MULTI-STATION GLUE DISPENSER AND GLUE DISPENSING METHOD THEREOF

TECHNICAL FIELD

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

BACKGROUND

[0002] As economy and technology are developing fast, the market demand for semiconductor is growing constantly. Wafer is a fundamental material for manufacturing semiconductor chips. Glue dispensing on wafer is a crucial process in advanced electronics manufacture and is widely used in chip packages and integrated circuit devices, with an aim to lower the risk of failure of devices which may be caused by sharp temperature change, fall, impact and shake etc. in the use of the devices, and to lengthen the use life of the products. Therefore, as a key and crucial step in electronics packaging, the quality of glue dispensing can directly affect the quality of electronics packaging. However, conventionally, glue dispensing is performed manually, its operating efficiency is low and the flow speed of the glue is not uniform enough, which may easily cause too much glue to be dispensed and inferior production quality. A glue dispenser is a novel automatic device which is mainly configured to dispense the glue onto a specific position along a preset path in a predetermined way.

[0003] Currently, an automatic glue dispenser usually includes one operating station in which a mechanical arm delivers a material to a glue dispensing unit, a preheating unit preheats the material and then glue dispensing is performed on the material. Since the glue dispensing process and the preheating process take long time, the mechanical arm of the glue dispenser cannot pick up another material until the glue dispensing on the material is finished, causing too long idle time and low utilization rate for the mechanical arm, and a low manufacture rate and incapability for mass production. In addition, the automatic production line for the glue dispenser is not

compact enough, and the operating line for the mechanical arm is relatively too long, causing waste in resource. Besides, in related art, the temperature control for the wafer is not good enough, negatively influencing the yield rate and the quality of the glue dispensing.

SUMMARY

[0004] The present disclosure aims to solve at least one of the technical problems in the prior art.

[0005] To this end, the present disclosure provides a multi-station glue dispenser, having a compact overall structure, effective glue dispensing, precise temperature control, high production efficiency, high product quality and other advantages.

[0006] The present disclosure also provides a glue dispensing method of a multi-station glue dispenser, having high degree of mechanization, high product quality and other advantages.

[0007] According to an embodiment in one aspect of the present disclosure, a multi-station glue dispenser is provided. The multi-station glue dispenser includes: a loading and unloading mechanism defining a motion space therein, a plurality of processing stations being provided at a peripheral of the loading and unloading mechanism, the loading and unloading mechanism being configured to move between the motion space and each of the plurality of processing stations to transport a wafer, and the plurality of processing stations including a positioning station, a preheating station and a plurality of glue dispensing stations; a wafer scanning and positioning mechanism located at the positioning station and configured to scan and position the wafer transported by the loading and unloading mechanism; a wafer preheating mechanism located at the preheating station and configured to preheat the wafer transported by the loading and unloading mechanism; a wafer heating mechanism located at the glue dispensing station and configured to heat the wafer in the processing station; and a glue dispensing mechanism fitting with the wafer heating mechanism to dispense glue on the heated wafer.

[0008] With the multi-station glue dispenser according to the embodiment of the present disclosure, in which the loading and unloading mechanism, the wafer scanning and positioning mechanism, the wafer preheating mechanism, the plurality of wafer heating mechanisms and the plurality of glue dispensing mechanisms are adopted, it can achieve scanning, positioning, preheating, and heating the wafer and dispensing glue onto the wafer. In addition, with the

plurality of processing stations in the multi-station glue dispenser, the glue dispensing quality can be improved, the utilization rate of the loading and unloading mechanism can be improved and the waiting time can be reduced. The multi-station glue dispenser has advantages including a compact structure, high operating efficiency and high product quality..

[0009] According to an embodiment of the present disclosure, the loading and unloading mechanism includes: a loading and unloading body defining the motion space therein, the loading and unloading body being provided with two ports that are respectively located at both ends of the loading and unloading body, the two ports being in communication with the motion space, and at least two processing stations being provided at each of both sides of the loading and unloading body; a movable element provided in the motion space and movable between the two ports; and a material taking machine provided on the movable element to pick up a wafer from the port or the processing station, or to place a wafer onto the port or the processing station.

[0010] According to an embodiment of the present disclosure, the loading and unloading body is in a shape of "⊏" with an opening facing upward~~down~~, each of a plurality of supporting legs of the loading and unloading body is provided with the port, and the loading and unloading mechanism further includes: two cartridges which are respectively provided on the positions corresponding to the ports on two support legs, and at least a portion of the material taking machine being configured to extend out of the port and into the cartridge to load and unload a wafer.

[0011] According to an embodiment of the present disclosure, the material taking machine includes: a mechanical arm, the mechanical arm having one end connected with the movable element and the other end that is movable; and a tray, the tray being provided on the other end of the mechanical arm and being configured to hold the wafer.

[0012] According to an embodiment of the present disclosure, the loading and unloading mechanism further includes a loading and unloading transmission mechanism, the loading and unloading transmission mechanism being provided between the two ports and being movable between the two ports to drive the movable element to move, and the loading and unloading transmission mechanism includes: a side panel extending within the loading and unloading body along a lengthwise direction of the loading and unloading body, the side panel having a mounting surface at a lateral side thereof; a transmission rail disposed on the mounting surface

and extending along the lengthwise direction of the loading and unloading body and the movable element being movably provided on the transmission rail; and a loading and unloading driving element provided on the mounting surface and connected with the movable element to drive the movable element to move.

[0013] According to an embodiment of the present disclosure, the wafer scanning and positioning mechanism is provided between two adjacent glue dispensing stations, and the wafer scanning and positioning mechanism includes: a scanning member configured to scan and identify the wafer; and an positioning member configured to position the wafer transported by the loading and unloading mechanism to adjust the position of the wafer.

[0014] According to an embodiment of the present disclosure, the wafer preheating mechanism and the wafer heating mechanism include: a base; a heater provided on the base, an upper surface of the heater being configured as a heating surface; and a lifting assembly provided on the base and movable between an ascending state and a non-ascending state, the lifting assembly being configured to support a wafer to allow the wafer to be spaced apart from the heating surface when the lifting assembly is in the ascending state and being configured to allow the wafer to be in contact with the heating surface when the lifting assembly is in the non-ascending state; wherein the heater is configured to heat the wafer in a non-contact way to allow the temperature of the wafer to raise gradually during the lifting assembly transits gradually from the ascending state to the non- ascending state.

[0015] According to an embodiment of the present disclosure, the base includes: a base board; a plurality of supporting rods provided on the base board; and a heater supporting platform provided on the plurality of supporting rods and spaced apart from the base board, and both the heater and the lifting assembly being provided on the heater supporting platform.

[0016] According to an embodiment of the present disclosure, the heater has a plurality of through holes that are correspondingly in inter-connection with a plurality of through holes of the heater supporting platform. The lifting assembly includes a plurality of ejector pins and an ejector pin driving element. The plurality of ejector pins extend through the through holes of the heater and the the through holes of the heater supporting platform and are movable along an axial direction of the through holes. When the lifting assembly is in a ascending state, the upper ends of the plurality of ejector pins protrude from the through holes to support a wafer. When the

lifting assembly is in a non-ascending state, the upper ends of the plurality of ejector pins are not higher than the heating surface. The ejector pin driving element is provided between the heater supporting platform and the base board and is connected with the plurality of ejector pins. The ejector pin driving element is configured to drive the plurality of ejector pins to move.

[0017] According to an embodiment of the present disclosure, heating surface has at least two heating regions for heating wafers of different sizes, each of the at least two heating regions has at least one vacuum absorption hole, and the wafer preheating mechanism further includes: a vacuum absorption member in communication with the vacuum absorption hole to fix the wafer when the wafer is one the heater..

[0018] According to an embodiment of the present disclosure, the heater supporting platform defines a heating chamber. The heater includes a heating tube, a heating plate, at least two thermocouples and a temperature controller. The heating tube extends into the heating chamber to perform heating. The heating plate is attached on the heater supporting platform and is located above the heater supporting platform. The upper surface of the heating plate is a heating surface. The heating plate is configured to receive heat from the heating tube and transfer the heat to the wafer via the heating surface. The heating plate has at least two heating regions. The at least two thermocouples are provided in the at least two heating regions respectively to detect the temperature of each heating region. The temperature controller is connected with the heating tube and the thermocouples. The temperature controller may control the heating of the heating tube based on the temperature detected by the thermocouples.

[0019] According to an embodiment of the present disclosure, the glue dispensing mechanism includes: a glue dispensing body; a glue dispensing head assembly movably provided on the glue dispensing head assembly and located above the wafer heating mechanism to dispense glue onto the wafer placed on the wafer heating mechanism; and a static charge dissipating member movably provided on the glue dispensing body and located above the wafer heating mechanism to dissipate static charges on the wafer heating mechanism and the wafer.

[0020] According to an embodiment of the present disclosure, the glue dispensing mechanism further includes: a mounting frame provided on the glue dispensing body; a barrel provided on the mounting frame and infused with glue; and a liquid level detecting member provided on the barrel and/or the mounting frame to determine the liquid level of the glue in the

barrel based on an optical signal or sensed signal regarding the liquid level of the glue in the barrel.

[0021] According to an embodiment of a second aspect of the present disclosure, a glue dispensing method of a multi-station glue dispenser is provided. The method includes the following steps: S1, obtaining a wafer and scanning and positioning the wafer; S2, preheating the wafer and measuring the temperature of the wafer continuously during the preheating; S3, transporting, when the wafer is preheated to a first set temperature, the wafer to a glue dispensing station to perform heating; and S4, dispensing glue onto the wafer when the wafer is heated to a second set temperature.

[0022] According to an embodiment of the present disclosure, in the step S2, the distance between the wafer and a heating source is adjusted to preheat the wafer.

[0023] According to an embodiment of the present disclosure, in the step S4, the temperature of the wafer is detected continuously, and the wafer is continuously to be heated when the temperature of the wafer is lower than the second set temperature.

[0024] Additional aspects and advantages of the present disclosure will be given at least in part in the following description, or become apparent partially from the following description, or can be learned from practicing of the present disclosure.

BRIEF DESCRIPTION OF DRAWINGS

[0025] The above and/or additional aspects and advantages of the present disclosure will become clear and easy to understand from the description of embodiments below in conjunction with the accompanying drawings, in which:

[0026] FIG. 1 is a schematic diagram illustrating an overall structure of a multi-station glue dispenser according to an embodiment of the present disclosure;

[0027] FIG. 2 is a schematic diagram illustrating a structure of a loading and unloading mechanism of a multi-station glue dispenser according to an embodiment of the present disclosure;

[0028] FIG. 3 is a schematic diagram illustrating a structure of a portion of a loading and unloading mechanism of a multi-station glue dispenser according to an embodiment of the present disclosure;

[0029] FIG. 4 is a stereogram illustrating a loading and unloading mechanism of a multi-station glue dispenser according to an embodiment of the present disclosure;

[0030] FIG. 5 is a schematic diagram illustrating a structure of a wafer preheating mechanism of a multi-station glue dispenser according to an embodiment of the present disclosure;

