

MULTI-STATION OPERATION GLUE DISPENSER AND OPERATION METHOD THEREFOR

TECHNICAL FIELD

[0001] The present disclosure relates to the field of glue dispensing, and more particularly, to
5 a multi-station operation glue dispenser and operation method therefor.

BACKGROUND

[0002] A glue dispenser is an automatic machine to control flow of a fluid and to dispense
and apply the fluid onto a surface or an interior of a product, in order to reduce the risk of failure
of an element due to temperature change, falling, vibration and other factors in the operation
10 process of the product so as to lengthen the use life of the product. Currently, the glue dispenser
has been widely used in the field of electronic packaging. Glue dispensing is a key and crucial
step in electronic packaging technology, and the quality of the glue dispensing can be directly
related to the quality of the electronic packaging.

[0003] Currently, a conventional glue dispenser adopts a gas cylinder to drive a heating
15 platform to move up and down. However, the heating platform is relatively heavy, when the gas
cylinder drives the heating platform to operate with a high frequency, the operational cost of the
equipment is increased, and the planeness of the heating platform can be easily affected during
the moving process. Therefore, frequent adjustments are needed for the planeness of the heating
platform, consuming manual work and time.

[0004] In the current material taking mechanism, a clamping device is usually adopted to
20 transfer a tray loaded with a workpiece onto a conveyor belt on a tray transport mechanism.
Since there is a difference in speed between the workpiece and the conveyor belt, jam or pause
may occur for the workpiece and the clamping device, causing transmission failure and
negatively influencing the production efficiency. Besides, when the tray is needed to be
25 conveyed for a long distance, especially when the tray as a whole is needed to be separated from

the conveying rail, the moving distance of the material taking mechanism is usually set to be relatively long with a relative large space occupation.

[0005] In a conventional glue dispenser, several functional areas are usually mixedly provided. For example, a preheating platform, an operation platform and a temperature keeping platform are collectively provided as one platform, which may greatly deteriorate the quality of the product which has been subject to glue dispensing.

[0006] Additionally, for some special processes, more than one operations needs to be performed on one workpiece. When each operation is finished, a next operation needs to be performed after a waiting time period to allow the glue to sufficiently flow or other operations to be completed. This waiting time period may be set according to practical processes. If the waiting time period is relatively long, the production efficiency would be negatively affected.

SUMMARY

[0007] The present disclosure is aimed to solve at least one of the technical problems in the prior art.

[0008] To this end, the present disclosure provides a multi-station operation glue dispenser, having advantages of a simple structure, high convenience to maintain, low operational cost and high glue dispensing efficiency.

[0009] The present disclosure also provides a operation method for the multi-station operation glue dispenser, having advantages of simple process, high convenience to implement and high glue dispensing efficiency.

[0010] According to embodiments of a first aspect of the present disclosure, a multi-station operation glue dispenser is provided. A multi-station operation glue dispenser includes: at least two conveying assemblies, each of the at least two conveying assemblies having an operation area; and an operation mechanism configured to move to the operation area of any of the at least two conveying assemblies and perform at least two repetitive operations on a workpiece placed in the operation area, a preset operation waiting time being present between the two repetitive operations. When the operation mechanism is located in the operation area of one of the at least two conveying assemblies, finishes one operation of the at least two repetitive operations on a workpiece in the operation area of the one of the at least two conveying assemblies and is in the

operation waiting time after which a next operation of the at least two repetitive operations is to be performed, the operation mechanism moves to the operation area of another conveying assembly of the at least two conveying assemblies and performs an operation on a workpiece placed in the operation area of the other conveying assembly.

5 **[0011]** The multi-station operation glue dispenser according to embodiments of the present disclosure adopts a suitable way of operation based on the operation time of the operation mechanism and the operation waiting time between two consecutive operations for the workpiece, to achieve an optimal balance between the operation time and the operation waiting time and to further raise the operational efficiency.

10 **[0012]** According to one embodiment of the present disclosure, operation time for the operation mechanism to perform any one operation is equal to or larger than the operation waiting time.

15 **[0013]** According to one embodiment of the present disclosure, each of the at least two conveying assemblies includes a first conveying unit, a second conveying unit and a third conveying unit, the first conveying unit. The second conveying unit and the third conveying unit are independent from each other and are sequentially arranged along a conveying direction. The workpiece is configured to move along the first conveying unit, the second conveying unit and the third conveying unit sequentially, the operation area corresponds to the second conveying unit, and the operation mechanism is configured to perform an operation on a workpiece that
20 moves to the second conveying unit.

25 **[0014]** According to one embodiment of the present disclosure, the multi-station operation glue dispenser may further include: a preheating platform located in the first conveying unit and configured to preheat a workpiece that moves to the first conveying unit; an operation platform located in the second conveying unit and configured to perform, by cooperating with the operation mechanism, glue dispensing operation on the preheated workpiece that moves to the second conveying unit; and a temperature keeping platform located in the third conveying unit and configured to perform a temperature keeping process on the workpiece that moves to the third conveying unit and has been subject to the glue dispensing operation.

30 **[0015]** According to one embodiment of the present disclosure, all of the first conveying unit, the second conveying unit and the third conveying unit are mounted on a same fixing base. Each

of the first conveying unit, the second conveying unit and the third conveying unit includes a conveying rail. The conveying rail is installed on the fixing base and is capable of moving up and down and is provided with a conveying passage extending along the conveying direction of the conveying rail. The workpiece is configured to move along the conveying rail.

5 **[0016]** According to one embodiment of the present disclosure, the multi-station operation glue dispenser may further include three elevating mechanisms which are a first elevating mechanism, a second elevating mechanism and a third elevating mechanism respectively. The first elevating mechanism is connected with the conveying rail of the first conveying unit. The second elevating mechanism is connected with the conveying rail of the second conveying unit.
10 The third elevating mechanism is connected with the conveying rail of the third conveying unit, and each of the three elevating mechanisms is configured to control its corresponding conveying rail to move up and down.

[0017] According to one embodiment of the present disclosure, each of the three elevating mechanisms is configured to control its corresponding conveying rail to move between a first
15 state and a second state. When any of the conveying rails is in the first state, the conveying rail is in a raised state and the workpiece is spaced apart from the adsorption module. When any of the conveying rails is in the second state, the conveying rail is in a lowered state and the workpiece is in contact with the corresponding adsorption module.

[0018] According to one embodiment of the present disclosure, each of the elevating
20 mechanisms includes: a jacking cylinder provided on the conveying passage and located below the heating module, wherein the jacking cylinder is connected with the conveying rail to drive the conveying rail to move from the second state to the first state; and an elastic connecting element having one end connected with the fixing base and another end connected with the conveying rail, wherein the elastic connecting element is configured to pull the conveying rail to
25 move from the first state to the second state through an elastic force when a jacking action force of the jacking cylinder is released.

[0019] According to one embodiment of the present disclosure, the multi-station operation glue dispenser may further include: a material taking mechanism provided on the first conveying unit of each of the at least two conveying assemblies and configured to clamp a tray loaded with
30 a workpiece from a tray loading/unloading mechanism.

[0020] According to embodiments of a second aspect of the present disclosure, an operation method for the multi-station operation glue dispenser is provided. The multi-station operation glue dispenser includes two conveying assemblies which are defined as a first conveying assembly and a second conveying assembly respectively. The operation method includes:

5 performing, by the operation mechanism, one operation on a workpiece on the first conveying assembly; moving the operation mechanism to the second conveying assembly, and performing, by the operation mechanism, one operation on a workpiece on the second conveying assembly; moving the operation mechanism to the first conveying assembly again, and performing, by the operation mechanism, a next operation on the workpiece located on the first conveying assembly
10 which has been subject to one operation; and moving the operation mechanism to the second conveying assembly again, and performing, by the operation mechanism, a next operation on the workpiece located on the second conveying assembly which has been subject to one operation. The operation mechanism is configured to move between the first conveying assembly and the second conveying assembly and consecutively perform a next operation on the workpiece on
15 each of the first and second conveying assemblies until a preset number of operations are performed.

[0021] According to one embodiment of the present disclosure, when the operation mechanism has performed an operation on the workpiece on one of the two conveying assemblies and is in the operation waiting time after which a next operation is to be performed,
20 the operation mechanism moves to the other conveying assembly and performs an operation on the workpiece on the other conveying assembly.

[0022] According to one embodiment of the present disclosure, when the operation mechanism moves to the other conveying assembly and performs an operation on the workpiece on the other conveying assembly, a condition that the operation waiting time of the current
25 workpiece lapses needs to be met.

[0023] According to one embodiment of the present disclosure, the operation and the next operation have the same operation trajectory and the same operation direction.

[0024] According to one embodiment of the present disclosure, three conveying assemblies are included, the operation mechanism is configured to move among the three conveying
30 assemblies and consecutively perform an operation on a workpiece corresponding thereto until a

preset number of operations are performed.

[0025] Additional aspects and advantages of the present disclosure would be given in the following description, or partly become apparent from the following description or practising the embodiments of the present disclosure.

