VACUUM GENERATING APPARATUS

FIELD OF THE INVENTION

The present invention relates to a vacuum generating apparatus, and more particularly to a movable vacuum generating apparatus that could be moved at any time to connect to an air pressure source for working at different positions in a manufacturing process to generate a vacuum suction for sucking and accordingly, transporting the electronic elements.

BACKGROUND OF THE INVENTION

With the innovation on manufacturing processes in the electronic and other related high-tech industries, high precision electronic and IC elements have been produced. These electronic/IC elements must be tested before being packaged. Generally, the produced electronic/IC elements are first positioned in a tray, which is also referred to as a wafer tray. These produced electronic/IC elements are then transported from the tray to a test bed for testing at a predetermined time.

To avoid the produced electronic/IC elements from being damaged due to contacting with human body, they are

normally transported from the tray to the test bed using a transporting apparatus, which is usually a vacuum suction apparatus utilizing a suction force to suck the electronic/IC elements thereto, and then transport the same to the test bed.

The above-mentioned vacuum suction apparatus generally has a fixedly mounted and immobilized base, and uses an automated robot to vacuum suck and transport the electronic/IC elements. An overall cost of the fixed-type vacuum suction apparatus is extremely high and is not affordable by general electronic element manufacturers or packaging firms; thus, only some big-scale manufacturers adopt the fixed-type vacuum suction apparatus.

Moreover, due to the immobilized base, the fixed-type vacuum suction apparatus is not freely movable and can only be used in some part of the manufacturing process to have limited application.

SUMMARY OF THE INVENTION

It is therefore a primary object of the present invention to provide a vacuum generating apparatus that may be conveniently moved at any time to connect to an air

pressure source or an air supply device for working at different positions in a manufacturing process.

Another object of the present invention is to provide a movable vacuum generating apparatus that is connected to an air pressure source or an air supply for the introduction of air pressure into the vacuum generating apparatus. As a result, vacuum suction is generated and that a suction cup device connected to the vacuum generating apparatus may suck and accordingly, transport the electronic elements.

A further object of the present invention is to provide a vacuum generating apparatus that may be switched to generate a cyclic sucking operation for transporting a large amount of electronic elements cyclically.

A still further object of the present invention is to provide a vacuum generating apparatus that may be switched to a manual or a foot switch for an operator to control the operating time period at discretion.

To achieve the above and other objects, the vacuum generating apparatus of the present invention includes a pressure regulating valve having a tube for connecting to an air pressure source; a vacuum generator connected

to the pressure regulating valve for generating a vacuum suction when air pressure is introduced thereto via the pressure regulating valve; a pressure release valve connected at a first end to the vacuum generator and at a second end to a suction-cup device; a mode switch connected to the vacuum generator for switching the latter between different operating modes; and a time pulse generator connected to the mode switch for generating a cyclic operating mode.

The pressure regulating valve is further provided with a manual regulating switch for controlling an air intake of the pressure regulating valve.

In a preferred embodiment of the present invention, the pressure release valve has a tube extended therefrom for connecting to the suction-cup device, which includes at least one suction cup.

In an ideal embodiment of the present invention, the mode switch is further connected to another switch, which may be, for example, a foot switch for an operator to control an operating time period at discretion.

In another feasible embodiment of the present invention, the pressure release valve is further provided at the

second end with a muffler for reducing noises produced by the pressure release valve during the operation thereof.

To use the vacuum generating apparatus, first move it to an air pressure source or an air supply device, and connect the tube of the pressure regulating valve to the air pressure source or the air supply device so that an air pressure is provided from the air pressure source or the air supply device to the pressure regulating valve. When the air pressure is introduced to the vacuum generator, a vacuum suction is generated by the vacuum generator for the suction cup device that is connected to the second end of the pressure release valve to suck the electronic elements.

The vacuum generator and the pressure release valve are controlled by the mode switch to switch between different operation modes. When the mode switch is switched to the time pulse generator, a cyclic operating mode may be generated using the time pulse generator, so that the vacuum generating apparatus of the present invention is able to provide a cyclical suction operation. When the mode switch is switched to the foot switch, an operator may control the operating time period at discretion to achieve the purpose of sucking

and transporting the electronic elements.

BRIEF DESCRIPTION OF THE DRAWINGS

The structure and the technical means adopted by the present invention to achieve the above and other objects can be best understood by referring to the following detailed description of the preferred embodiments and the accompanied drawings, wherein

Fig. 1 is a block diagram of a vacuum generating apparatus according to an embodiment of the present invention;

Fig. 2 is a block diagram of a vacuum generating apparatus according to another embodiment of the present invention;

Fig. 3 is a block diagram showing the vacuum generating apparatus of the present invention in a suction enabled state; and

Fig. 4 is a block diagram showing the vacuum generating apparatus of the present invention in a suction released state.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please refer to Fig. 1 that is a block diagram of a vacuum generating apparatus according to a first embodiment of the present invention. As shown, the vacuum generating apparatus in the first embodiment includes a pressure regulating valve 11 having a tube 111 for connecting to an air pressure source via the tube 111; a vacuum generator 12 connected to the pressure regulating valve 11 for generating a vacuum suction using the air pressure input thereto via the pressure regulating valve 11; a pressure release valve 13 connected at a first end to the vacuum generator 12 and at a second end to a suction-cup device; a mode switch 14 connected to the vacuum generator 12 for switching the latter between different operating modes; and a time pulse generator 15 connected to the mode switch 14 for generating a cyclic operating mode.

