CLAIMS

1. A polishing device that polishes surfaces of workpieces, the polishing device comprising:

a processing vessel that includes a bottom surface portion allowing an abrasive to pass therethrough and allows the workpieces to stay on the bottom surface portion;

a fluidizing unit that fluidizes the workpieces in the processing vessel;

an abrasive-feeding unit that feeds the abrasive to the workpieces present in the processing vessel; and

a suction unit that generates an air flow in a direction in which the abrasive passes through the processing vessel, and recovers the abrasive by suction.

2. The polishing device according to claim 1,

wherein the fluidizing unit is a vibrating unit that vibrates the processing vessel or a rotating unit that rotates the processing vessel about a center of the bottom surface portion as an axis.

3. The polishing device according to claim 2,

wherein the fluidizing unit further includes a fluidization control unit that changes a fluidization state.

4. The polishing device according to claim 2,

wherein the fluidizing unit is the rotating unit, and

the processing vessel is supported by the rotating unit so as to be inclined with respect to a horizontal plane.

5. The polishing device according to claim 4,

wherein an inclination angle of the processing vessel is in the

range of 30° to 70° with respect to the horizontal plane.

6. The polishing device according to claim 1,

wherein the bottom surface portion of the processing vessel is provided with an opening.

7. The polishing device according to claim 6,

wherein the opening is formed in a mesh shape and a mesh size of the opening is in the range of 70 μm to 1100 μm.

8. The polishing device according to claim 1,

wherein when suction is performed by the suction unit, an abrasive suction portion where the abrasive passes through the processing vessel and is sucked by the suction unit is formed on a part of the bottom surface portion of the processing vessel.

9. The polishing device according to claim 8,

wherein an area of the abrasive suction portion is in the range of 1/8 to 1/4 of an area of the bottom surface portion of the processing vessel.

10. The polishing device according to claim 8,

wherein a suction speed of the abrasive passing through the abrasive suction portion is 5 m/sec or more and lower than 100 m/sec.

11. The polishing device according to claim 10,

wherein a center of the abrasive suction portion is positioned so as to be distant from a direction, which is toward a lower end of a peripheral edge portion of the bottom surface portion from the center of the bottom surface portion of the processing vessel, by a predetermined angle in a rotation direction of the processing vessel.

12. The polishing device according to claim 2,

wherein an air flow control member, which controls an air flow allowing the abrasive to pass through the processing vessel, is disposed at the center of the bottom surface portion of the processing vessel.

13. The polishing device according to claim 1,

wherein the abrasive-feeding unit includes:

a storage tank that stores the abrasive;

an abrasive discharge port through which the abrasive is fed to the workpieces;

and a conveyance unit that conveys the abrasive supplied from the storage tank toward the abrasive discharge port,

the conveyance unit includes:

a conveyance screw that includes spiral blades provided on a rotating shaft; and

a trough in which the conveyance screw is provided and which includes the abrasive discharge port formed at a lower portion of an end thereof and an abrasive supply port formed at an upper surface of a rear portion thereof so as to be connected to the storage tank,

an inner space of the trough is divided into a space that is formed by the conveyance screw and the trough and a space that is positioned in front of the conveyance screw and includes the abrasive discharge port, and

a regulating plate, in which a crushing portion through which the abrasive passes is formed, is disposed between an end of the conveyance screw and the abrasive discharge port.

14. The polishing device according to claim 1,

wherein the workpiece is made of a hard and brittle material.

15. The polishing device according to claim 14,

wherein the workpiece is a component of a multilayer ceramic capacitor or an inductor.

16. A polishing method using a polishing device including a processing vessel that includes a bottom surface portion allowing an abrasive to pass therethrough and allowing workpieces to stay thereon, a fluidizing unit that fluidizes the workpieces, an abrasive-feeding unit that feeds the abrasive to the workpieces present in the processing vessel, and a suction unit that recovers the abrasive by suction, the polishing method comprising:

a workpiece-charging step of charging the workpieces into the processing vessel;

an air flow generating step of generating an air flow in a direction in which the abrasive passes through the processing vessel by the suction unit;

a fluidizing step of fluidizing the workpieces, which are charged into the processing vessel, by the fluidizing unit;

an abrasive-feeding step of feeding the abrasive to the workpieces, which are present in the processing vessel, from the abrasive- feeding unit;

a polishing step of polishing the workpieces by allowing the abrasive to pass between the workpieces charged into the processing vessel; and

an abrasive recovering step of recovering the abrasive by the suction unit.

