

NOZZLE SWING MECHANISM FOR CLEANING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates to a nozzle swing mechanism used
5 in a cleaning machine, and in particular to a mechanism that drives the
nozzles to perform reciprocating cleaning through a transmission
mechanism, thereby improving the cleaning quality of a preset plate and
setting the optimal cleaning time.

2. Description of the Related Art:

10 With the advancement of technology today, commonly used
electronic products and electronic devices such as smartphones, tablets,
and laptops are widely used, which has promoted the progress of related
industries such as semiconductors and circuit boards. There are also
many types of chemical substances used in the production of those
15 semiconductors and circuit boards. Therefore, it is easier for chemical
agents and solvents to remain on semiconductor boards, and these
agents and solvents will not only cause environmental pollution, but
also affect the yield rate of the finished products of these
semiconductors and circuit boards.

20 In the current process of cleaning the semiconductors and
circuit boards, a large number of water injection nozzles are often
required to clean the semiconductors and circuit boards, and nozzles in
a fixed position are more likely to have angles that cannot be cleaned.
Furthermore, with the changes in the types and sizes of semiconductors
25 and circuit boards, existing cleaning machines are unable to customize

the cleaning process and time at any time, which is the key point that those working in this industry are eager to study and improve.

SUMMARY OF THE INVENTION

Therefore, in view of the above problems and deficiencies, the
5 inventor collected relevant information, evaluated and considered various aspects, and used his many years of experience in this industry to continuously try and modify, and finally designed this nozzle swing mechanism for cleaning machine, which resulted in the birth of the present invention.

10 The main object of the present invention is that the nozzle swing mechanism for cleaning machine comprises a machine base, a conveying device, a cleaning device and an air knife assembly. The machine base comprises a cleaning area and a dewatering area in sequence. The conveying device comprises a feeding portion disposed
15 on one side of the cleaning area for conveying a preset plate, a discharging portion disposed on one side of the dewatering area, a power device and a plurality of conveying wheels driven by the power device. The cleaning device is disposed in the cleaning area, comprising a linkage device, a plurality of nozzles, a connection device, and a
20 transmission mechanism. The linkage device comprises a plurality of connection portions located above the conveying device and respectively connected with the nozzles, and a mounting mechanism located at at least one side of the connection portions. The mounting mechanism comprises a coupling portion protrudingly provided on one
25 side thereof for the assembly of the transmission mechanism. The air

knife assembly is located in the dewatering area, comprising a plurality of air knives disposed on the upper side of the conveying device. By reciprocating the nozzles, the same part of the preset plate is cleaned multiple times, thereby achieving the effect of using fewer nozzles to
5 clean the preset plate multiple times and saving the cost of installing more nozzles.

Another object of the present invention is that the conveying device each comprise a conveying portion for conveying a preset plate, and two rotating portions respectively located at two opposite sides of
10 the conveying portion; the power device is connected to at least one rotating portion of at least one conveying wheel through at least one first shaft to control the reciprocating rotation of the conveying wheel; each of the conveying wheels is equipped with at least two second axles on the rotating portion on one side away from the power device for
15 driving each other to rotate. This allows the same part of the preset plate to be cleaned multiple times.

Still another object of the present invention is that each air knife comprises a receiving space inside for accommodating pressurized gas supplied by a preset air pressurizing device, an air distribution plate
20 used to block the pressurized gas and to evenly distribute the pressurized gas, an air knife head with an air knife opening extended downward from a bottom side thereof, and at least one fastener disposed on the air knife head. The air volume is evenly adjusted by the air distribution plate, and the air volume blown out by the air knife opening
25 is adjusted in coordination with the locking of the fastener, so as to

achieve the effect of formulating the best water removal performance.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of the nozzle swing mechanism for cleaning machine according to the present invention.

5 FIG. 2 is a side view of the nozzle swing mechanism for cleaning machine according to the present invention.

FIGS. 3 is three different side views from different angles of the transmission mechanism of the nozzle swing mechanism for cleaning machine according to the present invention.

10 FIGS. 4 is three different schematic diagrams of the connection device of the nozzle swing mechanism for cleaning machine of the present invention.

FIGS. 5 is three different schematic diagrams of the linkage device of the nozzle swing mechanism for cleaning machine of the present invention.

15 FIG. 6 is a schematic diagram of the nozzle swing mechanism for cleaning machine of the present invention before the nozzles move.

FIG. 7 is a schematic diagram of the nozzle swing mechanism for cleaning machine of the present invention after the nozzles move.

20 FIG. 8 is a sectional top view of the nozzle swing mechanism for cleaning machine of the present invention.

FIGS. 9 is three different schematic diagrams of the air knife of the nozzle swing mechanism for cleaning machine of the present invention.

