

CLAIMS

1. An apparatus for cleaning semiconductor wafer comprising:

a brush module having a brush head for providing mechanical force on a surface of a wafer;

a swing arm of which an end mounts the brush module;

a rotating actuator connected with the other end of the swing arm, the rotating actuator driving the swing arm to swing across the whole surface of the wafer, which brings the brush head moving across the whole surface of the wafer; and

an elevating actuator connected with the other end of the swing arm, the elevating actuator driving the swing arm to rise or descend, which brings the brush module rising or descending,

wherein the brush module is vertically disposed and includes a brush base, a bearing, a flexible component, at least one damper, a mounting section, a brush shell and a coil spring,

and wherein the brush head is mounted on the brush base, an end of the bearing connects with the brush base and the other end of the bearing penetrates into the brush shell and connects to a side of the flexible component, the other side of the flexible component connects with the damper which is mounted on the brush shell, the coil spring is received in the brush shell, an end of the coil spring is fixed on the side of the flexible component and the other end of the coil spring is fixed on the mounting section which is a top plate of the brush shell and opposite to the flexible component, the brush shell is fixed at the end of the swing arm, an elastic deformation of the coil spring generates a press force that the brush head acts on the surface of the wafer, and the elastic deformation of the coil spring is determined by the height of a process position of the brush module.

2. The apparatus as claimed in claim 1, wherein the swing arm swings, rises or descends, or swings and simultaneously rises or descends under the drive of the rotating actuator or/and the elevating actuator.

3. The apparatus as claimed in claim 1, wherein the elevating actuator is installed with a hard stopper for restricting the vertical descend distance of the swing arm so as to restrict a press force of the brush head pressing on the wafer surface in an acceptable range.

4. The apparatus as claimed in claim 1, further comprising a strain gauge positioned on the swing arm to monitor the deformation of the coil spring while the brush head pressing on the wafer surface.

5. The apparatus as claimed in claim 4, further comprising a controller respectively connecting with the strain gauge and the elevating actuator, the press force of the brush module acted on the surface of the wafer detected by the strain gauge and the strain gauge producing a detecting signal, the strain gauge sending the detecting signal to the controller, the controller receiving the detecting signal and giving a feedback to the elevating actuator, the elevating actuator adjusting the height of the process position of the swing arm based on the feedback of the controller.

6. The apparatus as claimed in claim 1, further comprising a brush cleaning port for cleaning the brush head.

7. The apparatus as claimed in claim 6, wherein the brush cleaning port includes a force sensor installed at the bottom of the brush cleaning port and a signal cable connecting the force sensor to a controller for checking whether the brush module is in normal status.

8. The apparatus as claimed in claim 7, wherein the brush cleaning port includes a cover shielding the force sensor for protecting the force sensor from contacting cleaning liquid in the brush cleaning port.

9. The apparatus as claimed in claim 6, further comprising a couple of brush position sensors settled at opposite sides of the brush cleaning port for checking the status of the brush module, the brush position sensors being triggered when the brush head moves down in the brush cleaning port, the vertical moving distance of the brush head at the time that the brush position sensors are triggered being recorded and compared every time, if the value of vertical moving distance is out of the preset range, a signal of the brush module abnormal is sent out.

10. The apparatus as claimed in claim 1, further comprising a cleaning chamber, a wafer chuck disposed in the cleaning chamber for holding and positioning a wafer, a rotation driving mechanism for driving the wafer chuck to rotate, and at least one nozzle for delivering cleaning chemicals or de-ionized water onto the surface of the wafer.