MULTI-STATION WAFER CLEANING SYSTEM

Technical Field

The present invention belongs to the technical field of wafer cleaning, and specifically relates to a multi-station wafer cleaning system.

Background

Wafers are materials of semiconductor integrated circuits. During the production of the wafers, it is needed to clean the wafers. An existing wafer cleaning device includes a feeding device, a conveying device, and a cleaning device. However, there is no integration between these devices, making it impossible to form an efficient system, and a single cleaning device is unable to clean multiple wafers; and

therefore, it is necessary to provide a wafer cleaning system that can support multiple stations.

Summary

An objective of the present invention is to provide a wafer cleaning system that can support multiple stations.

In order to solve above technical problem, the present invention provides a multi-station wafer cleaning system, which includes: a plurality of feeding devices in which a plurality of laminates are arranged and are configured to erect to-be-cleaned wafer bodies; a transfer device which is arranged on the side of the feeding devices in a sliding mode and includes a transfer manipulator and a transfer workbench, the transfer manipulator being configured to clamp the wafer bodies in the feeding devices to the transfer workbench; a turnover device which is arranged on the side of the transfer device in a sliding mode and includes a turnover manipulator that is configured to turn over the wafer bodies on the transfer workbench; a conveying device which includes a conveying manipulator that is arranged on the side of the transfer unit through a three-axis moving pair; and a plurality of cleaning devices which are arranged on both sides of the conveying device respectively and distributed into four groups, two groups of the cleaning devices being arranged on each side of the conveying device, and each group of the cleaning devices having two stacked cleaning devices.

Preferably, the cleaning devices include cleaning bases, Bernoulli chucks, recovery mechanisms, gas-liquid separation mechanisms, a plurality of collecting covers, and a plurality

of spraying arms; the Bernoulli chucks are arranged on the tops of the cleaning bases, the recovery mechanisms are arranged around the outer sides of the Bernoulli chucks, the gas-liquid separation mechanisms are arranged on the tops of the recovery mechanisms and in communication with the recovery mechanisms, the collecting covers are arranged on the tops of the gas-liquid separation mechanisms in a sliding mode, and the spraying arms are rotatably arranged on the tops of the cleaning bases.

Preferably, each Bernoulli chucks includes a supporting seat which is rotatably arranged, a plurality of supporting posts being rotatably arranged on the top of the supporting seat, clamping posts being eccentrically arranged on the tops of the supporting posts, shifting plates being arranged on sidewalls of the supporting posts, and through shifting notches being formed in the shifting plates; a rotating seat which is coaxially arranged on the top of the supporting seat, shifting posts being arranged on the rotating seat and clamped in the shifting notches all the time; a plurality of elastic structures which are arranged between the bottom of the rotating seat and the top of the supporting seat and are configured to drive the rotating seat to rotate relative to the supporting seat if the supporting seat rotates at a variable speed and to drive the rotating seat to return to an initial position if the supporting seat changes from variable-speed rotation to constant-speed rotation; and an adsorption assembly which is coaxially arranged on the supporting seat.

Preferably, the elastic structures include fixed blocks, spring bodies, and movable blocks; and the fixed blocks are arranged on the top of the supporting seat, the movable blocks are arranged at the bottom of the rotating seat, the spring bodies are arranged between the fixed blocks and the movable blocks, and two ends of the spring body are fixed on sidewalls of the fixed blocks and sidewalls of the movable blocks respectively.

Preferably, a plurality of rotating notches are formed in the sidewall of the rotating seat, and the movable blocks are arranged in the rotating notches; and a plurality of supporting grooves are formed in the top of the supporting seat, the fixed blocks are arranged in the supporting grooves, and the fixed blocks extend into the rotating notches.

Preferably, a plurality of arc-shaped limiting slots are formed in the rotating seat; and a plurality of stroke limiting pins are arranged on the top of the supporting seat, each stroke limiting pin is inserted into the corresponding limiting slot, and axes of the limiting slots are coaxial with a rotating axis of the rotating seat.

Preferably, a plurality of buffering notches are formed in the sidewall of the rotating seat, and dampers are arranged in the buffering notches; damping plates are arranged on the top of the supporting seat; and fixed ends of the dampers are arranged on the sidewalls of the buffering

notches, and movable ends of the dampers are arranged on the damping plates.

Preferably, a plurality of shifting grooves are formed in the top of the supporting seat, and the shifting notches extend above the shifting grooves; connecting blocks are integrally arranged on the sidewall of the rotating seat and extend above the shifting grooves; and shifting blocks are arranged at the bottoms of the connecting blocks, shifting posts are arranged on the tops of the shifting blocks, and the shifting blocks are clamped in the shifting grooves.

Preferably, each adsorption assembly includes a gas outlet plate which is coaxially arranged on the supporting seat, and a plurality of gas outlets are formed in the top of the gas outlet plate; a support plate is arranged above the supporting seat in a covering mode, a plurality of supported holes are formed in the support plate, and a through hole fitting the gas outlet plate is formed in the support plate; and supporting posts penetrate the supported holes.