[0031] FIG. 6 is a front view illustrating a wafer preheating mechanism of a multi-station glue dispenser according to an embodiment of the present disclosure;

[0032] FIG. 7 is a schematic diagram illustrating a portion of a lifting assembly of a wafer heating mechanism of a multi-station glue dispenser according to an embodiment of the present disclosure;

[0033] FIG. 8 is a schematic diagram illustrating a structure of a portion of a wafer adsorption member of a multi-station glue dispenser according to an embodiment of the present disclosure;

[0034] FIG. 9 is a schematic diagram illustrating a structure of a wafer scanning and positioning mechanism of a multi-station glue dispenser according to an embodiment of the present disclosure;

[0035] FIG. 10 is a schematic diagram illustrating a structure of a heating tube of a wafer heating mechanism of a multi-station glue dispenser according to an embodiment of the present disclosure;

[0036] FIG. 11 is a schematic diagram illustrating a structure of a wafer heating mechanism in a processing station of the multi-station glue dispenser according to an embodiment of the present disclosure;

[0037] FIG. 12 is a schematic diagram illustrating a structure of a portion of an electrostatic elimination member of a multi-station glue dispenser according to an embodiment of the present disclosure;

[0038] FIG. 13 is a front view illustrating a glue dispensing mechanism of the multi-station glue dispenser according to an embodiment of the present disclosure;

[0039] FIG. 14 is a schematic diagram illustrating a structure of a glue dispensing mechanism of a multi-station glue dispenser according to an embodiment of the present disclosure;

[0040] FIG. 15 is a schematic diagram illustrating a portion of a processing station of a multi-station glue dispenser according to an embodiment of the present disclosure; and

[0041] FIG. 16 is a flowchart illustrating a glue dispensing method using a multi-station glue dispenser according to an embodiment of the present disclosure.

[0042] Reference numerals:

Multi-station glue dispenser 1000; Loading and unloading mechanism 100;

Loading and unloading body 110; Port 112; Processing station 113; Support leg 114; Side panel 115; Mounting surface 116; Transmission rail 118; Movable element 120;

Material taking machine 130; Mechanical arm 131; Tray 132; Cartridge 140;

Loading and unloading transmission mechanism 150; Wafer preheating mechanism 200;

wafer heating mechanism 210; Base 220; Base board 230; Supporting rod 240;

Heater supporting platform 250; Heating tube 252; Heating plate 257; Thermocouple 258;

Heater 260; Lifting assembly 270; ejector pin 272; ejector pin driving element 274;

vacuum absorption member 280; vacuum absorption hole 281;

Wafer scanning and positioning mechanism 300; Scanning member 310; positioning member 320; Glue dispensing mechanism 400;

barrel 600; Liquid level detecting member 610; Glue dispensing body 620; Glue dispensing head assembly 630; Static charge dissipating member 700.

DESCRIPTION OF EMBODIMENTS

[0043] The embodiments of the present disclosure will be described in detail below with reference to examples thereof as illustrated in the accompanying drawings, throughout which same or similar elements, or elements having same or similar functions are denoted by same or similar reference numerals. The embodiments described below with reference to the drawings are illustrative only, and are intended to explain, rather than limiting, the present disclosure.

[0044] In the description of the present disclosure, it shall be understood that, terms such as “center”, “longitudinal”, “crosswise”, “length”, “width”, “thickness”, “upper”, “lower”, “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 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.

[0045] In the description of the present disclosure, it shall be understood that, unless 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 particular meaning of such terms in the present disclosure may be understood in conjunction with particular conditions.

[0046] A multi-station glue dispenser 1000 according to an embodiment of the present disclosure will be described below with reference to the accompanying drawings.

[0047] As illustrated in FIG. 1 to FIG. 15, the multi-station glue dispenser 1000 according to an embodiment of the present disclosure includes a loading and unloading mechanism 100, a wafer scanning and positioning mechanism 300, a wafer preheating mechanism 200, a wafer heating mechanism 210 and a glue dispensing mechanism 400.

[0048] In particular, in the multi-station glue dispenser 1000 according to the embodiment of the present disclosure, the loading and unloading mechanism 100 defines a motion space therein, and a plurality of processing stations 113 are provided at a peripheral of the loading and unloading mechanism 100. The loading and unloading mechanism 100 is configured to move between the motion space and each of the plurality of processing stations 113 to transport a wafer. The plurality of processing stations include a positioning station, a preheating station and a plurality of glue dispensing stations. The wafer scanning and positioning mechanism 300 is located at the positioning station and is configured to scan and position the wafer transported by the loading and unloading mechanism 100. The wafer preheating mechanism 200 is located at

the preheating station and is configured to preheat the wafer transported by the loading and unloading mechanism 100. The wafer heating mechanism 210 is located at the glue dispensing station and is configured to heat the wafer in the processing station 113. The glue dispensing mechanism 400 fits with the wafer heating mechanism to dispense glue on the heated wafer.

