Description

TRAY TRANSFERRING DEVICE

Technical Field

[1] The present invention relates to a tray transferring device, and more particularly, to a tray transferring device installed at a tester or a sorter for transferring a tray loaded with a plurality of semiconductor devices thereon.

Background Art

[2] In a process for fabricating a semiconductor, a semiconductor device having undergone packaging process has to undergo various tests such as an electric characteristic test, for example DC characteristic and a burn-in test for testing reliability against external heat. According to the test results, the semiconductor devices are sorted to be good or bad.

[3] A semiconductor device is tested and sorted by a semiconductor device tester and/or a semiconductor device sorter.

[4] The semiconductor device tester or the semiconductor device sorter performs its function by loading a plurality of semiconductor devices into the respective trays and sequentially transferring the respective trays. Here, the trays are sequentially transferred by a tray transferring device.

[5] Performance of the semiconductor device tester or the semiconductor device sorter is determined according to an UPH (Units Per Hour), the number of sorted semiconductor devices per hour. The UPH is determined according to each component of the semiconductor device tester or the semiconductor device sorter.

[6] When a tray transferring device of the semiconductor device tester or the semiconductor device sorter is mal-operated, operating speed for testing or sorting process may be lessened.

Disclosure of Invention

Technical Problem

[7] Therefore, it is an object of the present invention to provide a tray transferring device capable of transferring a tray by stably holding the tray.

[8] It is another object of the present invention to provide a tray transferring device capable of stably supporting the side of a tray when the tray is transferred by being vertically moved.

Technical Solution

[9] To achieve these objects, there is provided a tray transferring device comprising: a tray holding unit including: a body unit for mounting a tray, the tray being loaded with a plurality of semiconductor devices thereon; a lifting unit installed at one end of the

body unitso as to be vertically moved in a direction perpendicular to the body unit, for supporting one end of the tray when vertically lifted; a rotation unit installed at the other end of the body unit, for pushing the other end of the tray to the lifting unit by being rotated when one end of the tray is supported by the lifting unit, thereby holding the tray; and a driving unit for driving the lifting unit to be up-down moved and the rotation unit to be rotated and a transfer unit for transferring a tray mounted at the tray holding unit by transferring the body unit.

[10] The lifting unit may comprise a lifting member having a gear portion and a supporting surface for supporting one end of a tray; a first bracket installed at one end of the body unit, the first bracket having a guide groove for guiding a vertical motion of the lifting member; and a rotation gear coupled to the gear portion, rotatably installed at the first bracket, and coupled to a first rotation shaft rotated by the driving unit..

[11] The rotation unit may comprise a second bracket installed at the other end of the body unit a second rotation shaft installed at the second bracket and rotated by the driving unit; and a rotation member coupled to the second rotation shaft, for pushing the other end of the tray as the second rotation shaft rotates.

[12] The tray holding unit may comprise one pair of guide rails for supporting both ends of the tray and guiding a motion of the tray at the side thereof.

[13] The tray transferring device according to the present invention may comprise a tray holding unit for holding a tray loaded with a plurality of semiconductor devices thereon and transferring the tray along a guide rail; a tray lifting unit installed at one or both ends of the guide rail, for up-down moving the tray; and a hooking unit including a hooking member for supporting the side of the tray or releasing the supported state of the tray by being linearly moved when the tray is vertically moved, and a linear driving unit coupled to the hooking member for linearly driving the hooking member.

[14] The linear driving unit may be operated by hydraulic or pneumatic pressure, and may include a housing having a cylinder space therein and covering a part of the hooking member so that the hooking member can be protruded and a piston member inserted into the cylinder space inside the housing, coupled to thehooking member, and moved by hydraulicor pneumatic pressure.

[15] The housing may be further installed with an elastic member for pressurizing a coupled portion of the hooking unit to the hooking member so that the hooking member can be protruded under no hydraulic or pneumatic pressure, and the elastic member may be installed to be linear with the cylinder space where the piston member is installed.

Advantageous Effects

[16] The tray transferring device according to the present invention has an advantage in that since the tray holding unit is configured to support one end of the tray as one end thereof is up-down moved, even if the tray is unstably mounted at the tray holding unit, the tray holding unit can stably hold the tray without a mal-operation.

