem of the present invention.

Although several exemplary embodiments have been shown and described, it would be appreciated by those skilled in the art that various changes or modifications may be made in these embodiments without departing from the principles and spirit of the disclosure, the scope of which is defined in the claims and their equivalents.

As used herein, an element recited in the singular and proceeded with the word "a" or "an" should be understood as not excluding plural of said elements or steps, unless such exclusion is explicitly stated. Furthermore, references to "one embodiment" of the present

invention are not intended to be interpreted as excluding the existence of additional embodiments that also incorporate the recited features. Moreover, unless explicitly stated to the contrary, embodiments "comprising" or "having" an element or a plurality of elements having a particular property may include additional such elements not having that property.

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What is claimed is,

1. An automatic distributing equipment for distributing a variety of components with different shapes, comprising:

a base;

a storage device mounted on the base to store the components thereon;

a recognition device configured to recognize the components stored on the storage device; and

a pickup device configured to pick up the recognized components based on a recognition result of the recognition device.

2. The automatic distributing equipment according to claim 1, wherein the storage device comprises a support tray configured to place the components thereon.

3. The automatic distributing equipment according to claim 2, wherein

the storage device further comprises a first support seat mounted on the base, and

the support tray is mounted on the first support seat.

4. The automatic distributing equipment according to claim 3, wherein

the support tray has a substantially circular shape, and

the storage device further comprises a first motor mounted on the first support seat, and the first motor is configured to drive the support tray to rotate.

5. The automatic distributing equipment according to claim 4, wherein

a plurality of division plates extending in a radial direction are provided on the support tray, so as to divide the support tray into a plurality of storage sections having a substantially fanlike shape.

6. The automatic distributing equipment according to claim 4,

wherein a ring-shaped blocking plate is provided on the periphery of the support tray, so as to block the components from falling out of the support tray.

7. The automatic distributing equipment according to claim 4,

wherein a fanlike blocking plate is provided on the support tray, so as to block the components from falling out of the support tray.

8. The automatic distributing equipment according to any one of claims 2-7,

wherein the storage device further comprises a vibration device mounted on the base

under the support tray and configured to vibrate the support tray.

9. The automatic distributing equipment according to claim 8,

wherein the vibration device vibrates the support tray in a manner of impulse hunting.

10. The automatic distributing equipment according to any one of claims 1-9, further comprising:

a storage tray comprising a plurality of holding portions configured to hold components with different shapes,

wherein the pickup device is further configured to place the picked components on the respective holding portions of the storage tray.

11. The automatic distributing equipment according to any one of claims 1-10, wherein the recognition device comprising:

a first support frame mounted on the base; and

a camera mounted on the support frame to capture images of the components stored on the storage device.

12. The automatic distributing equipment according to claim 11, wherein the recognition device further comprising:

a light source configured to illuminate the components stored on the storage device.

13. The automatic distributing equipment according to any one of claims 1-12, further comprising:

a first transmission device configured to transmit the components onto the storage device.

14. The automatic distributing equipment according to claim 13, wherein the first transmission device comprising:

a second support seat mounted on the base;

a conveyer belt assembly mounted on the second support seat and comprising a receiving end for receiving the components and a releasing end for releasing the components; and

a second motor mounted on the second support seat and configured to drive a conveyer belt of the conveyer belt assembly to move.

15. The automatic distributing equipment according to claim 14, further comprising:

a loading device configured to load the components onto the receiving end of the conveyer belt assembly.

16. The automatic distributing equipment according to claim 15, wherein the loading device comprising:

a rolling drum, orientated substantially in a horizontal direction, into which the receiving end of the conveyer belt assembly is inserted in a substantially horizontal direction;

a driving device configured to drive the rolling drum to rotate; and

at least a scraping plate mounted on an inner wall of the rolling drum in an axial direction.

17. The automatic distributing equipment according to claim 16, wherein the loading device further comprising:

an input device communicated with an inner space of the rolling drum at the other end of the rolling drum opposite to one end of the rolling drum for inserting the receiving end of the conveyer belt assembly, so as to input the components into the rolling drum.

18. The automatic distributing equipment according to claim 17, wherein the input device comprising:

a second support frame mounted on the base;

a funnel portion supported on the second support frame and configured to receive the components; and

a bending portion located under the funnel portion and communicated with the inner space of the rolling drum.

19. The automatic distributing equipment according to claim 15, wherein the driving device comprising:

a third support seat mounted on the base;

a third motor mounted on the third support seat; and

a plurality of rolling shafts mounted on the third support seat and rotatably engaged with an outer surface of the rolling drum, so as to drive the rotation of the rolling drum under the driving of the third motor.

20. The automatic distributing equipment according to any one of claims 14-19,

wherein an angle of a surface of the conveyer belt assembly with respect to a horizontal plane is adjustable in a lateral direction perpendicular to a transmitting direction of the conveyer belt.

21. The automatic distributing equipment according to claim 20,

wherein the second support seat comprises at least two arcuate brackets each comprising:

an arcuate groove;

a plurality of through holes arranged in an arcuate shape along the periphery of the arcuate groove; and

a lateral bracket on which the conveyer belt assembly is mounted,

wherein both ends of the lateral bracket are selectively engaged in two through holes of the plurality of through holes, so that the lateral bracket strides on a portion of the arcuate groove in a changeable posture.

22. The automatic distributing equipment according to any one of claims 14-19,

wherein at least one side of the receiving end of the conveyer belt assembly in a lateral direction is provided with a blocking plate.

23. The automatic distributing equipment according to any one of claims 14-20,

wherein a guide device is provided under the releasing end of the conveyer belt assembly, and the guide device is configured to guide the components from the conveyer belt assembly toward the storage device.

24. The automatic distributing equipment according to claim 23, wherein the guide device comprising:

a plurality of support rods pivotally mounted on the second support seat; and

a guide plate mounted on upper ends of the support rods and obliquely extending from a lower portion of the releasing end to the storage device.

25. The automatic distributing equipment according to claim 24, wherein the support rod comprises at least one telescoping rod.

26. The automatic distributing equipment according to any one of claims 1-25,

wherein the pickup device is a robot and comprises a plurality of grippers adapted to pick up the components with different shapes.

27. The automatic distributing equipment according to claim 10, further comprising a second transmission device, and the second transmission device comprising:

a fourth support seat mounted on the base; and

a transmission chain mounted on the fourth support seat,

wherein the storage tray is placed on the transmission chain, so as to move with the transmission chain.

28. The automatic distributing equipment according to any one of claims 1-27, wherein the base comprising:

a plurality of wheels mounted on a bottom of the base; and

a plurality of support legs telescopically mounted on the bottom of the base.