[0049] In other words, the multi-station glue dispenser 1000 according to the embodiment of the present disclosure mainly includes a loading and unloading mechanism 100, a wafer scanning and positioning mechanism 300, a wafer preheating mechanism 200, a plurality of wafer heating mechanisms 210 and a plurality of glue dispensing mechanisms. At least two processing stations 113 are provided at each of two sides of the loading and unloading mechanism 100. The wafer scanning and positioning mechanism 300 and the wafer preheating mechanism 200 are provided respectively at the two sides of the loading and unloading mechanism 100. Further, the loading and unloading mechanism 100 may include, but is not limited to, four processing stations 113. Two processing stations 113 are provided at one side of the loading and unloading mechanism 100, and the wafer scanning and positioning mechanism 300 may be provided between the two processing stations 113. Two processing stations 113 are provided at another side of the loading and unloading mechanism 100, and the wafer preheating mechanism 200 may be provided between the two processing stations 113. Each processing station 113 corresponds to one glue dispensing mechanism 400 and one wafer heating mechanism 210, and the glue dispensing mechanism 400 and the wafer heating mechanism 210 are disposed in the processing station 113. The wafer heating mechanism 210 is configured to heat the wafer, and the glue dispensing mechanism 400 is configured to dispense glue onto the heated wafer. The loading and unloading body 110 defines therein a motion space, and at least one portion of the loading and unloading mechanism 100 is able to reciprocate among the motion space, the wafer scanning and positioning mechanism 300, the wafer preheating mechanism 200 and the processing station 113, and can transport the wafer to the wafer scanning and positioning mechanism 300, the wafer preheating mechanism 200 and the processing station 113 or to transport the processed wafer out of the multi-station glue dispenser 1000. Particularly, first, a wafer is picked up by the loading and unloading mechanism 100 and is delivered to the wafer scanning and positioning mechanism 300 to be scanned and positioned and then the wafer is taken out. Secondly, the wafer is transported by the loading and unloading mechanism 100 into

the wafer preheating mechanism 200 to be preheated and then is taken out. Thirdly, the wafer is transported by the loading and unloading mechanism 100 into the processing station 113 to be heated by the wafer heating mechanism 210. When the temperature of the wafer meets a certain requirement, the glue dispensing mechanism 400 dispenses glue onto the wafer.

[0050] Therefore, with the multi-station glue dispenser 1000 according to the embodiment of the present disclosure, in which the loading and unloading mechanism 100, the wafer scanning and positioning mechanism 300, the wafer preheating mechanism 200, the plurality of wafer heating mechanisms 210 and the plurality of glue dispensing mechanisms are adopted, it can achieve scanning, positioning, preheating, and heating the wafer and dispensing glue onto the wafer. In addition, with the plurality of processing stations 113 in the multi-station glue dispenser 1000, the glue dispensing quality can be improved, the utilization rate of the loading and unloading mechanism 100 can be improved and the waiting time can be reduced. The multi-station glue dispenser 1000 has advantages including a compact structure, high operating efficiency and high product quality.

[0051] As illustrated in FIG. 2 to FIG. 4, according to an embodiment of the present disclosure, the loading and unloading mechanism 100 includes a loading and unloading body 110, a movable element 120 and a material taking machine 130. The loading and unloading body 110 defines the motion space therein, and the loading and unloading body 110 is provided with two ports 112 that are respectively located at both ends of the loading and unloading body 110 and are in communication with the motion space. At least two processing stations 113 are provided at each of two sides of the loading and unloading body 110. The movable element 120 is provided in the motion space and is movable between the two ports 112. The material taking machine 130 is provided on the movable element 120 to pick up a wafer from the port 112 or the processing station 113 or place a wafer onto the port 112 or the processing station 113. In other words, a port 112 may be provided at each of the left and right sides of the loading and unloading body 110. In the operation, a wafer to be processed may be conveyed to a position near the port 112 manually or automatically by a mechanical part. The loading and unloading body 110 defines a motion space therein, and the movable element 120 is disposed in the motion space. The movable element 120 is configured to reciprocate between the ports 112 at the two sides, and thus the position of the movable element 120 in the motion space can be adjusted. A material taking

machine 130 may be provided on the movable element 120. The material taking machine 130 is configured to cooperate with the movable element 120 to transport the wafer from the port 112 to the processing station 113 or from the processing station 113 to the port 112. It needs to be illustrated that, at least two processing stations 113 may be provided at each of two sides of the loading and unloading body 110, and when the movable element 120 moves to a designated station, the material taking machine 130 may place a wafer onto the designated station or pick up a wafer from the designated station.

[0052] Thus, the movable element 120 and the material taking machine 130 are provided in the loading and unloading body 110 of the loading and unloading mechanism 100, the movable element 120 can reciprocate in the loading and unloading body 110 to drive the material taking machine 130 to move in the loading and unloading body 110. Therefore, a wafer to be processed can be delivered to a designated station, and can be taken out from the designated station after being processed, so as to wait for a next processing.

[0053] Further, the loading and unloading body 110 is in a shape of "⊏" with an opening facing upward~~down~~. Each of a plurality of support legs 114 of the loading and unloading body 110 is provided with the port 112. The loading and unloading mechanism 100 further includes two cartridges 140 which are respectively provided on the positions corresponding to the ports 112 on two support legs 114. At least a portion of the material taking machine 130 is configured to extend out of the port 112 and into the cartridge 140 to load and unload a wafer. That is, The loading and unloading body 110 is configured in a shape of "⊏" with an opening facing upward~~down~~, therefore the multi-station glue dispenser has a more compact overall structure and a better space utilization. Each of the support legs 114 of the loading and unloading body 110 is provided with the port 112, facilitating loading and unloading operation of the loading and unloading mechanism, saving overall space occupation and wafer conveying time, and improving the overall processing efficiency. Further, two cartridges 140 are respectively provided on the two support legs 114 of the loading and unloading body 110, facilitating placement of the wafer to be processed and the processed wafer and saving large amount of manual cost and material cost. The cartridge 140 is provided on a position corresponding to the port 112, facilitating loading and unloading operation of the material taking machine 130 and avoiding unnecessary movement.