25 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Please refer to FIGS. 1-5, and FIGS. 8-9, which are front view of the nozzle swing mechanism, side view of the nozzle swing mechanism, three different side views from different angles of the transmission mechanism of the nozzle swing mechanism, three different
5 schematic diagrams of the connection device of the nozzle swing mechanism, three different schematic diagrams of the linkage device of the nozzle swing mechanism, sectional top view of the nozzle swing mechanism and three different schematic diagrams of the air knife of the nozzle swing mechanism of the present invention. The nozzle swing
10 mechanism for cleaning machine of the present invention mainly comprises a machine base **1**, a conveying device **2**, a cleaning device **3** and an air knife assembly **4**, and the connection relationship between the aforementioned components is as follows:

The machine base **1** comprises a cleaning area **11** and a
15 dewatering area **12** in sequence, and the conveying device **2** with reciprocating transport is installed in the machine base **1**.

The conveying device **2** comprises a feeding portion **21** located on one side of the cleaning area **11**, a discharging portion **22** located on one side of the dewatering area **12**, a power device **23**, and a plurality of
20 conveying wheels **24** driven by the power device **23**.

The cleaning device **3** is disposed in the cleaning area **11**. The cleaning device **3** comprises a linkage device **31**, a plurality of nozzles **32**, a connection device **33**, and a transmission mechanism **34**. The linkage device **31** comprises a plurality of connection portions **311**
25 located above the conveying device **2** and respectively connected with

the nozzles **32**, and a mounting mechanism **312** located at at least one side of the connection portions **311**. The mounting mechanism **312** comprises a baffle **3121** connected to the connection portions **311**, a main body **3122** protrudingly provided on the baffle **3121** on the other side of the connection portions **311**, and a coupling portion **3123** protrudingly provided on one side of the main body **3122** for the assembly of the connection device **33** and the transmission mechanism **34**. The connection device **33** comprises a plurality of protrusions **331** respectively connected to the coupling portions **3123**, and the coupling portion **3123** can be further fixed by a screw member **3124**. A top plate **332** is bent and extended at the top of the connection device **33** and is located above the transmission mechanism **34**. The transmission mechanism **34** has transmission connection portions **341** assembled on the connection device **33**.

Furthermore, the nozzles **32** are provided on the lower side of the conveying device **2** for cleaning the upper and lower sides.

The air knife assembly **4** is disposed in the dewatering area **12**. The air knife assembly **4** comprises a plurality of air knives **41** disposed above the conveying device **2**. Each air knife **41** has a receiving space **410** for receiving pressurized gas supplied by a preset air pressurizing device (not shown in the figures). Each air knife **41** is provided with an air distribution plate **42** to block the flow of the pressurized gas and to evenly distribute the pressurized gas. Each air knife **41** extends downward to have an air knife head **411** with an air knife opening **4110**, and at least one fastener **43** is provided on the air knife head **411**.

The conveying wheels **24** of the conveying device **2** each comprise a conveying portion **241** for conveying a preset plate **5** (such as a semiconductor, a circuit board, etc.), and two rotating portions **242** respectively located at the two sides of the conveying portion **241**. At least two first axles **25** are provided between the power device **23** and the conveying wheels **24**. Each of the first axles **25** has a first shaft **251** connected to the power device **23** and at least one rotating portion **242**. A first connecting member **252** (such as a belt, etc.) is connected between each two adjacent first axles **25** to drive the first axles **25** to rotate with each other. Each of the conveying wheels **24** is assembled with at least two second axles **26** on the rotating portion **242** on the side away from the power device **23**, and the second axles **26** are driven to rotate with each other through at least one second connecting member **261** (such as a belt, etc.). The power device **23** mentioned above can be a motor.

In addition, the two sides of the mounting mechanism **312** are each equipped with a sensing device **35** for detecting the swinging direction of the mounting mechanism **312**, and the sensing devices **35** are used to control the transmission mechanism **34** to move forward and backward.

Furthermore, the transmission mechanism **34** can be a pneumatic cylinder, a hydraulic cylinder, or a push rod that combines pneumatic, hydraulic, and electric functions. Such simple and equal changes and modifications do not limit the scope of protection of the present invention and are intended to be explained.

