Description

Test Device and Test Method thereof

Technical Field

The present invention relates to the technical field of chip testing, and more particularly to a test device and a test method thereof.

Background Art

As the control brain of electronic and electrical products, chips play an important role, and with the increasing level of science and technology and people's consumption in recent years, the market demand for chips is growing. In order to ensure the manufacturing quality of chips, it is generally necessary for chip manufacturers to regularly perform test and sorting operations on chips before leaving the factory. Since chips are stored in a tray and pins of the chips face downwards, the chips placed in this way cannot be contacted by test probes of a tester. Therefore, it is necessary to flip the chips to make the pins of the chips face upwards. However, the current automatic flipping is to flip the chips after taking the chips out, where only one chip is flipped at one time, thereby causing a low test efficiency.

Summary of the Invention

In view of this, the present invention provides a test device and a test method thereof, intended to solve the problem in the prior art that only one chip is flipped at each time of automatic flipping so as to cause a low test efficiency.

In order to achieve one of the above-mentioned objects, some or all of the objects, or other objects, the present invention provides a test device, including: a rack, a transfer tray, a transfer module, and a flip module holding a test carrier. The transfer module and the flip module are arranged on the rack. The transfer tray is placed on the rack. The rack has a first region and a second region.

When the transfer tray is located in the first region, the transfer module transfers the transfer tray to the second region, and the flip module holds the transfer tray, presses

the transfer tray and the test carrier to each other, and flips the transfer tray and the test carrier whereby multiple untested chips carried by the transfer tray are ~~all~~ mutually transferred to the test carrier.

Preferably, when the transfer tray is located in the second region, the flip module holds the transfer tray, presses the transfer tray and the test carrier to each other, and flips the transfer tray and the test carrier whereby multiple tested chips carried by the test carrier are ~~all~~ mutually transferred to the transfer tray, and the transfer module transfers the transfer tray to the first region.

Preferably, the first region is an ambient~~normal~~ temperature region, and the second region is an adjustable temperature region.

Preferably, the flip module is located in the second region.

Preferably, the test device further includes a suction mechanism and a first carrier. The suction mechanism is arranged on the rack. The first region includes a waiting area and a transfer area. The first carrier is placed on the rack and located in the waiting area. The suction mechanism sucks multiple untested chips carried by the first carrier to be mutually~~all~~ transferred to the transfer tray in the transfer area.

Preferably, the suction mechanism is located in the first region.

Preferably, the first region further includes a sorting area and a second carrier. The second carrier is placed on the rack and located in the sorting area. The suction mechanism sucks multiple tested chips carried by the transfer tray in the transfer area to be mutually~~all~~ transferred to the second carrier.

Preferably, the test device further includes a temperature pre-adjustment module. The temperature pre-adjustment module is arranged on the transfer module. The temperature pre-adjustment module adjusts the temperature of the transfer module to a first preset temperature. The first preset temperature differs from the temperature of the test carrier within a first preset range.

Preferably, the transfer module is made of a material with a first coefficient of thermal expansion. The test carrier is made of a material with a second coefficient of thermal expansion. The first coefficient of thermal expansion differs from the second coefficient of thermal expansion within a second preset range.

Preferably, the test device further includes a soaking station having a first temperature adjustment module, and a transport mechanism. The transport mechanism and the soaking station are arranged on the rack. The second region includes a flip area and a transition area. The soaking station is located in the transition area. The flip module is located in the flip area. The soaking station has at least two stack structures each having multi-layer storage spaces for accommodating multiple test carriers stored in a stacked manner. The first temperature adjustment module adjusts the temperature of the test carriers in the stack structures to a test temperature.

The transport mechanism transfers a test carrier having multiple untested chips from the flip area to one stack structure in the soaking station.

Preferably, the transport mechanism transfers a test carrier having multiple tested chips from the transition area to the flip module.

Preferably, the second region further includes a transport area. The transport mechanism includes an XYZ-axis mechanism. The transport mechanism moves to the flip area through the XYZ-axis mechanism, holds the test carrier having multiple untested chips from the flip module, moves along an X axis into the transport area, moves along a Y axis in the transport area, moves along the X axis into the transition area, moves along a Z axis to align with storage spaces at different layers, and transfers the test carrier having multiple untested chips to the stack structure.

Preferably, the transport mechanism moves along the Z axis through the XYZ-axis mechanism to align with the test carrier having multiple tested chips in storage spaces at different layers, moves along the X axis into the transport area, moves along the Y axis in the transport area, moves along the X axis into the flip area, and transfers the test carrier having multiple tested chips to the flip module.

Preferably, the test device further includes a transfer test mechanism arranged on the rack. The second region further includes a test area. The transfer test mechanism obtains the test carrier having multiple untested chips from the transition area and transfers the test carrier to the test area.

Preferably, the transfer test mechanism includes an XZ-axis mechanism. The transfer test mechanism moves along the X axis in the transition area through the XZ-axis

mechanism, transfers the test carrier having multiple untested chips to the test area, moves along the Z axis, and transfers the test carrier having multiple untested chips to be tested.

Preferably, the transfer test mechanism moves along the Z axis in the test area through the XZ-axis mechanism whereby the test carrier having multiple tested chips leaves the test area and then moves along the X axis, and the test carrier having multiple tested chips is transferred to the transition area.

Preferably, the transfer test mechanism has a correction platform provided with a camera unit. The correction platform detects the position of the test carrier having multiple untested chips through the camera unit, and corrects the position of the test carrier having multiple untested chips on the correction platform by rotating the test carrier having multiple untested chips in an XY-axis direction plane.

Preferably, the soaking station is provided with a rotating door. When the rotating door rotates to a first position, the storage space of the stack structure has an opening. When the rotating door rotates to a second position, the storage space of the stack structure is a closed cavity.

Preferably, an upper side ~~wall~~ of the test carrier is provided with multiple suction holes for vacuum suction of chips.

Preferably, the test device includes a first air bearing plate. The first air bearing plate is arranged on the flip module. An upper side ~~plate~~ of the first air bearing plate is provided with at least two vacuum holes and at least two rows of air outlets. A bottom side ~~wall~~ of the test carrier is provided with a vacuum input groove in the shape of a strip. The direction of the strip is consistent with a length direction of the test carrier. The vacuum input groove is ~~in communication with~~in fluid exchange with the multiple suction holes and corresponds to the at least two vacuum holes vertically. The at least two rows of air outlets are provided with air bearings. The test carrier is placed on the air bearing plate and movable on the air bearings.

Preferably, the first air bearing plate is provided with a push rod for pushing the test carrier to move on the air bearings.

Preferably, the bottom side ~~wall~~ of the test carrier is provided with a sliding seal

disposed around the vacuum input groove.

Preferably, the test device includes a second air bearing plate. The second air bearing plate is arranged on the transport mechanism. The first air bearing plate has the same structure as the second air bearing plate. When the flip module transfers the test carrier having multiple untested chips to the transport area in the flip area, the push rod of the first air bearing plate pushes the test carrier having multiple untested chips to move towards the second air bearing plate to reach the nearest vacuum hole in the second air bearing plate. At least one vacuum hole in the first air bearing plate and one vacuum hole of the second air bearing plate simultaneously correspond to the vacuum input groove vertically, and both provide vacuum to the vacuum input groove.