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BRIEF DESCRIPTION OF DRAWINGS

[0026] The above and/or additional aspects and advantages of the present disclosure would become apparent and easy to understand from the following description of embodiments in conjunction with the drawings, in which:

[0027] FIG. 1 is a schematic view showing a structure of a multi-station operation glue
10 dispenser seen from a view angle according to an embodiment of the present disclosure;

[0028] FIG. 2 is a schematic view showing a portion of a structure of a multi-station operation glue dispenser according to an embodiment of the present disclosure;

[0029] FIG. 3 is a schematic view showing a structure of a conveying rail of a multi-station operation glue dispenser that is seen from a view angle according to an embodiment of the
15 present disclosure;

[0030] FIG. 4 is a schematic view showing a contact between a workpiece and a heating platform of a multi-station operation glue dispenser according to an embodiment of the present disclosure;

[0031] FIG. 5 is a schematic view showing a structure of a conveying rail of a multi-station
20 operation glue dispenser that is seen from another view angle according to an embodiment of the present disclosure;

[0032] FIG. 6 is a schematic view showing a structure of a material taking mechanism of a multi-station operation glue dispenser according to an embodiment of the present disclosure;

[0033] FIG. 7 is a schematic illustrating contact of a workpiece with a conveying rail and a
25 material taking mechanism of a multi-station operation glue dispenser according to an embodiment of the present disclosure;

[0034] FIG. 8 is a flowchart illustrating a tray conveying process of a multi-station operation glue dispenser according to an embodiment of the present disclosure;

[0035] FIG. 9 is a schematic schematic showing a structure of a multi-station operation glue

dispenser that is seen from yet another view angle according to an embodiment of the present disclosure;

[0036] FIG. 10 is a flowchart of an operation method for the multi-station operation glue dispenser according to an embodiment of the present disclosure; and

5 **[0037]** FIG. 11 is a flowchart of an operation method for the multi-station operation glue dispenser according to an embodiment of the present disclosure.

[0038] Reference numerals:

[0039] Multi-station operation glue dispenser 1000;

[0040] First conveying assembly 100;

10 **[0041]** Second conveying assembly 200;

[0042] Fixing base 10;

[0043] Conveying rail 20; Supporting element 21; movable element 22; Main conveyor belt 232; Auxiliary conveyor belt 233;

[0044] Connecting plate 24; movement slot 25;

15 **[0045]** Material taking element 211; Clamping part 212; Mounting part 213; Holding plate 214; Clamping block 216; Connecting part 217;

[0046] Heating platform 30; Heat isolation plate 31;

[0047] Elevating mechanism 40; First elevating mechanism 41; Second elevating mechanism 42; Third elevating mechanism 43; jacking cylinder 411; Elastic connecting element 412.

20 **[0048]** Platform supporting element 60; Adsorption module 70; First state 80; Second state 90;

[0049] Driving element 240; Third rolling shaft 241; Third conveyor belt 242.

[0050] First conveying area 250;

[0051] Second conveying area 260;

25 **[0052]** First conveying unit 26; Preheating platform 261;

[0053] Second conveying unit 27; Operation platform 271;

[0054] Third conveying unit 28; Temperature keeping platform 281;

[0055] Tray 500.

DESCRIPTION OF EMBODIMENTS

[0056] Embodiments of the present disclosure will be described in further detail below. The examples of the embodiments are given in the drawings throughout which same or similar numerals represent same or similar elements or elements with same or similar functions. The
5 embodiments described in the following with reference to the drawings are exemplary, are intended to explain the present disclosure and can not be construed as limiting the present disclosure.

[0057] In the description of the present disclosure, it shall be understood that, terms such as “center”, “longitudinal”, “crosswise”, “length”, “width”, “thickness”, “upper”, “lower”,
10 “forward”, “backward”, “left”, “right”, “vertical”, “horizontal”, “top”, “bottom”, “inside”, “outside”, “clockwise”, “counter clockwise”, “axial”, “radial”, “circumferential” and others illustrating orientational or positional relations, are all on the basis of the orientational or positional relations illustrated in the drawings for convenience of simpleness of the description of the present disclosure, do not indicate or imply that the devices or elements must have a
15 specific orientation or must be constructed and operated in a specific orientation and thus cannot be construed as limiting the present disclosure. Additionally, features defined with “first” or “second” may implicitly or explicitly include one or more such features. In the description of the present disclosure, “a plurality of” means two or more, unless otherwise specifically indicated.

[0058] In the description of the present disclosure, it shall be understood that, unless
20 otherwise clearly specified and defined, terms such as “installation”, “connection”, “connected” shall be understood in a broad way, for example, may mean a fixed connection, a detachable connection, or an integral connection, may mean a mechanical or electrical connection, may mean a direct connection or indirect connection through a middle medium, or may mean communication between interiors of two parts. For a person of ordinary skill in the art, the
25 particular meaning of such terms in the present disclosure may be understood in conjunction with particular conditions.

[0059] A multi-station operation glue dispenser 1000 according to embodiments of the present disclosure will be described in detail with reference to the drawings in the following.

[0060] As illustrated in FIG. 1 to FIG. 11, the multi-station operation glue dispenser 1000
30 according to embodiments of the present disclosure includes at least two conveying assemblies

and an operation mechanism (not shown in the drawings) located above the conveying assemblies.

[0061] Specifically, each of the at least two conveying assemblies has an operation area. The operation mechanism is configured to move to the operation area of any of the at least two conveying assemblies and perform at least two repetitive operations on a workpiece placed in the operation area. A preset operation waiting time is present between the two repetitive operations. When the operation mechanism is located in an operation area of one of the at least two conveying assemblies, finishes one operation of the at least two repetitive operations on a workpiece in the operation area and is in the operation waiting time after which a next operation of the at least two repetitive operations is to be performed, the operation mechanism moves to an operation area of another conveying assembly of the at least two conveying assemblies and performs an operation on a workpiece placed in the operation area of the other conveying assembly.

[0062] In other words, the multi-station operation glue dispenser 1000 according to embodiments of the present disclosure mainly includes at least two conveying assemblies and an operation mechanism. In this embodiment, for example, two conveying assemblies are included. The two conveying assemblies are termed as a first conveying assembly 100 and a second conveying assembly 200 respectively in the following. Each of the first conveying assembly 100 and the second conveying assembly 200 is provided with at least one operation area. The number of the at least one operation area may be set to be one or more than one according to process requirements. In this embodiment, one operation area is taken as an example. Workpieces may be conveyed to operation areas to wait for operations. At this time, the operation mechanism may perform a first operation on a workpiece A in an operation area of the first conveying assembly 100. After the operation mechanism completes the first operation on the workpiece A, the workpiece A needs to wait for a preset operation waiting time. After the preset operation waiting time lapses, the operation mechanism performs a second operation on the workpiece A. During the operation waiting time of the workpiece A, the operation mechanism can move to the second operation assembly 200 to perform an operation on a workpiece B in an operation area B of the second conveying assembly 200. The operation process on the workpiece B is the same with that on the workpiece A.

[0063] In the present disclosure, there may be some special processes. For example, a plurality of operations need to be performed on a workpiece (the workpiece A or the workpiece B). After each operation is completed, before a next operation starts to be performed on the workpiece, the workpiece needs to wait for a time period until glue fully flows or another operation is finished. The preset operation waiting time may be set according to practical processes. When the operation waiting time is relatively long, the operation mechanism may move to another conveying assembly during the period of time (i.e., the relatively long operation waiting time in the unit of minute) to raise the operation efficiency. Optionally, if the preset operation waiting time is less than or equal to operation time of the operation mechanism, the operation mechanism may switch to the first conveying assembly 100 immediately after the operation mechanism finishes a first operation on the workpiece B on the second conveying assembly 200, and perform a second operation on the workpiece A in the operation area of the first conveying assembly. If the preset operation waiting time is longer than the operation time of the operation mechanism, the operation mechanism waits after the operation mechanism finishes the operation on the second conveying assembly 200, until the preset operation waiting time lapses. At this time, the operation mechanism performs a second operation on the workpiece A in the operation area of the first conveying assembly 100, or moves to an operation area of a third conveying assembly (if provided) and performs an operation on a workpiece C in the operation area of the third conveying assembly. If the preset operation waiting time is less than or equal to twice the operation time of the operation mechanism, the operation mechanism may switch to the first conveying assembly 100 immediately after finishing an operation on the third conveying assembly, and perform a second operation on the workpiece A on the operation area of the first conveying assembly 100. In this way, a proper operation way can be selected based on the operation time of the operation mechanism and the operation waiting time between two consecutive operations on a workpiece, so as to achieve an optimal balance between the operation time and the operation waiting time and to further improve the production efficiency.

[0064] The preset operation waiting time may be the time for the glue to fully flow or the time for performing another process or other processes, and will not be limited here.

[0065] Besides, the multi-station operation glue dispenser 1000 according to the embodiments of the present disclosure may be applied in other circumstances. In any

circumstance in which multiple operations are required and “an operation waiting time” is needed between any two adjacent operations, the operation principle of the multi-station operation glue dispenser 1000 of the present disclosure may be adopted to solve a corresponding problem.

5 **[0066]** Based on the above, the multi-station operation glue dispenser 1000 according to the embodiments of the present disclosure can not only fully utilize the operation waiting time, but also optimally set the number of the conveying assemblies based on the operation time of the operation mechanism and the operation waiting time between two adjacent operations on a workpiece, so as to achieve an optimal balance between the operation time and the operation
10 waiting time, and to further improve the operation efficiency.