Preferably, each Bernoulli chuck further includes a base body on which a driving motor is arranged; an output shaft of the driving motor is hollowed out; a gas outlet post is arranged at the bottom of the gas outlet plate, and the gas outlet post is hollowed out and in communication with the gas outlets, and is are inserted into the output shaft of the driving motor; rotating rings are integrally arranged at the bottom of the rotating seat, and the bottoms of the rotating rings are inserted into the output shaft of the driving motor; supporting rings are integrally arranged at the bottom of the supporting seat, the inner walls of the supporting rings are connected to the outer walls of the rotating rings through a bearing, a plurality of clamping cylinders are arranged on the top of the base body, and clamping blocks are arranged on piston rods of the clamping cylinders and can be fitted to the outer walls of the supporting rings; and the base body is erected on the top of each cleaning base.

Preferably, first connecting rings are integrally arranged on the sidewall of the output shaft of the driving motor; second connecting rings are integrally arranged on the inner sidewalls of the rotating rings, the tops of the second connecting rings are fitted to the bottoms of the first connecting rings, and the inner sidewalls of the second connecting rings are fitted the sidewall of the output shaft of the driving motor; magnetic flow grooves are formed in the sidewall of the output shaft of the driving motor and are fitted the inner sidewalls of the second connecting rings; and magnetic fluid is arranged in the magnetic flow grooves.

Preferably, a drawing rod is arranged between the gas outlet post and the output shaft of the driving motor in a sliding mode, the top of the drawing rod is connected to the bottom of the gas outlet plate, and the outer sidewall of the drawing rod is connected to the output shaft of the driving motor through a key slot and a key block; first drawing rings are arranged on the inner wall of the through hole, and the gas outlet plate is clamped in the first drawing rings;

second drawing rings are arranged on the sidewall of the gas outlet plate and are clamped above the first drawing rings; annular sealing grooves are formed in the tops of the first drawing rings, and O-shaped rings are clamped in the sealing grooves; and a detection camera is arranged above the support plate.

Preferably, abutting grooves are formed in the tops of the first drawing rings; and annular abutting rings are arranged at the bottoms of the second drawing rings and are clamped in the abutting grooves.

Preferably, the bottom of the drawing rod extends out of the bottom of the driving motor, drawing blocks are arranged on the sidewall of the drawing rod, and an annular drawing groove is formed in the drawing blocks; a drawing motor is arranged on the base body, an output shaft of the drawing motor is perpendicular to the axis of the drawing rod, an eccentric drawing post is arranged on the output shaft of the drawing motor, and the drawing post is inserted into the drawing groove.

The present invention has the beneficial effects that:

1, by the feeding device, a plurality of to-be-cleaned wafer bodies can be erected and the cleaned wafer bodies can be collected, and in combination with the transfer manipulator, the wafer bodies can be quickly fed and stored;

2, the wafer bodies can be temporarily stored by the transfer workbench, and in combination with the turnover manipulator, the wafer bodies can be turned over to realize double-sided cleaning;

3, by the conveying manipulator, the wafer bodies can be conveyed between the transfer workbench and the cleaning devices; and

4, the cleaning devices are arranged on both sides of the conveying manipulator, which can improve the conveying efficiency of the wafer bodies compared with a mode of arranging on single side, and a plurality of cleaning devices are stacked in each group, which can provide a plurality of stations, thereby improving the cleaning efficiency of the wafer bodies.

Other features and advantages of the present invention will be described in the following description and, and will become partially apparent from the description, or be learned through the embodiments of the present invention.

In order to make the above objectives, features, and advantages of the present invention more apparent and easier to understand, preferred embodiments are provided below for detailed description in cooperation with the accompanying drawings.

Brief Description of the Drawings

In order to more clearly describe the specific embodiments of the present invention or the technical solutions in the prior art, the drawings accompanying in the description of the specific embodiments or prior art will be briefly described below. Obviously, the accompanying drawings described below are some embodiments of the present invention, and those skilled in the art may obtain other drawings based on these accompanying drawings without any inventive effort.

FIG. 1 is a top view of a preferred embodiment of a multi-station wafer cleaning system according to the present invention;

FIG. 2 is a front view of a preferred embodiment of a multi-station wafer cleaning system according to the present invention;

FIG. 3 is a sectional view of a cleaning device according to the present invention;

FIG. 4 is a three-dimensional diagram of a preferred embodiment of a Bernoulli chuck according to the present invention;

FIG. 5 is a three-dimensional diagram of a preferred embodiment of a Bernoulli chuck according to the present invention;

FIG. 6 is a sectional view of a preferred embodiment of a Bernoulli chuck according to the present invention;

FIG. 7 is an enlarged diagram of a part A in FIG. 3;

FIG. 8 is a three-dimensional diagram of a preferred embodiment of a Bernoulli chuck according to the present invention;

FIG. 9 is a schematic structural diagram of a preferred embodiment of a supporting seat and a rotating seat according to the present invention;

FIG. 10 is an enlarged diagram of a part B in FIG. 6;

FIG. 11 is an enlarged diagram of a part C in FIG. 6; and

FIG. 12 is an enlarged diagram of a part D in FIG. 6.