[17] Also the tray transferring device according to the present invention has an advantage in that since the hooking member of the hooking unit of the tray lifting unit for up-down moving the tray is configured to be linearly moved, thereby supporting the tray more stably than the conventional rotation member.

Brief Description of the Drawings

[18] FIG. 1 is a planar view showing one example of equipment where a tray transferring device according to the present invention is installed;

[19] FIG. 2 is a planar view of the tray transferring device according to the present invention;

[20] FIG. 3 is a perspective view of a tray holding unit of the tray transferring device of FIG. 2;

[21] FIG. 4 is a partial perspective view of a lifting unit of the tray holding unit of FIG. 3; and FIG. 5 is a partial perspective view of a rotation unit of the tray holding unit of FIG. 3;

[22] FIGS. 6 and 7 are partially cut-out perspective views showing another example of the lifting unit of the tray holding unit of FIG. 3;

[23] FIGS. 8 and 9 are operational views of the tray holding unit;

[24] FIG.10 is a perspective view of a tray transferring device according to the present invention;

[25] FIGS. 11 and 12 are sectional views showing a hooking unit of a tray lifting unit of FIG. 10; and

[26] FIGS. 13 to 16 are operational views of the tray lifting unit of FIG. 10.

Mode for the Invention

[27] Hereinafter, a tray transferring device according to the present invention will be explained in more detail with reference to the attached drawings.

[28] The tray transferring device according to the present invention serves to transfer a tray 101 loaded witha plurality of semiconductor devices thereon, and is applied to a semiconductor device tester or a semiconductor device sorter having a construction for transferring the tray 101.

[29] As shown in FIG. 1, an equipment having the tray transferring device according to the present invention includes: a loading unit 10 installed at a body 1 for loading a semiconductor device to be tested; an inspecting unit 20 for inspecting the semiconductor devices by transferring the semiconductor devices loaded on the tray 101

loaded by the loading unit 10 by a transferring tool (not shown) and a sorting unit 30 for sorting the semiconductor devices into good or bad according to test result by the inspecting unit 20.

[30] The loading unit 10, the sorting unit 30, etc. may be provided with a tray transferring device for transferring the tray 101.

[31] As shown in FIGS. 2 and 7, the tray transferring device according to the present invention comprises a tray holding unit 200 installed at the body 1 and holding a tray 101 mounted therein; and a transfer unit for transferring the tray holding unit 200.

[32] The tray holding unit 200 includes a body unit 210, a lifting unit 220 installed at one end of the body unit 210, a rotation unit 230 installed at the other end of the body unit 210, and a driving unit 240 for driving the lifting unit 220 and the rotation unit 230.

[33] The tray holding unit 200 may comprise one pair of guide rails 110 for supporting both ends of the tray 101 and guiding a motion of the tray 101 at the side thereof.

[34] The body unit 210 is movably installed on the body 1 forming the equipment, and the tray 101 loaded with semiconductor devices thereon is mounted above the body unit 210. Preferably, the body unit 210 is installed so as to be linearly moved by a linear driving unit (not shown) serving as a transferring unit.

[35] The linear driving unit for transferring the tray holding unit 200 in order to transfer the tray 101 mounted at the tray holding unit 200 by moving the body unit 210 may have various configurations such as a combination of a belt and a pulley, a rack and a pinion. Detailed explanations will be omitted for convenience.

[36] As shown in FIGS. 3 and 4A, the lifting unit 220 is installed at one end of the body unit 210 so as to be vertically moved in a direction perpendicular to the body unit, for supporting one end of the tray 101 when vertically lifted.

[37] The lifting unit 220 is installed so that a lifting member 221 can be vertically moved at an upper side of the body unit 210. Accordingly, any configuration to vertically move the lifting member 221 can be implemented.

[38] As shown in FIG. 4A, the lifting unit 220 may comprise a lifting member 221 having a gear portion 221a and a supporting surface 221b for supporting one end of the tray 101; a first bracket 222 installed at one end of the body unit 210, the first bracket 222 having a guide groove 222a for guiding a vertical motion of the lifting member 221; and a rotation gear 223 coupled to the gear portion 221a, rotatably installed at the first bracket 222, and coupled to a first rotation shaft 224 rotated by the driving unit 240. The first rotation shaft 224 is connected to a first rotation arm 225, and is rotated as the first rotation arm 225 rotates.