[0054] Optionally, the material taking machine 130 includes a mechanical arm 131 and a tray 132. The mechanical arm 131 has one end connected with the movable element 120 and another end that is movable. The tray 132 is provided on the other end of the mechanical arm 131 and is configured to hold the wafer. It needs to be illustrated that, by providing the mechanical arm 131, the material taking machine 130 can reach a specific target position easily, improving accuracy and preciseness of the loading and unloading operation. Besides, the tray 132 is provided on the other end of the mechanical arm 131, facilitating placement of the wafer onto the tray 132 and guaranteeing that the material taking machine 130 can drive the wafer to reach the target position smoothly during the operating process.

[0055] In some embodiments of the present disclosure, the loading and unloading mechanism 100 further includes a loading and unloading transmission mechanism 150. The loading and unloading transmission mechanism 150 is provided between the two ports 112 and is movable between the two ports 112 to drive the movable element 120 to move. The loading and unloading transmission mechanism 150 includes a side panel 115, a transmission rail 118 and a loading and unloading driving element. The side panel 115 extends within the loading and unloading body 110 along a lengthwise direction of the loading and unloading body 110. The side panel 115 has a mounting surface 116 at a lateral side thereof, the transmission rail 118 is disposed on the mounting surface 116 and extends along the lengthwise direction of the loading and unloading body 110. The movable element 120 is provided movably on the transmission rail 118. The loading and unloading driving element is provided on the mounting surface 116, and is connected with the movable element 120 to drive the movable element 120 to move. In other words, the loading and unloading transmission mechanism 150 is provided between the two ports 112, the movable element 120 can perform the reciprocal movement in the loading and unloading body 110 with the aid of the loading and unloading transmission mechanism 150. The loading and unloading transmission mechanism 150 of the multi-station glue dispenser 1000 is provided within the loading and unloading body of the multi-station glue dispenser 1000, and mainly includes the side panel 115, the transmission rail 118 and the loading and unloading driving element. The side panel 115 is located within the loading and unloading body and extends along the lengthwise direction of the loading and unloading body. The side panel 115 has the mounting surface 116 at one side of thereof, and the transmission rail 118 extends on the

mounting surface 116 along the lengthwise direction of the loading and unloading body. The movable element 120 is provided on the transmission rail 118, and is configured to reciprocate on the transmission rail 118 under drive of the loading and unloading driving element, and the loading and unloading driving element may be provided on the mounting surface 116.

[0056] Thus, by providing the loading and unloading transmission mechanism 150 in the loading and unloading body of the multi-station glue dispenser 1000 to drive the movable element 120 to move, and by cooperation of the side panel 115, the transmission rail 118 and the loading and unloading driving element, it is guaranteed that the movable element 120 can reciprocate on the transmission rail 118 to convey a material to a designated station.

[0057] Further, the wafer scanning and positioning mechanism 300 is provided between two adjacent glue dispensing stations. The wafer scanning and positioning mechanism 300 includes a scanning member and an positioning member. The scanning member is configured to scan and identify a wafer. The positioning member is configured to position the wafer transported by the loading and unloading mechanism 100 to adjust the position of the wafer. In other words, the wafer scanning and positioning mechanism 300 is provided between two glue dispensing mechanisms 400, so as to facilitate the transport of the wafer to either of the two glue dispensing mechanisms 400 after scanning and/or positioning the wafer. In this way, the transport distance can be reduced effectively, transport of the wafer by the loading and unloading mechanism 100 is convenient, and the multi-station glue dispenser 1000 having the wafer scanning and positioning mechanism 300 has a compact overall structure and a tidy appearance. Further, The scanning member 310 can scan the wafer, and can determine whether the wafer has been subject to the glue dispensing operation, so as to reduce the error rate, to prevent a processed wafer from being subject to a repeated processing operation or a wafer to be processed from missing a processing operation. In this way, it can effectively guarantee the accuracy and efficiency of the processing. By positioning the wafer, the wafer can be precisely positioned according to positions on the wafer that need a glue dispensing, thereby the position of the wafer can be adjusted, reducing the workload for the subsequent processes and improving the processing efficiency.

[0058] As illustrated in FIG. 5 to FIG. 7, according to an embodiment of the present disclosure, the wafer preheating mechanism 200 ~~and the wafer heating mechanism 210~~ includes a base 220, a heater 260 and a lifting assembly 270. The heater 260 is provided on the base 220

and an upper surface of the heater 260 is configured as a heating surface. The lifting assembly 270 is provided on the base 220, and the lifting assembly 270 is movable between an ascending state and a non-ascending state. The lifting assembly 270 is configured to support a wafer to allow the wafer to be spaced apart from the heating surface when the lifting assembly 270 is in the ascending state. In addition, the lifting assembly 270 is configured to allow the wafer to be in contact with the heating surface when the lifting assembly 270 is in a non-ascending state. The heater 260 is configured to heat the wafer in a non-contact way to allow the temperature of the wafer to raise gradually during the lifting assembly 270 transits gradually from the ascending state to the non-ascending state. In other words, the wafer preheating mechanism 200 according to the embodiment of the present disclosure mainly includes the base 220, the heater 260 and the lifting assembly 270, and the base 220 may be located below the heater 260 and the lifting assembly 270 to support the lifting assembly 270 and the heater 260. The upper surface of the heater 260 may be configured as the heating surface. The lifting assembly 270 is configured to support a wafer and the lifting assembly 270 is configured to move between the ascending state and the non-ascending state. Particularly, when the lifting assembly 270 is in the ascending state, the wafer is spaced apart from the heating surface, and when the lifting assembly 270 is in the non-ascending state, the wafer is in contact with the heating surface. That is, the temperature of the wafer may change with the change in the distance between the wafer and the heating surface. Optionally, the lifting assembly 270 may transit from the non-ascending state to the ascending state by projecting from the heating surface, and transit from the ascending state to the non-ascending state by retracting from the heating surface. Particularly, when the lifting assembly 270 is below the heating surface, the lifting assembly 270 is in the non-ascending state. It needs to be noted that, the wafer preheating mechanism 200 according to the embodiment of the present disclosure may adopt the lifting assembly 270 and the heater 260 of other structures as long as they can satisfy the requirement of allowing the lifting assembly 270 to move between the ascending state and the non-ascending state.

