

above, a buff processing apparatus also scrubs the surface of the substrate by using a roll-type buff processing member having the nodule or a pencil-type buff processing member having the slit. In this case, the above-described problem may arise.

[0009]

Embodiments of the present invention seek to improve the processing ability of the substrate processing treatment (the cleaning treatment or the buff processing treatment) of scrubbing the surface of the substrate by using a roll-type processing member having the nodule or a pencil-type processing member having the slit.

[0009a]

An aspect of the present invention provides a roll member for processing a surface of a substrate by contacting the surface of the substrate, comprising a nodule on a surface, wherein the nodule comprises at least a first edge portion and a second edge portion, a groove portion is formed adjacent to the first edge portion and the second edge portion, the groove portion has a width and a depth which do not closed by deformation of the nodule contacting the substrate, the nodule is divided by the groove portion so as to form the first edge portion and the second edge portion, and each of the first edge portion and the second edge portion is configured to be able to face-contact the substrate at a substantially identical height each other to the groove portion when contacting the substrate.

Another aspect of the present invention provides a roll member for processing a surface of a substrate by contacting the surface of the substrate, comprising a nodule on a surface, wherein the nodule comprises at least a first edge portion and a second edge portion, a groove portion is formed adjacent to the first edge portion and the second edge portion, the groove portion has a width and a depth which do not closed by deformation of the nodule contacting the substrate, the nodule is divided by the groove portion so as to form the first edge portion and the second edge portion, the first edge portion is an upstream edge positioned at an upstream side when a front end surface of the nodule contacts the surface of the substrate by a rotation of the roll member, and the roll member comprises a plurality of the upstream edges arranged in a rotation direction of the roll member, and the upstream edges are formed by a slit or a concave portion being formed on the front end surface of the nodule.

Another aspect of the present invention provides a roll member for processing a surface of a substrate by contacting the surface of the substrate, comprising a nodule on a surface, wherein the nodule comprises at least a first edge portion and a second edge portion, a groove portion is formed adjacent to the first edge portion and the second edge portion, the groove portion has a width and a depth which do not closed by deformation of the nodule contacting the substrate, the nodule is divided by the groove portion so as to form the first edge

portion and the second edge portion, and a slit or a concave portion is provided on a front end surface of the nodule, and the slit or the concave portion has a shape which is narrowed in the depth direction.

Another aspect of the present invention provides a roll member for processing a surface of a substrate by scrubbing the surface of the substrate, comprising a nodule on a surface, wherein the nodule comprises a slit or a concave portion extending non-parallel to a rotation direction of the roll member to divide the nodule to form a first edge portion and a second edge portion, each of the first edge portion and the second edge portion is configured to be able to face-contact the substrate at a substantially identical height each other to the groove portion when contacting the substrate.

Another aspect of the present invention provides a roll member for processing a surface of a substrate by scrubbing the surface of the substrate, comprising a nodule on a surface, wherein the nodule comprises a slit or a concave portion extending non-parallel to a rotation direction of the roll member to divide the nodule to form a first edge portion and a second edge portion, and the slit is bent in a convex shape in the rotation direction of the roll member.

There is also disclosed a substrate processing apparatus comprising the roll member as described above; a rotational driving mechanism which rotates the roll member about a rotation axis; and a substrate holder which holds the substrate so that the surface of the substrate is parallel to the rotation axis direction of the roll-type processing member at a position contacting the nodule of the roll-type processing member.

Another aspect of the present invention provides a pencil member for processing a surface of a substrate by scrubbing the surface of the substrate at a bottom surface thereof, wherein a continuous and linear-shaped slit is formed on the bottom surface while not being divided from one edge to the other edge, and the slit has a width and a depth which do not closed by deformation of the pencil member contacting the substrate.

There is also disclosed a substrate processing apparatus comprising the pencil member as described above; a rotational driving mechanism which rotates the pencil member about the rotation axis perpendicular to the bottom surface; and a substrate holder which holds the substrate so that the surface of the substrate is parallel to the bottom surface of the pencil member at a position contacting the bottom surface of the pencil member.

There is also disclosed a substrate processing apparatus comprising the pencil member as described above; and a substrate rotation mechanism which rotates the substrate while holding the substrate so that the surface of the substrate is parallel to the bottom surface of the pencil member at a position contacting the bottom surface of the pencil member.

[0010]

A roll-type processing member according to an aspect of the present disclosure is a roll-type processing member for processing a surface of a substrate by scrubbing the surface of the substrate, including: a nodule which is formed on a surface of the roll-type processing member, wherein the nodule includes a plurality of upstream edges which are provided in the rotation direction of the roll-type processing member, the plurality of upstream edges being edges located at the upstream sides of a front end surface of the nodule when the front end surface contacts the surface of the substrate by the rotation of the roll-type processing member.

[0011]

With this configuration, since the upstream edges of

CLAIMS

1. A roll member for processing a surface of a substrate by contacting the surface of the substrate, comprising:

a nodule on a surface,

wherein the nodule comprises at least a first edge portion and a second edge portion,

a groove portion is formed adjacent to the first edge portion and the second edge portion,

the groove portion has a width and a depth which do not closed by deformation of the nodule contacting the substrate,

the nodule is divided by the groove portion so as to form the first edge portion and the second edge portion, and

each of the first edge portion and the second edge portion is configured to be able to face-contact the substrate at a substantially identical height each other to the groove portion when contacting the substrate.

