CLAIMS

[Claim 1] A substrate cleaning apparatus for cleaning a substrate, comprising:

a roll holder configured to support a horizontally elongated roll cleaning member and rotate the roll cleaning member;

a vertical movement mechanism, having a vertically movable unit vertically movable by actuation of an actuator having a regulating device, configured to vertically move the roll holder coupled to the vertically movable unit so that the roll cleaning member applies a predetermined roll load to the substrate at the time of cleaning the substrate;

a load cell provided between the vertically movable unit of the vertical movement mechanism and the roll holder and configured to measure the roll load; and

a controller configured to perform feedback control of the roll load through the regulating device of the actuator based on a measured value of the load cell.

[Claim 2] The substrate cleaning apparatus according to claim 1, wherein the vertically movable unit of the vertical movement mechanism comprises a vertically movable shaft vertically movable by actuation of the actuator, or a vertically movable arm extending in a horizontal direction and having a base end coupled to the vertically movable shaft.

[Claim 3] The substrate cleaning apparatus according to claim 1, further comprising:

a tilting mechanism provided between the vertically movable unit of the vertical movement mechanism and the roll holder and configured to tilt the roll holder.

[Claim 4] The substrate cleaning apparatus according to claim 1, wherein the load cell is provided at a substantially central area along a longitudinal direction of the roll holder and is coupled to the vertically movable unit of the vertical movement mechanism.

[Claim 5] The substrate cleaning apparatus according to claim 1, wherein the controller is configured to start the feedback control of the roll load from when the roll load is applied to the substrate.

[Claim 6] The substrate cleaning apparatus according to claim 1, wherein the controller arbitrarily sets, for each preset roll load, timing to start the feedback control of the roll load applied to the substrate.

[Claim 7] The substrate cleaning apparatus according to claim 5, wherein an electropneumatic regulator is used as the regulating device, and the controller arbitrarily sets, for each preset roll load, an operation amount of the electropneumatic regulator before starting the feedback control of the roll load applied to the substrate.

[Claim 8] A substrate processing apparatus having a substrate cleaning apparatus according to any of claims 1 to 7.

CLAIMS

[Claim 1] A substrate cleaning apparatus for cleaning a substrate, comprising:

a roll holder configured to support a horizontally elongated roll cleaning member and rotate the roll cleaning member;

a vertical movement mechanism, having a vertically movable unit vertically movable by actuation of an actuator having a regulating device, configured to vertically move the roll holder so that the roll cleaning member applies a predetermined roll load to the substrate at the time of cleaning the substrate;

a load cell provided between the vertically movable unit of the vertical movement mechanism and the roll holder and configured to measure the roll load by measuring a load applied in a direction of the roll load;

a controller configured to perform feedback control of the roll load through the regulating device of the actuator based on a measured value of the load cell; and

a tilting mechanism provided between the vertically movable unit of the vertical movement mechanism and the roll holder and configured to tilt the roll holder.

[Claim 2] The substrate cleaning apparatus according to claim 1, wherein the vertically movable unit of the vertical movement mechanism comprises a vertically movable shaft vertically movable by actuation of the actuator.

[Claim 3] The substrate cleaning apparatus according to claim 2, wherein the load cell is provided in the vertically movable shaft and coupled to a substantially central area along the longitudinal direction of the roll holder through the tilting mechanism.

[Claim 4] The substrate cleaning apparatus according to claim 2, wherein the vertically movable shaft is coupled to a substantially central area along the longitudinal direction of the roll holder through the load cell and the tilting mechanism.

[Claim 5] The substrate cleaning apparatus according to claim 1, wherein the vertically movable unit of the vertical movement mechanism comprises a vertically movable arm extending in a horizontal direction and having a base end coupled to a vertically movable shaft vertically movable by actuation of the actuator.

[Claim 6] The substrate cleaning apparatus according to claim 5, wherein the load cell is provided at a substantially central area along a longitudinal direction of the roll holder and is coupled to the vertically movable arm through the tilting mechanism.

[Claim 7] The substrate cleaning apparatus according to claim 5, wherein the vertically movable arm is coupled to a substantially central area along the longitudinal direction of the roll holder through the load cell and the tilting mechanism.

[Claim 8] The substrate cleaning apparatus according to any one of claims 1 to 7, wherein the tilting mechanism comprises a shaft perpendicular to a rotational shaft of the roll cleaning member and a bearing rotatably supporting the shaft.

[Claim 9] The substrate cleaning apparatus according to any one of claims 1 to 8, wherein the controller is configured to start the feedback control of the roll load from when the roll load is applied to the substrate.

[Claim 10] The substrate cleaning apparatus according to any one of claims 1 to 9, wherein the controller arbitrarily sets, for each preset roll load, timing to start the feedback control of the roll load applied to the substrate.

[Claim 11] The substrate cleaning apparatus according to claim 9 or 10, wherein an electropneumatic regulator is used as the regulating device, and the controller arbitrarily sets, for each preset roll load, an operation amount of the electropneumatic regulator before starting the feedback control of the roll load applied to the substrate.

[Claim 12] The substrate cleaning apparatus according to any one of claims 1 to 11, wherein a vertical line passing through the center of gravity of the roll holder passes through substantially a center of the load cell.

[Claim 13] A substrate processing apparatus having a substrate cleaning apparatus according to any one of claims 1 to 12.

[Claim 14] A substrate cleaning apparatus for cleaning a substrate, comprising:

a roll holder configured to support a horizontally elongated roll cleaning member and rotate the roll cleaning member;

a pressing mechanism, having a pressing unit movable in a direction of pressing the roll cleaning member against the substrate by actuation of an actuator having a regulating device, configured to move the roll holder so that the roll cleaning member applies a predetermined roll load to the substrate at the time of cleaning the substrate;

a load cell provided between the pressing unit of the pressing mechanism and the roll holder and configured to measure the roll load by measuring a load applied in a direction of the roll load;

a controller configured to perform feedback control of the roll load through the regulating device of the actuator based on a measured value of the load cell; and

a tilting mechanism provided between the pressing unit of the pressing mechanism and the roll holder and configured to tilt the roll holder.

[Claim 15] The substrate cleaning apparatus according to claim 14, wherein the tilting mechanism comprises a shaft perpendicular to a rotational shaft of the roll cleaning member and a bearing rotatably supporting the shaft.

[Claim 16] A substrate processing apparatus having a substrate cleaning apparatus according to claim 14 or 15.