[39] A roller 226 inserted into a guide groove 241a formed in a driving rail 241 is coupled to the end of the first rotation arm 225.

[40] The first bracket 222 may be integrally formed with the body unit 210, or may be separately formed from the body unit 210.

[41] The rotation unit 230 is installed at the other end of the body unit 210, thereby pushing the other end of the tray 101 towards the lifting unit 220 and holding the tray 101 by being rotated when the lifting unit 220 supports one end of the tray 101. The rotation unit 230 may have any configuration as long as it can push the other end of the tray 101 by being rotated. As shown in FIGS. 3 and 5, the rotation unit may comprise a second bracket 232 installed at the other end of the body unit 210; a second rotation shaft 234 installed at the second bracket 232 and rotated by the driving unit 240 and a rotation member 231 coupled to the second rotation shaft 234, for pushing the other end of the tray 101 as the second rotation shaft 234 rotates.

[42] The second rotation shaft 234 is connected to a second rotation arm 235, and is rotated as the second rotation arm 235 rotates. A roller 236 inserted into the guide groove 241a formed in the driving rail 241 is coupled to the end of the second rotation arm 235.

[43] The first bracket 222 may be integrally formed with the body unit 210, or may be separately formed from the body unit 210.

[44] The driving unit 240 is configured to vertically move the lifting unit 220 and to rotate the rotation unit 230, and may have various configurations. As shown in FIG. 3, the driving unit 240 includes a driving rail 241 connected to the body 1 by one or more hinge members 242, the driving rail 241 having a guide groove 241a for inserting the roller 226 of the lifting unit 210 and the roller 236 of the rotation unit 230; and a linear driving unit 243 for pulling and pushing the driving rail 241 so that the driving rail 241 can be restricted to a hinge member 242 thus to be rotated.

[45] The driving unit 240 is installed along the guide rail 110, and may be configured in one or plurality in number. The driving unit 240 may be individually coupled to the lifting unit 220 and the rotation unit 230.

[46] As the linear driving unit 243, pneumatic or hydraulic cylinder, linear motor, etc. may be used.

[47] The lifting unit 210 may have any configuration to vertically move the lifting member 221 for supporting one end of the mounted tray 101. The lifting unit 210 may have various configurations including a rack and pinion shown in FIG. 4.

[48] FIGS. 6 and 7 are partially cut-out perspective views showing another example of the lifting unit of FIG. 4. Hereinafter, the differences of the lifting unit from FIG.4 will be explained with reference to FIGS. 6 and 7.

[49] The lifting unit 210 has a configuration to vertically move the lifting member 221. As shown in FIGS. 6 and 7, the lifting unit 210 may comprise a lifting member 221 having a supporting surface 221b for supporting one end of the tray 101, and a guide

pin 221c; a first bracket 222 installed at one end of the body unit 210, the first bracket 222 having a guide groove 222a-1 for guiding a vertical motion of the lifting member 221; and a driving arm 223-1 rotatably installed at the first bracket 222, coupled to a first rotation shaft 224 rotated by the driving unit 240, the driving arm 223-1 having an up-down motion supporting unit 223a-1 for up-down moving the lifting member 221 by supporting the guide pin 221c of the lifting member 221 at the other end thereof. Components of the lifting unit 220 having the same structures as those in FIG. 4 will be given the same reference numerals, and its explanation will be omitted.

[50] The up-down motion supporting unit 223a-1 for supporting the guide pin 221c of the lifting member 221 may be configured to support the guide pin 221c only upwardly, may be configured as a slot formed at the driving arm 223-1, or may be configured as a slot partially cut-out as shown in FIG. 7. Here, the guide pin 221c may also have various configurations to be supported by the up-down motion supporting unit 223a-1 of the driving arm 223-1.

[51] Once the first rotation shaft 224 is rotated as the first rotation arm 225 of the driving unit 240 rotates, the driving arm 223-1 coupled to the first rotation shaft 224 is rotated. And, the guide pin 221c of the lifting member 221 supported by the driving arm 223-1 is upwardly moved or downwardly moved, thereby vertically moving the lifting member 221.