17. A polishing method using a polishing device including a

processing vessel that includes a bottom surface portion allowing an abrasive to pass therethrough and allowing workpieces to stay thereon and a discharge portion through which the workpieces are discharged to the outside, a fluidizing unit that fluidizes the workpieces, an abrasive-feeding unit that feeds the abrasive to the workpieces present in the processing vessel, and a suction unit that recovers the abrasive by suction, the polishing method comprising:

a workpiece-charging step of continuously or intermittently charging the workpieces into the processing vessel;

an air flow generating step of generating an air flow in a direction in which the abrasive passes through the processing vessel by the suction unit;

a fluidizing-advancing step of fluidizing the workpieces, which are present in the processing vessel, by the fluidizing unit and advancing the workpieces, which are charged in the workpiece-charging step, toward the discharge portion;

an abrasive-feeding step of feeding the abrasive to the workpieces, which are present in the processing vessel, from the abrasive-feeding unit;

a polishing step of polishing the workpieces by allowing the abrasive to pass between the workpieces that are present in the processing vessel;

an abrasive recovering step of recovering the abrasive by the suction unit; and

a workpiece recovering step of recovering the workpieces that are discharged from the discharge portion.

18. The polishing method according to claim 16 or 17,

wherein a passage speed of the abrasive, which passes between the workpieces charged into the processing vessel, is 5 m/sec or more and lower than 100 m/sec.

19. The polishing method according to claim 16,

wherein the fluidizing unit is a rotating unit that rotates the processing vessel about a center of the bottom surface portion as an axis, and

in the fluidizing step, the processing vessel is rotated in the range of 5% to 50% of a critical rotational speed by the rotating unit.

CLAIMS

1. A polishing device that polishes surfaces of a plurality of workpieces, the polishing device comprising:

a processing vessel that includes a bottom surface portion having a surface side and a back side and allowing an abrasive to pass therethrough, and allows the plurality of the workpieces to stay on the surface side of the bottom surface portion;

a fluidizing unit that fluidizes the plurality of the workpieces in the processing vessel;

an abrasive-feeding unit that feeds the abrasive to the surface side of the bottom surface portion; and

a suction unit that generates an air flow in a direction from the surface side to the back side of the bottom surface portion, and recovers the abrasive by suction, on the back side of the bottom surface portion.

2. The polishing device according to claim 1,

wherein the fluidizing unit is a vibrating unit that vibrates the processing vessel or a rotating unit that rotates the processing vessel about a center of the bottom surface portion as an axis.

3. The polishing device according to claim 2,

wherein the fluidizing unit further includes a fluidization control unit that changes a fluidization state.

4. The polishing device according to claim 2,

wherein the fluidizing unit is the rotating unit, and

the processing vessel is supported by the rotating unit so as to be inclined with respect to a horizontal plane.

5. The polishing device according to claim 4,

wherein an inclination angle of the processing vessel is in the range of 30° to 70° with respect to the horizontal plane.

6. The polishing device according to claim 1,

wherein the bottom surface portion of the processing vessel is provided with an opening.

7. The polishing device according to claim 6,

wherein the opening is formed in a mesh shape and a mesh size of the opening is in the range of 70 μm to 1100 μm.

8. The polishing device according to claim 1,

wherein when suction is performed by the suction unit, an abrasive suction portion where the abrasive passes through the processing vessel and is sucked by the suction unit is formed on a part of the bottom surface portion of the processing vessel.

9. The polishing device according to claim 8,

wherein an area of the abrasive suction portion is in the range of 1/8 to 1/4 of an area of the bottom surface portion of the processing vessel.

10. The polishing device according to claim 8,

wherein a suction speed of the abrasive passing through the abrasive suction portion is 5 m/sec or more and lower than 100 m/sec.