[0067] According to an embodiment of the present disclosure, operation time for the operation mechanism to perform any one operation is equal to or larger than the operation waiting time. When the operation time for the operation mechanism to perform any one operation is equal to or larger than the operation waiting time, the operation mechanism can
15 move to other conveying assembly to perform an operation on a workpiece on the other conveying assembly immediately after finishing a current operation. It shall be illustrated that, the operation mechanism may perform multiple identical operations, and the time periods of the multiple identical operations may be same or different and may be set according to process requirements.

20 **[0068]** In some specific embodiments of the present disclosure, each of the at least two conveying assemblies includes a first conveying unit 26, a second conveying unit 27 and a third conveying unit 28. The first conveying unit 26, the second conveying unit 27 and the third conveying unit 28 are independent from each other and are sequentially arranged along a conveying direction. The workpiece is configured to move along the first conveying unit 26, the
25 second conveying unit 27 and the third conveying unit 28 sequentially. The operation area corresponds to the second conveying unit 27. The operation mechanism is configured to perform an operation on the workpiece that moves to the second conveying unit 27.

[0069] In some specific embodiments of the present disclosure, the multi-station operation glue dispenser 1000 may further include a material taking mechanism provided on the first
30 conveying unit 26 of each of the conveying assemblies. The material taking mechanism is

configured to clamp a tray 500 loaded with a workpiece from a tray loading/unloading mechanism.

[0070] The operation method for the multi-station operation glue dispenser 1000 according to embodiments of the present disclosure will be described in detail in the following.

5 **[0071]** As illustrated in FIG. 1 and FIG. 11, two conveying assemblies are included and are defined as a first conveying assembly 100 and a second conveying assembly 200. The operation method includes steps as follows. The operation mechanism performs one operation on a workpiece on the first conveying assembly 100, then moves to the second conveying assembly 200 and performs one operation on a workpiece on the second conveying assembly 200. After
10 that, the operation mechanism moves to the first conveying assembly 100 again, and performs a next operation on the workpiece located on the first conveying assembly 100 which has been subject to one operation. Then, the operation mechanism moves to the second conveying assembly 200 again, and performs a next operation on the workpiece located on the second conveying assembly 200 which has been subject to one operation. The operation mechanism
15 moves between the first conveying assembly 100 and the second conveying assembly 200 and consecutively performs a next operation on a workpiece on each of the first and second conveying assemblies until a preset number of operations are performed.

[0072] In other words, the operation method for the multi-station operation glue dispenser 1000 according to embodiments of the present disclosure mainly includes the following steps.
20 Firstly, a number of at least one operation on a workpiece located on each of the conveying assemblies is set. if the number of the at least one operation is equal to 1, the operation mechanism performs an operation on the workpiece A located on the first conveying assembly 100, and switches to the second conveying assembly 200 and performs an operation on the workpiece B located on the second conveying assembly 200 after the completion of the
25 operation on the workpiece A. If the number of the at least one operation is equal to 2 or more, the operation mechanism will repeat a former operation after completion of the former operation. For example, the operation mechanism consecutively performs a second operation on the workpiece A after performing an operation on the workpiece B, and the above steps are repeated until a preset number of operations are performed.

30 **[0073]** In some specific embodiments of the present disclosure, when the operation

mechanism has performed an operation on a workpiece on one of the conveying assemblies and is in the operation waiting time after which a next operation is to be performed, the operation mechanism may move to other conveying assembly and perform an operation on the workpiece located on the other conveying assembly. That is, during the preset operation waiting time, the operation mechanism is in a state of waiting for the glue to fully flow or waiting for a next processing step, which is not limited here. Thus, during the operation waiting time, the operation mechanism may move to other conveying assembly and perform an operation on the workpiece on the other conveying assembly, so as to utilize effectively the operation waiting time in which the operation mechanism would otherwise be in an idle state and to raise the production efficiency.

[0074] According to an embodiment of the present disclosure, when the operation mechanism moves to other conveying assembly and performs an operation on a workpiece on the other conveying assembly, a condition that the operation waiting time of the current workpiece lapses needs to be met. During the operation waiting time, the current workpiece may wait for the glue to fully flow or a next processing operation. A second operation can be performed on the workpiece only after the operation waiting time lapses, which can guarantee the yield rate of the products.

[0075] Preferably, an operation may have an operation trajectory and an operation orientation the same with that of a next operation, and more than one operations may have a same operation trajectory and a same operation orientation, facilitating the implementation and operation of the operation mechanism and further guaranteeing the yield rate of the products.

[0076] In some other specific embodiments of the present disclosure, three conveying assemblies are included. The operation mechanism moves among the three conveying assemblies, and consecutively performs an operation on the workpiece on each of the conveying assemblies until a preset number of operations are performed. By providing three conveying assemblies, the operation mechanism moves back and forth among the three conveying assemblies to perform operations on workpieces located on the three conveying assemblies, further improving the operation efficiency.

[0077] The multi-station operation glue dispenser 1000 according to embodiments of the present disclosure will be described in detail in the following in conjunction with the drawings.

[0078] As illustrated in FIG. 1 to FIG. 11, the multi-station operation glue dispenser 1000 according to embodiments of the present disclosure includes a conveying assembly, three heating platforms 30 and a material taking mechanism.

[0079] In detail, the conveying assembly includes a first conveying unit 26, a second conveying unit 27 and a third conveying unit 28 all of which are independent from each other and are sequentially provided along a conveying direction. A workpiece moves sequentially along the first conveying unit 26, the second conveying unit 27 and the third conveying unit 28. The first conveying unit 26 includes a first conveying area 250 and a second conveying area 260 adjoining the first conveying area 250. The first conveying area 250 is close to the tray loading/unloading mechanism. Three heating platforms 30 are provided on the first conveying unit 26, the second conveying unit 27 and the third conveying unit 28 respectively and are mounted onto a same fixing base 10. Each of the three heating platforms 30 is configured to heat the workpiece that moves onto the heating platform 30. The material taking mechanism is mounted onto the first conveying unit 26 and is located in the first conveying area 250. The material taking mechanism is movable in the first conveying area 250 along the conveying direction and may extend into a material box in the workpiece loading/unloading mechanism to clamp a tray 500 to deliver the tray 500 to the second conveying area 260.

[0080] In other words, the multi-station operation glue dispenser 1000 according to embodiments of the present disclosure mainly includes a conveying assembly, three heating platforms 30 and a material taking mechanism. The conveying assembly includes a first conveying unit 26, a second conveying unit 27 and a third conveying unit 28. The first conveying unit 26, the second conveying unit 27 and the third conveying unit 28 are independent from each other and are sequentially arranged along the conveying direction.

[0081] The first conveying unit 26 includes a first conveying area 250 and a second conveying area 260. The first conveying area 250 adjoins the second conveying area 260, and the first conveying area 250 is close to the tray loading/unloading mechanism and is provided with a material taking mechanism therein. Each of the first conveying unit 26, the second conveying unit and the third conveying unit 28 includes a heating platform 30. Each heating platform 30 is configured to heat the workpiece that moves to the heating platform 30.

[0082] In operation, the material taking mechanism approaches to the tray loading/unloading

mechanism and can extend into a material box to fetch the workpiece. The material box accommodates a tray 500 and the tray 500 accommodates a workpiece. In particular, the material taking mechanism first holds a front part of the tray 500 and drive the front part of the tray 500 to pass through the first conveying area 250 to the second conveying area 260. Then the material taking mechanism returns to its initial position and holds a rear part of the tray 500. The material taking mechanism pushes the rear part of the tray 500, and the front part of the tray 500 is conveyed at the same time. By repeating the above process, the whole tray 500 could be conveyed to the second conveying area 260. The workpiece then moves to the heating platform 30 of the first conveying unit 26 to be heated by the current heating platform 30. After being heated, the workpiece continue to move to the second conveying unit 27 to be heated by the heating platform 30 of the second conveying unit 27. After being heated, the workpiece continue to move to the third conveying unit 28 to be heated by the heating platform 30 of the third conveying unit 28. After being heated, the workpiece continues to move to a next operation station to be further conveyed.

[0083] In this way, the multi-station operation glue dispenser 1000 according to embodiments of the present disclosure adopts a multi-stage operation platform including a first conveying unit 26, a second conveying unit 27 and a third conveying unit 28. Each of the first, second and third conveying units is provided with a heating platform 30. A workpiece can sequentially pass through the first conveying unit 26, the second conveying unit 27 and the third conveying unit 28 along a conveying direction, and can be heated by the heating platform 30 of each of the first conveying unit 26, the second conveying unit 27 and the third conveying unit 28, thereby effectively improving the glue dispensing efficiency and the glue dispensing effect of the glue dispenser and facilitating repair, maintenance, assembly and disassembly of the multi-station operation glue dispenser 1000 by the design of the multi-stage structure. By providing the first conveying area 250 and the second conveying area 260 adjoining the first conveying area 250 to transfer and convey the workpiece, a compact-type material taking mechanism can be provided in the first conveying area 250 to enable long-distance conveyance of the workpiece. The reciprocal movement of the material taking mechanism can enable conveyance of the workpiece and improve the conveying efficiency.

[0084] In some specific embodiments of the present disclosure, the conveying assembly

includes a conveying rail 20. The conveying rail 20, the fixing base 10, the heating platform 30 and the elevating mechanism 40 and others may form an operation platform.

[0085] The operation platform of the multi-station operation glue dispenser 1000 according to the present disclosure will be described below in detail with reference to specific
5 embodiments.