2. The roll member according to claim 15, wherein the first edge portion is an upstream edge positioned at an upstream side when a front end surface of the nodule contacts the surface of the substrate by a rotation of the roll member, and the roll member comprises a plurality of the upstream edges arranged in a rotation direction of the roll member.

3. A roll member for processing a surface of a substrate by contacting the surface of the substrate, comprising:

a nodule on a surface,

wherein the nodule comprises at least a first edge portion and a second edge portion,

a groove portion is formed adjacent to the first edge portion and the second edge portion,

the groove portion has a width and a depth which do not closed by deformation of the nodule contacting the substrate,

the nodule is divided by the groove portion so as to form the first edge portion and the second edge portion,

the first edge portion is an upstream edge positioned at an upstream side when a front end surface of the nodule contacts the surface of the substrate by a rotation of the roll member, and the roll member comprises a plurality of the upstream edges arranged in a rotation direction of the roll member, and

the upstream edges are formed by a slit or a concave portion being formed on the front end surface of the nodule.

4. The roll member according to claim 3,

wherein the adjacent nodules in the rotation direction of the roll member include an overlap portion in which the adjacent nodules overlap each other in the rotation axis direction of the roll member, and the upstream edges formed by the slit or the concave portion has a length in which a non-overlap portion except for the

overlap portion in the front end surface is covered in the rotation axis direction of the roll member.

5. A roll member for processing a surface of a substrate by contacting the surface of the substrate, comprising:

a nodule on a surface,

wherein the nodule comprises at least a first edge portion and a second edge portion,

a groove portion is formed adjacent to the first edge portion and the second edge portion,

the groove portion has a width and a depth which do not closed by deformation of the nodule contacting the substrate,

the nodule is divided by the groove portion so as to form the first edge portion and the second edge portion, and

a slit or a concave portion is provided on a front end surface of the nodule, and

the slit or the concave portion has a shape which is narrowed in the depth direction.

6. A roll member for processing a surface of a substrate by scrubbing the surface of the substrate, comprising:

a nodule on a surface,

wherein the nodule comprises a slit or a concave portion extending non-parallel to a rotation direction of the roll member to divide the nodule to form a first edge portion and a second edge portion,

each of the first edge portion and the second edge portion is configured to be able to face-contact the substrate at a substantially identical height each other to the groove portion when contacting the substrate.

7. A roll member for processing a surface of a substrate by scrubbing the surface of the substrate, comprising:

a nodule on a surface,

wherein the nodule comprises a slit or a concave portion extending non-parallel to a rotation direction of the roll member to divide the nodule to form a first edge portion and a second edge portion, and

the slit is bent in a convex shape in the rotation direction of the roll member.

8. The roll member according to one of claims 1 to 7 further comprising:

a roll-shaped axis core;

the nodule on the surface; and

a roll-shaped sponge member fixed at an outer circumference of the axis core.

9. A substrate processing apparatus comprising:

the roll member according to any one of claims 1 to

8;

a rotational driving mechanism which rotates the roll member about a rotation axis; and

a substrate holder which holds the substrate so that

the surface of the substrate is parallel to the rotation axis direction of the roll-type processing member at a position contacting the nodule of the roll-type processing member.

10. A pencil member for processing a surface of a substrate by scrubbing the surface of the substrate at a bottom surface thereof,

wherein a continuous and linear-shaped slit is formed on the bottom surface while not being divided from one edge to the other edge, and

the slit has a width and a depth which do not closed by deformation of the pencil member contacting the substrate.

11. The pencil member according to claim 10, wherein the depth of the slit is a depth where, when scrubbing the substrate of the bottom surface, at least a part of the bottom surface contacts the surface of the substrate but the slit does not contact the surface of the substrate.

12. The pencil member according to claim 10 or 11, wherein the pencil member is provided with a plurality of slits having different depths.

13. The pencil member according to claim 12, wherein the slit closer to a center of the bottom surface has a deeper depth.

14. The pencil member according to any one of claims 10 to 13,

wherein the pencil member is a pencil-type cleaning member that performs a cleaning treatment on the surface of the substrate, and is formed of soft sponge.

15. The pencil member according to any one of claims 10 to 14,

wherein the pencil member is a pencil-type buff processing member for performing a buff processing treatment on the surface of the substrate, and

wherein the pencil-type buff processing member includes a base portion and a buff processing pad provided at the lower surface of the base portion so as to be used as the bottom surface.

16. A substrate processing apparatus comprising:

the pencil member according to any one of claims 10 to 15;

a rotational driving mechanism which rotates the pencil member about the rotation axis perpendicular to the bottom surface; and

a substrate holder which holds the substrate so that the surface of the substrate is parallel to the bottom surface of the pencil member at a position contacting the bottom surface of the pencil member.

17. A substrate processing apparatus comprising:
the pencil member according to any one of claims 10 to 15; and
a substrate rotation mechanism which rotates the substrate while holding the substrate so that the surface of the substrate is parallel to the bottom surface of the pencil member at a position contacting the bottom surface of the pencil member.