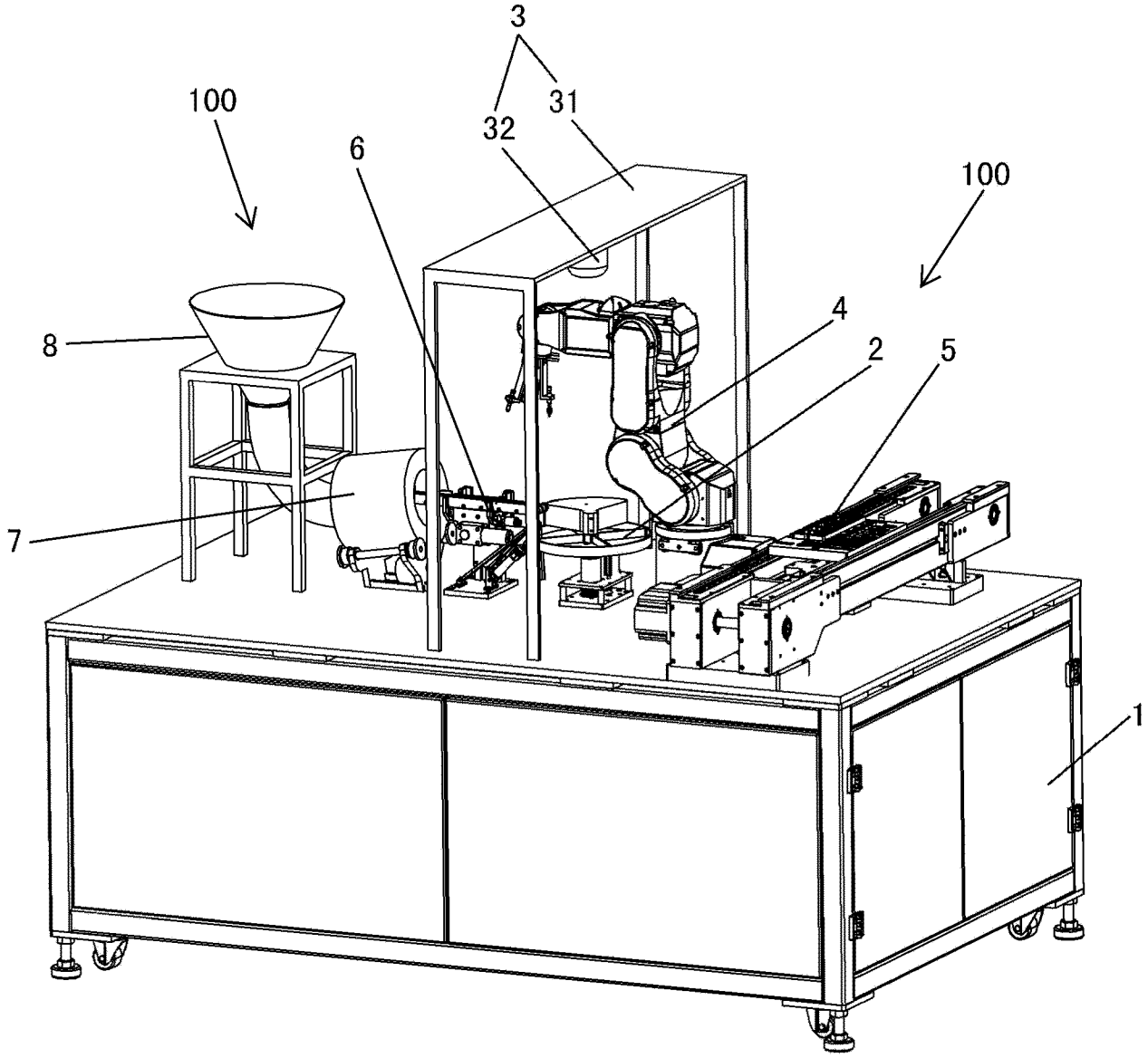


Fig. 1

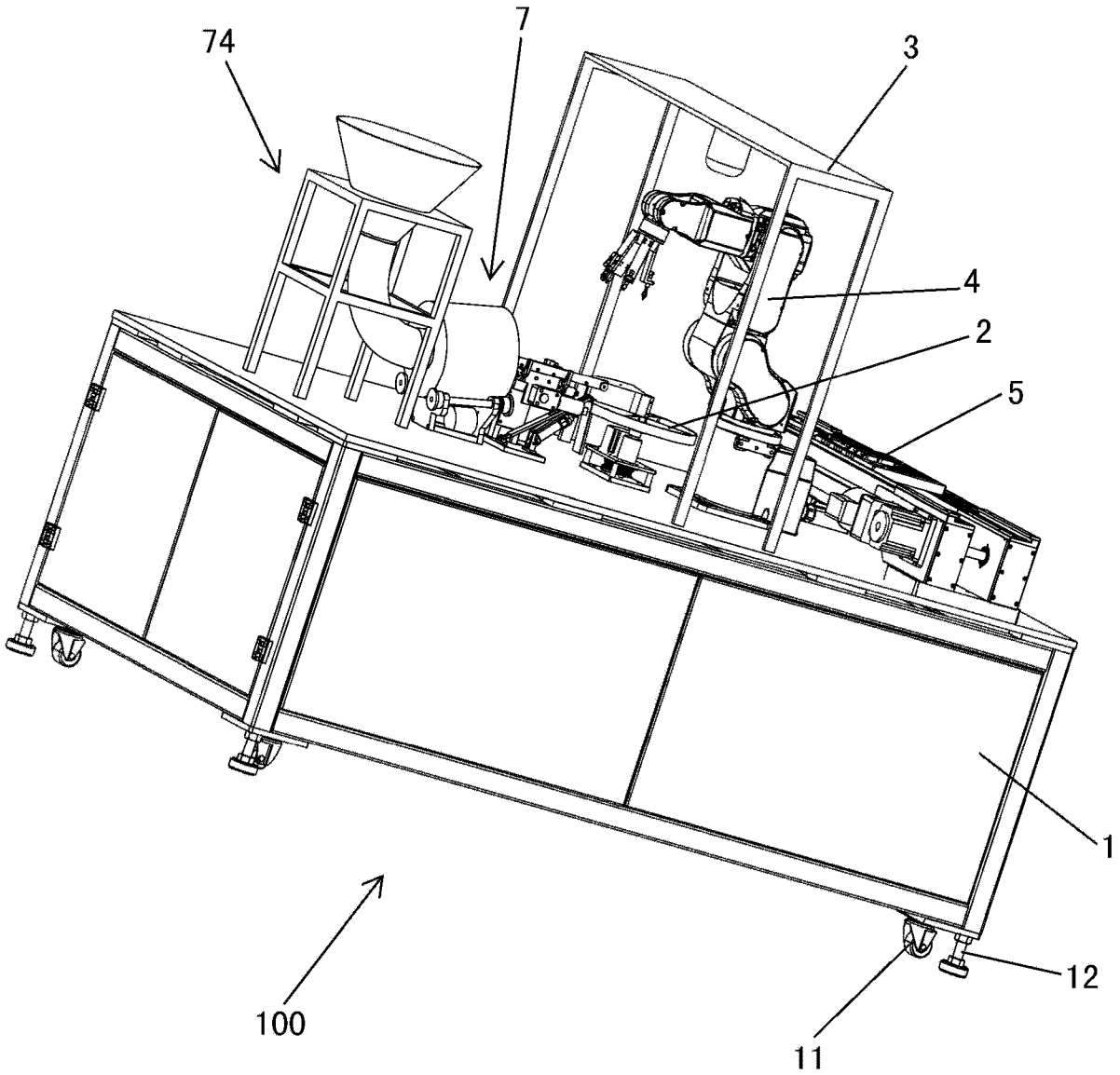


Fig. 2

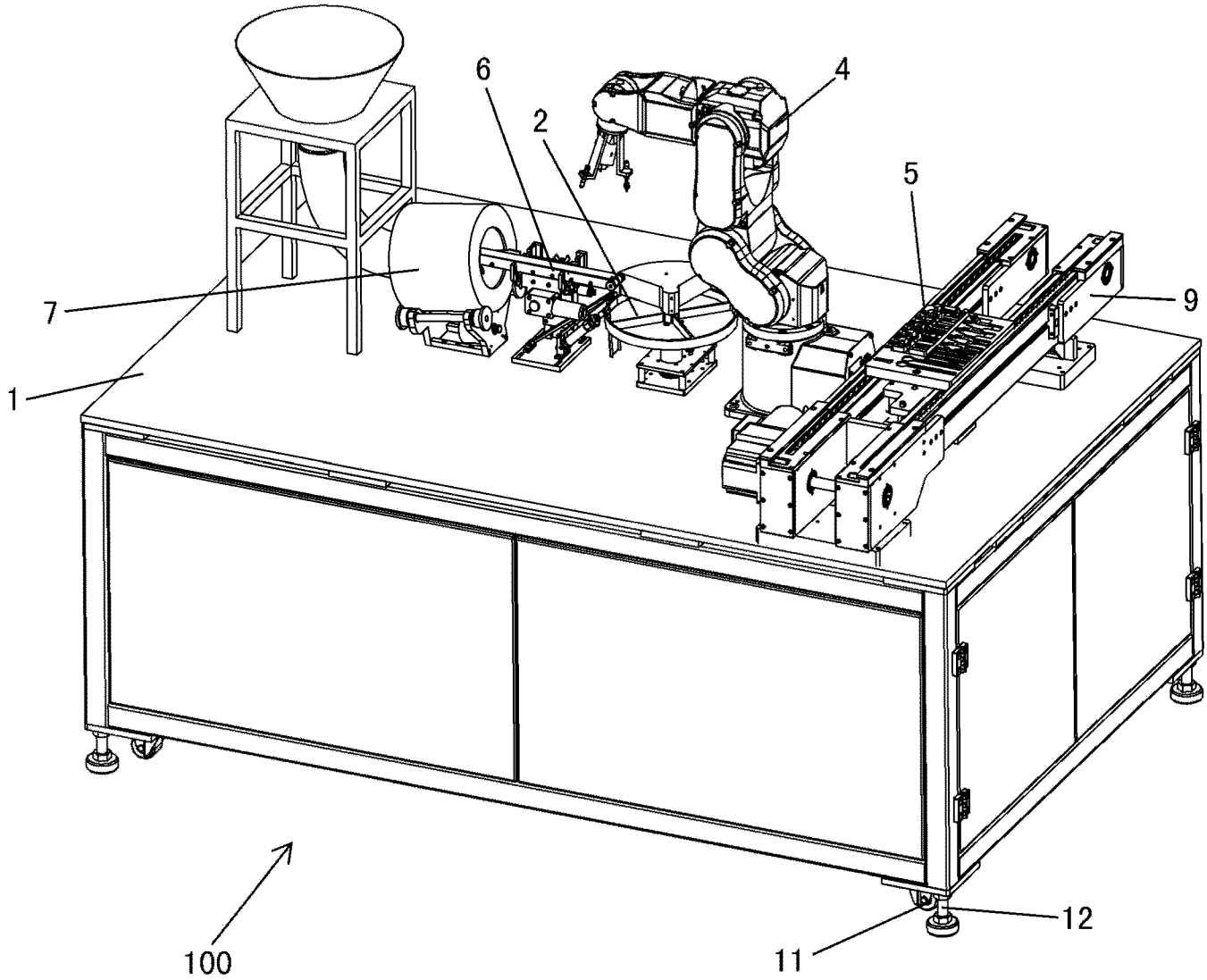


Fig. 3

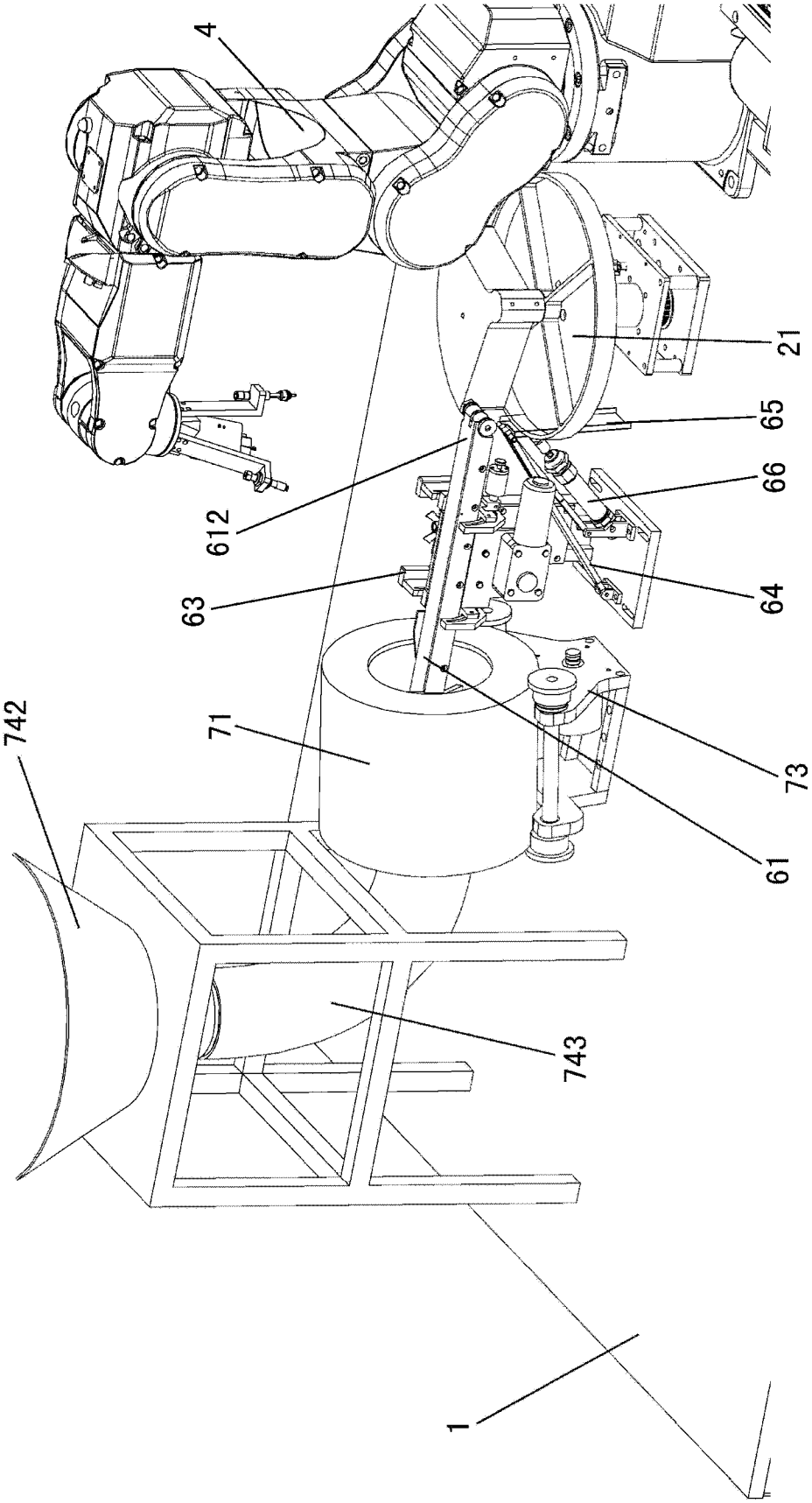


Fig. 4

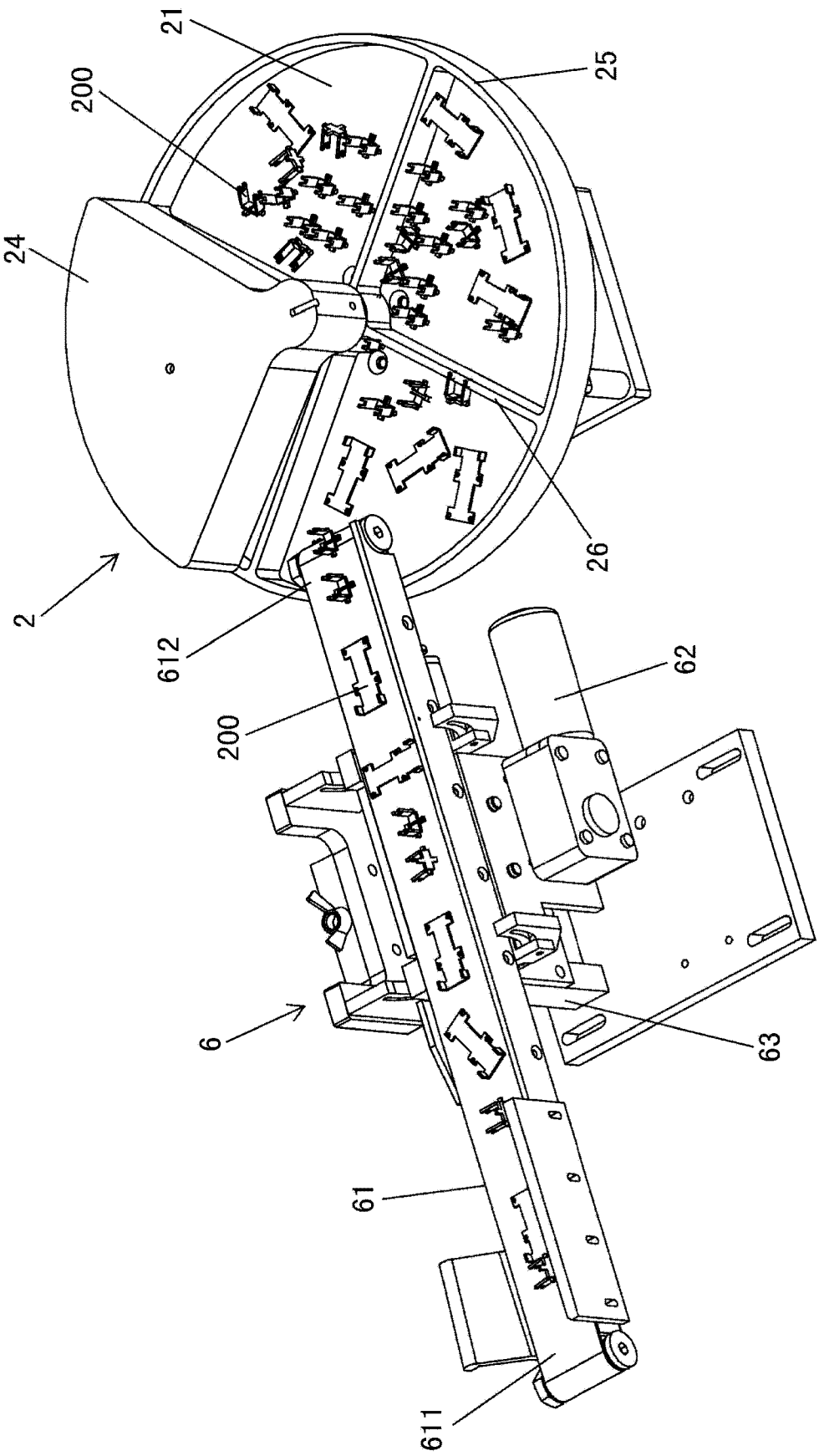


Fig. 5

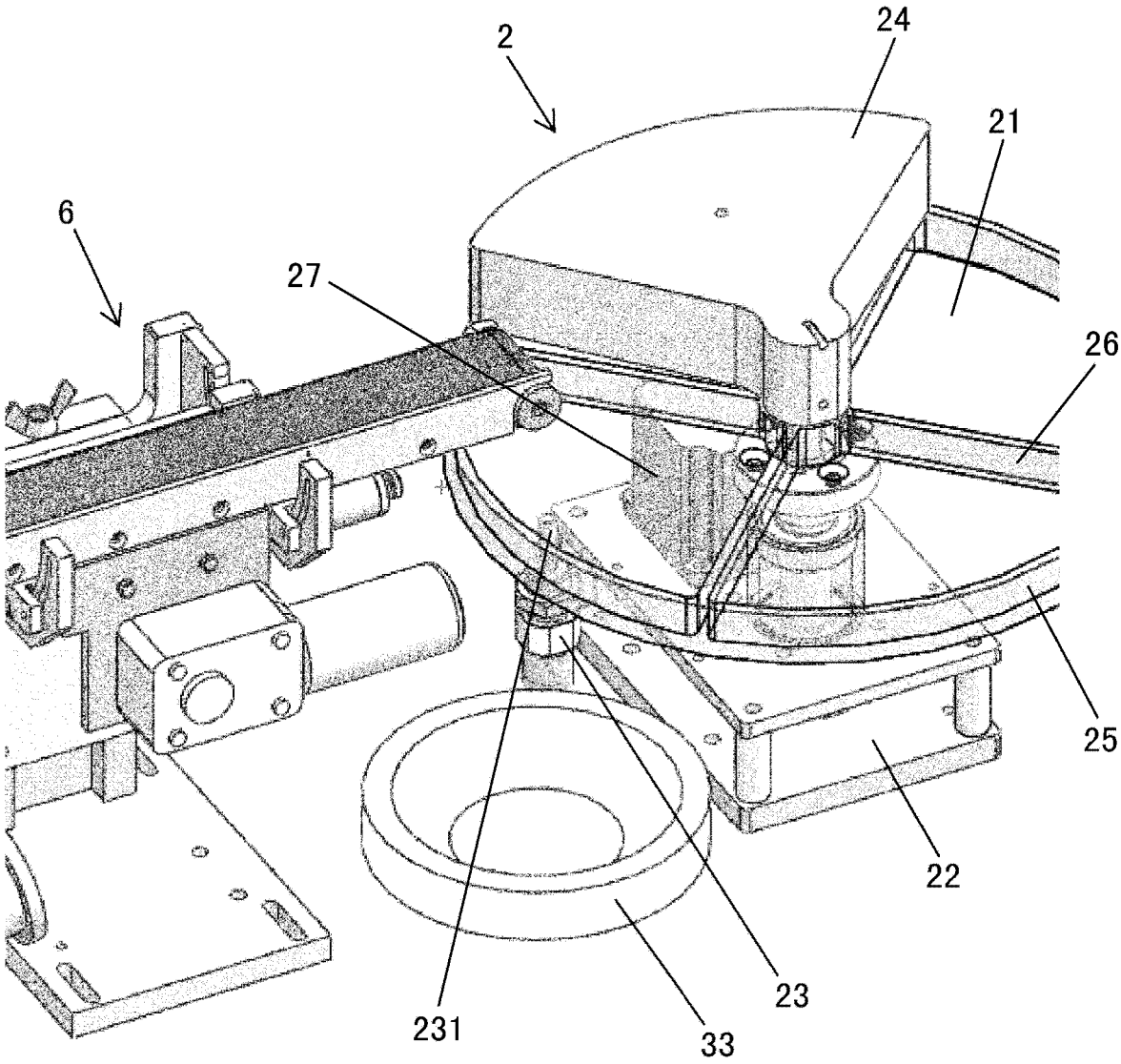


Fig. 6

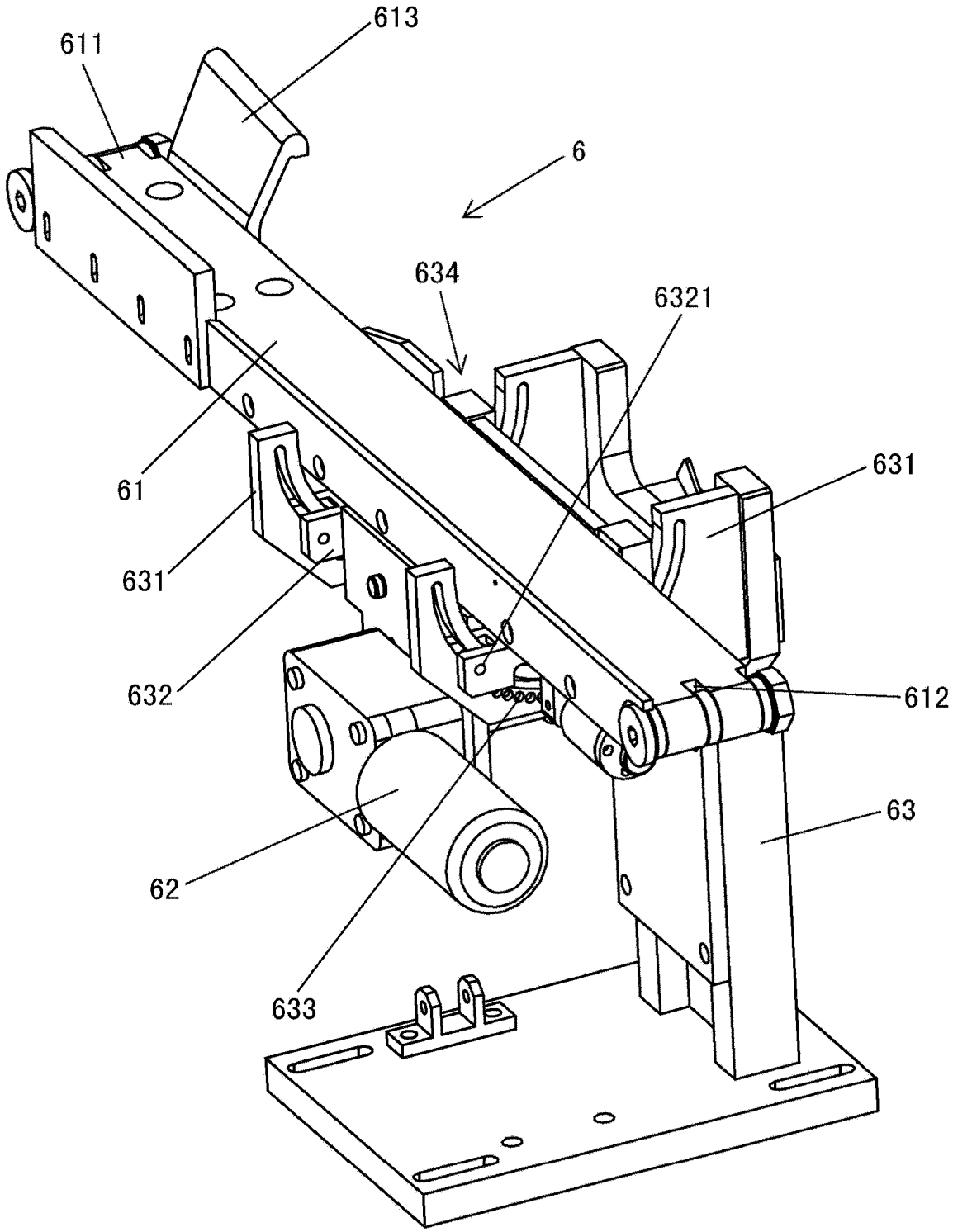


Fig. 7

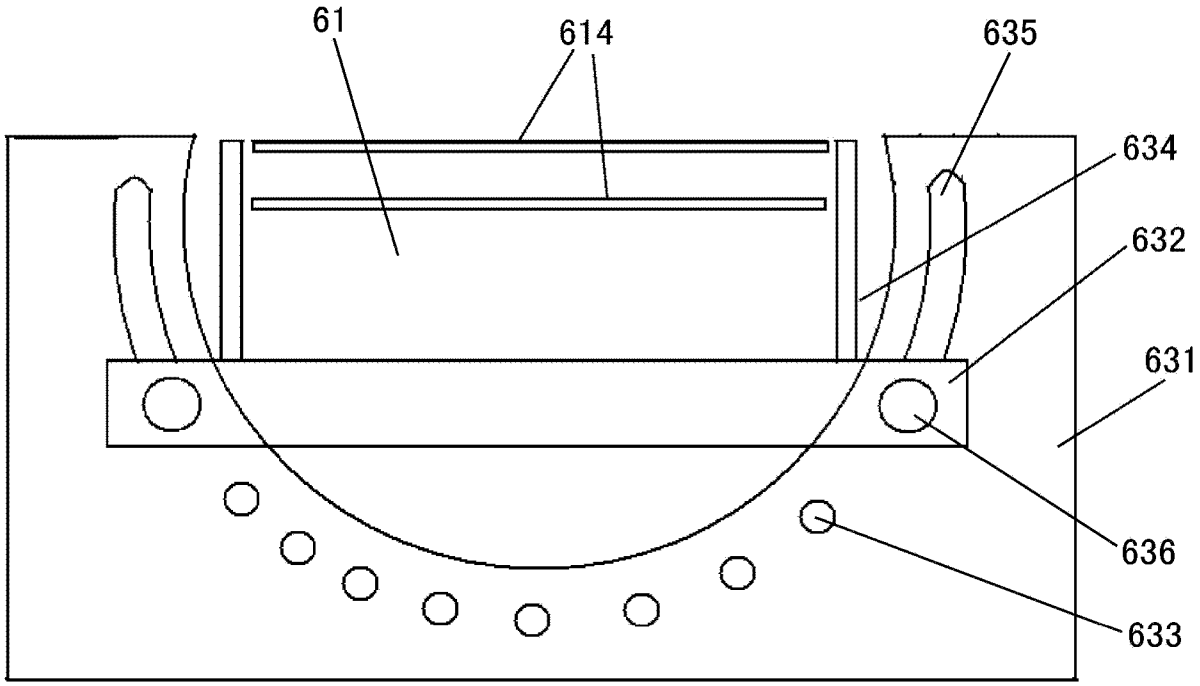


Fig. 8

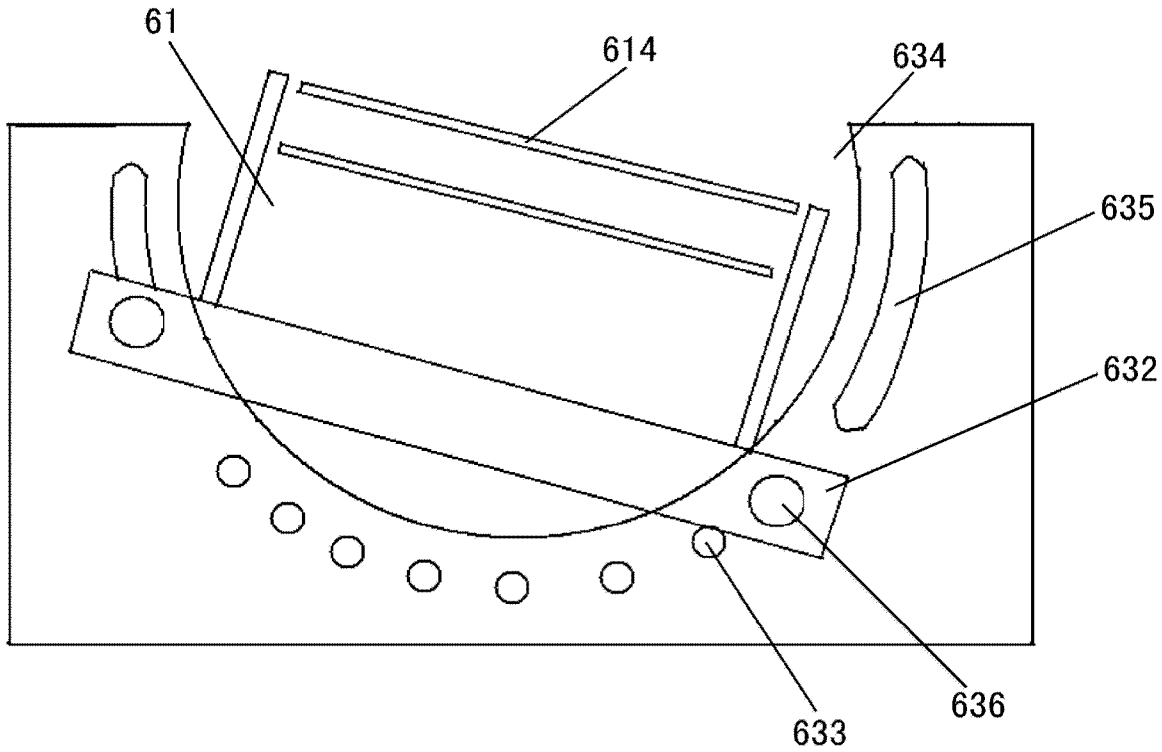


Fig. 9

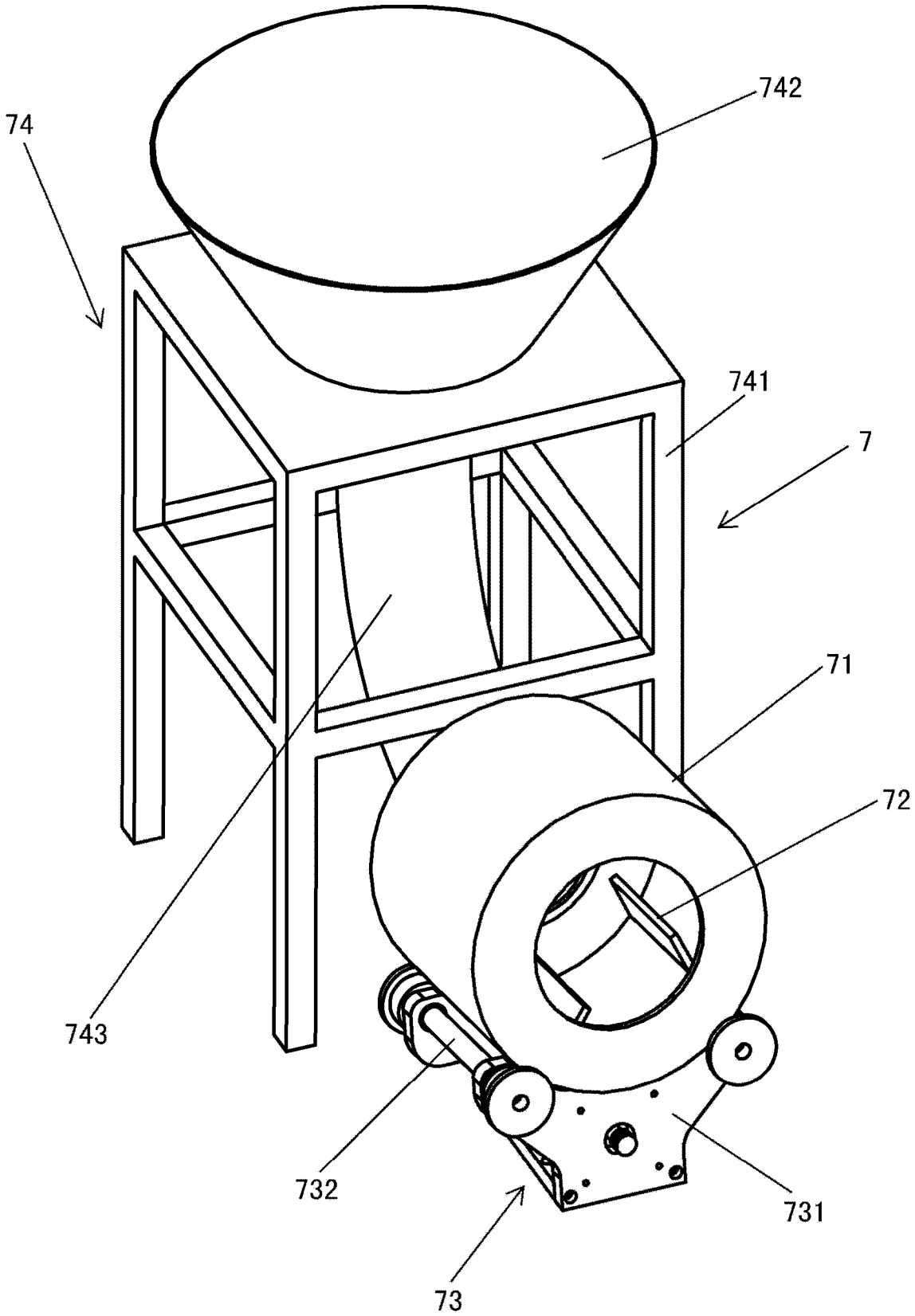


Fig. 10

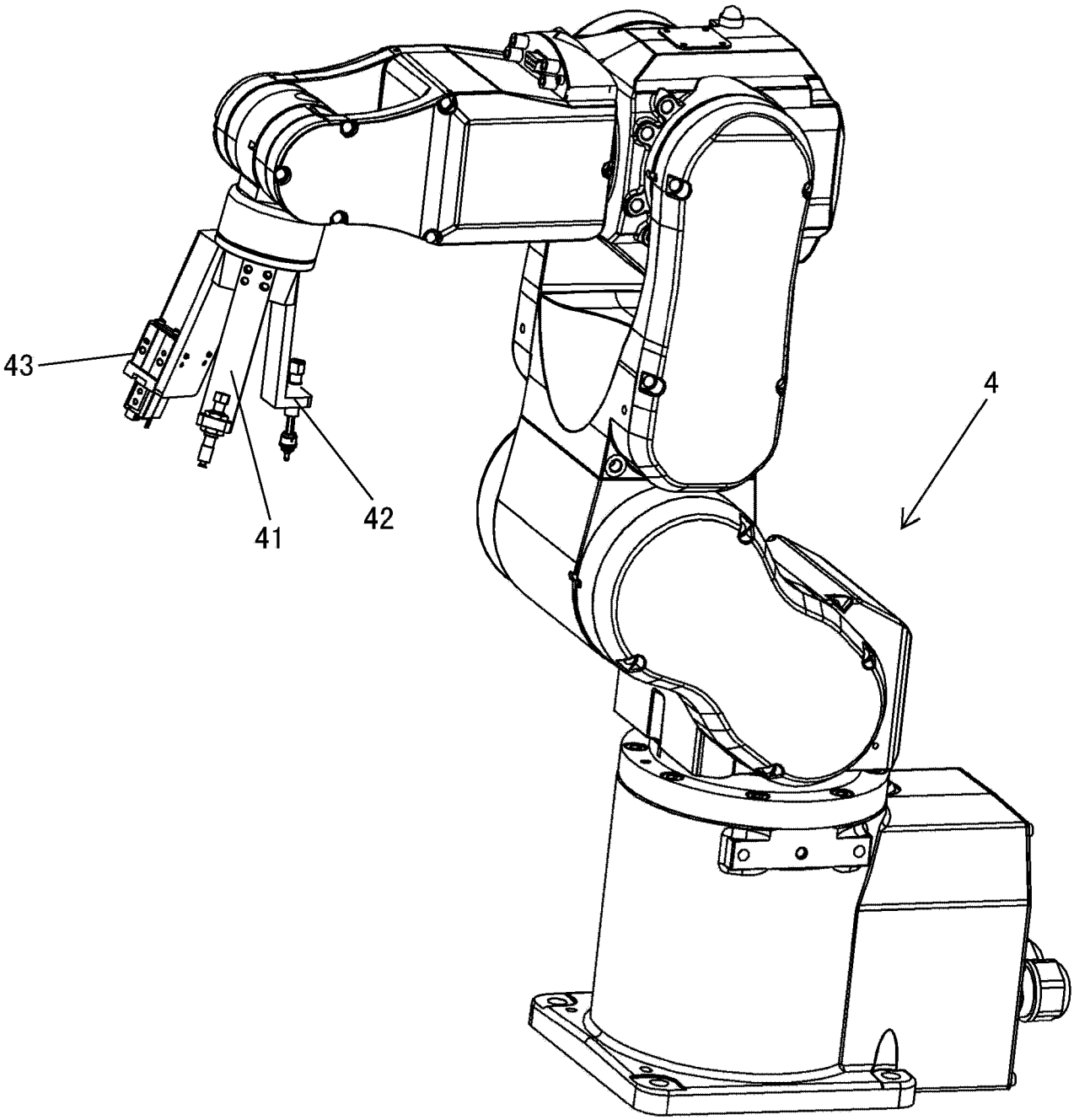


Fig. 11

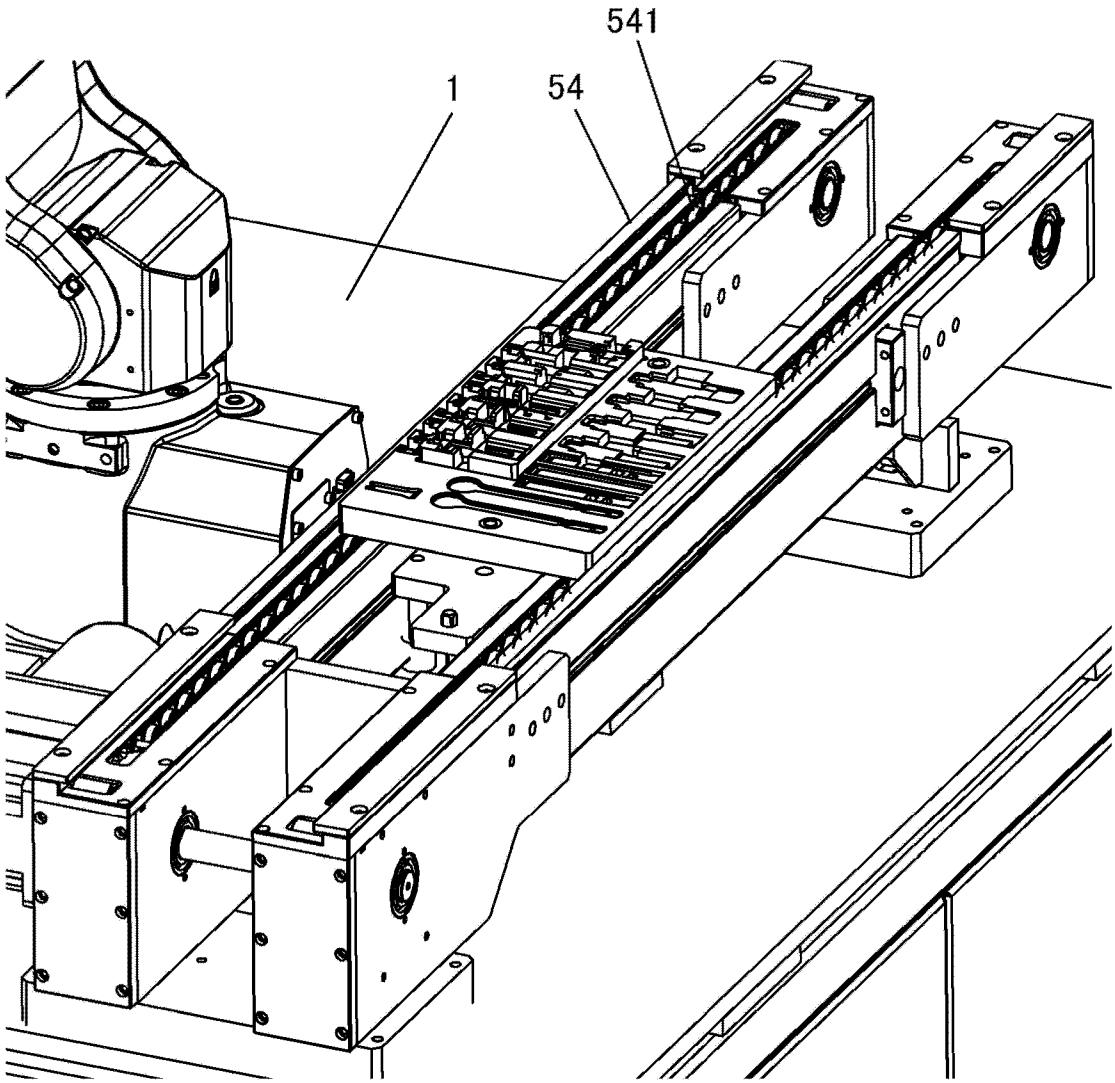


Fig. 12