[0086] As illustrated in FIG. 2 to FIG. 4 and FIG. 9, the operation platform according to embodiments of the present disclosure includes a fixing base 10, a conveying rail 20, a heating platform 30 and an elevating mechanism 40.

[0087] In particular, the fixing base 10 is configured to install parts. The conveying rail 20 is
10 installed on the fixing base 10 and can move up and down, and is provided with a conveying passage extending along its conveying direction. The conveying rail 20 carries the workpiece. The heating platform 30 is provided on the conveying passage and is connected with the fixing base 10. The heating platform 30 is configured to heat the workpiece that moves onto the heating platform 30. The elevating mechanism 40 is connected with the conveying rail 20 and is
15 configured to control the conveying rail 20 to move between a first state 80 and a second state 90. When the conveying rail 20 is in the first state 80, the conveying rail 20 is in a raised state and the workpiece is spaced apart from the heating platform 30. When the conveying rail 20 is in the second state 90, the conveying rail 20 is in a lowered state and the workpiece is in contact with the heating platform 30.

[0088] In other words, the operation platform according to embodiments of the present disclosure mainly includes a fixing base 10, a conveying rail 20, a heating platform 30 and an elevating mechanism 40. The fixing base 10 may serve as a base for assembling parts and provide the function of support. The conveying rail 20 may be installed above the fixing base 10. The workpiece may be held on the conveying rail 20, and the conveying rail 20 may move up
25 and down. That is, the workpiece may move up and down in synchronization with the conveying rail 20, and may move along the conveying direction. The heating platform 30 may be provided above the fixing base 10, and the heating platform 30 is provided in the conveying passage, and at least one part of the heating platform 30 may output heat. When the workpiece moves to a position corresponding to the heating platform 30, the conveying rail 20 may drive the workpiece
30 to move downward until a lower-end surface of the workpiece is in contact with a heating

surface of the heating platform 30. In this way, the workpiece can be heated by the heating platform 30.

[0089] It needs to be noted that, the fixing base 10 may be installed with a plurality of conveying rails 20 in parallel with each other which can be applied in different operation conditions. The workpiece can be placed on the tray 500.

[0090] The processes for raising and lowering the conveying rail 20 will be described below in detail.

[0091] Referring to FIG. 9, FIG. 9 is a left view of the structure in FIG. 2. The elevating mechanism 40 connected with the conveying rail 20 can control the conveying rail 20 to move between the first state 80 and the second state 90. When the conveying rail 20 is in the first state 80, the elevating mechanism 40 lifts up the conveying rail 20 in such a manner that the conveying rail 20 is spaced apart from the heating platform 30, enabling the workpiece to move along the conveying direction. When the workpiece is conveyed to a position corresponding to the heating platform 30, the elevating mechanism 40 may control the conveying rail 20 to switch to the second state 90, that is, the elevating mechanism 40 controls the conveying rail 20 to be lowered along the up-down direction until the workpiece is in contact with the heating platform 30. It needs to be noted that, contact heating is taken as an example for illustration. However, the operation platform according to embodiments of the present disclosure may apply to non-contact heating in which the heating temperature can be controlled by controlling the distance between the workpiece and the heating platform 30.

[0092] Therefore, in the operation platform according to embodiments of the present disclosure, the elevating mechanism controls the conveying rail to move towards or away from the heating platform. In comparison with the prior-art operation platform, the operation platform according to embodiments of the present disclosure does not need to frequently lift a heating platform having a relatively large weight to allow the heating platform to be in contact with the workpiece on the conveying rail, thus can have a reduced operation cost, avoid frequent leveling of the heating platform and improve the production efficiency.

[0093] According to an embodiment of the present disclosure, the conveying rail 20 includes a supporting element 21 and a movable element 22. The supporting element 21 is connected with the fixing base 10, and the movable element 22 is slidably connected on the supporting element

21 and is connected with the elevating mechanism 40. A workpiece is placed on the movable element 22. By providing the supporting element 21 and the movable element 22 in cooperation with each other, the space can be allocated in an orderly way, thereby saving the space occupation. In this way, a more stable and compact overall structure of the multi-station operation glue dispenser 1000 can be provided, thereby improving the overall production efficiency.

[0094] In some specific embodiments of the present disclosure, the conveying rail 20 includes two supporting elements 21, two movable elements 22 and two transmission elements. The two supporting elements 21 are provided on the fixing base 10 and are spaced apart from each other. Each of the two movable elements 22 is movably provided on a corresponding one of the two supporting elements 21 and is connected with the elevating mechanism 40. Each of the two transmission elements is provided on a corresponding one of the two movable elements 22, and a conveying passage is defined between the two transmission elements, and the two transmission elements hold a workpiece together.

[0095] In other words, as illustrated in FIG. 2 and FIG. 3, two supporting elements 21, two movable elements 22 and two transmission elements are provided. The two supporting elements 21 are provided on the fixing base 10 and are spaced apart from each other. The two supporting elements 21 can define an activity space therebetween and can provide a function of support. A movable element 22 capable of moving up and down can be provided on each of the two supporting elements 21, and the elevating mechanism 40 is configured to drive the movable element 22 to move up and down. A transmission element may be provided on each of the movable elements 22, and the two transmission elements on the two movable elements 22 may cooperate with each other to hold a workpiece and to allow the workpiece to move along the conveying direction.

[0096] According to an embodiment of the present disclosure, the conveying rail 20 further includes a connecting plate 24. The connecting plate 24 may be positioned below the heating platform 30 and is connected with the elevating mechanism 40. The connecting plate 24 has two ends that are connected with the two movable elements 22 respectively. The elevating mechanism 40 drives the two movable elements 22 to move up and down by the connecting plate 24. In this way, the two movable elements 22 at two sides can be equally stressed, which

guarantees stability in the operation of the conveying rail 20. Further, the compactness of the space utilization can be improved, which can further improve the compactness of the overall device.

[0097] As illustrated in FIG. 3, in some specific embodiments of the present disclosure, the transmission element includes a plurality of rolling shaft assemblies and a conveyor belt assembly. The plurality of rolling shaft assemblies may be provided on two facing sides of the two movable elements 22, and each of the rolling shaft assemblies is rotatable around its axial direction. The conveyor belt assembly may be provided on the rolling shaft assemblies and is driven by the rolling shaft assemblies to drive the workpiece to move along the conveying passage. The combined use of the rolling shaft assemblies and the conveyor belt assembly has advantages of low cost and high easiness to maintain and repair.

[0098] Preferably, the operation platform further includes a conveying rail width adjustment mechanism that is provided on the fixing base 10 and connected with the conveying rail 20 to adjust the width of the conveying passage. In other words, the conveying rail width adjustment mechanism is configured to adjust the width of the conveying passage according to different sizes of workpieces, and is applicable for conveying workpieces of different sizes, thereby achieving advantages including easy operation, wide applicability and lower manufacture cost.

[0099] According to an embodiment of the present disclosure, the operation platform further includes a platform supporting element 60. The platform supporting element 60 is provided on the fixing base 10 and extends along the up-down direction. An upper end of the platform supporting element 60 is connected with the heating platform 30 to support the heating platform 30. The platform supporting element 60 can provide support for the heating platform 30 and guarantee the structural stability.

[00100] Optionally, the heating platform 30 has a vacuum suction holes. The operation platform further includes a vacuum generator in communication with the vacuum suction hole to suck the workpiece with a negative pressure. By providing the vacuum suction hole on the heating platform 30, the workpiece can be fixed during the heating process, preventing the workpiece from moving during the heating process, and enabling a more stable heating process and a more uniform heating for the workpiece.

[00101] In some specific embodiments of the present disclosure, the elevating mechanism 40

includes a jacking cylinder 411 and an elastic connecting element 412. The jacking cylinder 411 may be provided on the conveying passage and is located below the heating platform 30. The jacking cylinder 411 is connected with the conveying rail 20 to drive the conveying rail to move from a second state 90 to a first state 80. The elastic connecting element 412 has one end connected with the fixing base 10 and another end connected with the conveying rail 20. When the jacking action force of the jacking cylinder 411 is released, the elastic connecting element 412 pulls the conveying rail 20 to move from the first state 80 to the second state 90 through an elastic force.

[00102] In other words, as illustrated in FIG. 1, FIG. 2 and FIG. 9, an elastic connecting element 412 may be provided between the fixing base 10 and the conveying rail 20. A tension spring may be used as the elastic connecting element 412. Using a tension spring as the elastic connecting element 412 has advantages including various sources, cheap cost, and high convenience in use. The elastic connecting element 412 may extend along the up-down direction. A jacking cylinder 411 adjacent to the elastic connecting element 412 is configured to drive the elastic connecting element 412 to extend or retract. By controlling the extending or retracting state of the elastic connecting element 412, the conveying rail 20 can be controlled to switch between the second state 90 and the first state 80.

[00103] According to an embodiment of the present disclosure, the heating platform 30 includes a heat isolation plate 31 provided between a heating module of the heating platform 30 and the platform supporting element 60. By providing the heat isolation plate 31 between the heating module of the heating platform 30 and the platform supporting element 60, the heating module can be prevented from transferring heat to the jacking cylinder 411, preventing the jacking cylinder 411 from being heated, which would otherwise affect the preciseness of the jacking operation. In this way, the use life of the jacking cylinder can be extended.

