interface unit, two locating holes 203 formed in the edge ring 201 and multiple semicircular notches 204 distributed on the periphery of the edge ring 201. The locating holes 203 can be engaged with the locating pins on the support surface. There is a one-to-one correspondence relationship of the quantity and positions between the semicircular notches 204 and the thread through-holes formed in the bottom assembly of the quartz reaction outer tube.

The auxiliary support structure mentioned above ensures the loading accuracy of the outer tube (the concentricity of the outer tube and the reaction chamber), meanwhile prevents the contamination caused by the direct contact of the outer tube and the bracket 3, and further avoids the damage occurred during the connection and separation of the quartz reaction tube and the bracket 3.

Fig.3 is a structural view of the auxiliary support structure of the inner tube of the quartz reaction tube according to one embodiment of the present invention. As shown in Fig.3, the auxiliary support structure 30 includes a first interface unit to be connected to the bracket 3, and a second interface unit to be connected to the bottom assembly of the inner tube of the quartz reaction tube. As shown in Fig.1 and Fig.3, the bracket 3 includes a semi-annulus support surface with multiple locating pins thereon; the ~~outer~~ inner tube interface unit includes a hollow cylinder 302, an edge ring 301 positioned around the periphery of the cylinder and adjoined with the first interface unit, two locating holes 303 formed in the edge ring 301 and multiple semicircular notches 304 distributed on the periphery of the edge ring 301. The locating holes 303 can be engaged with the locating pins on the support surface. Wherein, an annulus protrusion is formed at the end of the hollow cylinder 302 away from the edge ring 301. For reducing the weight, the hollow cylinder 302 has a hollowed-out structure. The pattern of the hollowed-out structure can be any shape. In the embodiment, the hollowed-out structure is composed of four circles uniformly distributed on the annular side wall of the hollow cylinder 302.

The auxiliary support structure mentioned above ensures the loading accuracy of the inner tube (concentricity of the inner tube and the reaction chamber), meanwhile prevents the contamination caused by the direct contact of the inner tube and the bracket 3, and further avoids the damage occurred during the connection and separation of the quartz reaction tube and the bracket 3, which protects the inner tube. Therefore, the two auxiliary support structures

CLAIMS:

1. A loading and unloading device for a quartz reaction tube of a semiconductor diffusion equipment, which is used in combination with a lifting device having an interface flange attachable to the reaction tube for the quartz reaction tube, including:

a translation drive structure including a support platform composed of two support plates stacked up and down and a handle connected to the support platform; wherein the lower support plate is fixedly connected to a group of height-adjustable rollers;

a linear guide rail mounted on the upper support plate;

a bracket positioned on the linear guide rail;

an auxiliary support structure working in conjunction with the bracket to detachably fix the quartz reaction tube to the bracket, which includes a first interface unit to be connected to the bracket and a second interface unit to be connected to the bottom assembly of the quartz reaction tube;

wherein during the loading procedure, the front end of the translation drive structure is docked with and stopped at the doorframes of the semiconductor diffusion equipment by a fixing structure, and the bracket is moved along the linear guide rail with the quartz reaction tube ~~is~~ into the semiconductor diffusion equipment such that the quartz reaction tube is docked with the interface flange of the lifting device ~~by horizontally moving the bracket along the linear guide rail~~.

2. The loading and unloading device according to claim 1, wherein the quartz reaction tube includes an inner tube and an outer tube; the second interface unit includes at least an inner tube interface unit to be connected to the bottom assembly of the inner tube of the quartz reaction tube and/or at least an outer tube interface unit to be connected to the bottom assembly of the outer tube of the quartz reaction tube.

3. The loading and unloading device according to claim 2, wherein the bracket includes a semi-annulus support surface having multiple locating pins provided thereon; the outer tube interface unit includes a hollow cylinder, an edge ring positioned around the periphery of the cylinder and adjoined with the first interface unit, multiple locating holes formed in the edge ring to be engaged with the locating pins on the support surface, and multiple semicircular notches distributed on the periphery of the edge ring; the quantity and position of the semicircular notches are correspondent to those of the thread through-holes formed in the bottom assembly of

the quartz reaction outer tube.

4. The loading and unloading device according to claim 2, wherein the bracket includes a semi-annulus support surface having multiple locating pins provided thereon; the ~~outer~~ inner tube interface unit includes a hollow cylinder, an edge ring positioned around the periphery of the cylinder and adjoined with the first interface unit, multiple locating holes formed in the edge ring to be engaged with the locating pins on the support surface; wherein the hollow cylinder has an annulus protrusion formed at the end away from the edge ring.

5. The loading and unloading device according to claim 1, wherein the space between the two stacked support plates is controlled by a space adjusting unit.

6. The loading and unloading device according to claim 5, wherein the space adjusting unit is a rotating and lifting mechanism with a rotating handle.

7. The loading and unloading device according to claim 1, wherein the handle is a lifting handle and is detachably fixed and connected to the support platform.

8. The loading and unloading device according to claim 1, wherein the front end of the translation drive structure is docked with the doorframes of the semiconductor diffusion equipment through locating blocks and locating pins.

9. The loading and unloading device according to claim 1, wherein the lower support plate has multiple linear guide pillars engaged into the through holes of the upper support plate.

10. A loading and unloading method for the reaction tube of the semiconductor diffusion equipment by using the device according to claim 1, including a loading procedure and an unloading procedure; the loading procedure includes the following steps:

Step S11, placing the first interface unit of the auxiliary support structure on the bracket; placing the bottom of the quartz reaction tube into the second interface unit of the auxiliary support structure;

Step S12, actuating the handle to dock the front end of the translation drive structure with the doorframes of the semiconductor diffusion equipment through the fixing structure;

Step S13, actuating the bracket to horizontally move the quartz reaction tube along the linear guide rail to dock with the interface flange of the lifting device;

Step S14, using the lifting device to lift the quartz reaction tube with the auxiliary support structure up into the reaction chamber of the semiconductor diffusion equipment;

the unloading procedure includes the following steps: