SECTIONAL VACUUM SUCTION DEVICE

FIELD OF THE INVENTION

The present invention relates to a sectional vacuum suction device, and more particularly a vacuum suction device that can be used to suck and transport electronic elements that are positioned on differently sized trays simply by changing a lower header case thereof to effectively reduce the equipment cost.

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, and 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 vacuum suction device, which utilizes a suction force to suck the electronic/IC elements thereto, and then transport the same to the test bed.

Vacuum suction devices may be divided into two types, namely, an automatic and a manual vacuum suction device.

The automatic vacuum suction device uses an automated robot to vacuum suck and transport electronic/IC elements. An overall cost of the automatic vacuum suction device is extremely high and is not affordable by general electronic element manufacturers or packaging firms; therefore only some big-scale manufacturers adopt the automatic vacuum suction device.

The manual vacuum suction device is adopted by mostly small to mid scale manufacturers, and is hand held and operated by an operator to suck and transport electronic/IC elements between the trays and the test bed. The currently available manual vacuum suction devices are individually produced to a different specification according to the sizes of trays and electronic/IC elements to be sucked and transported

with the vacuum suction devices. Therefore, each of the manual vacuum suction devices has a fixed structure and specifications only for handling trays or electronic/IC elements having the same size, and could not be exchanged in use. In the event, a manual vacuum suction device with a fixed structure and specifications is purchased and found incompatible with the existing trays and/or electronic/IC elements to be transported; thus, the manufacturer could only discard or put the manual vacuum suction device aside. This is of course an unnecessary waste in cost, and any improper disposal of the discarded device would bring problems in the environment and might also cause harms to people.

SUMMARY OF THE INVENTION

It is therefore a primary object of the present invention to provide a sectional vacuum suction device that varies in size and can therefore be used to suck and transport electronic/IC elements positioned on differently sized trays.

Another object of the present invention is to provide a sectional vacuum suction device that is conveniently

assembled from different components and can be easily operated to transport electronic/IC elements via a suction force.

A further object of the present invention is to provide a sectional vacuum suction device for the use of sucking and transporting the electronic/IC elements that are positioned on differently sized trays; furthermore, environmental problems possibly caused by an unusable and/or discarded vacuum suction device can be avoided.

To achieve the above and other objects, the sectional vacuum suction device according to the present invention includes an elongated upper header case, a lower header case, a plurality of intermediate pipes, and a plurality of suction cups.

The upper header case is provided on top with an air pipe connector and defines an open-bottom air space.

The lower header case is configured for fitly and removably connecting to a lower side of the upper header case. The lower header case defines an open-topped air space, and is provided at a bottom with a plurality of connection holes.

Each of the intermediate pipes has an upper end extended into and connected to the connection hole located at the bottom of the lower header case, and a lower end for receiving one of the suction cups thereto.

An air compressor is connected to the air pipe connector located at the top of the upper header case.

In an ideal embodiment of the present invention, each of the intermediate pipes is provided near the upper end with a sideward protrusion corresponding to a recess in the connection hole to enable foolproof connection of the intermediate pipes to the connection hole.

The intermediate pipes may be straight pipes or bent pipes so that the suction cups connected to the lower ends of the intermediate pipes may always be set to an angular position best for sucking electronic or IC elements. It is noted that the suction cups have two communicable open ends.

The sectional vacuum suction device of the present invention must be assembled before it could be used and operated to transport electronic or IC elements.

To assemble the sectional vacuum suction device, first connect the upper header case to the lower header case. The assembled vacuum suction device is connected at the air pipe connector on the upper header case to an air compressor in order to utilize a suction force produced by the air compressor to suck the electronic or IC elements. When the air compressor is controlled to produce a suction force, the suction cups connected to the lower ends of the intermediate pipes are controlled to be in contact with the electronic elements that await to be transported in a horizontal position. The suction force generated by the air compressor is transmitted to the suction cups in creating a vacuum to suck the electronic elements to the suction cups and achieve the purpose of transporting the electronic elements.

The connection holes provided at the bottom of the lower header case may be designed and arranged according to the specifications of the trays as well as the sizes of electronic/IC elements that are to be transported. As result, the sectional vacuum suction device is conveniently applicable to differently sized trays and electronic/IC elements by simply changing the lower header case to the one that is size and arrangement

compatible with the connection hole. Therefore, the sectional vacuum suction device may have effectively reduced the cost as well as avoided does not the possible environmental problems.

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 an exploded perspective view showing an upper and a lower header case for a sectional vacuum suction device according to an embodiment of the present invention;

Fig. 2 shows a straight intermediate pipe connected to the lower header case of the sectional vacuum suction device of the present invention;

Fig. 3 shows a bent intermediate pipe connected to the lower header case of the sectional vacuum suction device of the present invention;

Fig. 4 shows a suction cup connected to a lower end of the bent intermediate pipe of Fig. 3;

Fig. 5 shows a suction cup connected to a lower end of the straight intermediate pipe of Fig. 2;

Fig. 6 is a fragmentary and assembled vertical sectional view of the sectional vacuum suction device of the present invention; and

Fig. 7 shows the use of the sectional vacuum suction device of the present invention to transport IC elements.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please refer to Figs. 1 to 6, in which a sectional vacuum suction device according to the present invention is shown. As shown, the sectional vacuum suction device of the present invention includes an elongated upper header case 11, a lower header case 12, a plurality of intermediate pipes 13, and a plurality of suction cups 131.

The upper header case 11 is provided on a top with an air pipe connector 111 and defines an open-bottom air space 112.

The lower header case 12 is configured for fitly and removably connecting to a lower side of the upper header case 11. The lower header case 12 defines an open-topped air space 121, and is provided at a bottom with a plurality of connection holes 122.

Each of the intermediate pipes 13 has an upper end detachably extended into and connected to the connection hole 122 located at the bottom of the lower header case 12, and a lower end for detachably receiving one of the suction cups 131 thereto.

An air compressor (not shown) is connected to the air pipe connector 111 located at the top of the upper header case 11.

In an ideal embodiment of the present invention, each of the intermediate pipes 13 is provided near the upper end with a sideward protrusion 132 corresponding to a recess (not shown) in the connection hole 122 to enable foolproof connection of the intermediate pipes 13 to

the connection hole 122.

The intermediate pipes 13 may be either straight pipes or bent pipes, so that the suction cups 131 connected to the lower ends of the intermediate pipes 13 may always be set to an angular position best for sucking electronic or IC elements. It is noted the suction cups 131 have two communicable open ends.

The sectional vacuum suction device of the present invention must be assembled before it could be used and operated to transport electronic or IC elements. To assemble the sectional vacuum suction device, the upper header case 11 needs to be connected to the lower header case 12 first, so that the open-bottom air space 112 and the open-topped air space 121 are communicable with one another. Then, connect the upper ends of the intermediate pipes 13 to the connection holes 122 at the bottom of the lower header case 12, and connect the suction cups 131 to the lower ends of the intermediate pipes 13 to complete the sectional vacuum suction device of the present invention. Finally, connect the assembled vacuum suction device at the air pipe connector 111 to an air compressor, so as to utilize a suction force produced by the air compressor to suck

the electronic or IC elements.

In the illustrated embodiment of the present invention, each of the connection holes 122 is internally provided with a stopper (not shown), and each of the intermediate pipes 13 is provided near the upper end with a sideward protrusion 132 corresponding to a recess (not shown) provided in the connection hole 122 to provide a foolproof design, ensuring that the intermediate pipe 13 can always be conveniently and smoothly extended into the connection hole 122 in a correct direction and to a correct depth. The foolproof design may be varied in position and structure according to actual need.

When the air compressor is controlled a suction force is generated. The suction cups 131 that are connected to the lower ends of the intermediate pipes 13 are placed horizontally to allow the occurrence of transportation of elements when the two come in contact with each other. The suction force generated by the air compressor is transmitted to the suction cups 131 via the air spaces 112, 121 in the upper and lower header cases 11, 12. This creates a vacuum to suck the electronic elements to the suction cups 131 in achieving the purpose of

transporting the electronic elements.

Fig. 7 shows a tray 2 having a plurality of IC elements 3 positioned thereon. When it is desired to move the IC elements 3 from one position to another position within the tray 2, or to transport the IC elements 3 from the tray 2 to a test bed, the sectional vacuum suction device of the present invention may be used to achieve such movement or transport easily.

The connection holes 122 provided at the bottom of the lower header case 12 vary in both size and arrangement to meet the specifications of different trays 2 and/or the sizes of different electronic or IC elements 3. The sectional vacuum suction device of the present invention may be used to transport differently sized elements 3 that are placed on different trays 2. By connecting the upper header case 11 to a lower header case 12 with having connection holes 122 and intermediate pipes 13 configured and arranged corresponding to the specification of the tray 2 and/or the elements 3 in order to allow the occurrence of transportation.

Therefore, the sectional vacuum suction device of the

present invention has the following advantages:

1. Not only is it easy to assemble and to operate, it can also be connected to various types of air compressors; furthermore, it is environmental friendly to largely reduce the manufactual and operational costs thereof.

2. Lower header cases 12 having differently configured and arranged connection holes may be selectively connected to the upper header case 11 for the sectional vacuum suction device to suck elements that are different in size, which are place on differently sized trays and accordingly, enable quick and convenient transport of the electronic or IC elements between the trays and the test bed.

The present invention has been described with a preferred embodiment thereof and it is understood that many changes and modifications in the described embodiment 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 sectional vacuum suction device, comprising:

an upper header case being provided on top with an air pipe connector and defining an open-bottom air space therein;

a lower header case being configured for fitly and detachable connector that is connected to a lower side of the upper header case; the lower header case defining an open-topped air space therein, and being provided at a bottom with a plurality of connection holes;

a plurality of intermediate pipes, each of which having an upper end detachably extended into and connected to the connection hole at the bottom of the lower header case; and

a plurality of suction cups being separately and detachably connected to a lower ends of the intermediate pipes.

2. The sectional vacuum suction device as claimed in

claim 1, wherein the air pipe connector on the upper header case is connected to an air compressor.

3. The sectional vacuum suction device as claimed in claim 1, wherein each of the intermediate pipes is provided at a predetermined position near an upper end thereof with a sideward protrusion corresponding to a recess provided in the connection hole to ensure a foolproof connection of the intermediate pipe to the connection hole.

4. The sectional vacuum suction device as claimed in claim 1, wherein the intermediate pipes are selected from the group consisting of straight pipes and bent pipes to enable the suction cups connected thereto to be set to an angular position best for sucking electronic or IC elements.

5. The sectional vacuum suction device as claimed in claim 1, wherein each of the suction cups has two communicable open ends.