[00104] Thus, the fixing base 10, the conveying rail 20, the heating platform 30 and the elevating mechanism 40 are adopted in the operation platform of the present disclosure, the conveying rail 20 is controlled by the elevating mechanism 40 to move back and forth between the first state 80 and the second state 90. The conveying rail 20 is driven by the elevating mechanism 40 to bring the workpiece to be heated by the heating platform 30 when the workpiece moves to a position above the corresponding heating platform 30, optimizing the

structure of the operation platform, facilitating maintenance and repair and improving the use life of the overall equipment.

[00105] In some embodiments of the present disclosure, the conveyor belt assembly includes a main conveyor belt 232 installed on the conveying rail 20 in the second conveying area 260. A tray conveying platform may be formed of the conveying rail 20, the material taking mechanism and the main conveyor belt 232.

[00106] The tray conveying platform of the multi-station operation glue dispenser 1000 according to the present disclosure will be described in detail with reference to specific embodiments.

[00107] As illustrated in FIG. 5 to FIG. 7, the tray conveying platform according to embodiments of the present disclosure cooperates with the tray loading/unloading mechanism to convey a tray 500. The tray conveying platform includes the conveying rail 20, the material taking mechanism and the main conveyor belt 232.

[00108] In particular, the conveying rail 20 corresponds to a material box of the tray loading/unloading mechanism and is configured to receive a tray 500 from the material box. The conveying rail 20 includes a first conveying area 250 and a second conveying area 260 adjoining the first conveying area 250. The first conveying area 250 is close to the tray loading/unloading mechanism. The material taking mechanism is installed on the conveying rail 20 and is located in the first conveying area 250. The material taking mechanism is movable in the first conveying area 250 along the conveying rail 20 and is configured to extend into the tray cartridge to clamp a tray 500 so as to transfer the tray 500 to the second conveying area 260. The main conveyor belt 232 is provided on the conveying rail 20 and is located in the second conveying area 260. The main conveyor belt 232 is configured to convey a tray 500 delivered by the material taking mechanism.

[00109] In other words, the tray conveying platform according to embodiments of the present disclosure mainly includes the conveying rail 20, the material taking mechanism and the main conveyor belt 232. The tray conveying platform may cooperate with the tray loading/unloading mechanism to transfer and convey the tray 500. In particular, the conveying rail 20 may correspond to the material box of the tray loading/unloading mechanism, and the tray 500 in the material box may be transferred to the conveying rail 20 by the material taking mechanism. The

conveying rail 20 includes a first conveying area 250 and a second conveying area 260. The first conveying area 250 adjoins the second conveying area 260. The first conveying area 250 is close to the tray loading/unloading mechanism, the material taking mechanism may be provided in the first conveying area 250. In particular, the material taking mechanism may be installed on the conveying rail 20, and the material taking mechanism is movable along the conveying rail 20 and is configured to extend into the tray cartridge to fetch a tray. After the tray is fetched, the tray 500 may be driven by the material taking mechanism to move in the first conveying area 250 along the conveying rail 20.

[00110] The tray 500 located in the first conveying area 250 may be conveyed by the material taking mechanism to the second conveying area 260. In particular, the material taking mechanism may firstly hold a front part of the tray 500, and drive the front part of the tray 500 to pass through the first conveying area 250 to the second conveying area 250. Then, the material taking mechanism may return to its initial position and hold a rear part of the tray 500. The material taking mechanism pushes the rear part of the tray 500, and the front part of the tray 500 is conveyed at the same time. By repeating the above process, the whole tray 500 could be conveyed to the second conveying area 260, and the tray 500 may be fully separated from the conveying rail 20.

[00111] The main conveyor belt 232 may be provided in the second conveying area 260 and may be installed on the conveying rail 20. The tray 500 conveyed onto the second conveying area 260 may be conveyed by the main conveyor belt 232 to a subsequent operation station along the conveying rail 20.

[00112] Thus, in the tray conveying platform according to embodiments of the present disclosure, by providing the first conveying area 250 and the second conveying area 260 which adjoins the first conveying area 250 to transfer and convey the tray 500, long-distance conveyance of the tray 500 can be realized using a compact material taking mechanism in the first conveying area 250, and the tray 500 can be fully separated from the conveying rail through reciprocal movements of the material taking mechanism, improving the conveying efficiency of the tray 500.

[00113] According to an embodiment of the present disclosure, the first conveying area 250 and the second conveying area 260 are coaxial, and the tray 500 may be directly conveyed to the

second conveying area 260 via the first conveying area 250, improving the conveying efficiency.

[00114] The material taking mechanism according to embodiments of the present disclosure will be described in detail in the following.

[00115] As illustrated in FIG. 4 to FIG. 7, the material taking mechanism according to
5 embodiments of the present disclosure includes a material taking element 211 and a driving element 240.

[00116] In particular, the material taking mechanism is installed on the conveying unit having the conveying rail 20 and cooperating with the tray loading/unloading mechanism. The material taking mechanism is configured to transfer the tray 500 placed in the tray loading/unloading
10 mechanism to the conveying rail 20. A mounting part 213 of the material taking element 211 is provided at an outer side of the conveying unit, a clamping part 212 of the material taking element 211 is configured to project into the interior of the conveying unit and correspond to the conveying rail 20. The material taking element 211 is movable along the conveying rail 20 and is configured to extend into the tray loading/unloading mechanism to clamp a tray 500. The driving
15 element 240 is provided at the outer side of the conveying unit and is connected with the material taking element 211. The driving element 240 is configured to drive the material taking element 211 to move back and forth along the conveying rail 20. The conveying unit is provided with a movement slot 25 into which the clamping part 212 can be fitted. The clamping part 212 is configured to extend through the movement slot 25 to extend into the interior of the conveying
20 unit to hold the tray 500, and to move, when driven by the material taking element 21, back and forth relative to the movement slot 25.

[00117] In other words, the material taking mechanism according to embodiments of the present disclosure mainly includes the material taking element 211 and the driving element 240. The material taking element 211 may be installed at the outer side of the convey unit by the
25 mounting part 213 and is connected with the driving element 240. The material taking element 211 may be driven by the driving element 240 to move back and forth along the conveying rail 20. In particular, the mounting part 213 may be installed at the outer side of the conveying unit, and the clamping part 212 of the material fetching element 211 may be connected with the mounting part 213 and is configured to protrude into the interior of the conveying unit and
30 correspond to the conveying rail 20. Thus, through cooperation of the material taking element

211 with the driving element 240, the tray 500 can be conveyed to the conveying rail from the tray loading/unloading mechanism and the tray 500 can be transferred forward along the conveying direction of the conveying rail 20 by the back-and-forth movement of the material taking mechanism.

5 **[00118]** The conveying unit will be described in detail in the following.

[00119] The conveying unit may be provided with a movement slot 25 into which the clamping part 212 can be fitted. The clamping part 212 is configured to extend through the movement slot 25 and to the interior of the conveying unit to hold a tray 500. When the driving element 211 drives the mounting part 213 to move forward along the conveying direction, the clamping part 212 can move forward relative to the movement slot 25 and thus can drive the tray 500 to move forward along the conveying direction. When the driving element 211 drives the mounting part 213 to move along a direction opposite to the conveying direction, the clamping part 212 can move backward relative to the movement slot 25, and thus can drive the tray 500 to move in a direction opposite to the conveying direction. By repeating the above operation, the material taking element may move back and forth to transfer and convey the tray 500.

[00120] Thus, in the material taking mechanism according to embodiments of the present disclosure, the material taking element 211 is provided at the outer side of the conveying unit, and the material taking element 211 can be controlled by the driving element 240 to move back and forth along the conveying rail 20. When the material taking element 211 faces a direction the same with the conveying direction, the material taking element 211 can convey the tray 500 along the conveying direction, and after the tray 500 is conveyed forward by a certain distance, the material taking element 211 may move along a direction opposite to the conveying direction and move back to the initial position and clamp the tray 500 again and convey the tray 500 forward for a distance. Through cooperation of the driving element 240 and the material taking element 211 moving back and forth, long-distance conveyance for the tray 500 can be realized using the compact-sized material taking element 211, improving the conveying efficiency of the tray 500. Besides, the conveying unit may be provided with a movement slot 25, the clamping part 212 of the material taking element 211 is configured to extend through the movement slot 25 to clamp the tray 500. The clamping part 212 is configured to move back and forth relative to the movement slot 25. By the cooperation of the movement slot 25 with the material taking element

211, the moving range of the material taking element 211 can be limited, preventing the material taking element 211 from moving out of range and improving the overall structural compactness.

[00121] In some embodiments of the present disclosure, the clamping part 212 may be provided with jaws that are openable and closable to clamp a tray 500. In particular, when the jaws are opened, the clamping part 212 is ready to grab the tray 500, and when the jaws are closed, the clamping part 212 can clamp the tray 500 so as to convey the tray 500, effectively improving the stability in the transferring process.

[00122] As illustrated in FIG. 6, according to an embodiment of the present disclosure, the material taking element 211 is a structure having pneumatic clamping arms. The clamping part 212 includes two clamping plates 214. The two clamping plates 214 are provided opposite to each other and cooperate with each other to define jaws. As illustrated in FIG. 5, one clamping plate 214 may be located above the conveying rail 20 and the other clamping plate 214 may extend through the movement slot 25. By providing the material taking element 211 as pneumatic clamping arms, degree of automation can be improved.