In the figures:

000, wafer body; 001, feeding device; 0021, transfer manipulator; 0022, transfer workbench; 0031, turnover manipulator; 0041, conveying manipulator; 005, cleaning device; 0051, cleaning base; 0052, Bernoulli chuck; 0053, recovery mechanism; 0054, gas-liquid separation mechanism; 0055, collecting cover; 0056, spraying arm;

100, supporting seat; 110, supporting post; 120, clamping post; 130, shifting plate; 131, shifting notch; 140, elastic structure; 141, fixed block; 142, spring body; 143, movable block; 150, supporting groove; 160, stroke limiting pin; 170, damping plate; 180, shifting groove; 190, supporting ring;

200, rotating seat; 210, shifting post; 220, rotating notch; 230, limiting slot; 240, buffering notch; 250, damper; 260, connecting block; 270, shifting block; 280, rotating ring; 281, second connecting ring;

300, gas outlet plate; 310, gas outlet; 320, gas outlet post; 330, drawing rod; 331, drawing block; 332, drawing groove; 340, second drawing ring; 341, abutting ring;

400, support plate; 410, supported hole; 420, first drawing ring; 421, sealing groove; 422, O-shaped ring; 423, abutting groove; 430, through hole;

500, base body; 510, driving motor; 511, first connecting ring; 512, magnetic flow groove; 520, clamping cylinder; 530, clamping block; 540, drawing motor; and 541, drawing post; and

600, detection camera.

Detailed Description

In order to make the objectives, technical solutions, and advantages of the embodiments of the present invention clearer, the technical solutions of the present invention will be described clearly and completely below in conjunction with the accompanying drawings. Obviously, the described embodiments are only part of the embodiments of the present invention, not all of them. Based on the embodiments of the present invention, all other embodiments obtained by those of ordinary skill in the art without creative effort also fall within the protection scope of the present invention.

Embodiment 1

As shown in FIG. 1 to FIG. 12, a multi-station wafer cleaning system provided by this embodiment includes: a plurality of feeding devices 001 in which a plurality of laminates are arranged and are configured to erect to-be-cleaned wafer bodies 000; a transfer device which is arranged on the side of the feeding devices 001 in a sliding manner and includes a transfer manipulator 0021 and a transfer workbench 0022, the transfer manipulator 0021 being configured to clamp the wafer bodies 000 in the feeding devices 001 to the transfer workbench 0022, the feeding devices 001 being configured to erect a plurality of to-be-cleaned wafer bodies 000 and collect the cleaned wafer bodies 000, and in combination with the transfer manipulator 0021, the wafer bodies 000 being rapidly fed and stored;

a turnover device which is arranged on the side of the transfer device in a sliding manner and includes a turnover manipulator 0031 that is configured to turn over the wafer bodies 000 on the transfer workbench 0022, in which, the wafer bodies 000 can be temporarily stored by the transfer workbench 0022, and in combination with the turnover manipulator 0031, the wafer bodies 000 can be turned over to realize double-sided cleaning;

a conveying device which includes a conveying manipulator 0041 that is arranged on the side of the transfer unit through a three-axis sliding pair, the conveying manipulator 0041 being configured to convey the wafer bodies 000 between the transfer workbench 0022 and the cleaning devices 005; and

a plurality of cleaning devices 005 which are arranged on both sides of the conveying device separately and distributed into four groups, two groups of cleaning devices 005 being arranged on each side of the conveying device separately, and each group of the cleaning devices 005 having two stacked cleaning devices 005, in which, the cleaning devices 005 are arranged on both sides of the conveying manipulator 0041, which can improve the conveying efficiency of the wafer bodies 000 compared with a mode of arranging on single side, and a plurality of cleaning devices 005 are stacked in each group, which can provide a plurality of stations, thereby improving the cleaning efficiency of the wafer bodies 000;

further, the working process of the cleaning system provided by the present invention includes: placing the to-be-cleaned wafer bodies 000 in the transfer device; transferring the to-be-cleaned wafer bodies 000 on the transfer workbench 0022 by the transfer manipulator 0021; conveying the to-be-cleaned wafer bodies 000 to the cleaning devices 005 by the conveying manipulator 0041 to clean one side of the to-be-cleaned wafer bodies 000; then conveying the wafer bodies 000 with one side cleaned back to the transfer workbench 0022 by the conveying manipulator 0041; taking out the wafer bodies 000 with one side cleaned from the transfer workbench 0022 by the turnover manipulator 0031, turning over the wafer bodies 000 and then conveying back to the transfer workbench 0022; conveying the wafer bodies 000 back to the cleaning devices 005 by the conveying manipulator 0041 to clean the other side of the wafer bodies 000; then conveying the wafer bodies 000 with double sides cleaned back to the transfer workbench 0022 by the conveying manipulator 0041; and finally, placing back to the feeding device 001 by the transfer manipulator 0021.

The cleaning devices 005 include cleaning bases 0051, Bernoulli chucks, recovery mechanisms 0053, gas-liquid separation mechanisms 0054, a plurality of collecting covers, and a plurality of spraying arms 0056;

the Bernoulli chucks 0052 are arranged on the tops of the cleaning bases 0051, the recovery mechanisms 0053 are arranged around the outer sides of the Bernoulli chucks, the gas-liquid separation mechanisms 0054 are arranged on the tops of the recovery mechanisms 0053 and in communication with the recovery mechanisms 0053, the collecting covers are arranged on the tops of the gas-liquid separation mechanisms 0054 in a sliding mode, and the spraying arms 0056 are rotatably arranged on the tops of the cleaning bases 0051; and the wafer

bodies 000 can be clamped by the Bernoulli chucks 0052, the spraying arms 0056 can spray cleaning media to the wafer bodies 000, the collecting covers 0055 are arranged into a plurality of layers, and the collecting cover 0055 at each layer can independently lift to collect different cleaning media; the gas-liquid separation mechanisms 0054 can be configured to perform gas-liquid separation on the cleaning media collected by the collecting covers 0055; and the recovery mechanisms 0053 can be configured to recover the cleaning media used in wafer cleaning.

