

Claims

1. An elastic membrane to be used in a substrate processing apparatus that comprises a control device, a polishing pad for polishing the substrate and a substrate holding unit for holding the substrate and pressing the substrate against the polishing pad, the elastic membrane being attached to the substrate holding unit and holds a surface opposite to a polishing surface of the substrate,

the elastic membrane comprising at least one sensor that measures physical quantity of the elastic membrane, and includes a storage unit for storing physical quantity information and a communication unit;

wherein identification information of the sensor is stored in the storage unit, and the control device determines based on the identification information read from the sensor whether or not to interlock the substrate processing apparatus to which the elastic membrane is attached.

2. A retainer ring to be used in a substrate processing apparatus that comprises a control device, a polishing pad for polishing the substrate and a substrate holding unit for holding the substrate and pressing the substrate against the polishing pad, the retainer ring being attached to the substrate holding unit and supports an outer periphery of the substrate,

the retainer ring comprising plural sensors that measure physical quantity of the retainer ring, and includes a storage unit for storing physical quantity information and a communication unit;

wherein identification information of the sensor is stored in the storage unit, and the control device determines based on the identification information read from the sensor whether or not to interlock the substrate processing apparatus to which the retainer ring is attached.

3. A substrate processing apparatus for processing a substrate comprising:

a polishing pad for polishing the substrate;

a substrate holding unit for holding the substrate and pressing the substrate against the polishing pad;

an elastic membrane, to be used in the substrate processing apparatus, that is attached to the substrate holding unit and holds a surface opposite to a polishing surface of the substrate;

at least one pressure chamber formed between the elastic membrane and the substrate holding unit;

at least one strain sensor that is fitted to the elastic membrane, measures strain of the elastic membrane, and includes a storage unit for storing strain information and a communication unit;

a detector that is provided in a neighborhood of the elastic membrane and reads and writes information from and into the strain sensor fitted to the elastic membrane;

a control device that is connected to the detector and sets a processing condition in the substrate processing apparatus based on the strain information of the elastic membrane read from the strain sensor; and

a jetting unit for jetting gas or liquid to a side wall of the elastic membrane holding the substrate to peel the polished substrate from the elastic membrane;

wherein the control device adjusts pressure in the pressure chamber based on the strain information of the elastic membrane so that the gas or the liquid from the jetting unit is jetted to a boundary between the elastic membrane and the substrate.

4. The substrate processing apparatus according to claim 3, wherein identification information of the strain sensor is stored in the storage unit, and the control device determines based on the identification information read from the strain sensor whether it is possible to drive the substrate processing apparatus to which the elastic membrane is attached.

5. The substrate processing apparatus according to claim 3, wherein when an abnormality occurs in the substrate processing apparatus, the control device records information on a processing condition of the substrate into the storage unit in the strain sensor.

6. The substrate processing apparatus according to claim 3, wherein

the control device adjusts pressure in the pressure chamber based on the strain information of the elastic membrane measured by the strain sensor.

7. The substrate processing apparatus according to claim 3, wherein the jetting unit is configured so that a jetting angle of the gas or the liquid is adjustable, and wherein the substrate processing apparatus includes:

an imaging unit for imaging a boundary portion between the elastic membrane and the substrate;

an image processing unit for detecting a position of the boundary portion from an image obtained by the imaging unit; and

a jetting angle adjustment unit for determining a jetting angle by the jetting unit based on the position of the boundary portion detected by the image processing unit to adjust the jetting angle.

8. A substrate processing apparatus comprising:

a polishing pad for polishing the substrate;

a substrate holding unit for holding the substrate and pressing the substrate against the polishing pad;

a retainer ring for supporting an outer periphery of the substrate;

a plurality of strain sensors that are fitted to the retainer ring, measures strain of the retainer ring, and includes a storage unit for storing strain information and a communication unit;

a detector that is provided in a neighborhood of the retainer ring and reads and writes information from and into the strain sensors fitted to the retainer ring; and

a control device that is connected to the detector and sets a processing condition in the substrate processing apparatus

based on the strain information of the retainer ring read from the strain sensors;

wherein the control device is configured to detect deviations of the strain amounts of the plurality of strain sensors during a test polishing and to finish the test polishing when the deviations are within a predetermined value.

9. The substrate processing apparatus according to claim 8, wherein the control device changes a processing condition of the substrate according to a distribution of an amount of the strain detected by the plurality of strain sensors.