Preferably, the suction mechanism adopts an integral-type suction cup structure for sucking ~~all~~ the multiple untested chips carried by the first carrier with one suction action, or sucking ~~all~~ the multiple tested chips carried by the transfer tray with one suction action.

Preferably, the test device includes a vibrator arranged on the flip module for providing vibration when flipping the transfer tray and the test carrier.

Preferably, the test device includes a sorter. The second region further includes a non-defective product area, a defective product area and an under-retest area. The sorter selects a corresponding type of chips from the second carrier and transfers the chips to the non-defective product area, the defective product area or the under-retest area.

Preferably, the test device includes a tray stack structure arranged on the rack. The tray stack structure is located in the non-defective product area, the defective product area or the under-retest area for stacking multiple trays.

Preferably, the test device includes a tray elevator arranged on the rack. The tray elevator transfers one tray below the tray stack structure in an XY-axis direction and transfers the tray to be stacked in the tray stack structure in a Z-axis direction.

Preferably, the transport mechanism is provided with a cleaner for blowing air to clean the multiple suction holes.

The present invention proposes a test method of a test device. The method includes:

receiving, by a transfer module, a loading signal, and identifying that a transfer tray is

located in a first region;

transferring, by the transfer module, the transfer tray to a second region;

holding, by a flip module, the transfer tray, pressing the transfer tray and a test carrier to each other, and flipping the transfer tray and the test carrier whereby multiple untested chips carried by the transfer tray are mutuallyall transferred to the test carrier; and

transferring the test carrier having multiple untested chips to be tested.

Preferably, after the step of transferring the test carrier having multiple untested chips to be tested, the method includes:

receiving, by the transfer module, an unloading signal, and identifying that the transfer tray is located in the second region;

holding, by the flip module, the transfer tray, pressing the transfer tray and the test carrier to each other, and flipping the transfer tray and the test carrier whereby multiple tested chips carried by the test carrier are mutuallyall transferred to the transfer tray; and

transferring, by the transfer module, the transfer tray to the first region.

The implementation of embodiments of the present invention will have the following beneficial effects.

When the transfer tray is in the first region, the transfer module moves to the first region. The transfer tray is transferred from the first region to the second region and placed into the flip module. The flip module holds the transfer tray, presses the transfer tray and the test carrier to each other, so that the transfer tray abuts against the test carrier, and the transfer tray and the test carrier are flipped, thereby allowing multiple untested chips of the transfer tray to be transferred to the test carrier. At this moment, pins of the chips face upwards, so as to solve the problem in the prior art that only one chip is flipped at each time of automatic flipping so as to cause a low test efficiency.

Brief Description of the Drawings

In order to more clearly illustrate the technical solutions in the embodiments of the present invention or the prior art, the drawings needing to be used in the description of the embodiments or the prior art will be briefly introduced below. It is apparent that the

drawings in the following description are merely some embodiments of the present invention. Those ordinarily skilled in the art may also obtain other drawings according to these drawings without involving any inventive effort.

In the drawings:

Fig. 1 is a schematic diagram of an upper structure of a test device in one embodiment;

Fig. 2 is a schematic diagram of a lower structure of a test device in one embodiment;

Fig. 3 is a region distribution diagram of a test device in one embodiment;

Fig. 4 is a flowchart of a test method of a test device in one embodiment;

Fig. 5 is a schematic structure diagram of a flip module in one embodiment; and

Fig. 6 is a schematic structure diagram of a flip module in another direction in one embodiment; and.

Fig. 7 is a schematic diagram of a test carrier moving from a first air bearing plate to a second air bearing plate in one embodiment.

Detailed Description of the Invention

The technical solutions in the embodiments of the present invention will now be described clearly and completely hereinafter with reference to the accompanying drawings in the embodiments of the present invention. It is apparent that the embodiments described are only a few, but not all embodiments of the present invention. All other embodiments obtained by those ordinarily skilled in the art based on the embodiments in the present invention without involving any inventive effort should fall within the scope of protection of the present invention.

As shown in Figs. 1 to 3, an embodiment of the present invention discloses a test device, including a rack 2, a transfer tray 11, a transfer module 21, and a flip module 22 holding a test carrier 12. The transfer module 21 and the flip module 22 are arranged on the rack 2. The transfer tray 11 is placed on the rack 2. The rack 2 has a first region A and a second region B.

The region where the rack 2 is located is divided into a first region A and a second region B. The first region A is a normal orn ambient temperature region, and the second region B is an adjustable temperature region.

When the transfer tray 11 is located in the first region A, the transfer module 21 transfers

the transfer tray 11 to the second region B, and the flip module 22 holds the transfer tray 11, presses the transfer tray 11 and the test carrier 12 to each other, and flips the transfer tray 11 and the test carrier 12 whereby multiple untested chips carried by the transfer tray 11 are mutuallyall transferred to the test carrier 12.

The transfer tray 11 carries multiple untested chips, and is located in the first region A. At this moment, pins of the chips on the transfer tray 11 face downwards. The transfer module 21 is configured to move back and forth between the first region A and the second region B, and transfer the transfer tray 11 from the first region A to the second region B, or transfer the transfer tray 11 from the second region B to the first region A. The transfer module 21 holds the transfer tray 11 in the first region A, transfers the transfer tray 11 from the first region A to the second region B, and transfers the transfer tray to the flip module 22. The flip module 22 holds the transfer tray 11. That is to say, the transfer tray 11 is held by the flip module 22 instead of the transfer module 21. The transfer tray 11 is located below the test carrier 12. The transfer tray 11 and the test carrier 12 correspond vertically. The transfer tray 11 and the test carrier 12 are pressed to each other.- Specifically, the flip module 22 pushes the transfer tray 11 to move towards the test carrier 12. An upper side wall of the transfer tray 11 abuts against a lower side wall of the test carrier 12. The flip module 22 flips the transfer tray 11 and the test carrier 12 whereby the location of the transfer tray 11 below the test carrier 12 is changed into the location of the transfer tray 11 above the test carrier 12, and the multiple untested chips originally in the transfer tray 11 are transferred to the test carrier 12. At this moment, the pins of the multiple untested chips on the test carrier 12 face upwards. For this purpose, a flip action completes the transition from the pins of the chips facing downwards to the pins of the chips facing upwards, and then the test carrier 12 is moved out from the flip module 22 and transferred for testing.

In summary, when the transfer tray 11 is in the first region A, the transfer module 21 moves to the first region A. The transfer tray 11 is transferred from the first region A to the second region B and placed into the flip module 22. The flip module 22 holds the transfer tray 11, presses the transfer tray 11 and the test carrier 12 to each other, so that the transfer tray 11 abuts against the test carrier 12, and the transfer tray 11 and the test

carrier 12 are flipped, thereby allowing multiple untested chips of the transfer tray 11 to be transferred to the test carrier 12. At this moment, pins of the chips face upwards, so as to solve the problem in the prior art that only one chip is flipped at each time of automatic flipping so as to cause a low test efficiency.