Each Bernoulli chuck 0052 includes: a supporting seat 100, a rotating seat 200, a plurality of elastic structures 140, and an adsorption assembly, in which, the supporting seat 100 is rotatably arranged, a plurality of supporting posts 110 are rotatably arranged on the top of the supporting seat 100, clamping posts 120 are eccentrically arranged on the tops of the supporting posts 110, the supporting posts 110 can be rotated to drive the clamping posts 120 to rotate eccentrically so as to clamp and release the wafer bodies 000, and the arrangement positions of the clamping posts 120 are on a connecting line of axes of the supporting posts 110 and the axis of the supporting seat 100 and are at the end close to the axis of the supporting seat 100; shifting plates 130 are arranged on the sidewalls of the supporting posts 110, and through shifting notches 131 are formed in the shifting plates 130; the rotating seat 200 is coaxially arranged on the top of the supporting seat 100, shifting posts 210 are arranged on the rotating seat 200 and are clamped in the shifting notches 131 all the time, the rotating seat 200 can be rotated to drive the shifting posts 210 to rotate, and because the shifting posts 210 are clamped in the shifting notches 131, the shifting plates 130 can be driven to rotate to drive the supporting posts 110 to rotate so as to clamp and release the wafer bodies 000; the plurality of elastic structures 140 are arranged between the bottom of the rotating seat 200 and the top of the supporting seat 100 and are configured to drive the rotating seat 200 to rotate relative to the supporting seat 100 if the supporting seat 100 rotates at a variable speed and to drive the rotating seat 200 to return to an initial position if the supporting seat 100 changes from variable-speed rotation to constant-speed rotation; if the supporting seat 100 rotates at a constant speed, the supporting seat 100 is fixed relative to the rotating seat 200 in position, and at the moment, the wafer bodies 000 are clamped by the clamping posts 120 and can be driven to rotate to be cleaned; if rotating at a variable speed, the supporting seat 100 rotates relative to the rotating seat 200, at the moment, the shifting posts 210 are rotated to drive the shifting plates 130 to rotate so as to drive the supporting posts 110 to rotate to release the wafer bodies 000, and thus the positions of the clamping posts 120 in contact with the wafer bodies 000 can be cleaned, thereby improving the cleaning effect; further, after a short period of variable-speed motion,

the supporting seat 100 performs a constant-speed motion again, accordingly, the rotating seat 200 is returned, and then the sidewalls of the wafer bodies 000 are clamped again; and the adsorption assembly is coaxially arranged on the supporting seat 100 and can effectively adsorb the wafer bodies 000, thus the wafer bodies 000 are prevented from shaking in the axial direction during cleaning, thereby improving the cleaning effect.

The elastic structures 140 include fixed blocks 141, spring bodies 142, and movable blocks 143; the fixed blocks 141 are arranged on the top of the supporting seat 100, the movable blocks 143 are arranged at the bottom of the rotating seat 200, the spring bodies 142 are arranged between the fixed blocks 141 and the movable blocks 143, and two ends of the spring bodies 142 are fixed on the sidewalls of the fixed blocks 141 and the sidewalls of the movable blocks 143 respectively; if the supporting seat 100 rotates at the variable speed, the rotating seat 200 will oppositely rotate, thus the movable blocks 143 can be driven to extrude and rotate the spring bodies 142, and the fixed blocks 141 can abut against the spring bodies 142; and if the supporting seat 100 rotates at the constant speed, the spring bodies 142 rebound to return the movable blocks 143, so as to return the rotating seat 200.

A plurality of rotating notches 220 are formed in the sidewall of the rotating seat 200, and the movable blocks 143 are arranged in the rotating notches 220; a plurality of supporting grooves 150 are formed in the top of the supporting seat 100, and the fixed blocks 141 are arranged in the supporting grooves 150 and extend into the rotating notches 220; the fixed blocks 141 can be stably erected by the supporting grooves 150, and vertical spaces for mounting the fixed blocks 141 can be reduced; and the rotating notches 220 have spaces for the movable blocks 143 to rotate.