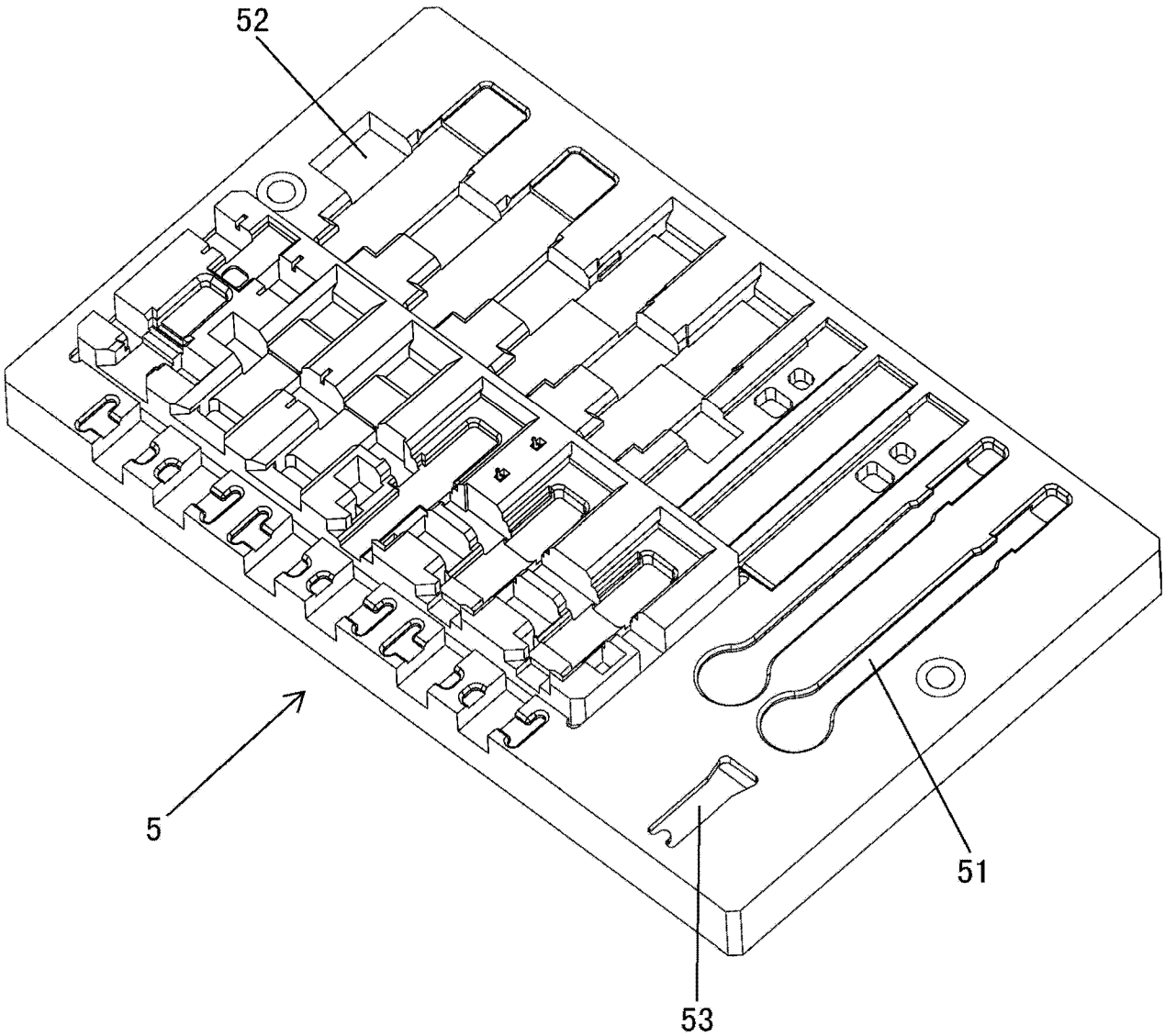


Fig. 13

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/053551

A. CLASSIFICATION OF SUBJECT MATTER
INV. B07C5/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B07C

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 741 402 A1 (UTHEMANN CYRIL DE [CH]) 10 January 2007 (2007-01-10) abstract; figures	1-9
X	US 2005/038556 A1 (GAGNON ALAIN [CA] ET AL) 17 February 2005 (2005-02-17) abstract; figures	1-9
X	US 2010/106297 A1 (INAZUMI MITSUHIRO [JP] ET AL) 29 April 2010 (2010-04-29) figures	1
X	WO 2009/076452 A2 (ROBOTIC SYSTEMS & TECHNOLOGIES [US]; TREAT MICHAEL R [US]; BRADY DAVID) 18 June 2009 (2009-06-18) figures	1