[00123] Further, as illustrated in FIG. 5, each of the clamping plates 214 includes a clamping block 216. In particular, the clamping block 216 is an elongated member, and one end of the clamping block 216 is a free end and extends towards the tray loading/unloading mechanism. The elongated member can increase a contact area for clamping, thereby improving the stability during the clamping process. The clamping blocks 216 for the two clamping plates 214 are positioned at the inner side of the conveying unit. The connecting part 217 of one clamping plate 214 is positioned above the conveying rail 20 and the connecting part 217 of the other clamping plate 214 extends through the movement slot 25 to be connected with a corresponding clamping block 216. The material taking element 211 further includes a pneumatic clamping arm driving element connected respectively with the mounting part 213 and the clamping part 216 to adjust the size of opening of the jaws to clamp a tray 500 of a different size. When adjusting the size of an opening formed by the jaws, the pneumatic clamping arm driving element may drive one connecting part 217 to move towards or away from the other connecting part 217. During the adjustment, the connecting part 217 may cooperate with the movement slot 25 to improve the stability and repeatability of the adjustment.

[00124] According to an embodiment of the present disclosure, the tray fetching equipment

300 further includes a connecting part 217. The connecting part 217 has one end connected with another end of the clamping block 216 and another end connected with the pneumatic clamping arm driving element. The connecting part 217 can be detachably connected with the clamping block 216, thereby facilitating repair and replacement of the clamping block 216 and providing a wide applicability for conveying units of various sizes.

[00125] Optionally, the clamping block 216 is in parallel with the conveying rail 20, and the connecting part 217 is vertical to the clamping block 216, effectively improving the stability when fetching a tray.

[00126] According to an embodiment of the present disclosure, the driving element 240 includes a plurality of rolling shafts 241 and a conveyor belt 242. The plurality of rolling shafts 241 are provided on one side of the conveying rail 20, and each of the plurality of rolling shafts 241 is rotatable around its own axis. The conveyor belt 242 is provided on the plurality of rolling shafts 241 and are driven by the plurality of rolling shafts 241 to drive the material taking element 211 to move back and forth along the conveying passage.

[00127] As illustrated in FIG. 7, by providing a plurality of rolling shafts 241 on one side of the conveying rail 20 and allowing each of the plurality of rolling shafts 241 to rotate around its own axis and to drive the conveyor belt 242 provided thereon to move back and forth along the conveying direction, the material taking element 211 can be driven to move back and forth along the conveying passage.

[00128] In some specific embodiments of the present disclosure, the material taking mechanism further includes a collision prevention mechanism. The collision prevention mechanism is provided on an outer side of the conveying unit and is connected with the material taking element 211 to send a signal when the material taking element 211 is collided. By providing the collision prevention mechanism, a signal can be generated when the material taking element 211 is collided. In this way, an operator can be warned of the collision, and can solve the abnormal condition in which the material taking element 211 is hit, thereby effectively improving the efficiency for solving an abnormal condition and the material taking efficiency for the material taking mechanism, and reducing the loss caused by the abnormal condition by cooperating with an emergency braking mechanism.

[00129] Thus, in the material taking mechanism according to embodiments of the present

disclosure, through cooperation of the material taking element 211 with the driving element 240, the clamping part 212 of the material taking element 211 can move back and forth in the movement slot 25 along the conveying direction, to realize transfer and long-distance conveyance of the tray 500.

5 **[00130]** In some specific embodiments of the present disclosure, the conveyor belt assembly according to embodiments of the present disclosure further includes an auxiliary conveyor belt 233. As illustrated in FIG. 5 to FIG. 7, the auxiliary conveyor belt 233 is provided on the conveying rail 20 and is positioned in the first conveying area 250. The auxiliary conveyor belt 233 is configured to convey the tray 500 transferred by the material taking mechanism.

10 **[00131]** In other words, when the tray 500 is positioned in the first conveying area 250, the one side of tray 500 may be connected with the material taking mechanism and the other side of the tray 500 may be positioned onto the auxiliary conveyor belt 233. The conveying speed of the main conveyor belt 242 may be configured as consistent with that of the auxiliary conveyor belt 233, such that the difference between the speed of the tray 500 when entering the second
15 conveying area 260 and the speed of the main conveyor belt 232 can be effectively reduced, and failures such as conveyance stoppage due to difference in conveying speeds can be prevented when the tray 500 is entering the second conveying area 260.

[00132] According to an embodiment of the present disclosure, the main conveyor belt 232 is provided in an inner side of the second conveying area 260, the auxiliary conveyor belt 233 is
20 provided in an inner side of the first auxiliary area 250 and is opposite to the material taking mechanism. That is, the auxiliary conveyor belt 233 is provided at one side of the first conveying area 250 along the conveying direction and the material taking mechanism is provided at the other side of the first conveying area 250.

[00133] Thus, in comparison with the prior art in which a conveyor belt is adopted for
25 conveyance and there is a difference in speed between the tray 500 and the conveyor belt, and pause of the tray 500 and the material taking mechanism would occur due to the difference in speed, the tray conveying platform according to embodiments of the present disclosure optimizes the structure of the tray conveying platform, improves the security and stability in the conveyance, and improves the conveying efficiency.

30 **[00134]** A tray conveying method for the tray conveying platform according to embodiments

of the present disclosure will be described in detail in the following.

[00135] As illustrated in FIG. 8, a tray conveying method for the tray conveying platform according to embodiments of the present disclosure includes following steps:

[00136] clamping a front part of a tray by a material taking mechanism, and transferring the clamped front part of the tray to a first conveying area 250 by the material taking mechanism;

[00137] clamping a rear part of the tray by the material taking mechanism, transferring the clamped rear part of the tray to the first conveying area 250 by the material taking mechanism, and pushing the front part of the tray to the second conveying area 260 by the material taking mechanism correspondingly; and

[00138] conveying the front part of the tray to a subsequent operation station by a conveyor belt and at the same time driving the rear part of the tray to be conveyed to the subsequent operation station until the tray is completely separated from the conveying rail 20.

[00139] In other words, the tray conveying method for the tray conveying platform according to embodiments of the present disclosure mainly includes following steps. Firstly, the front part of the tray, i.e., an end of the tray that is close to the conveying rail 20, may be clamped by the material taking mechanism and may be driven by the material taking mechanism to move to the first conveying area 250. Next, the material taking mechanism moves to the rear part of the tray, and the rear part of the tray is clamped by the material taking mechanism and moves to the first conveying area 250, and the front part of the tray is pushed to the second conveying area 260 correspondingly. Finally, the front part of the tray is driven by the conveyor belt to move along the conveying direction, and at the same time the rear part of the tray is also driven to continue moving, so as to achieve movement of the whole tray towards a subsequent operation station until the tray is completely separated from the conveying rail 20. That is, the tray can be conveyed through reciprocal movements of the material taking mechanism.

[00140] In some specific embodiments of the present disclosure, the material taking mechanism includes jaws configured to be opened and closed to clamp and hold a tray. When the jaws are opened, the jaws can perform an capturing operation on a tray. When the jaws are closed, the jaws can clamp the tray to allow the tray to be transferred, improving the stability in the transferring process.

[00141] Thus, the tray conveying method for the tray conveying platform according to

embodiments of the present disclosure , not only enables long-distance transfer of the tray, but also reduces the speed difference between the tray and the main conveyor belt 232, relieves pauses of the tray and the material taking mechanism, and realizes a stable and orderly transfer of the tray to the conveying rail 20 until the tray is completely separated from the conveying rail

20.

[00142] Three heating platforms 30 of the multi-station operation glue dispenser 1000 according to the present disclosure will be described below in detail with reference to specific embodiments.

[00143] As illustrated in FIG. 1 and FIG. 2, the multi-station operation glue dispenser 1000 according to embodiments of the present disclosure includes three heating platforms 30. The three heating platforms 30 include a preheating platform 261, an operation platform 271 and a temperature keeping platform 281.

[00144] In particular, the conveying assembly includes a first conveying unit 26, a second conveying unit 27 and a third conveying unit 28 that are independent from each other and are sequentially arranged along the conveying direction. A workpiece moves sequentially along the first conveying unit 26, the second conveying unit 27 and the third conveying unit 28. The preheating platform 261 is located on the first conveying unit 26 and is configured to preheat the workpiece that moves to the first conveying unit 26. The operation platform 271 is located in the second conveying unit 27 and is configured to perform by cooperating with the operation mechanism, glue dispensing operation on the preheated workpiece that moves to the second conveying unit 27. The temperature keeping platform 281 is located in the third conveying unit 28 and is configured to perform a temperature keeping process on the workpiece that moves to the third conveying unit 28 and has been subject to the glue dispensing operation.

[00145] In other words, the multi-station operation glue dispenser 1000 according to embodiments of the present disclosure mainly includes conveying assemblies, a preheating platform 261, an operation platform 271 and a temperature keeping platform 281. The conveying assembly includes a first conveying unit 26, a second conveying unit 27 and a third conveying unit 28 which are independent from each other and are sequentially arranged along the conveying direction. The preheating platform 261 is provided on the first conveying unit 26, the operation platform 271 is provided on the second conveying unit 27, and the temperature

keeping platform 281 is provided on the third conveying unit 28. In operation, a workpiece firstly moves to the first conveying unit 26 along the conveying direction, and is preheated by the preheating platform 261. Next, the preheated workpiece moves to the second conveying unit 27 along the conveying direction and is subject to a glue dispensing process by the operation platform 271 when the workpiece moves to the operation platform 271. Finally, the workpiece that has been subject to the glue dispensing process moves to the third conveying unit 28 and is subject to a temperature keeping process performed by the temperature keeping platform 281.