A plurality of arc-shaped limiting slots 230 are formed in the rotating seat 200; a plurality of stroke limiting pins 160 are arranged on the top of the supporting seat 100, each stroke limiting pin 160 is inserted into the corresponding limiting slot 230, and axes of the limiting slots 230 are coaxial with the rotating axis of the rotating seat 200; the limiting pins slide in the limiting slots 230 and can limit the stroke of the rotating seat 200, thereby preventing the rotating seat 200 from excessively rotating to affect the operation;

a plurality of buffering notches 240 are formed in the sidewall of the rotating seat 200, and dampers 250 are arranged in the buffering notches 240; damping plates 170 are arranged on the top of the supporting seat 100, fixed ends of the dampers 250 are arranged on the sidewalls of the buffering notches 240, and movable ends of the dampers 250 are arranged on the damping plates 170; the dampers 250 can be stably erected by the buffering notches 240; the damping plates 170 can abut against the dampers 250 in motion; the rotating seat 200 can

be rotated and return stably by the dampers 250;

a plurality of shifting grooves 180 are formed in the top of the supporting seat 100, and the shifting notches 131 extend above the shifting grooves 180; connecting blocks 260 are integrally arranged on the sidewall of the rotating seat 200 and extend above the shifting grooves 180; shifting blocks 270 are arranged at the bottoms of the connecting blocks 260, the shifting posts 210 are arranged on the tops of the shifting blocks 270, and the shifting blocks 270 are clamped in the shifting grooves 180; the connecting blocks 260 and the shifting blocks 270 are connected by bolts; the rotating seat 200 can be rotated to drive the connecting blocks 260 to rotate, the connecting blocks 260 in rotating drive the shifting blocks 270 to rotate, and the shifting blocks 270 in rotating drive the shifting posts 210 to rotate so as to drive the clamping posts 120 to eccentrically to clamp and release the wafer bodies 000;

each adsorption assembly includes a gas outlet plate 300 which is coaxially arranged on the supporting seat 100, a plurality of gas outlets 310 are formed in the top of the gas outlet plate 300, and gas for adsorbing the wafer bodies 000 can be sprayed through the gas outlets 310; a negative pressure area is formed below the wafer bodies 000 according to a Bernoulli principle, thus the wafer bodies 000 can be adsorbed to the top of the gas outlet plate 300; the sprayed gas can be nitrogen; a support plate 400 is arranged above the supporting seat 100 in a covering mode; a plurality of supported holes 410 are formed in the support plate 400; a through hole 430 fitting the gas outlet plate 300 is formed in the support plate 400; and supporting posts 110 penetrate the supported holes 410, thus the supporting post 110 can be fitted to the sidewalls of the wafer bodies 000 to assist in clamping the wafer bodies 000.

Each Bernoulli chuck 0052 further includes a base body 500; a driving motor 510 is arranged on the base body 500, and an output shaft of the driving motor 510 is hollowed out; a gas outlet post 320 is arranged at the bottom of the gas outlet plate 300, and the gas outlet post 320 is hollowed out and in communication with the gas outlets 310 and is inserted into the output shaft of the driving motor 510; the gas for adsorbing the wafer bodies 000 is charged into the gas outlet post 320; the gas outlet post 320 is hollowed out, so the gas can be conveyed to the gas outlets 310, and the gas is discharged through the gas outlets 310 to adsorb the wafer bodies 000; rotating rings 280 are integrally arranged at the bottom of the rotating seat 200, and the bottoms of the rotating rings 280 are inserted into the output shaft of the driving motor 510; supporting rings 190 are integrally arranged at the bottom of the supporting seat 100, and inner walls of the supporting rings 190 are connected to the outer walls of the rotating rings 280 by a bearing; a plurality of clamping cylinders 520 are arranged on the top of the base body 500, and clamping blocks 530 are arranged on piston rods of the clamping cylinders 520 and

can be fitted to the outer walls of the supporting rings 190; if it is needed to clean the wafer bodies 000, the clamping blocks 530 are driven by the clamping cylinders 520 to clamp the supporting rings 190, thereby preventing the supporting rings 190 from rotating; the rotating seat 200 is driven by the driving motor 510 to rotate so as to drive the clamping posts 120 to eccentrically rotate to place the wafer bodies 000 on the top of the support plate 400; then the gas is charged into the gas outlet post 320 to adsorb the wafer bodies 000 on the Bernoulli chuck 0052 provided by the present invention; then the piston rods are released by the clamping cylinders 520, the clamping posts 120 eccentrically rotate to clamp the wafer bodies 000, and the driving motor 510 rotates to drive the wafer bodies 000 to rotate to be cleaned; the base body 500 is erected on the top of each cleaning base 0051, and thus the Bernoulli chuck 0052 can be erected.

First connecting rings 511 are integrally arranged on the sidewall of the output shaft of the driving motor 510; second connecting rings 281 are integrally arranged on the inner sidewalls of the rotating rings 280, the tops of the second connecting rings 281 are fitted to the bottoms of the first connecting rings 511, and the inner sidewalls of the second connecting rings 281 are fitted to the sidewall of the output shaft of the driving motor 510; magnetic flow grooves 512 are formed in the sidewall of the output shaft of the driving motor 510 and are fitted to the inner sidewalls of the second connecting rings 281, and magnetic fluid is arranged in the magnetic flow grooves 512; the magnetic flow grooves 512 can provide a good operation environment for the magnetic fluid; due to the magnetic field, an annular space is filled with the magnetic fluid, and a series of sealing rings will established, thus the sealing effect is achieved, and metal particles generated by abrasion of the output shaft of the driving motor 510 during operation can be prevented from moving to the wafer bodies 000 through mounting gaps.