The pressure regulating valve 11 is further provided with a manual regulating switch 112 for controlling an air intake of the pressure regulating valve 11.

In a preferred embodiment of the present invention, the pressure release valve 13 has a tube 131 extended therefrom for connecting to the suction-cup device,

which includes at least one suction cup.

In an ideal embodiment of the present invention, the mode switch 14 is further connected to another switch 141, which may be, for example, a foot switch for an operator to control an operating time period at discretion.

In another feasible embodiment of the present invention shown in Fig. 2, the pressure release valve 13 is further provided at the second end with a muffler 132 for reducing noises produced by the pressure release valve 13 during the operation thereof.

Please refer to Figs. 3 and 4 that are block diagrams showing the operation of the vacuum generating apparatus of the present invention. To use the vacuum generating apparatus, first move it to an air pressure source or an air supply device, and connect the tube 111 of the pressure regulating valve 11 to the air pressure source or the air supply device so that an air pressure is introduced from the air pressure source or the air supply device to the pressure regulating valve 11. When the air pressure is introduced to the vacuum generator 12 via the pressure regulating valve 11, a vacuum suction is generated by the vacuum generator

12 for sucking the electronic elements. The electronic elements are sucked by the vacuum suction via the suction-cup device connected to the second end of the pressure release valve 13, as indicated by the black arrows in Fig. 3.

When the suction operation is completed, the vacuum generator 12 stops the generation of vacuum suction. At this point, the air pressure is released via the pressure release valve 13, and the vacuum generating apparatus of the present invention is quickly restored to a non-suction condition, so that the suction-cup device connected to the second end of the pressure release valve 13 is relaxed without any suction force to thereby release the electronic elements vacuum-sucked thereto, as indicated by the black arrows in Fig. 4.

In the second embodiment shown in Fig. 2, noises produced by the pressure release valve 13 during the operation thereof is reduced by the muffler 132 provided at the second end of the pressure release valve 13.

Through the operation of the vacuum generator 12 and the pressure release valve 13, the electronic elements may be vacuum-sucked and transported.

The mode switch 14 to switch between different operating modes may control the vacuum generator 12 and the pressure release valve 13 to suction generate or to suction release. In the illustrated embodiments, the mode switch 14 may be selectively switched to the time pulse generator 15 or the foot switch 141.

When the mode switch 14 is switched to the time pulse generator 15, a cyclic operating mode may be generated using the time pulse generator 15, so that the vacuum generating apparatus of the present invention could enable a cyclical suction operation. That is, the vacuum is generated and released within a certain time-pulse period. The time pulse generator 15 may be adjusted to a different time cycle according to actual need.

When the mode switch 14 is switched to the foot switch 141, an operator may control an operating time period of the vacuum generating apparatus at discretion to achieve the purpose of sucking and transporting the electronic elements.

With its mobility, the vacuum generating apparatus of the present invention may be moved at any time to a

different working position in a manufacturing process for connecting to an available air pressure source or an air supply to provide an air pressure for the vacuum generator 12 to generate a vacuum suction, which is supplied to the suction-cup device via the pressure release valve 13 for the suction-cup device to vacuum-suck and transport the electronic elements.

The present invention has been described with some preferred embodiments thereof and it is understood that many changes and modifications in the described embodiments can be carried out without departing from the scope and the spirit of the invention that is intended to be limited only by the appended claims.

CLAIMS :

What is claimed is:

1. A vacuum generating apparatus, comprising:

a pressure regulating valve having a tube for connecting to an air pressure source;

a vacuum generator connected to the pressure regulating valve for generating a vacuum suction using an air pressure input thereto via the pressure regulating valve;

a pressure release valve connected at a first end to the vacuum generator and at a second end to a suction-cup device;

a mode switch connected to the vacuum generator for switching the latter between different operating modes; and

a time pulse generator connected to the mode switch for generating a cyclic operating mode.

2. The vacuum generating apparatus as claimed in claim 1, wherein the pressure regulating valve is provided with a manual regulating switch for controlling an

air intake of the pressure regulating valve.

3. The vacuum generating apparatus as claimed in claim 1, wherein the pressure release valve is provided at the second end with a tube for connecting to the suction cup device.

4. The vacuum generating apparatus as claimed in claim 1, wherein the pressure release valve is provided at the second with a muffler to reduce noises produced by the pressure release valve during the operation thereof.

5. The vacuum generating apparatus as claimed in claim 1, wherein the mode switch is further connected to another switch.

6. The vacuum generating apparatus as claimed in claim 5, wherein the switch is a foot switch for an operator to control an operating time period at discretion.