[0059] It needs to be noted that, the heater 260 includes two parts. Specifically, one of the two parts is a heating module located in a slot of a heater supporting platform, and the other of the two parts is a heat-conducting plate attached to an upper surface of the heating module. The upper surface of the heat-conducting plate is the heating surface. When the lifting assembly 270

moves from the ascending state to the non-ascending state, the wafer may be held at any position between the ascending state and the non-ascending state so as to be heated. In other words, the heating position of the wafer may be selected according to a temperature requirement. When the wafer approaches the heating surface gradually, the temperature of the wafer rises gradually to enable a uniform and stable heating.

[0060] Therefore, through cooperation of the base 220, the heater 260 and the lifting assembly 270, the wafer preheating mechanism 200 drives the lifting assembly 270 to move between the ascending state and the non-ascending state to adjust the distance between the wafer and the heating surface so as to achieve a non-contact heating of the wafer. The wafer may even move onto the heating surface gradually from a position at a maximum height to which the lifting assembly 270 can rise, so as to achieve a gradual increase in the temperature of the wafer, thereby eliminating the risk of breakage of the wafer due to a sharp rise in its temperature in a current contact-type preheating process, and achieving an adjustable height of the wafer from the heating surface. The wafer can be heated at different positions based on different requirements, which has advantages including gradual temperature rise, high selectivity and strong operability.

[0061] Further, the base 220 includes a base board 230, a plurality of supporting rods 240 and a heater supporting platform 250. The plurality of supporting rods 240 are provided on the base board 230. The heater supporting platform 250 is provided on the plurality of supporting rods 240 and is spaced apart from the base board 230. The heater 260 and the lifting assembly 270 are provided on the heater supporting platform 250. The supporting rods 240 can support the heater supporting platform 250, and the heater supporting platform 250 is spaced apart from the base board 230, facilitating installation of driving elements of the lifting assembly 270 and electrical control elements of the heater 260.

[0062] Optionally, the heater 260 has a plurality of through holes that are correspondingly in inter-connection with a plurality of through holes of the heater supporting platform 250. The lifting assembly 270 includes a plurality of ejector pins 272 and an ejector pin driving element 274. The plurality of ejector pins 272 extend through the through holes of the heater 260 and the the through holes of the heater supporting platform 250 and are movable along an axial direction of the through holes. When the lifting assembly 270 is in a first position, the upper ends of the plurality of ejector pins 272 protrude from the through holes to support a wafer. When the lifting

assembly 270 is in a second position, the upper ends of the plurality of ejector pins 272 are not higher than the heating surface. The ejector pin driving element 274 is provided between the heater supporting platform 250 and the base board 230 and is connected with the plurality of ejector pins 272. The ejector pin driving element 274 is configured to drive the plurality of ejector pins 272 to move. By allowing the ejector pin driving element 272 to drive the plurality of ejector pins 272 to protrude from the heating surface, the wafer can be supported by the plurality of ejector pins 272 and the distance over which the plurality of ejector pins 272 protrude from the heating surface can also be adjusted, to realize a non-contact-type heating of the wafer. It needs to be noted that, when the ejector pins 272 move to a position below the heating surface, the wafer may fall onto the heating surface and be in contact with the heating surface.

[0063] Preferably, the heating surface has at least two heating regions for heating wafers of different sizes. Each of the at least two heating regions has at least one vacuum absorption hole 281. The wafer preheating mechanism 200 further includes a vacuum absorption member 280 The vacuum absorption member 280 is in communication with the vacuum absorption hole 281 to fix a wafer when the wafer is on the heater 260. Particularly, when the lifting assembly is below the heating surface, the lifting assembly does not have the function of supporting the wafer and the wafer is in direct contact with the heating surface At this time, the wafer is fixed on the heating surface through vacuum absorption to prevent the wafer from moving, thereby facilitating a subsequent process and achieving advantages such as a simple structure, high easiness to operate and prevention of damages to the wafer.

[0064] Further, the heater supporting platform 250 defines a heating chamber. The heater 260 includes a heating tube 252, a heating plate 257, at least two thermocouples 258 and a temperature controller. The heating tube 252 extends into the heating chamber to perform heating. The heating plate 257 is attached on the heater supporting platform and is located above the heater supporting platform. The upper surface of the heating plate 257 is a heating surface. The heating plate 257 is configured to receive heat from the heating tube 252 and transfer the heat to the wafer via the heating surface. The heating plate 257 has at least two heating regions. The at least two thermocouples 258 are provided in the at least two heating regions respectively to detect the temperature of each heating region. The temperature controller is connected with the

heating tube 252 and the thermocouples 258. The temperature controller may control the heating of the heating tube 252 based on the temperature detected by the thermocouples 258.