In the present embodiment, when the transfer tray 11 is located in the second region B, the flip module 22 holds the transfer tray 11, presses the transfer tray 11 and the test carrier 12 to each other, and flips the transfer tray 11 and the test carrier 12 whereby multiple tested chips carried by the test carrier 12 are ~~all~~ mutually transferred to the transfer tray 11, and the transfer module 21 transfers the transfer tray 11 to the first region A.

After multiple untested chips in the test carrier 12 have been tested, the test carrier 12 is transferred back to the test carrier 12 in the second region B, and the flip module 22 holds the test carrier 12 again. At this moment, the test carrier 12 is located below the transfer tray 11. Thereafter, the transfer tray 11 and the test carrier 12 are pressed to each other and then flipped, whereby the positions of the test carrier 12 and the transfer tray 11 are changed. The test carrier 12 is located above the transfer tray 11. Multiple tested chips in the test carrier 12 are ~~all~~ mutually transferred to the transfer tray 11. Then, the~~The~~ transfer module 21 moves ~~out~~ the transfer tray 11 away from the test carrier 12 and subsequently transfers the transfer tray back to the first region A. For this purpose, the flip module 22 not only loads the untested chips after being flipped, but also unloads the tested chips after being flipped.

In the present embodiment, the flip module 22 is located in the second region B.

In the present embodiment, the test device further includes a suction mechanism 23 and a first carrier 13. The suction mechanism 23 is arranged on the rack 2. The first region A includes a waiting area A1 and a transfer area A2. The first carrier 13 is placed on the rack 2 and located in the waiting area A1. The suction mechanism 23 sucks multiple untested chips carried by the first carrier 13 to be ~~all~~ mutually transferred to the transfer tray 11 in the transfer area A2.

The first carrier 13 is placed in the waiting area A1, and the transfer tray 11 is placed in the transfer area A2. If the first carrier 13 carries multiple untested chips and the transfer

tray 11 is empty, the suction mechanism 23 sucks the multiple untested chips from the first carrier 13, and transfers the multiple untested chips from the waiting area A1 to the transfer area A2, and then places the untested chips in the transfer tray 11.

In the present embodiment, the suction mechanism 23 is located in the first region A.

In the present embodiment, the first region A further includes a sorting area A3 and a second carrier 14. The second carrier 14 is placed on the rack 2 and located in the sorting area A3. The suction mechanism 23 sucks multiple tested chips carried by the transfer tray 11 in the transfer area A2 to be ~~all~~ mutually transferred to the second carrier 14.

The second carrier 14 is placed in the sorting area A3. When the transfer tray 11 carries multiple tested chips in the transfer area A2, the suction mechanism 23 sucks the multiple tested chips in the transfer tray 11, transfers the tested chips from the transfer area A2 to the sorting area A3, and places the multiple tested chips in the second carrier 14.

In the present embodiment, the test device further includes a temperature pre-adjustment module. The temperature pre-adjustment module is arranged on the transfer module 21. The temperature pre-adjustment module 21 adjusts the temperature of the transfer module to a first preset temperature. The first preset temperature differs from the temperature of the test carrier 12 within a first preset range.

The temperature pre-adjustment module heats the transfer module 21 to a first preset temperature. The temperature of the test carrier 12 is close to a test temperature. The first preset range is [1°C, 4°C].

In the present embodiment, the transfer module 21 is made of a material with a first coefficient of thermal expansion. The test carrier 12 is made of a material with a second coefficient of thermal expansion. The first coefficient of thermal expansion differs from the second coefficient of thermal expansion within a second preset range. The first coefficient of thermal expansion is the same as or similar to the second coefficient of thermal expansion. The second preset range is [5*10(-6), 30*10(-6)] for the thermal coefficient α. The difference between the first coefficient of thermal expansion and the second coefficient of thermal expansion may be smaller than 20%, 10%, 5%, 3%, 1%. ~~The second preset range is [5, 30].~~

In the present embodiment, the test device further includes a soaking station 24 having a first temperature adjustment module, and a transport mechanism 25. The transport mechanism 25 and the soaking station 24 are arranged on the rack 2. The second region B includes a flip area B1 and a transition area B2. The soaking station 24 is located in the transition area B2. The flip module 22 is located in the flip area B1. The soaking station 24 has at least two stack structures each having multi-layer storage spaces for accommodating multiple test carriers 12 stored in a stacked manner. The first temperature adjustment module adjusts the temperature of the test carriers 12 in the stack structures to the test temperature.

The transport mechanism 25 transfers the test carrier 12 having multiple untested chips from the flip area B1 to one stack structure in the soaking station 24.

The transport mechanism 25 moves between the flip area B1 and the transition area B2. The transport mechanism 25 moves out the test carrier 12 having multiple untested chips from the flip module 22, transfers the test carrier 12 from the flip area B1 to the transition area B2, and places the test carrier into the storage space of the stack structure in the soaking station 24. The first temperature adjustment module heats the test carrier 12 in the stack structure and adjusts the temperature thereof to the test temperature.

Specifically, one of the at least two stack structures is configured to store the test carrier 12 carrying untested chips, while the other stack structure is configured to store the test carrier 12 carrying tested chips.

In the present embodiment, the transport mechanism 25 transfers the test carrier 12 having multiple tested chips from the transition area B2 to the flip module 22.

The transport mechanism 25 moves out the test carrier 12 having tested chips from the stack structure in the soaking station 24, transfers the test carrier 12 from the transition area B2 to the flip area B1, and then transfers the test carrier to the flip module 22 for holding.

In the present embodiment, the second region B further includes a transport area B3. The transport mechanism 25 includes an XYZ-axis mechanism. The transport mechanism 25 moves to the flip area B1 through the XYZ-axis mechanism, holds the test carrier 12 having multiple untested chips from the flip module 22, moves along an

X axis into the transport area B3, moves along a Y axis in the transport area B3, moves along the X axis into the transition area B2, moves along a Z axis to align with storage spaces at different layers, and then transfers the test carrier 12 having multiple untested chips to the stack structure.

The transport mechanism 25 is provided with an XYZ-axis mechanism, and is movable in an X-axis direction, a Y-axis direction and a Z-axis direction through the XYZ-axis mechanism. When the transport mechanism 25 needs to obtain the test carrier 12 having multiple untested chips in the flip area B1, the transport mechanism 25 moves to the flip area B1, holds the test carrier 12 from the flip module 22, moves via an X axis and a Y axis whereby the test carrier 12 enters the transition area B2, moves along a Z axis whereby the test carrier 12 moves upwards, aligns with storage spaces at different layers, and then transfers the test carrier 12 into the stack structure.