[52] Hereinafter, the operation of the tray holding unit will be explained in more detail with reference to the attached drawings.

[53] FIGS. 8 and 9 are operational views of the tray holding unit.

[54] As shown in FIG. 8, once the tray 101 is mounted at the body unit 210, a controller (not shown) operates the driving unit 240.

[55] More concretely, as the linear driving unit 243 of the driving unit 240 pushes the driving rail 241, the driving rail 241 restricted to the hinge shaft 242 is upwardly moved in an orbit motion.

[56] Here, as the driving rail 241 is upwardly moved, the rollers 226 and 236 inserted into the guide groove 241a of the driving rail 241 are upwardly moved.

[57] Once the rollers 226 and 236 are upwardly moved, the first and second rotation arms 225 and 235 coupled to the rollers 226 and 236 are respectively rotated thus to rotate first and the second rotation shafts 224 and 234.

[58] When the first rotation shaft 224 rotates, the rotation gear 223 coupled to the first rotation shaft 224 rotates. As a result, as shown in FIG. 9, the lifting member 221 gear-coupled to the rotation gear 223 is upwardly moved thus to support one end of the tray 101. Here, when the second rotation shaft 234 rotates in the contrary process, the lifting member 221 is downwardly moved.

[59] When the second rotation shaft 234 rotates, the rotation member 231 coupled to the

second rotation shaft 234 is together rotated, thereby pushing the other end of the tray 101 as shown in FIG. 9. Here, when the second rotation shaft 234 rotates in the contrary process, the rotation unit 230 is rotated thus to be positioned in a direction not to be interfered with the tray 101.

[60] By the driving unit 240, the tray holding unit 200 holds the tray 101 by the lifting unit 220 and the rotation unit 230. When the tray 101 is completely held by the tray holding unit 220, the controller drives the transfer unit so that the tray holding unit 220 can move along the guide rail 110 with a certain interval or speed according to a control signal.

[61] In the conventional art, both ends of the tray 101 are held by a pair of rotation members. Accordingly, when the tray 101 is unstably mounted, the tray 101 may deviate therefrom by the rotation member and mal-operation may be occurred.

[62] However, in the present invention, the tray holding unit 200 is configured so as to support one end of the tray 101 by being up-down moved. Accordingly, even if the tray 101 is unstably mounted, the tray holding unit 200 can hold the tray 101 without mal-operation.

[63] The tray transferring device according to the present invention may further comprise a tray lifting unit 300 for loading or lowering the loaded trays 101 in order to move the tray 101 along the guide rail 110 installed at least one of both ends of the guide rail 110.

[64] As shown in FIG. 10, the tray lifting unit 300 includes a plurality of guiding members 320 installed in correspondence to the shape of the tray 101 for guiding a vertical motion of the tray 101; at least one hooking unit 310 for supporting the tray 101 so as to dispose the tray 101 over the guide rail 110, a tray supporting unit 330 for supporting a lower surface of the tray 101 thereby mounting the tray 101 to the tray holding unit 200, or for upwardly moving the tray 101 from the tray holding unit 200; and a driving unit 340 for up-down moving the tray supporting unit 330.

[65] The tray supporting unit 330 is configured to be up-down moved with supporting the tray 101 without interference with the tray holding unit 200. As shown in FIG. 10, the tray supporting unit 330 may be implemented as a plurality of supporting bars 331 for supporting a lower surface of the tray. The tray supporting unit 330 may be implemented to have various shapes such as 'L' shape according to the position of the linear driving unit 340, etc.

[66] The linear driving unit 340 is configured to up-down move the tray 101 by supporting the tray supporting unit 330, and may be implemented as a linear motor, a pneumatic cylinder, a hydraulic cylinder, etc. The linear driving unit 340 may be composed of a plurality of devices respectively having a preset moving distance.

[67] The guide member 320 may be installed at a position corresponding to a vertex of

the tray 101, and with consideration of the motion of the tray 101, may be cut-out in a portion corresponding to the guide rail 110.

[68] As shown in FIG. 10, the hooking unit 310 may include a hooking member 311 for supporting the side of the tray 101 or releasing the supported state of the tray by being linearly moved at the time of up-down moving the tray 101; and a linear driving unit 340 coupled to the hooking member 311 for linearly moving the hooking member 311.