[0065] That is, the heater supporting platform 250 defines a heating chamber therein. A heating tube 252 is disposed in the heating chamber to provide heat for the wafer, and the heating tube 252 can be formed by brake forming. A heating plate 257 is disposed above the heating chamber. An upper surface of the heating plate 257 is a heating surface, and the heat provided by the heating tube 252 can be provided to the wafer via the heating surface so as to improve the temperature of the wafer. The heating plate 257 can be divided into at least two heating regions, and at least two thermocouples 258 are provided in the at least two heating regions respectively to detect the temperature of each heating region. The wafer heating mechanism 210 which performs heating in different regions further includes a temperature controller. The temperature controller is mounted on a rack and can be connected connected with the heating tube 252 and the at least two thermocouples 258. Temperature information detected by the at least two thermocouples 258 can be feedback to the temperature controller, so that the temperature controller can control the heating state of the heating tube 252 based on the feedback information.

[0066] Through combination of the heater supporting platform 250, the heating tube 252, the heating plate 257, the at least two thermocouples 258 and the temperature controller, the wafer heating mechanism 210 can be controlled in different regions, enabling regional control on the temperature of the wafer. In this way, a uniform heating of the wafer can be achieved, and a high glue dispensing efficiency and a high product quality can be achieved.

[0067] As illustrated in FIG. 13 to FIG. 15, in some embodiments of the present disclosure, the glue dispensing mechanism includes a glue dispensing body 620, a glue dispensing head assembly 630 and a static charge dissipating member 700. The glue dispensing body 620 is provided thereon with a processing station, the glue dispensing head assembly 630 is movably provided on the glue dispensing body 620 and is located above the wafer heating mechanism to dispense glue onto a wafer placed on the wafer heating mechanism. The static charge dissipating member 700 is movably provided on the glue dispensing body 620 and is located above the wafer heating mechanism to dissipate static charges on the wafer heating mechanism and the wafer. In other words, the glue dispenser 1000 provided with the static charge dissipating

member according to embodiments of the present disclosure includes the glue dispensing body 620, the glue dispensing head assembly 630 and the static charge dissipating member 700. The glue dispensing body 620 is provided therein with a processing station for placing a wafer. The glue dispensing head assembly 630 is provided above the processing station to dispense glue onto the wafer, and during the dispensing, the glue dispensing head assembly 630 can move to a position above a specific position of the wafer that needs a glue dispensing. The glue dispensing body 620 is further provided with the static charge dissipating member 700, during the process of dispensing glue onto a wafer by the glue dispensing head assembly 630, the static charge dissipating member 700 may operate according to practical need to remove static charges in the processing station and processing environments surrounding the processing station.

[0068] Thus, in the glue dispenser 1000 provided with the static charge dissipating member according to embodiments of the present disclosure, through combination of the glue dispensing body 620, the glue dispensing head assembly 630 and the static charge dissipating member 700, the static charge dissipating member 700 ionizes the air to generate large quantities of positive and negative charges and blows these positive and negative charges out to generate an air flow with positive and negative charges to neutralize the charges on a surface of an object. When the object has negative charges on its surface, the object absorbs positive charges in the air flow, or when the object has positive charges on its surface, the object absorbs negative charges in the air flow. In this way, the static charges on the surface of the object can be neutralized, and thus the static charges can be dissipated.

[0069] Further, the glue dispensing mechanism 400 further includes a mounting frame, a barrel 600 and a liquid level detecting member 610. The mounting frame is provided on the glue dispensing body 620. The barrel 600 is provided on the mounting frame and is infused with glue. The liquid level detecting member 610 is provided on the barrel 600 and/or the mounting frame to determine the liquid level of the glue in the barrel 600 based on an optical signal or sensed signal regarding the liquid level of the glue in the barrel 600. In other words, the glue dispensing mechanism 400 mainly includes the mounting frame, the barrel 600 and the liquid level detecting member 610. The mounting frame is configured to fix the barrel 600. The barrel 600 is configured to contain the glue needed for glue dispensing. The liquid level detecting member 610 is disposed on the barrel 600 or the mounting frame, and is configured to determine the

liquid level of the glue in the barrel based on the optical signal or sensed signal regarding the liquid level of the glue in the barrel 600. Thus, through cooperation of the mounting frame, the barrel 600 and the liquid level detecting member 610, the liquid level of the glue in the barrel 600 can be determined based on the optical signal or sensed signal regarding the liquid level of the glue in the barrel 600. By providing the liquid level detecting member 610 on the glue dispensing mechanism 400, the operator can detect the remaining amount of the glue in the barrel 600 in real-time, to remind the operator to add glue or replace a used barrel 600 with a new one infused with glue in time when the remaining amount of the glue is significantly low, preventing interruption of processing due to lack of glue and thereby preventing lowering the processing efficiency.

[0070] As illustrated in FIG. 16, a glue dispensing method using the multi-station glue dispenser according to an embodiment of the present disclosure includes the following steps of: S1, obtaining a wafer and scanning and positioning the wafer; S2, preheating the wafer and measuring the temperature of the wafer continuously during the preheating; S3, transporting, when the wafer is preheated to a first set temperature, the wafer to a glue dispensing station to perform heating; and S4, dispensing glue onto the wafer when the wafer is heated to a second set temperature.

[0071] In an embodiment of the present disclosure, in the step S2, the wafer is preheated by adjusting the distance between the wafer and a heating source.

[0072] In some embodiments of the present disclosure, in the step S4, the temperature of the wafer is detected continuously, and the wafer is continuously to be heated when the temperature of the wafer is lower than the second set temperature.

[0073] Based on the above, the multi-station glue dispenser 1000 according to embodiments of the present disclosure has advantages such as a compact overall structure, good glue dispensing effect, accurate temperature control, good production efficiency and high product quality.

[0074] In the multi-station glue dispenser according to embodiments of the present disclosure, other structures and operations are easy to understand and implement for those skilled in the art, and will not be discussed in detail.