Please refer to FIGS. 1, 2, 6 and 7, which are front view of the nozzle swing mechanism, side view of the nozzle swing mechanism, schematic diagram of the nozzle swing mechanism before the nozzles move and schematic diagram of the nozzle swing mechanism after the nozzles move. As can be clearly seen from the figures, in actual application of the present invention, the preset plate 5 is first fed into the feeding portion 21 of the conveying device 2, and the preset plate 5 is moved toward the discharging portion 22 via the conveying wheels 24. When the preset plate 5 is transported into the cleaning area 11, the nozzles 32 of the cleaning device 3 are connected to a preset pump (not shown) to transport the pressurized cleaning liquid, so that the nozzles 32 perform high-pressure cleaning on the preset plate 5. The nozzles 32 located above the conveying device 2 are moved forward and backward through the transmission mechanism 34, thereby performing multiple high-pressure cleaning on the moving preset plate 5. Moreover, the nozzles 32 moving forward and backward can clean dirt from more angles. When the preset plate 5 reaches the output side of the cleaning area 11, the conveying wheels 24 rotate in the opposite direction through the rotation of the power device 23, thereby moving the preset plate 5 toward the feeding portion 21, so that the cleaning device 3 can continue to perform the cleaning action. When the preset plate 5 reaches the input side of the cleaning area 11, the conveying wheels 24 are rotated in opposite direction by the rotation of the power device 23, so that the preset plate 5 moves toward the discharging portion 22, so as to achieve the purpose of repeatedly cleaning the dirt attached to the preset

plate 5. Therefore, the preset plate 5 can be cleaned multiple times with fewer nozzles 32, and the cost of installing more nozzles 32 can be saved. Furthermore, by being able to individually set the transmission frequency of the transmission mechanism 34 and the reciprocating speed 5 per minute of the power device 23, the effect of establishing the optimal cleaning time is achieved.

Furthermore, after the preset plate 5 is cleaned, the preset plate 5 enters the dewatering area 12, and the air knives 41 of the air knife assembly 4 spray the pressurized gas onto the surface of the preset plate 10 5 through the preset air pressurizing device, thereby removing the cleaning liquid attached to the preset plate 5. The air distribution plate 42 disposed inside each air knife 41 can block the gas that is pressurized by the preset air pressurizing device from being sprayed into the receiving space 410, and allow the gas to flow along the surface of the 15 air distribution plate 42. The internal pressure of the gas cannot be released directly. After the gas is equalized here, it flows out and is released along the gap between the air distribution plate 42 and the inner wall of the air knife 41, achieving the effect of uniform spraying of the gas. The air knife head 411 can adjust the size of the air knife 20 opening 4110 by adjusting the looseness or tightness of the fastener 43, thereby achieving the effect of controlling the air flow volume of the respective air knife 41. After being blown by the air knives 41, the preset plates 5 are transported to the discharging portion 22 along the conveying wheels 24 for collection. The purpose of controlling the 25 blowing and water removal efficiency in accordance with the material of

each preset plate 5 is achieved by adjusting the air volume.

Please refer to FIG. 8, is a sectional top view of the nozzle swing mechanism for cleaning machine of the present invention. It can be clearly seen from the figure that the present invention transports the preset plate 5 through the conveying wheels 24 of the conveying device 2, and each of the conveying wheels 24 is connected to the adjacent conveying wheels 24 through the second axles 26 assembled on the two opposite rotating portions 242 to drive them to rotate. In a preferred embodiment of the present invention, the conveying wheels 24 can be connected by couplings 27 to be arranged side by side, so as to achieve the purpose of transporting more preset plates 5 at the same time.

The spraying range of the nozzles can be set according to the needs, and the transmission mechanism on the cleaning device can further set the forward and backward pushing distance and the number of reciprocating swings per minute, and the number of nozzles installed and the distance between them can also be further set.

Furthermore, the detailed operating principle of the above-mentioned nozzle swing is that the spraying range of the nozzles 32 is set to 400mm, and the nozzles 32 are matched with the transmission mechanism 34 to move forward and backward by 25mm respectively, so that the spraying range of the nozzles 32 is 450mm in total, and the transmission mechanism 34 can reciprocate 60 times per minute (adjustable); the number of nozzles 32 is set to 8 and the interval between them is 50mm; the conveying wheels 24 below can transport 25mm forward and backward and can reciprocate 10 times in 1 minute,

and the transport speed is 2M/1min; the length of the preset plate 5 to be transported is set to 500mm. Based on this, the cleaning time is estimated to be 30 seconds. The preset plate 5 takes 15 seconds to enter and leave. Therefore, the cleaning time of the preset plate 5 is 15
5 seconds, the nozzles 32 reciprocate 15 times, and the conveying wheels 24 reciprocate 2.5 times. The distance between the nozzles 32 is 50mm so that the nozzles 32 can reach the front and back positions of the nozzles 32 after reciprocating. The same position will be cleaned through three nozzles. The number of times the same position is cleaned
10 is (the number of times the nozzles 32 reciprocate $\times 2$) $\times$ (the number of times the conveying wheels 24 reciprocate $\times 2$), the number of times the same position is cleaned is $(15 \times 2) \times (2.5 \times 2) \times 3 = 30 \times 5 = 150 +$ (the number of times the 8 nozzles 32 are cleaned is 8) $= 158$ times, so it takes 30 seconds to clean the same position of preset plate 5 158 times.