[69] The hooking member 311 is provided with a hook portion inserted into a supporting groove 101a formed at a lower surface or a side surface of the tray 101.

[70] The linear driving unit 340 is installed on the body 1, and is configured to linearly move the hooking member 311. The linear driving unit 340 may be implemented as various devices operated by a hydraulic pressure or a pneumatic pressure.

[71] As shownin FIGS. 11 and 12, the linear driving unit 340 may include a housing 342 having a cylinder space 341 therein and covering a part of the hooking member 311 so that the hooking member 311 can be protruded; and a piston member 343 inserted into the cylinder space 341 of the housing 342, coupled to the hooking member 311, and moved by a pneumatic pressure or a hydraulic pressure.

[72] The housing 342 is formed as a plurality of members 342a and 342b for facilitation of the assembly. An air inlet 346 for introducing air so as to push the piston member 343 is outwardly penetratingly formed at one end of the cylinder space 341 inside the housing 342. And, an air outlet 347 for exhausting air when the piston member 343 is pushed is formed at the other end of the cylinder space 341.

[73] An air supply pipe 345 for supplying air into the cylinder space 341 under control of the controller is connected to the air inlet 346.

[74] The housing 342 is covered by a covering member 349 under a state that a sealing member for sealing the inside of the cylinder space 341 is interposed therebetween and the piston member 343 is outwardly protruded.

[75] The piston member 343 is configured to be moved along the cylinder space 341 by a pneumatic pressure, and is provided with a protruding portion 343a for dividing the cylinder space 341 into two spaces. At least one sealing member for separating the two spaces from each other and moving the piston member 343 along the cylinderspace 341 is installed at the protruding portion 343a.

[76] The housing 342 may be further provided with an elastic member 348 for pressurizing a portion of the hooking member 311 coupled thereto thereby protruding it under no pneumatic pressure or hydraulic pressure.

[77] As shown in FIG. 11, the elastic member 348 may be installed so as to be linear with the cylinder space 341 where the piston member 343 is installed.

[78] The operation of the tray lifting unit will be explained in more detail with reference to the attached drawings.

[79] The tray lifting unit 300 downwardly moves the tray 101 loaded above the tray holding unit 200 thus to mount it at the tray holding unit 200, or upwardly moves the tray 101 from the tray holding unit 200. A process for upwardly moving the tray 101 is contrary to that for downwardly moving the tray 101. Hereinafter, the process for downwardly moving the tray 101 will be explained.

[80] As shown in FIG. 13, the linear driving unit 340 is operated by the controller. Then, the tray supporting unit 330 moves to a lower surface of the loaded tray 101 over the guide rail 110 thus to support the lower surface of the tray 101.

[81] Once the tray supporting unit 330 supports the lower surface of the tray 101, the controller operates the linear driving unit 340 of the hooking unit 310. Then, the controller moves the hooking member 311 inserted into the supporting groove 101a of the tray 101, thereby releasing the hooked state of the tray 101.

[82] More concretely, air is introduced into the cylinder space 341 of the linear driving unit 340 through the air inlet 346 connected to the air supply pipe 345.

[83] As air is introduced into one side of the cylinder space 341, air disposed at the other side of the cylinder space 341 is exhausted through the air outlet 347. Accordingly, the piston member 343 is backwardly moved, and the hooking member 311 coupled to the piston member 343 is moved thus to release the hooked state of the tray 101.

[84] Once the hooked state of the tray 101 is released, the linear driving unit 340 downwardly moves the tray supporting unit 330. As shown in FIG. 14, since the trays 101 have to be downwardly moved one by one, the tray supporting unit 330 have to be firstly moved by a height of the tray 101.

[85] Once the tray 101 is firstly moved, as shown in FIG. 15, the controller drives the linear driving unit 340, thereby moving the hooking member 311 to the supporting groove 101a of the above loaded tray 101 thereby supporting the above loaded tray 101. Herein the hooking member 311 is backwardly moved thus to hook the tray 101 by exhausting the air introduced into one side of the cylinder space 341, thereby backwardly moving the piston member 343 with the elastic force of the elastic member 348.