In the present embodiment, the transport mechanism 25 moves along the Z axis through the XYZ-axis mechanism to align with the test carrier 12 having multiple tested chips in storage spaces at different layers, moves along the X axis into the transport area B3, moves along the Y axis in the transport area B3, moves along the X axis into the flip area B1, and transfers the test carrier 12 having multiple tested chips to the flip module 22.

The transport mechanism 25 moves to the transition area B2 through the XYZ-axis mechanism, moves in the Z axis, enters the stack structure, and aligns with one test carrier 12 in storage spaces at different layers. Multiple chips carried by the test carrier 12 have been tested. The transport mechanism 25 holds the test carrier 12 transferred from the stack structure, moves along the X axis and the Y axis, enters the flip area B1, and transfers the test carrier 12 having multiple tested chips to the flip module 22. The test carrier 12 is held by the flip module 22.

In the present embodiment, the test device further includes a transfer test mechanism 26 arranged on the rack 2. The second region B further includes a test area B4. The transfer test mechanism 26 obtains the test carrier 12 having multiple untested chips from the transition area B2 and transfers the test carrier to the test area B4.

The transfer test mechanism 26 obtains the test carrier 12 having multiple untested chips

from the stack structure in the soaking station 24, transfers the test carrier 12 to the test area B4, and tests the multiple untested chips in the test carrier 12 in the test area B4.

In the present embodiment, the test device further includes a tester 27 arranged on the rack 2. The tester 27 is located in the test area B4. The transfer test mechanism 26 transfers the test carrier 12 to the test area B4. The test carrier 12 is located below the tester 27. The transfer test mechanism 26 holds the test carrier 12 to move upwards whereby pins of the chip are in contact with control pins of the tester 27. Then the tester 27 tests the chips in the test carrier 12.

In the present embodiment, the transfer test mechanism 26 includes an XZ-axis mechanism. The transfer test mechanism 26 moves along the X axis in the transition area B2 through the XZ-axis mechanism, transfers the test carrier 12 having multiple untested chips to the test area B4, moves along the Z axis, and transfers the test carrier 12 having multiple untested chips to be tested.

The transfer test mechanism 26 moves between the test area B4 and the transition area B2 through the XZ-axis mechanism. The transfer test mechanism 26 moves to the transition area B2 through the XZ-axis mechanism, holds the test carrier 12 having multiple untested chips transferred from the stack structure, and moves to the test area B4 along the X axis. The test carrier 12 is located below the tester 27. The transfer test mechanism 26 moves along the Z axis again, and transfers the test carrier 12 into the tester 27. The tester 27 tests the multiple untested chips in the test carrier 12.

In the present embodiment, the transfer test mechanism 26 moves along the Z axis in the test area B4 through the XZ-axis mechanism whereby the test carrier 12 having multiple tested chips leaves the test area and then moves along the X axis, and the test carrier 12 having multiple tested chips is transferred to the transition area B2.

The transfer test mechanism 26 moves along the Z axis through the XZ-axis mechanism whereby the test carrier 12 moves downwards. The test carrier 12 leaves the tester 27, and then moves along the X axis. The test carrier 12 having multiple tested chips is transferred to the transition area B2 and then to the stack structure.

In the present embodiment, the transfer test mechanism 26 has a correction platform provided with a camera unit. The correction platform detects the position of the test

carrier 12 having multiple untested chips through the camera unit, and corrects the position of the test carrier 12 having multiple untested chips on the correction platform by rotating the test carrier 12 having multiple untested chips in an XY-axis direction plane.

The camera unit captures the position of the test carrier 12 on the correction platform. The correction platform is provided with a reference column. By using the reference column as a reference standard, it is determined whether there is deviation in the placement of a test position. If yes, the position of the test carrier 12 on the correction platform is corrected by rotating the test carrier 12 in the X axis or/and the Y axis so as to align the pins of the chips in the test carrier 12 with probes of the tester 27 when the test carrier 12 is in the test area B4.

In the present embodiment, the soaking station 24 is provided with a rotating door. When the rotating door rotates to a first position, the storage space of the stack structure has an opening. When the rotating door rotates to a second position, the storage space of the stack structure is a closed cavity.

Specifically, the rotating door is provided at an inlet/outlet of the stack structure. When the rotating door rotates to a first position, the inlet/outlet of the stack structure is opened. When the rotating door rotates to a second position, the inlet/outlet of the stack structure is closed to form a closed cavity. Thus, the stack structure has a heat preservation function.

In the present embodiment, an upper side ~~wall~~ of the test carrier 12 is provided with multiple suction holes for vacuum suction of chips.

~~In~~ As shown in Fig. 7, in the present embodiment, the test device includes a first air bearing plate 71. The first air bearing plate 71 is arranged on the flip module 22. An upper side ~~plate~~ of the first air bearing plate 71 is provided with at least two vacuum holes 711 and at least two rows of air outlets 712. A bottom side ~~wall~~ of the test carrier 12 is provided with a vacuum input groove 12b in the shape of a strip. The direction of the strip is consistent with a length direction of the test carrier 12. The vacuum input groove 12b is ~~in communication with~~in fluid exchange with the multiple suction holes and corresponds to the at least two vacuum holes 711 vertically. The at least two rows

of air outlets 712 are provided with air bearings. The test carrier 12 is placed on the air bearing plate and movable on the air bearings.

The at least two vacuum holes 711 are ~~in communication with~~in fluid exchange with the vacuum inlet groove 12b whereby the at least two vacuum holes 711 are ~~in communication with~~in fluid exchange with the multiple suction holes so as to provide vacuum suction to the multiple suction holes. The test carrier 12 moves on an air bearing plate, so as to reduce friction generated by the movement of the test carrier 12.

In the present embodiment, the first air bearing plate is provided with a push rod for pushing the test carrier 12 to move on the air bearings.

In the present embodiment, the bottom side ~~wall~~ of the test carrier 12 is provided with a sliding seal disposed around the vacuum input groove.

~~In~~ As shown in Fig. 7, in the present embodiment, the test device includes a second air bearing plate 72. The second air bearing plate is arranged on the transport mechanism 25. The first air bearing plate 71 has the same structure as the second air bearing plate 72. When the flip module 22 transfers the test carrier 12 having multiple untested chips to the transport area B3 in the flip area B1, the push rod of the first air bearing plate 71 pushes the test carrier 12 having multiple untested chips to move towards the second air bearing plate 72 to reach the nearest vacuum hole 721 in the second air bearing plate 72. At least one vacuum hole 711 in the first air bearing plate 71 and one vacuum hole 721 of the second air bearing plate 72 simultaneously correspond to the vacuum input groove 12b vertically, and both provide vacuum to the vacuum input groove 12b.

The test carrier 12 is transferred from the flip module 22 to the transport mechanism 25, and the suction holes of the test carrier 12 can maintain vacuum suction during the transfer process.

In some embodiments, the test device includes a third air bearing plate and a fourth air bearing plate. The third air bearing plate and the fourth air bearing plate are respectively arranged in the soaking station 24 and the transfer test mechanism 26. The third air bearing plate and the fourth air bearing plate both have the same structure as the first air bearing plate.