[0075] 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 of 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.

[0076] 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 variations 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

What is claimed is:

1. A multi-station glue dispenser, comprising:

a loading and unloading mechanism defining a motion space therein, a plurality of processing stations being provided at a peripheral of the loading and unloading mechanism, the loading and unloading mechanism being configured to move between the motion space and each of the plurality of processing stations to transport a wafer, and the plurality of processing stations comprising a positioning station, a preheating station and a plurality of glue dispensing stations;

a wafer scanning and positioning mechanism located at the positioning station and configured to scan and position the wafer transported by the loading and unloading mechanism;

a wafer preheating mechanism located at the preheating station and configured to preheat the wafer transported by the loading and unloading mechanism;

a wafer heating mechanism located at the glue dispensing station and configured to heat the wafer in the processing station; and

a glue dispensing mechanism fitting with the wafer heating mechanism to dispense glue on the heated wafer.

2. The multi-station glue dispenser of claim 1, wherein the loading and unloading mechanism comprises:

a loading and unloading body defining the motion space therein, the loading and unloading body being provided with two ports that are respectively located at both ends of the loading and unloading body, the two ports being in communication with the motion space, and at least two processing stations being provided at each of both sides of the loading and unloading body;

a movable element provided in the motion space and movable between the two ports; and

a material taking machine provided on the movable element to pick up a wafer from the

port or the processing station, or to place a wafer onto the port or the processing station.

3. The multi-station glue dispenser of claim 2, wherein the loading and unloading body is in a shape of "⊏" with an opening facing upward~~down~~, each of a plurality of supporting legs of the loading and unloading body is provided with the port, and the loading and unloading mechanism further comprises:

two cartridges which are respectively provided on the positions corresponding to the ports on two support legs, and at least a portion of the material taking machine being configured to extend out of the port and into the cartridge to load and unload a wafer.

4. The multi-station glue dispenser of claim 2 or 3, wherein the loading and unloading mechanism further comprises a loading and unloading transmission mechanism, the loading and unloading transmission mechanism being provided between the two ports and being movable between the two ports to drive the movable element to move, and the loading and unloading transmission mechanism comprises:

a side panel extending within the loading and unloading body along a lengthwise direction of the loading and unloading body, the side panel having a mounting surface at a lateral side thereof;

a transmission rail disposed on the mounting surface and extending along the lengthwise direction of the loading and unloading body, the movable element being movably provided on the transmission rail; and

a loading and unloading driving element provided on the mounting surface and connected with the movable element to drive the movable element to move.

5. The multi-station glue dispenser of any of claims 1 to 4, wherein the wafer scanning and positioning mechanism is provided between two adjacent glue dispensing stations, and the wafer scanning and positioning mechanism comprises:

a scanning member configured to scan and identify the wafer; and

an positioning member configured to position the wafer transported by the loading and unloading mechanism to adjust the position of the wafer.

6. The multi-station glue dispenser of any of claims 1 to 5, wherein the wafer preheating mechanism and the wafer heating mechanism comprise:

a base;

a heater provided on the base, an upper surface of the heater being configured as a heating surface; and

a lifting assembly provided on the base and movable between an ascending state and a non-ascending state, the lifting assembly being configured to support a wafer to allow the wafer to be spaced apart from the heating surface when the lifting assembly is in the ascending state and being configured to allow the wafer to be in contact with the heating surface when the lifting assembly is in the non-ascending state;

wherein the heater is configured to heat the wafer in a non-contact way to allow the temperature of the wafer to raise gradually during the lifting assembly transits gradually from the ascending state to the non- ascending state.

7. The multi-station glue dispenser of claim 6, wherein, the base comprises:

a base board;

a plurality of supporting rods provided on the base board; and

a heater supporting platform provided on the plurality of supporting rods and spaced apart from the base board, and both the heater and the lifting assembly being provided on the heater supporting platform.

8. The multi-station glue dispenser of claim 7, wherein the heating surface has at least two heating regions for heating wafers of different sizes, each of the at least two heating regions has at least one vacuum absorption hole, and the wafer preheating mechanism further comprises:

a vacuum absorption member in communication with the vacuum absorption hole to fix the wafer when the wafer is one the heater.

9. The multi-station glue dispenser of any of claims 1 to 8, wherein the glue dispensing mechanism comprises:

a glue dispensing body;

a glue dispensing head assembly movably provided on the glue dispensing head assembly and located above the wafer heating mechanism to dispense glue onto the wafer placed on the wafer heating mechanism; and

a static charge dissipating member movably provided on the glue dispensing body and located above the wafer heating mechanism to dissipate static charges on the wafer heating

mechanism and the wafer.

10. The multi-station glue dispenser of claim 9, wherein the glue dispensing mechanism further comprises:.

a mounting frame provided on the glue dispensing body;

a barrel provided on the mounting frame and infused with glue; and

a liquid level detecting member provided on the barrel and/or the mounting frame to determine the liquid level of the glue in the barrel based on an optical signal or sensed signal regarding the liquid level of the glue in the barrel.

11. A glue dispensing method of a multi-station glue dispenser, comprising the following steps:

S1, obtaining a wafer and scanning and positioning the wafer;

S2, preheating the wafer and measuring the temperature of the wafer continuously during the preheating;

S3, transporting, when the wafer is preheated to a first set temperature, the wafer to a glue dispensing station to perform heating; and

S4, dispensing glue onto the wafer when the wafer is heated to a second set temperature.

12. The method of claim 11, wherein in the step S4, the temperature of the wafer is detected continuously, and the wafer is continuously to be heated when the temperature of the wafer is lower than the second set temperature.