[86] Once the above tray 101 is supported by the hooking member 311, as shown in FIG. 16, the tray supporting unit 330 downwardly moves the tray 101 to mount it at the tray holding unit 200.

[87] Once the tray 101 is mounted at the tray holding unit 200, the tray holding unit 200 holds the tray 101 and moves it along the guide rail 110.

[88] The hooking member 311 of the hooking unit 310 of the tray lifting unit is configured to be linearly moved, thereby more stably supporting the tray 101 than the conventional rotation members for supporting a tray by being rotated.

[89] It will also be apparent to those skilled in the art that various modifications and

variations can be made inthe present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Claims

[1] A tray transferring device, comprising:
a tray holding unit including: a body unit for mounting a tray, the tray being loaded with a plurality of semiconductor devices thereon; a lifting unit installed at one end of the body unit so as to be vertically moved in a direction perpendicular to the body unit, for supporting one end of the tray when vertically lifted; a rotation unit installed at the other end of the body unit, for pushing the other end of the tray to the lifting unit by being rotated when one end of the tray is supported by the lifting unit, thereby holding the tray; and a driving unit for driving the lifting unit to be up-down moved and the rotation unit to be rotated and
a transfer unit for transferring a tray mounted at the tray holding unit by transferring the body unit.

[2] The tray transferring device of claim 1, wherein the lifting unit comprises:
a lifting member having a gear portion and a supporting surface for supporting one end of a tray;
a first bracket installed at one end of the body unit, the first bracket having a guide groove for guiding a vertical motion of the lifting member; and
a rotation gear coupled to the gear portion, rotatably installed at the first bracket, and coupled to a first rotation shaft rotated by the driving unit.

[3] The tray transferring device of claim 1, wherein the lifting unit comprises:
a lifting member having a supporting surface for supporting one end of the tray and a guide pin;
a first bracket installed at one end of the body unit, the first bracket having a guide groove for guiding a vertical motion of the lifting member; and
a driving arm rotatably installed at the first bracket and coupled to a first rotation shaft rotated by the driving unit, the driving arm having an up-down motion supporting unit for up-down moving the lifting member by supporting the guide pin of the lifting member at the other end thereof.

[4] The tray transferring device of claim 2 or 3, wherein the rotation unit comprises:
a second bracket installed at the other end of the body unit;
a second rotation shaft installed at the second bracket and rotated by the driving unit; and
a rotation member coupled to the second rotation shaft, for pushing the other end of the tray as the second rotation shaft rotates.

[5] The tray transferring device of claim 2 or 3, wherein the tray holding unit comprises one pair of guide rails for supporting both ends of the tray and guiding

a motion of the tray at the side thereof.

[6] The tray transferring device of claim 1, further comprising:
a hooking unit including a hooking member for supporting the side of the tray or releasing the supported state of the tray by being linearly moved when the tray lifting unit is vertically moved, and a linear driving unit coupled to the hooking member for linearly driving the hooking member.

[7] A tray transferring device, comprising:
a tray holding unit for holding a tray loaded with a plurality of semiconductor devices thereon and transferring the tray along a guide rail;
a tray lifting unit installed at one or both ends of the guide rail, for up-down moving the tray; and
a hooking unit including a hooking member for supporting the side of the tray or releasing the supported state of the tray by being linearly moved when the tray is vertically moved, and a linear driving unit coupled to the hooking member for linearly driving the hooking member.

[8] The tray transferring device of claim 6 or 7, wherein the linear driving unit is operated by hydraulic or pneumatic pressure.

[9] The tray transferring device of claim 6 or 7, wherein the linear driving unit comprises:
a housing having a cylinder space therein and covering a part of the hooking member so that the hooking member can be protruded; and
a piston member inserted into the cylinder space inside the housing, coupled to the hooking member, and moved by a hydraulic or pneumatic pressure.

[10] The tray transferring device of claim 9, wherein the housing be further installed with an elastic member for pressurizing a coupled portion of the hooking unit to the hooking member so that the hooking member can be protruded under no hydraulic or pneumatic pressure.

[11] The tray transferring device of claim 10, wherein the elastic member is installed so as to be linear with the cylinder space where the piston member is installed.