A drawing rod 330 is arranged between the gas outlet post 320 and the output shaft of the driving motor 510 in a sliding mode, the top of the drawing rod 330 is connected to the bottom of the gas outlet plate 300, and the outer sidewall of the drawing rod 330 is connected to the output shaft of the driving motor 510 through a key groove and a key block; first drawing rings 420 are arranged on the inner wall of the through hole 430, and the gas outlet plate 300 is clamped in the first drawing rings 420; second drawing rings 340 are arranged on the sidewall of the gas outlet plate 300 and are clamped above the first drawing rings 420; annular sealing grooves 421 are formed in the tops of the first drawing rings 420, O-shaped rings 422 are clamped in the sealing grooves 421, and a detection camera 600 is arranged above the support plate 400; if the output shaft of the driving motor 510 rotates, the drawing rod 330 can be driven

to rotate by the key groove and the key block, and the drawing rod 330 in rotating can drive the gas outlet plate 300 to rotate; the O-shaped rings 422 can prevent gas leakage, thus gas can be discharged at the most efficiency by the gas outlet plate 300 to adsorb the wafer bodies 000, thereby improving the efficiency of operation; further, the detection camera 600 can be configured to detect whether the wafer bodies 000 are broken during the cleaning process; if it is detected by the camera that the wafer bodies 000 are broken, the driving motor 510 will stop rotating, and the gas outlet plate 300 is driven by the drawing rod 330 to be pulled downwards, thus the O-shaped rings 422 are compressed by the second drawing rings 340, and the cleaning medium can be prevented from flowing into the driving motor 510 through the mounting gaps;

annular abutting grooves 423 are formed in the tops of the first drawing rings 420; annular abutting rings 341 are arranged at the bottoms of the second drawing rings 340 and are clamped in the abutting grooves 423; and the abutting rings 341 can be stably supported by the abutting grooves 423, thus the gas outlet plate 300 can be stably clamped in the support plate 400, and a sealing labyrinth can be formed, which can further prevent the cleaning medium from flowing inside.

The bottom of the drawing rod 330 extends out of the bottom of the driving motor 510, drawing blocks 331 are arranged on the sidewall of the drawing rod 330, and an annular drawing groove 332 is formed in the drawing blocks 331; a drawing motor 540 is arranged on the base body 500, and an output shaft of the drawing motor 540 is perpendicular to the axis of the drawing rod 330; an eccentric drawing post 541 is arranged on the output shaft of the drawing motor 540 and is inserted into the drawing groove 332; the output shaft of the drawing motor 540 rotates to drive the drawing post 541 to rotate eccentrically, the drawing post 541 in eccentric rotating can drive the drawing blocks 331 to slide up and down, and drawing blocks 331 in sliding up and down can drive the drawing rod 330 to slide up and down. The output shaft of the drawing motor 540 is perpendicular to the drawing rod 330 (namely the drawing motor 540 is horizontally arranged), so that the vertical height of a driving device of the drawing rod 330 can be reduced.

In addition, a use method for a Bernoulli chuck 0052 provided by the present invention includes:

firstly, clamping the supporting seat 100 with the clamping cylinders 520, and driving the rotating seat 200 by the driving motor 510 to rotate relative to the supporting seat 100 so as to drive the clamping posts 120 to rotate eccentrically to place the wafer bodies 000 on the top of the support plate 400; secondly, releasing the supporting rings 190 by the clamping cylinders 520, returning the rotating seat 200 by the rebounding of the spring body 142, and eccentrically

rotating the clamping posts 120 to clamp the wafer bodies 000; thirdly, starting to blow out shielding gas through the gas outlets 310 to draw the wafer bodies 000; fourthly, driving the rotating seat 200 by the driving motor 510 to rotate so as to start to clean the wafer bodies 000; fifthly, periodically accelerating and decelerating the driving motor 510 during cleaning to drive the clamping posts 120 to eccentrically rotate to release the wafer bodies 000 so as to make the cleaning medium contact with the positions, abutted by the clamping posts 120, of the sidewall of the wafer bodies 000, and after periodic acceleration and deceleration, keeping the rotating speed of the driving motor 510 constant, and returning the clamping posts 120 to clamp the wafer bodies 000; and sixthly, after cleaning, clamping the supporting seat 100 with the clamping cylinders, driving the rotating seat 200 by the driving motor 510 to rotate so as to drive the clamping posts 120 to rotate eccentrically to release the wafer bodies 000, and then taking out the wafer bodies 000.

Each device (components with specific structures not described) in the present invention is a standard component or component known to those skilled in the art, and its structure and principle can be obtained by those skilled in the art through technical manuals or conventional experimental methods. Furthermore, software programs involved in the present invention are all obtained in the prior art, and there are no any improvements to the software programs in the present invention.

In the description of the embodiments of the present invention, unless otherwise explicitly specified and limited, the terms “mount”, “linkage”, and “connection” should be understood in a broad sense. For example, they may refer to fixed connection, detachable connection, or integral connection; they may refer to mechanical connection or electrical connection; they may refer to direct linkage, or indirect linkage through an intermediate medium, or communication between two components. For those of ordinary skill in the art, the specific meaning of these terms in the context of the present invention can be understood according to the specific situation.

In the description of the present invention, it is to be noted that the terms “center”, “upper”, “lower”, “left”, “right”, “vertical”, “horizontal”, “inner”, “outer” and the like that indicate orientation or positional relationships are based on the orientation or positional relationships shown in the accompanying drawings, and are only used for the convenience of describing the present invention and simplifying the description. They do not indicate or imply that the apparatuses or components must have a specific orientation or be constructed and operated in a specific orientation, and therefore should not be construed as limiting the present invention. In addition, the terms “first”, “second”, and “third” are used solely for descriptive purposes and

should not be understood as indicating or implying relative importance.