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 August 2015	04/11/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Wich, Roland

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/053551

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2009/138088 A1 (SCANVAEGT INT AS [DK]; SKYUM HENRIK FRANK [DK]) 19 November 2009 (2009-11-19) figures	1
X	WO 2012/052614 A1 (ZENROBOTICS OY [FI]; VALPOLA HARRI [FI]) 26 April 2012 (2012-04-26) figures	1
X	EP 0 706 838 A1 (PELLENC SA [FR]; S I T A [FR]) 17 April 1996 (1996-04-17) figures	1
X	GB 2 167 211 A (BRITISH CAST IRON RES ASS) 21 May 1986 (1986-05-21) figures	1
X	US 5 041 907 A (SAGER JAMES L [US] ET AL) 20 August 1991 (1991-08-20) figures	1
X	DE 10 2006 003859 B3 (BOSCH GMBH ROBERT [DE]) 1 March 2007 (2007-03-01) figures	1
X	CH 693 710 A5 (SIG PACK SYSTEMS AG [CH]) 31 December 2003 (2003-12-31) abstract	1
X	WO 2007/083327 A2 (VALKA EHF [IS]; HELGI HJALMARSSON [IS]) 26 July 2007 (2007-07-26) figures	1

1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2015/053551

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-9

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-9

   Support tray