[00146] Thus, the multi-station operation glue dispenser 1000 according to embodiments of the present disclosure adopts a multi-stage operation platform including the preheating platform 261, the operation platform 271 and the temperature keeping platform 281. A workpiece is preheated by the preheating platform 261, is subject to a glue dispensing in the operation platform 271 and is finally subject to a temperature keeping process in the temperature keeping platform 281. The workpiece passes sequentially through the preheating platform 261, the operation platform 271 and the temperature keeping platform 281 along the conveying direction, thereby effectively improving the glue dispensing efficiency and the glue dispensing effect of the glue dispenser. In addition, the multi-stage structural design achieves high convenience of repair, assembly and disassembly.

[00147] According to an embodiment of the present disclosure, all of the first conveying unit 26, the second conveying unit 27 and the third conveying unit 28 are installed on a same fixing base 10. Each of the first conveying unit 26, the second conveying unit 27 and the third conveying unit 28 includes a conveying rail 20. The conveying rail 20 is installed on the fixing base 10 and is capable of moving up and down, and is provided with a conveying passage extending along a conveying direction of the conveying rail 20. The workpiece is configured to move along the conveying rail 20.

[00148] In other words, as illustrated in FIG. 1 and FIG. 2, the first conveying unit 26, the second conveying unit 27 and the third conveying unit 28 may be provided on the same fixing base 10, and each of the first, second and third conveying units includes a conveying rail 20. The conveying rail 20 is installed on the fixing base 10 and is capable of moving up and down. The conveying rail 20 may drive the workpiece to move in a vertical direction to adjust the distance of the workpiece from the preheating platform, the operation platform 271 or the temperature

keeping platform.

[00149] In some specific embodiments of the present disclosure, three elevating mechanisms 40 are included, as illustrated in FIG. 9. FIG. 8 is a left view of the structure shown in FIG. 1. The three elevating mechanisms 40 are a first elevating mechanism 41, a second elevating mechanism 42 and a third elevating mechanism 43 respectively. The first elevating mechanism 41 is connected with the conveying rail 20 of the first conveying unit 26, the second elevating mechanism 42 is connected with the conveying rail 20 of the second conveying unit 27, and the third elevating mechanism 43 is connected with the conveying rail 20 of the third conveying unit 28. Each of the three elevating mechanisms is configured to control its corresponding conveying rail 20 to move up and down.

[00150] In other words, as illustrated in FIG. 9, by providing an elevating mechanism 40 in each of the conveying units, each of the conveying units may be controlled by an independent elevating mechanism 40 to move up and down. The conveying units are independent from each other without interfering each other. When one of the conveying units breaks down, only the broken-down conveying unit needs to be repaired, which is convenient for repair and maintenance.

[00151] According to an embodiment of the present disclosure, each of the preheating platform 261, the operation platform 271 and the temperature keeping platform 281 includes a heating module and an adsorption module 70. In particular, the heating module is provided on the conveying passage and is configured to heat a workpiece that moves to a corresponding platform. The adsorption module 70 is provided at an upper side of the heating module and is configured to absorb the workpiece that moves to a corresponding platform.

[00152] In other words, as illustrated in FIG. 1 and FIG. 9, the workpiece moves along the conveying passage, is heated by the heating module provided in the conveying passage and is absorbed by the adsorption module 70 provided at the upper side of the heating module when the workpiece moves to a corresponding platform. It needs to be noted that, there is no requirement for the sequence of the operations of the heating module and the adsorption module 70. The workpiece may be heated first and then be absorbed, or may be absorbed first and then be heated, or heated and absorbed at the same time. By providing the heating module and the adsorption module 70, the workpiece can be fixed during the heating process, preventing the workpiece

from moving during the heating process, and allowing a more stable and uniform heating during the heating process. The adsorption module 70 may include a vacuum generator.

[00153] Optionally, each of the three elevating mechanisms may control a corresponding conveying rail 20 to move between a first state 80 and a second state 90. When any of the conveying rails 20 is in the first state 80, the conveying rail 20 is in a raised state and the workpiece is spaced apart from a corresponding adsorption module 70. When any of the conveying rails 20 is in the second state 90, the conveying rail 20 is in a lowered state and the workpiece is in contact with a corresponding adsorption module 70.

[00154] In other words, when any of the conveying rails 20 is in the first state 80, a corresponding elevating mechanism lifts up the conveying rail 20, and meanwhile, the conveying rail 20 is spaced apart from the adsorption module 70, and the workpiece may move along the conveying direction.

[00155] When the workpiece moves to a position above the adsorption module 70, a corresponding elevating mechanism may control the conveying rail 20 to switch to the second state 90, that is, the elevating mechanism drives the conveying rail 20 to be lowered, and the workpiece on the conveying rail 20 is also lowered to be in contact with the adsorption module 70. By driving the conveying rail 20 to move up and down by the elevating mechanism, it may improve, to some extent, the technical solution in the prior art in which relatively heavy modules such as the heating platform and the absorption platform are driven to move up and down.

[00156] In some specific embodiments of the present disclosure, the elevating mechanism includes a jacking cylinder 411 and an elastic connecting element 412. The jacking cylinder 411 is provided on the conveying passage and is located below the heating module. The jacking cylinder 411 is connected with the conveying rail 20 to drive the conveying rail 20 to move from the second state 90 to the first state 80. The elastic connecting element 412 has one end connected with the fixing base 10 and another end connected with the conveying rail 20. The elastic connecting element is configured to pull the conveying rail 20 to move from the first state 80 to the second state 90 through an elastic force when a jacking action force of the jacking cylinder 411 is released.

[00157] In operation, firstly, the jacking cylinder 411 performs a lifting operation to allow the conveying rail 20 to move to the first state 80 from the second state 90, that is, the conveying rail

20 is in a raised state and the workpiece is spaced apart from the adsorption module 70, and the workpiece moves along the conveying direction. Then, when the jacking cylinder 411 releases its jacking action force, the elastic connecting element 412 pulls the conveying rail 20 to move from the first state 80 to the second state 90, that is the conveying rail 20 is in a lowered state and the workpiece is in contact with the adsorption module 70.

[00158] Preferably, the elastic connecting element 412 may be a tension spring. The tension spring is configured to control the movement of the conveying rail 20 using a resilience force (i.e., a pulling force) after being stretched. The tension spring has advantages such as a large pulling force, a good pulling effect, various sources, and a low cost.

[00159] In some specific embodiments of the present disclosure, each of the preheating platform 261, the operation platform 271 and the temperature keeping platform 281 includes a platform supporting element 60. The platform supporting element 60 is provided on the fixing base 10 and is connected with the heating module to support the heating module. By providing a platform supporting element 60 that is connected with the fixing base 10 in each of the preheating platform 261, the operation platform 271 and the temperature keeping platform 281, the platform supporting element 60 can provide support for a heating platform since the preheating platform 261, the operation platform 271 and the temperature keeping platform 281, other parts and the adsorption module 70 causes the heating platform to be heavy, guaranteeing a structural stability.

[00160] According to an embodiment of the present disclosure, each of the preheating platform 261, the operation platform 271 and the temperature keeping platform 281 includes a heat isolation plate 31. As illustrated in FIG. 4, the heat isolation plate 31 may be provided between the heating module and the platform supporting element 60. By providing the heat isolation plate 31 between the heating module and the platform supporting element 60 in each of the preheating platform 261, the operation platform 271 and the temperature keeping platform 281, heat dissipation can be effectively reduced, the heating efficiency of the heating module can be improved, heat transfer to the platform supporting element 60 can be reduced, and the use life of the platform supporting element 60 can be improved.

[00161] Thus, the multi-station operation glue dispenser 1000 according to embodiments of the present disclosure adopts a multi-stage operation platform including the preheating platform

261, the operation platform 271 and the temperature keeping platform 281, and the workpiece is subject to a preheating process, a glue dispensing process and a temperature keeping process in this order, effectively improving the glue dispensing efficiency and the glue dispensing effect of the glue dispenser and facilitating repair and maintenance by using the multi-stage structural design. Besides, by driving the conveying rail 20 to move up and down using the elevating mechanism 40 without driving relatively heavy modules such as the heating platform and the suctioning platform to move up and down, it has advantages such as an optimized platform structure, convenient repair and maintenance and extended use life of the overall equipment.

[00162] An operation method for the multi-station operation glue dispenser 1000 according to embodiments of the present disclosure will be described in detail in the following.

[00163] As illustrated in FIG. 10, the operation method for the multi-station operation glue dispenser according to embodiments of the present disclosure includes following steps:

[00164] clamping the front part of the tray 500 by the material taking mechanism, and transferring the clamped front part of the tray 500 to the first conveying area 250 by the material taking mechanism, the tray 500 carrying a workpiece;

[00165] clamping the rear part of the tray 500 by the material taking mechanism, and transferring the clamped rear part of the tray 500 to the first conveying area 250 by the material taking mechanism, and pushing the front part of the tray 500 to the second conveying area 260 correspondingly.