In some embodiments provided in the present invention, it is to be understood that the disclosed systems, apparatuses, and methods can be implemented in other ways. The apparatus embodiments described above are merely illustrative. For example, the division of units is only a logical functional division, and alternative divisions may be used in actual implementation. For another example, a plurality of units or components may be combined or integrated into another system, or some features may be omitted or not executed. Another point is that the coupling or direct coupling or communication connection shown or discussed may be implemented through some communication interfaces, and indirect coupling or communication connection between the apparatuses or units may be implemented in electrical, mechanical, or of other forms.

The unit described as a separate component may or may not be physically separated, and the component displayed as a unit may or may not be a physical unit, meaning it can be located in one place or distributed across a plurality of network units. According to actual needs, some or all of the units can be selected to achieve the objectives of solution of the embodiment.

In addition, all functional units in each embodiment of the present invention may be integrated into a single processing unit, or provided as separate physical units, or two or more units are integrated into one unit.

Based on the ideal embodiment of the present invention described above, relevant personnel can make various changes and modifications without departing from the scope of the technical concept of the present invention. The technical scope of the present invention is not limited to the content in the description and must be determined according to the scope of the claims.

Claims

1. A multi-station wafer cleaning system, comprising:

a plurality of feeding devices (001) in which a plurality of laminates are arranged and configured to erect to-be-cleaned wafer bodies (000);

a transfer device which is arranged on the side of the feeding devices (001) in a sliding mode and comprises a transfer manipulator (0021) and a transfer workbench (0022), the transfer manipulator (0021) being configured to clamp the wafer bodies (000) in the feeding devices (001) to the transfer workbench (0022);

a turnover device which is arranged on the side of the transfer device in a sliding mode and comprises a turnover manipulator (0031) that is configured to turn over the wafer bodies (000) on the transfer workbench (0022);

a conveying device which comprises a conveying manipulator (0041) that is arranged on the side of the transfer unit through a three-axis moving pair; and

a plurality of cleaning devices (005) which are arranged on both sides of the conveying device respectively and are distributed into four groups, two groups of the cleaning devices (005) being arranged on each side of the conveying device, and each group (005) of the cleaning devices having two stacked cleaning devices (005).

2. The multi-station wafer cleaning system according to claim 1, wherein

the cleaning devices (005) comprise cleaning bases (0051), Bernoulli chucks (0052), recovery mechanisms (0053), gas-liquid separation mechanisms (0054), a plurality of collecting covers (0055), and a plurality of spraying arms (0056);

the Bernoulli chucks (0052) are arranged on the tops of the cleaning bases (0051), the recovery mechanisms (0053) are arranged around the outer sides of the Bernoulli chucks (0052), the gas-liquid separation mechanisms (0054) are arranged on the tops of the recovery mechanisms (0053) and in communication with the recovery mechanisms (0053), the collecting covers (0055) are arranged on the tops of the gas-liquid separation mechanisms (0054) in a sliding mode, and the spraying arms (0056) are rotatably arranged on the tops of the cleaning bases (0051).

3. The multi-station wafer cleaning system according to claim 2, wherein

each Bernoulli chuck (0052) comprises a supporting seat (100) which is rotatably arranged, a plurality of supporting posts (110) being rotatably arranged on the top of the supporting seat (100), clamping posts (120) being eccentrically arranged on the tops of the supporting posts (110), shifting plates (130) being arranged on sidewalls of the supporting posts

(110), and through shifting notches (131) being formed in the shifting plates (130);

a rotating seat (200) which is coaxially arranged on the top of the supporting seat (100), shifting posts (210) being arranged on the rotating seat (200) and clamped in the shifting notches (131) all the time;

a plurality of elastic structures (140) which are arranged between the bottom of the rotating seat (200) and the top of the supporting seat (100) and are configured to

drive the rotating seat (200) to rotate relative to the supporting seat (100) if the supporting seat (100) rotates at a variable speed, and

drive the rotating seat (200) to return to an initial position if the supporting seat (100) changes from variable-speed rotation to constant-speed rotation; and

an adsorption assembly which is coaxially arranged on the supporting seat (100).

4. The multi-station wafer cleaning system according to claim 3, wherein

the elastic structures (140) comprise fixed blocks (141), spring bodies (142), and movable blocks (143);

the fixed blocks (141) are arranged on the top of the supporting seat (100), the movable blocks (143) are arranged at the bottom of the rotating seat (200), the spring bodies (142) are arranged between the fixed blocks (141) and the movable blocks (143), and two ends of the spring bodies (142) are fixed on sidewalls of the fixed blocks (141) and sidewalls of the movable blocks (143) respectively.

5. The multi-station wafer cleaning system according to claim 4, wherein

a plurality of rotating notches (220) are formed in the sidewall of the rotating seat (200), and the movable blocks (143) are arranged in the rotating notches (220); and

a plurality of supporting grooves (150) are formed in the top of the supporting seat (100), the fixed blocks (141) are arranged in the supporting grooves (150), and

the fixed blocks (141) extend into the rotating notches (220).