In the present embodiment, the suction mechanism 23 adopts an integral-type suction

cup structure for sucking ~~all~~ the multiple untested chips carried by the first carrier 13 with one suction action, or sucking ~~all~~ the multiple tested chips carried by the transfer tray 11 with one suction action.

The suction mechanism 23 adopts an integral-type suction cup structure, and can suck the chips in the entire first carrier 13 and the chips in the entire transfer tray 11 at one time.

In the present embodiment, the test device includes a vibrator arranged on the flip module 22 for providing vibration when flipping the transfer tray 11 and the test carrier 12. The vibrator generates vibration to vibrate the chips, thereby facilitating the transfer of the chips from the transfer tray 11 to the test carrier 12, or from the test carrier 12 to the transfer tray 11. It is also possible to shake the chips to be aligned so that the suction holes are more robust to chip suction.

In the present embodiment, the test device includes a sorter. The second region B further includes a non-defective product area A4, a defective product area A5 and an under-retest area. The sorter selects a corresponding type of chips from the second carrier 14 and transfers the chips to the non-defective product area A4, the defective product area A5 or the under-retest area. The sorter sorts and places the tested chips.

In the present embodiment, the test device includes a tray stack structure arranged on the rack 2. The tray stack structure is located in the non-defective product area A4, the defective product area A5 or the under-retest area for stacking multiple trays.

In the present embodiment, the test device includes a tray elevator arranged on the rack 2. The tray elevator transfers one tray below the tray stack structure in an XY-axis direction and transfers the tray to be stacked in the tray stack structure in a Z-axis direction. The tray elevator has a function of moving along XYZ axes. One tray is moved below the tray stack structure by the movement in the X axis and the Y axis, moved upwards by the movement in the Z axis, and then stacked in the tray stack structure.

In the present embodiment, the transport mechanism 25 is provided with a cleaner for blowing air to clean the multiple suction holes.

In the present embodiment, the rack 2 is designed in a layered structure. Components

of the test device are respectively installed in an upper space and a lower space, which is beneficial to reducing the overall volume of the device, making full use of a longitudinal space, reducing the requirements for an installation space of the device, and improving the applicable scenario of the device.

In some embodiments, a flip module 22 according to Embodiment 1 of the present invention is shown in Figs. 5 and 6. The flip module includes a flip driving mechanism 1a, a flip box 2a, a first carrying mechanism 3, a second carrying mechanism 4, and a combination mechanism 5. The flip box 2a is formed with a flip cavity. The first carrying mechanism 3 and the second carrying mechanism 4 are oppositely arranged in the flip cavity. The combination mechanism 5 is arranged on the flip box 2a and connected to the first carrying mechanism 3. The combination mechanism 5 is configured to drive the first carrying mechanism 3 to move towards or away from the second carrying mechanism 4.

When the first carrying mechanism 3 is attached to the second carrying mechanism 4 under the drive of the combination mechanism 5, the flip driving mechanism 1a may drive the flip box 2a to rotate.

When the first carrying mechanism 3 is located below the second carrying mechanism 4, the first carrying mechanism 3 may carry chips to be tested, or may receive tested chips carried by the second carrying mechanism 4. Pins of the chips located on the first carrying mechanism 3 face downwards.

When the second carrying mechanism 4 is located below the first carrying mechanism 3, the second carrying mechanism 4 may receive chips to be tested which are carried by the first carrying mechanism 3 for testing, or may carry tested chips. Pins of the chips located on the second carrying mechanism 4 face upwards.

After the above flip module 22 is used, the flip box 2a may rotate under the drive of the flip driving mechanism 1a when the first carrying mechanism 3 is attached to the second carrying mechanism 4, so as to rotate the chips located in the flip box 2a and change the direction of the pins of the chips located in the flip box 2a from downward to upward.

In some embodiments, the first carrying mechanism 3 includes a transfer carrying

assembly 31 and a transfer receiving clamp 32. The transfer receiving clamp 32 is arranged in the flip cavity. The combination mechanism 5 is connected to the transfer receiving clamp 32. The transfer carrying assembly 31 may be slidably connected to the transfer receiving clamp 32.

When the first carrying mechanism 3 is located below a test conveying mechanism, the transfer carrying assembly 31 may carry chips to be tested, or may receive tested chips carried by the second carrying mechanism 4.

The combination mechanism 5 may drive the transfer carrying assembly 31 to move towards or away from the second carrying mechanism 4 whereby the first carrying mechanism 3 moves towards or away from the second carrying mechanism 4.

In some embodiments, the transfer carrying assembly 31 includes a transfer vehicle body 311. The transfer vehicle body 311 may be slidably connected to the transfer receiving clamp 32. The transfer tray 11 is arranged on the transfer vehicle body 311.

When the first carrying mechanism 3 is located below the second carrying mechanism 4, the transfer tray 11 may carry chips to be tested, or may receive tested chips carried by the second carrying mechanism 4.

The transfer tray 11 is arranged on the transfer vehicle body 311. When the transfer vehicle body 311 moves, the transfer tray 11 may follow the transfer vehicle body 311 to move synchronously. If the transfer vehicle body 311 moves into the flip box 2a, the transfer tray 11 will also enter the flip box 2a with the transfer vehicle body 32 whereby the chips carried on the transfer tray 11 will also enter the flip box 2a for subsequent flip and detection.

The surface of a side of the transfer vehicle body 311 facing the second carrying mechanism 4 is a plane, so that the transfer tray 11 moves more smoothly, thereby preventing the transfer tray 11 arranged on the transfer vehicle body 311 from tilting or shaking when moving with the transfer vehicle body 311.

The surface of a side of the transfer tray 11 facing the second carrying mechanism 4 is also a plane, so that the chips are placed more smoothly, thereby preventing the chips placed on the transfer tray 11 from tilting or shaking when moving with the transfer tray 11.

A transfer groove is formed on a side ~~wall~~ of the transfer vehicle body 311. A transfer protrusion is formed on the transfer receiving clamp 32 at a position corresponding to the transfer groove. The transfer protrusion may be inserted into the transfer groove whereby the transfer vehicle body 311 may slide relative to the transfer receiving clamp 32.

The transfer groove extends in a horizontal direction. Correspondingly, the transfer protrusion also extends in the horizontal direction whereby the transfer vehicle body 311 may slide in the horizontal direction onto the transfer receiving clamp 32.

There may be multiple transfer grooves parallel to each other. Correspondingly, there may be multiple transfer protrusions parallel to each other. The multiple transfer grooves are provided in one-to-one correspondence with the multiple transfer protrusions. Still further, the transfer protrusions may be replaced by bearings and guide grooves as long as the friction can be reduced.

The flip module 22 further includes a transfer positioner 6. When the transfer vehicle body 311 slides into the flip box 2a relative to the transfer receiving clamp 32, the transfer positioner 6 may laterally position the transfer vehicle body 311 so as to prevent the transfer vehicle body 311 from sliding out of the flip box 2a.