15 However, through normal cleaning, and in the process that the nozzles 32 and the conveying wheels 24 do not reciprocate, the preset plate 5 can only be cleaned 8 times at the same position for 30 seconds.

 The main feature of the present invention is that the nozzles 32 of the cleaning device 3 reciprocate and cooperate with the conveying
20 wheels 24 of the conveying device 2 to reciprocate to clean the same part of the preset plate 5 multiple times, thereby achieving the effect of multiple cleaning of the preset plate 5 by relying on fewer nozzles 32. A secondary feature is that the air volume is evenly adjusted by the air distribution plate 42 in each of the air knives 41, so as to coordinate
25 with the locking of the associating fastener 43 to adjust the air volume

blown out by the respective air knife opening **4110**.

The above description is merely a preferred embodiment of the present invention and does not limit the patent scope of the present invention. Therefore, all simple modifications and equivalent structural
5 changes made by using the contents of the description and drawings of the present invention shall be included in the patent scope of the present invention and shall be clearly stated.

To sum up, the nozzle swing mechanism for cleaning machine of the present invention can indeed achieve its efficacy and purpose
10 when it is used. Therefore, the present invention is an invention with excellent practicability and meets the application requirements for an invention patent. I would like to file an application in accordance with the law, and hope that the review committee will approve the application as soon as possible to protect the inventor's hard work. If
15 there is any doubt from the review committee, please do not hesitate to send a letter to instruct, and the inventor will do his best to cooperate.

What the invention claimed is:

1. A nozzle swing mechanism for cleaning machine, comprising a machine base, a conveying device, a cleaning device and an air knife assembly, wherein:

5 said machine base comprises a cleaning area and a dewatering area in sequence;

 said conveying device comprises a feeding portion located on one side of said cleaning area for conveying preset plate, a discharging portion located on one side of said dewatering area, a power device, and
10 a plurality of conveying wheels driven by said power device;

 said cleaning device is disposed in said cleaning area, said cleaning device comprising a linkage device, a plurality of nozzles, a connection device and a transmission mechanism, said linkage device comprising a plurality of connection portions located above said
15 conveying device and respectively connected with said nozzles, and a mounting mechanism located at at least one side of said connection portions, said mounting mechanism comprising a coupling portion protrudingly providing on one side thereof for assembly with said transmission mechanism for providing reciprocating movement;

20 said air knife assembly is disposed in said dewatering area, said air knife assembly comprising a plurality of air knives disposed above said conveying device.

 2. The nozzle swing mechanism for cleaning machine as claimed in claim 1, wherein said cleaning device further comprises two
25 sensing devices respectively located at two opposite sides of said

mounting mechanism for detecting the swinging direction of said mounting mechanism, said mounting mechanism further comprises a baffle connected to said connection portions and a main body protrudingly provided on said baffle on the side opposite to said connection portions, and said coupling portion is protrudingly provided on one side of said main body for the assembly of said connection device and said transmission mechanism, said connection device comprises a plurality of protrusions connected to said coupling portions of said mounting mechanism, and said transmission mechanism comprises a plurality of transmission connection portions assembled on said connection device.

3. The nozzle swing mechanism for cleaning machine as claimed in claim 1, wherein said nozzles are capable of setting spray range according to needs; said transmission mechanism of said cleaning device is capable of setting forward and backward push distance and the number of reciprocating swings per minute; the number and spacing of each said nozzle is further configurable, the spraying range of said nozzles is 400mm, the forward and backward pushing distances of said nozzles in combination with said transmission mechanism are 25mm respectively, said transmission mechanism is capable of reciprocating 60 times per minute, the number of said nozzles is 8, and each of said nozzles is spaced 50mm apart.

4. The nozzle swing mechanism for cleaning machine as claimed in claim 1, wherein said conveying wheels of said conveying device each comprise a conveying portion for conveying said preset

plate and two rotating portions respectively located at two opposite sides of said conveying portion; said power device is connected to at least one said rotating portion of at least one said conveying wheel through at least one first shaft to control the reciprocating rotation of
5 said conveying wheel; each of said conveying wheels is equipped with at least two second axles on said rotating portion on one side away from said power device for driving each other to rotate, each said conveying wheels is capable of transporting 25mm forward and backward and is capable of reciprocating 10 times in 1 minute, with a conveying speed of
10 2M/1min.

5. The nozzle swing mechanism for cleaning machine as claimed in claim 1, wherein each said air knife comprises a receiving space for receiving pressurized gas supplied by a preset air pressurizing device, each said air knife is provided with an air distribution plate used
15 to block a flow of a pressurized gas forced therein and to evenly distribute the pressurized gas, an air knife head with an air knife opening extended downward from a bottom side thereof, and at least one fastener disposed on said air knife head.