6. The multi-station wafer cleaning system according to claim 5, wherein

a plurality of arc-shaped limiting slots (230) are formed in the rotating seat (200); and

a plurality of stroke limiting pins (160) are arranged on the top of the supporting seat (100), each stroke limiting pin (160) is inserted into the corresponding limiting slot (230), and

axes of the limiting slots (230) are coaxial with a rotating axis of the rotating seat (200).

7. The multi-station wafer cleaning system according to claim 6, wherein

a plurality of buffering notches (240) are formed in the sidewall of the rotating seat (200), and dampers (250) are arranged in the buffering notches (240);

damping plates (170) are arranged on the top of the supporting seat (100); and

fixed ends of the dampers (250) are arranged on the sidewalls of the buffering notches (240), and movable ends of the dampers (250) are arranged on the damping plates (170).

8. The multi-station wafer cleaning system according to claim 7, wherein

a plurality of shifting grooves (180) are formed in the top of the supporting seat (100), and the shifting notches (131) extend above the shifting grooves (180);

connecting blocks (260) are integrally arranged on the sidewall of the rotating seat (200) and extend above the shifting grooves (180); shifting blocks (270) are arranged at the bottoms of the connecting blocks (260), and the shifting posts (210) are arranged on the tops of the shifting blocks (270); and

the shifting blocks (270) are clamped in the shifting grooves (180).

9. The multi-station wafer cleaning system according to claim 8, wherein

each adsorption assembly comprises a gas outlet plate (300) which is coaxially arranged on the supporting seat (100), and a plurality of gas outlets (310) are formed in the top of the gas outlet plate (300);

a support plate (400) is arranged above the supporting seat (100) in a covering mode, a plurality of supported holes (410) are formed in the support plate (400), and a through hole (430) fitting the gas outlet plate (300) is formed in the support plate (400); and

the supporting posts (110) penetrate the supported holes (410).

10. The multi-station wafer cleaning system according to claim 9, wherein

each Bernoulli chuck further comprises a base body (500) on which a driving motor (510) is arranged, wherein an output shaft of the driving motor (510) is hollowed out; a gas outlet post (320) is arranged at the bottom of the gas outlet plate (300), and the gas outlet post (320) is hollowed out and in communication with the gas outlets (310) and is inserted into the output shaft of the driving motor (510);

rotating rings (280) are integrally arranged at the bottom of the rotating seat (200), and the bottoms of the rotating rings (280) are inserted into the output shaft of the driving motor (510);

supporting rings (190) are integrally arranged at the bottom of the supporting seat (100), inner walls of the supporting rings (190) are connected to outer walls of the rotating rings (280) through a bearing;

a plurality of clamping cylinders (520) are arranged on the top of the base body (500), and clamping blocks (530) are arranged on piston rods of the clamping cylinders (520) and can be fitted to the outer walls of the supporting rings (190);

the base body (500) is erected on the top of each cleaning base (0051).

11. The multi-station wafer cleaning system according to claim 10, wherein

first connecting rings (511) are integrally arranged on the sidewall of the output shaft of the driving motor (510);

second connecting rings (281) are integrally arranged on the inner sidewalls of the rotating rings (280), the tops of the second connecting rings (281) are fitted to the bottoms of the first connecting rings (511), the inner sidewalls of the second connecting rings (281) are fitted to the sidewall of the output shaft of the driving motor (510); and

magnetic flow grooves (512) are formed in the sidewall of the output shaft of the driving motor (510) and are fitted to the inner sidewalls of the second connecting rings (281), and magnetic fluid is arranged in the magnetic flow grooves (512).

12. The multi-station wafer cleaning system according to claim 11, wherein

a drawing rod (330) is arranged between the gas outlet post (320) and the output shaft of the driving motor (510) in a sliding mode, the top of the drawing rod (330) is connected to the bottom of the gas outlet plate (300), and the outer sidewall of the drawing rod (330) is connected to the output shaft of the driving motor (510) through a key slot and a key block;

first drawing rings (420) are arranged on the inner wall of the through hole (430), and the gas outlet plate (300) is clamped in the first drawing rings (420); second drawing rings (340) are arranged on the sidewall of the gas outlet plate (300) and are clamped above the first drawing rings (420);

annular sealing grooves (421) are formed in the tops of the first drawing rings (420), and O-shaped rings (422) are clamped in the sealing grooves (421); and

a detection camera (600) is arranged above the support plate (400).

13. The multi-station wafer cleaning system according to claim 12, wherein

annular abutting grooves (423) are formed in the tops of the first drawing rings (420);

annular abutting rings (341) are arranged at the bottoms of the second drawing rings (340); and

the abutting rings (341) are clamped in the abutting grooves (423).

14. The multi-station wafer cleaning system according to claim 13, wherein

the bottom of the drawing rod (330) extends out of the bottom of the driving motor (510), drawing blocks (331) are arranged on the sidewall of the drawing rod (330), and an annular drawing groove (332) is formed in the drawing blocks (331); a drawing motor (540) is arranged on the base body (500), an output shaft of the drawing motor (540) is perpendicular to an axis of the drawing rod (330), an eccentric drawing post (541) is arranged on the output shaft of the drawing motor (540), and the drawing post (541) is inserted into the drawing groove (332).