The transfer positioner 6 is provided with a positioning pin 61, and the transfer vehicle body 311 is provided with a positioning pin hole adapted to the positioning pin 61. When the transfer vehicle body 311 slides into the flip box 2a relative to the transfer receiving clamp 32, the positioning pin 61 may be inserted into the positioning pin hole through the flip box 2a, thereby realizing the positioning of the transfer vehicle body 311.

The first carrying mechanism 3 further includes a transfer suction assembly 33 arranged on the flip box 2a. The transfer suction assembly 33 is configured to suck and fix the transfer vehicle body 311 located on the transfer receiving clamp 32.

It will be appreciated that when the transfer vehicle body 311 slides into the flip box 2a relative to the transfer receiving clamp 32, the transfer suction assembly 33 works. Thus, the transfer vehicle body 311 located on the transfer receiving clamp 32 may be sucked and fixed, thereby realizing the positioning of the transfer vehicle body 311, preventing

the transfer vehicle body 311 from sliding out of the flip box 2a, and also avoiding the movement of the transfer vehicle body 311 when the flip box 2a is flipped.

The second carrying mechanism 4 includes a test carrier 12 and a test receiving clamp 42. The test receiving clamp 42 is arranged in the flip cavity. The test carrier 12 may be slidably connected to the test receiving clamp 42. The test receiving clamp 42 may be configured to receive and store the test carrier 12.

When the second carrying mechanism 4 is located below the first carrying mechanism 3, the test carrier 12 may receive chips to be tested which are carried by the first carrying mechanism 3, or may carry tested chips.

When the flip driving mechanism 1a drives the flip box 2a to rotate, the chips originally located on the transfer tray 11 will fall onto the test carrier 12 under the action of gravity when the second carrying mechanism 4 is located below the first carrying mechanism 3. After the combination mechanism 5 drives the transfer carrying assembly 31 to move away from the second carrying mechanism 4, the chips originally located on the transfer tray 11 will be gradually separated from the transfer tray 11. At this moment, the test carrier 12 will receive chips to be tested which are carried by the first carrying mechanism 3 (i.e. the transfer tray 11), and then the test carrier 12 may convey the received chips to be tested to a test machine for testing. After the testing is finished, the test carrier 12 may carry tested chips and convey the tested chips into the flip cavity of the flip box 2a.

The surface of a side of the test carrier 12 facing the first carrying mechanism 3 is a plane, so that the chips carried on the test carrier 12 move more smoothly, thereby preventing the chips carried on the test carrier 12 from tilting or shaking when moving with the test carrier 12.

A test groove is formed on a side ~~wall~~ of the test carrier 12. A test protrusion is formed on the test receiving clamp 42 at a position corresponding to the test groove. The test protrusion may be inserted into the test groove whereby the test carrier 12 may slide relative to the test receiving clamp 42.

The test groove extends in a horizontal direction. Correspondingly, the test protrusion also extends in the horizontal direction whereby the test carrier 12 may slide in the

horizontal direction onto the test receiving clamp 42.

There may be multiple test grooves parallel to each other. Correspondingly, there may be multiple test protrusions parallel to each other. The multiple test grooves are provided in one-to-one correspondence with the multiple test protrusions.

The second carrying mechanism 4 further includes a test suction assembly 43 arranged on the flip box 2a. The test suction assembly 43 is configured to suck and fix the test carrier 12 located on the test receiving clamp 42.

It will be appreciated that when the test carrier 12 slides into the flip box 2a relative to the test receiving clamp 42, the test suction assembly 43 works. Thus, the test carrier 12 located on the test receiving clamp 42 may be sucked and fixed, thereby realizing the positioning of the test carrier 12, preventing the test carrier 12 from sliding out of the flip box 2a, and also avoiding the movement of the test carrier 12 when the flip box 2a is flipped.

The combination mechanism 5 includes a combination driving assembly 51 and a combination block 52. The combination block 52 is slidably connected to the flip box 2a and connected to the first carrying mechanism 3. The combination driving assembly 51 is configured to drive the combination block 52 to slide relative to the flip box 2a whereby the first carrying mechanism 3 moves towards or away from the second carrying mechanism 4.

The flip box 2a is provided with a sliding block 21a, and the combination block 52 is slidably connected to the sliding block 21a, so that the combination block 52 may be slidably connected to the flip box 2a.

The combination driving assembly 51 includes a combination motor module 511, a combination power conduction module 512 and two combination lead screws 513. The combination motor module 511, the combination power conduction module 512 and the combination lead screws 513 are respectively installed on the flip box 2a. The combination power conduction module 512 is connected between the combination motor module 511 and the combination lead screws 513. The combination motor module 511 drives the combination lead screws 513 to rotate through the combination power conduction module 512. The combination lead screws 513 are in threaded

connection with the combination block 52.

The combination motor module 511 may provide power to the movement of the combination block 52. The combination power conduction module 512 may conduct the power provided by the combination motor module 511 to the combination block 52. When the combination motor module 511 drives the combination lead screws 513 to rotate through the combination power conduction module 512, the combination block 52 may slide relative to the flip box 2a in an axial direction of the combination lead screws 513 during the rotation of the combination lead screws 513 due to the threaded connection between the combination lead screws 513 and the combination block 52, so that the first carrying mechanism 3 moves towards or away from the second carrying mechanism 4.

The combination motor module 511 is provided with a combination motor. The combination power conduction module 512 includes a first roller 5121, a second roller 5122 and a conveyor belt 5123. The first roller 5121 is connected to an output shaft of the combination motor. The second roller 5122 is connected to one end of the combination lead screw 513. The conveyor belt 5123 is wound around the first roller 5121 and the second roller 5122.

When the combination motor works, the first roller 5121 rotates with the output shaft of the combination motor, thereby driving the conveyor belt 5123 to move and further driving the second roller 5122 to rotate, whereby the combination lead screws 513 rotate.

The combination power conduction module 512 further includes a third roller 5124. The conveyor belt 5123 is wound around the third roller 5124 in addition to the first roller 5121 and the second roller 5122. That is, the conveyor belt 5123 is wound around the first roller 5121, the second roller 5122 and the third roller 5124.

By arranging the third roller 5124, transmission points of the combination power conduction module 512 are increased, thereby ensuring the effective rotation of the combination lead screws 513.

The flip driving mechanism 1a includes a flip support 11a, a flip shaft 12a and a flip power assembly 13. The flip shaft 12a is rotatably connected to the flip support 11a and

connected to the flip box 2a. The flip power assembly 13 is configured to drive the flip shaft 12a to rotate whereby the flip box 2a rotates.

The flip support 11a includes a first support 111 and a second support 112. The flip shaft 12a includes a first rotary shaft 121 and a second rotary shaft 122. One end of the first rotary shaft 121 is rotatably connected to the first support 111, and the other end of the first rotary shaft 122 is connected to the flip box 2a. One end of the second rotary shaft 122 is rotatably connected to the second support 112, and the other end of the second rotary shaft 122 is connected to the flip box 2a. The first rotary shaft 121 and the second rotary shaft 122 are coaxially arranged. The flip power assembly 13 is connected to the second rotary shaft 122 to complete the installation and connection between the flip driving mechanism 1a and the flip box 2a.