[00166] The tray 500 moves sequentially along the first conveying unit 26, the second conveying unit 27 and the third conveying unit 28. When the tray 500 moves to a position above a corresponding heating platform 30, the heating platform 30 may heat the workpiece.

[00167] In other words, when the tray 500 is clamped and fetched out from the tray cartridge by the material taking mechanism, the tray 500 is conveyed to the first conveying area 250 of the first conveying unit 26 first, and then to the second conveying area 250, and then to the second conveying unit 27 and the third conveying unit 28 through reciprocal movement of the material taking mechanism.

[00168] According to one embodiment of the present disclosure, the multi-station operation glue dispenser 1000 further includes three elevating mechanisms 40. The three elevating mechanisms 40 correspond to the first conveying unit 26, the second conveying unit 27 and the

third conveying unit 28 respectively. The operation method further includes following steps. When the tray 500 moves to a position above a corresponding heating platform 30, an elevating mechanism 40 corresponding to the heating platform 30 may control a corresponding conveying rail 20 to be in a lowered state to drive the workpiece 500 to move downward to be connected with the heating module of the heating platform 30 so as to be heated. When the heating is finished, the conveying rail 20 is in a raised state and the workpiece is spaced apart from the corresponding heating platform 30. In other words, when the tray 500 is conveyed to a position above the corresponding heating platform 30 of the first conveying unit 26 by the material taking mechanism, the corresponding elevating mechanism 40 can drive the conveying rail 20 of the first conveying unit 26 to drive the workpiece 500 to move downward until the heating module can heat the workpiece 500. When the heating is finished, the elevating mechanism 40 drives the conveying rail 20 of the first conveying unit 26 to drive the workpiece 500 to move upward. At this time, the heating platform 30 keeps still, the conveying rail 20 of the first conveying unit 26 maintains an upward trend and is spaced apart from the heating platform 30. The tray 500 may move subsequently to the second conveying unit 27 and the third conveying unit 28, and the corresponding elevating modules 40 of the second conveying unit 27 and the third conveying unit 28 works in the same principle as above.

[00169] As above, the operation method for the multi-station operation glue dispenser 1000 according to embodiments of the present disclosure can realize multi-stage type heating including such as the preheating stage, the glue dispensing stage and the temperature keeping stage. In this way, it can further improve the glue dispensing effect and the glue dispensing efficiency, and can solve, by controlling the conveying rail 20 to be lifted or lowered and the heating platform 30 to keep still, technical defects in the prior art. In the prior art, an operation platform with a conventional structure may adopt large quantities of cables and pipelines, it is easy to cause abrasion and wear to the cables and pipelines during up-down movements of the operation platform at a high frequency and it further causes inconvenient maintenance. In the contrary, since the improved heating platform keeps still, abrasion and wear to the cables and pipelines can be prevented.

[00170] In the description of the present disclosure, the description with reference to the terms “one embodiment”, “some embodiments”, “exemplary embodiments”, “example”, “specific

example”, or “some examples”, etc., means that specific features, structures, materials, or characteristics described in conjunction with the embodiment(s) or example(s) are included in at least one embodiment or example of the present disclosure. In the present disclosure, any illustrative reference to the above terms does not necessarily refer to the same embodiment(s) or example(s). In addition, specific characteristics, structures, materials or features described may be combined in a suitable manner in any one or more embodiments or examples.

[00171] Although the embodiments of the present disclosure have been shown and described above, it can be appreciated by those of ordinary skill in the art that various changes, modifications, replacements and variants can be made to the above embodiments without departing from the principle and the spirit of the present disclosure. The scope of the disclosure is defined by claims and equivalents thereof.

CLAIMS

1. A multi-station operation glue dispenser, comprising:

at least two conveying assemblies, each of the at least two conveying assemblies having an operation area; and

5 an operation mechanism configured to move to the operation area of any of the at least two conveying assemblies and perform at least two repetitive operations on a workpiece placed in the operation area, a preset operation waiting time being present between the two repetitive operations;

wherein when the operation mechanism is located in the operation area of one of the at
10 least two conveying assemblies, finishes one operation of the at least two repetitive operations on a workpiece in the operation area of the one of the at least two conveying assemblies and is in the operation waiting time after which a next operation of the at least two repetitive operations is to be performed, the operation mechanism moves to the operation area of another conveying assembly of the at least two conveying assemblies and performs an
15 operation on a workpiece placed in the operation area of the other conveying assembly.

2. The multi-station operation glue dispenser according to claim 1, wherein operation time for the operation mechanism to perform any one operation is equal to or larger than the operation waiting time.

3. The multi-station operation glue dispenser according to claim 1, wherein each of the at
20 least two conveying assemblies comprises a first conveying unit, a second conveying unit and a third conveying unit, the first conveying unit, the second conveying unit and the third conveying unit are independent from each other and are sequentially arranged along a conveying direction, the workpiece is configured to move along the first conveying unit, the second conveying unit and the third conveying unit sequentially, the operation area
25 corresponds to the second conveying unit, and the operation mechanism is configured to perform an operation on a workpiece that moves to the second conveying unit.

4. The multi-station operation glue dispenser according to claim 3, further comprising:

a preheating platform located in the first conveying unit and configured to preheat a

workpiece that moves to the first conveying unit;

an operation platform located in the second conveying unit and configured to perform, by cooperating with the operation mechanism, glue dispensing operation on the preheated workpiece that moves to the second conveying unit; and

5 a temperature keeping platform located in the third conveying unit and configured to perform a temperature keeping process on the workpiece that moves to the third conveying unit and has been subject to the glue dispensing operation.

5. The multi-station operation glue dispenser according to claim 4, wherein all of the first conveying unit, the second conveying unit and the third conveying unit are mounted on a same fixing base, and each of the first conveying unit, the second conveying unit and the third conveying unit comprises a conveying rail, the conveying rail is installed on the fixing base and is capable of moving up and down and is provided with a conveying passage extending along the conveying direction of the conveying rail, and the workpiece is configured to move along the conveying rail.

15 6. The multi-station operation glue dispenser according to claim 5, further comprising:
three elevating mechanisms which are a first elevating mechanism, a second elevating mechanism and a third elevating mechanism respectively, the first elevating mechanism being connected with the conveying rail of the first conveying unit, the second elevating mechanism being connected with the conveying rail of the second conveying unit, the third elevating mechanism being connected with the conveying rail of the third conveying unit, and each of the three elevating mechanisms being configured to control its corresponding conveying rail to move up and down.

7. The multi-station operation glue dispenser according to claim 6, wherein each of the three elevating mechanisms is configured to control its corresponding conveying rail to move between a first state and a second state, and when any of the conveying rails is in the first state, the conveying rail is in a raised state and the workpiece is spaced apart from the adsorption module, and when any of the conveying rails is in the second state, the conveying rail is in a lowered state and the workpiece is in contact with the corresponding adsorption module.

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8. The multi-station operation glue dispenser according to claim 7, wherein each of the elevating mechanisms comprises:

a jacking cylinder provided on the conveying passage and located below the heating module, wherein the jacking cylinder is connected with the conveying rail to drive the conveying rail to move from the second state to the first state; and

an elastic connecting element having one end connected with the fixing base and another end connected with the conveying rail, wherein the elastic connecting element is configured to pull the conveying rail to move from the first state to the second state through an elastic force when a jacking action force of the jacking cylinder is released.

9. The multi-station operation glue dispenser according to any of claims 3-8, further comprising:

a material taking mechanism provided on the first conveying unit of each of the at least two conveying assemblies and configured to clamp a tray loaded with a workpiece from a tray loading/unloading mechanism.

10. An operation method for the multi-station operation glue dispenser of claim 1, wherein the multi-station operation glue dispenser comprises two conveying assemblies which are defined as a first conveying assembly and a second conveying assembly respectively, the operation method comprising:

performing, by the operation mechanism, one operation on a workpiece on the first conveying assembly;

moving the operation mechanism to the second conveying assembly, and performing, by the operation mechanism, one operation on a workpiece on the second conveying assembly;

moving the operation mechanism to the first conveying assembly again, and performing, by the operation mechanism, a next operation on the workpiece located on the first conveying assembly which has been subject to one operation; and

moving the operation mechanism to the second conveying assembly again, and performing, by the operation mechanism, a next operation on the workpiece located on the second conveying assembly which has been subject to one operation;

wherein the operation mechanism is configured to move between the first conveying assembly and the second conveying assembly and consecutively perform a next operation on

the workpiece on each of the first and second conveying assemblies until a preset number of operations are performed.

11. The operation method according to claim 10, wherein when the operation mechanism has performed an operation on the workpiece on one of the two conveying assemblies and is
5 in the operation waiting time after which a next operation is to be performed, the operation mechanism moves to the other conveying assembly and performs an operation on the workpiece on the other conveying assembly.

12. The operation method according to claim 11, wherein when the operation mechanism moves to the other conveying assembly and performs an operation on the workpiece on the
10 other conveying assembly, a condition that the operation waiting time of the current workpiece lapses needs to be met.

13. The operation method according to claim 10, wherein the operation and the next operation have the same operation trajectory and the same operation direction.

14. The operation method according to claim 10, wherein three conveying assemblies are
15 comprised, the operation mechanism is configured to move among the three conveying assemblies and consecutively perform an operation on a workpiece corresponding thereto until a preset number of operations are performed.