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2. claims: 10, 27

   Strorage tray

   ---

3. claims: 11, 12

   Camera

   ---

4. claims: 13-25

   Transmission device

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5. claim: 26

   Robot

   ---

6. claim: 28

   Wheels, support legs

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2015/053551

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1741402 A1	10-01-2007	AT 458451 T	15-03-2010
		CA 2551336 A1	04-01-2007
		EP 1741402 A1	10-01-2007
		FR 2887757 A1	05-01-2007
		US 2007010802 A1	11-01-2007
US 2005038556 A1	17-02-2005	US 2005038556 A1	17-02-2005
		WO 2005020063 A1	03-03-2005
US 2010106297 A1	29-04-2010	CN 101726722 A	09-06-2010
		JP 2010100421 A	06-05-2010
		US 2010106297 A1	29-04-2010
WO 2009076452 A2	18-06-2009	US 2011005342 A1	13-01-2011
		US 2011262250 A1	27-10-2011
		WO 2009076452 A2	18-06-2009
WO 2009138088 A1	19-11-2009	AT 537429 T	15-12-2011
		DK 2277020 T3	02-04-2012
		EP 2277020 A1	26-01-2011
		ES 2377711 T3	30-03-2012
		WO 2009138088 A1	19-11-2009
WO 2012052614 A1	26-04-2012	CN 103347661 A	09-10-2013
		EP 2629939 A1	28-08-2013
		JP 2013541775 A	14-11-2013
		RU 2013123021 A	27-11-2014
		US 2013266205 A1	10-10-2013
		WO 2012052614 A1	26-04-2012
		WO 2012052615 A1	26-04-2012
EP 0706838 A1	17-04-1996	AT 195272 T	15-08-2000
		DE 69518293 D1	14-09-2000
		DE 69518293 T2	29-03-2001
		EP 0706838 A1	17-04-1996
		ES 2151587 T3	01-01-2001
		FR 2725640 A1	19-04-1996
GB 2167211 A	21-05-1986	NONE	
US 5041907 A	20-08-1991	NONE	
DE 102006003859 B3	01-03-2007	AT 500545 T	15-03-2011
		CA 2636710 A1	02-08-2007
		DE 102006003859 B3	01-03-2007
		EP 1982246 A1	22-10-2008
		ES 2359990 T3	30-05-2011
		US 2009012644 A1	08-01-2009
		WO 2007085318 A1	02-08-2007
CH 693710 A5	31-12-2003	NONE	
WO 2007083327 A2	26-07-2007	EP 1984122 A2	29-10-2008
		US 2009026119 A1	29-01-2009
		WO 2007083327 A2	26-07-2007