The flip power assembly 13 includes a rotating plate 131 and a rotating handle 132. One end of the rotating plate 131 is connected to the flip shaft 12a. The rotating handle 132 is connected to the other end of the rotating plate 131. By operating the rotating handle 132, the rotating plate 131 drives the rotating shaft 12 to rotate so as to realize the rotation of the flip box 2a.

The flip module 22 further includes a flip chassis 7. The flip support 11a is arranged on the flip chassis 7. The flip chassis 7, serving as a base plate, may be configured to install other structures, such as the flip support 11a of the flip driving mechanism 1a.

The flip module 22 further includes a vibrator 8 arranged on the flip box 2a. The vibrator 8 is configured to provide a vibration source during chip positioning to prevent chips from adhering to the transfer tray 11, thereby preventing positional deviation of the chips caused by not falling to a chip positioning corner of the test carrier 12.

The working principle of the flip module 22 provided in Embodiment 1 of the present invention is as follows:

Firstly, chips to be tested are carried by the first carrying mechanism 3 and conveyed into the conveying box 2 whereby the first carrying mechanism 3 is located below the second carrying mechanism 4. The combination mechanism 5 drives the first carrying mechanism 3 for the first time whereby the first carrying mechanism 3 moves towards the second carrying mechanism 4 (upwards in a height direction) until the first carrying

mechanism is attached to the second carrying mechanism 4. In this process, pins of the chips located on the first carrying mechanism 3 always face downwards.

Thereafter, the flip driving mechanism 1a drives the flip box 2a to rotate for the first time, so as to flip the flip box 2a by 180°, whereby the second carrying mechanism 4 is located below the first carrying mechanism 3, and the orientation of the pins of the chips is changed from downward to upward. After the first rotation of the flip box 2a is completed, the combination mechanism 5 drives the transfer conveying mechanism 3 for the second time, whereby the transfer conveying mechanism 4 moves away from the second carrying mechanism 4 (upwards in the height direction) until the transfer conveying mechanism is separated from the second carrying mechanism 4. The second carrying mechanism 4 receives chips to be tested which are originally carried by the first carrying mechanism 3, and conveys the received chips to be tested to an external test machine for testing. After the testing is completed, the second carrying mechanism 4 sends the tested chips back into the flip box 2a, whereby the second carrying mechanism 4 is located below the first carrying mechanism 3 again.

Then, the combination mechanism 5 drives the first carrying mechanism 3 for the third time, whereby the first carrying mechanism 3 moves towards the second carrying mechanism 4 (downwards in the height direction) until the first carrying mechanism is attached to the second carrying mechanism 4. The flip driving mechanism 1a drives the flip box 2a to rotate for the second time, so as to flip the flip box 2a by 180°, whereby the first carrying mechanism 3 is located below the second carrying mechanism 4 again.

Finally, the combination mechanism 5 drives the first carrying mechanism 3 for the fourth time, whereby the first carrying mechanism 3 moves away from the second carrying mechanism 4 (downwards in the height direction) until the first carrying mechanism is separated from the second carrying mechanism 4. The first carrying mechanism 3 receives the tested chips carried by the second carrying mechanism 4.

As shown in Fig. 4, an embodiment of the present invention also discloses a test method of a test device. The method includes the following steps.

In step S101, a transfer module receives a loading signal, and identifies that a transfer tray is located in a first region.

In step S102, the transfer module transfers the transfer tray to a second region.

In step S103, a flip module holds the transfer tray, presses the transfer tray and a test carrier to each other, and flips the transfer tray and the test carrier whereby multiple untested chips carried by the transfer tray are ~~all~~ mutually transferred to the test carrier.

In step S104, the test carrier having multiple untested chips is transferred to be tested.

When the transfer tray is in the first region, the transfer module moves to the first region. The transfer tray is transferred from the first region to the second region and placed into the flip module. The flip module holds the transfer tray, presses the transfer tray and the test carrier to each other, whereby the transfer tray abuts against the test carrier, and flips the transfer tray and the test carrier, thereby allowing multiple untested chips of the transfer tray to be transferred to the test carrier. At this moment, pins of the chips face upwards, so as to solve the problem in the prior art that only one chip is flipped at each time of automatic flipping so as to cause a low test efficiency.

In the present embodiment, after step S104, the method includes the following steps.

The transfer module receives an unloading signal, and identifies that the transfer tray is located in the second region.

The flip module holds the transfer tray, presses the transfer tray and the test carrier to each other, and flips the transfer tray and the test carrier whereby multiple tested chips carried by the test carrier are ~~all~~ mutually transferred to the transfer tray.

The transfer module transfers the transfer tray to the first region.

What has been disclosed above is merely a preferred embodiment of the present invention and it is not intended to limit the scope of the present invention. Therefore, equivalent changes made according to the claims of the present invention may be encompassed by the present invention.

Claims

1. A test device, comprising: a rack, a transfer tray, a transfer module, and a flip module holding a test carrier, wherein the transfer module and the flip module are arranged on the rack, the transfer tray is placed on the rack, and the rack has a first region and a second region; and

when the transfer tray is located in the first region, the transfer module transfers the transfer tray to the second region, and the flip module holds the transfer tray, presses the transfer tray and the test carrier to each other, and flips the transfer tray and the test carrier whereby multiple untested chips carried by the transfer tray are ~~all~~ mutually transferred to the test carrier.

2. The test device according to claim 1, wherein when the transfer tray is located in the second region, the flip module holds the transfer tray and the test carrier, presses the transfer tray and the test carrier to each other, and flips the transfer tray and the test carrier whereby multiple tested chips carried by the test carrier are ~~all~~ mutually transferred to the transfer tray, and the transfer module transfers the transfer tray to the first region.

3. The test device according to claim 1, wherein the first region is an ambient~~normal~~ temperature region, and the second region is an adjustable temperature region.

4. The test device according to claim 1, wherein the flip module is located in the second region.

5. The test device according to claim 2, further comprising: a suction mechanism and a first carrier, wherein the suction mechanism is arranged on the rack, the first region comprises a waiting area and a transfer area, the first carrier is placed on the rack and located in the waiting area, and the suction mechanism sucks multiple untested chips carried by the first carrier to be mutually~~all~~ transferred to the transfer tray in the transfer area.

6. The test device according to claim 5, wherein the suction mechanism is located in the first region.

7. The test device according to claim 5, wherein the first region further comprises a sorting area and a second carrier, the second carrier is placed on the rack and located in the sorting area, and the suction mechanism sucks multiple tested chips carried by the transfer tray in the transfer area to be mutually~~all~~ transferred to the second carrier.

8. The test device according to claim 1, further comprising: a temperature pre-adjustment module, wherein the temperature pre-adjustment module is arranged on the transfer module, the temperature pre-adjustment module adjusts the temperature of the transfer module to a first preset temperature, and the first preset temperature differs from the temperature of the test carrier within a first preset range.

9. The test device according to claim 8, wherein the transfer module is made of a material with a first coefficient of thermal expansion, the test carrier is made of a material with a second coefficient of thermal expansion, and the first coefficient of thermal expansion differs from the second coefficient of thermal expansion within a second preset range.

10. The test device according to claim 2, further comprising: a soaking station having a first temperature adjustment module, and a transport mechanism, wherein the transport mechanism and the soaking station are arranged on the rack, the second region comprises a flip area and a transition area, the soaking station is located in the transition area, the flip module is located in the flip area, the soaking station has at least two stack structures each having multi-layer storage spaces for accommodating multiple test carriers stored in a stacked manner, and the first temperature adjustment module adjusts the temperature of the test carriers in the stack structures to a test temperature; and

the transport mechanism transfers a test carrier having multiple untested chips from the flip area to one stack structure in the soaking station.

11. The test device according to claim 10, wherein the transport mechanism transfers a test carrier having multiple tested chips from the transition area to the flip module.

12. The test device according to claim 11, wherein the second region further comprises a transport area, the transport mechanism comprises an XYZ-axis mechanism, and the transport mechanism moves to the flip area through the XYZ-axis mechanism, holds the test carrier having multiple untested chips from the flip module, moves along an X

axis into the transport area, moves along a Y axis in the transport area, moves along the X axis into the transition area, moves along a Z axis to align with storage spaces at different layers, and transfers the test carrier having multiple untested chips to the stack structure.

13. The test device according to claim 12, wherein the transport mechanism moves along the Z axis through the XYZ-axis mechanism to align with the test carrier having multiple tested chips in storage spaces at different layers, moves along the X axis into the transport area, moves along the Y axis in the transport area, moves along the X axis into the flip area, and transfers the test carrier having multiple tested chips to the flip module.

14. The test device according to claim 10, further comprising: a transfer test mechanism arranged on the rack, wherein the second region further comprises a test area, and the transfer test mechanism obtains the test carrier having multiple untested chips from the transition area and transfers the test carrier to the test area.

15. The test device according to claim 14, wherein the transfer test mechanism comprises an XZ-axis mechanism, and the transfer test mechanism moves along the X axis in the transition area through the XZ-axis mechanism, transfers the test carrier having multiple untested chips to the test area, moves along the Z axis, and transfers the test carrier having multiple untested chips to be tested.

16. The test device according to claim 15, wherein the transfer test mechanism moves along the Z axis in the test area through the XZ-axis mechanism whereby the test carrier having multiple tested chips leaves the test area and then moves along the X axis, and the test carrier having multiple tested chips is transferred to the transition area.

17. The test device according to claim 15, wherein the transfer test mechanism has a correction platform provided with a camera unit, and the correction platform detects the position of the test carrier having multiple untested chips through the camera unit, and corrects the position of the test carrier having multiple untested chips on the correction platform by rotating the test carrier having multiple untested chips in an XY-axis direction plane.

18. The test device according to claim 10, wherein the soaking station is provided with

a rotating door, when the rotating door rotates to a first position, the storage space of the stack structure has an opening, and when the rotating door rotates to a second position, the storage space of the stack structure is a closed cavity.

19. The test device according to claim 10, wherein an upper side ~~wall~~ of the test carrier is provided with multiple suction holes for vacuum suction of chips.

20. The test device according to claim 19, comprising: a first air bearing plate, wherein the first air bearing plate is arranged on the flip module, an upper side ~~plate~~ of the first air bearing plate is provided with at least two vacuum holes and at least two rows of air outlets, a bottom side ~~wall~~ of the test carrier is provided with a vacuum input groove in the ~~shape of a strip, the~~ direction along~~of the strip is consistent with~~ a length direction of the test carrier, the vacuum input groove is in fluid exchange~~communication~~ with the multiple suction holes and matches with~~corresponds to~~ the at least two vacuum holes vertically, the at least two rows of air outlets are provided with air bearings, and the test carrier is placed on the air bearing plate and movable on the air bearings.

21. The test device according to claim 20, wherein the first air bearing plate is provided with a push rod for pushing the test carrier to move on the air bearings.

22. The test device according to claim 20, wherein the bottom side ~~wall~~ of the test carrier is provided with a sliding seal disposed around the vacuum input groove.

23. The test device according to claim 21, comprising: a second air bearing plate, wherein the second air bearing plate is arranged on the transport mechanism, the first air bearing plate has the same structure as the second air bearing plate, when the flip module transfers the test carrier having multiple untested chips to the transport area in the flip area, the push rod of the first air bearing plate pushes the test carrier having multiple untested chips to move towards the second air bearing plate to reach the nearest vacuum hole in the second air bearing plate, and at least one vacuum hole in the first air bearing plate and one vacuum hole of the second air bearing plate simultaneously correspond to the vacuum input groove vertically, and both provide vacuum to the vacuum input groove.

24. The test device according to claim 7, wherein the suction mechanism adopts an integral-type suction cup structure for sucking ~~all~~ the multiple untested chips carried by

the first carrier with one suction action, or sucking ~~all~~ the multiple tested chips carried by the transfer tray with one suction action.

25. The test device according to claim 1, comprising: a vibrator arranged on the flip module for providing vibration when flipping the transfer tray and the test carrier.

26. The test device according to claim 7, comprising: a sorter, wherein the second region further comprises a non-defective product area, a defective product area and an under-retest area, and the sorter selects a corresponding type of chips from the second carrier and transfers the chips to the non-defective product area, the defective product area or the under-retest area.

27. The test device according to claim 26, comprising: a tray stack structure arranged on the rack, wherein the tray stack structure is located in the non-defective product area, the defective product area or the under-retest area for stacking multiple trays.

28. The test device according to claim 27, comprising: a tray elevator arranged on the rack, wherein the tray elevator transfers one tray below the tray stack structure in an XY-axis direction and transfers the tray to be stacked in the tray stack structure in a Z-axis direction.

29. The test device according to claim 19, wherein the transport mechanism is provided with a cleaner for blowing air to clean the multiple suction holes.

30. A test method of a test device, comprising:

receiving, by a transfer module, a loading signal, and identifying that a transfer tray is located in a first region;

transferring, by the transfer module, the transfer tray to a second region;

holding, by a flip module, the transfer tray, pressing the transfer tray and a test carrier to each other, and flipping the transfer tray and the test carrier whereby multiple untested chips carried by the transfer tray are ~~all~~ mutually transferred to the test carrier; and

transferring the test carrier having multiple untested chips to be tested.

31. The test method of the test device according to claim 30, wherein after the step of transferring the test carrier having multiple untested chips to be tested, the method comprises:

receiving, by the transfer module, an unloading signal, and identifying that the transfer tray is located in the second region;

holding, by the flip module, the transfer tray, pressing the transfer tray and the test carrier to each other, and flipping the transfer tray and the test carrier whereby multiple tested chips carried by the test carrier are ~~all~~ mutually transferred to the transfer tray; and

transferring, by the transfer module, the transfer tray to the first region.