11. The polishing device according to claim 10,

wherein a center of the abrasive suction portion is positioned so as to be distant from a direction, which is toward a lower end of a peripheral edge portion of the bottom surface portion from the center of the bottom surface portion of the processing vessel, by a predetermined

angle in a rotation direction of the processing vessel.

12. The polishing device according to claim 2,

wherein an air flow control member, which controls an air flow allowing the abrasive to pass through the processing vessel, is disposed at the center of the bottom surface portion of the processing vessel.

13. The polishing device according to claim 1,

wherein the abrasive-feeding unit includes:

a storage tank that stores the abrasive;

an abrasive discharge port through which the abrasive is fed to the plurality of the workpieces;

and a conveyance unit that conveys the abrasive supplied from the storage tank toward the abrasive discharge port,

the conveyance unit includes:

a conveyance screw that includes spiral blades provided on a rotating shaft; and

a trough in which the conveyance screw is provided and which includes the abrasive discharge port formed at a lower portion of an end thereof and an abrasive supply port formed at an upper surface of a rear portion thereof so as to be connected to the storage tank,

an inner space of the trough is divided into a space that is formed by the conveyance screw and the trough and a space that is positioned in front of the conveyance screw and includes the abrasive discharge port, and

a regulating plate, in which a crushing portion through which the abrasive passes is formed, is disposed between an end of the conveyance screw and the abrasive discharge port.

14. The polishing device according to claim 1,

wherein the workpiece is made of a hard and brittle material.

15. The polishing device according to claim 14,

wherein the workpiece is a component of a multilayer ceramic capacitor or an inductor.

16. A polishing method using a polishing device including a processing vessel that includes a bottom surface portion having a surface side and a back side and allowing an abrasive to pass therethrough, and allows a plurality of workpieces to stay on the surface side of the bottom surface portion, a fluidizing unit that fluidizes the plurality of the workpieces, an abrasive-feeding unit that feeds the abrasive to the plurarity of the workpieces present in the processing vessel, and a suction unit that recovers the abrasive by suction, the polishing method comprising:

a workpiece-charging step of charging the plurality of the workpieces into the processing vessel;

an air flow generating step of generating an air flow in a direction from the surface side to the back side of the bottom surface portion by the suction unit;

a fluidizing step of fluidizing the plurarity of the workpieces, which are charged into the processing vessel, by the fluidizing unit;

an abrasive-feeding step of feeding the abrasive to the surface side of the bottom surface portion from the abrasive- feeding unit;

a polishing step of polishing the plurality of the workpieces by allowing the abrasive to pass between the workpieces charged into the processing vessel by the air flow; and

an abrasive recovering step of recovering the abrasive by the suction unit, on the back side of the bottom surface portion.

17. A polishing method using a polishing device including a processing vessel that includes a bottom surface portion having a surface side and a back side and allowing an abrasive to pass therethrough and a discharge portion through which a plurality of workpieces are discharged to the outside, and allows the plurality of the workpieces to stay on the surface side of the bottom surface portion, a fluidizing unit that fluidizes the plurality of the workpieces, an abrasive-feeding unit that feeds the abrasive to the plurality of the workpieces present in the processing vessel, and a suction unit that recovers the abrasive by suction, the polishing method comprising:

a workpiece-charging step of continuously or intermittently charging the plurality of the workpieces into the processing vessel;

an air flow generating step of generating an air flow in a direction from the surface side to the back side of the bottom surface portion by the suction unit;

a fluidizing-advancing step of fluidizing the plurality of the workpieces, which are present in the processing vessel, by the fluidizing unit and advancing the plurality of the workpieces, which are charged in the workpiece-charging step, toward the discharge portion;

an abrasive-feeding step of feeding the abrasive to the surface side of the bottom surface portion from the abrasive-feeding unit;

a polishing step of polishing the plurality of the workpieces by allowing the abrasive to pass between the workpieces that are present in the processing vessel by the air flow;

an abrasive recovering step of recovering the abrasive by the suction unit, on the back side of the bottom surface portion; and

a workpiece recovering step of recovering the plurality of the workpieces that are discharged from the discharge portion.

18. The polishing method according to claim 16 or 17,

wherein a passage speed of the abrasive, which passes between the workpieces charged into the processing vessel, is 5 m/sec or more and lower than 100 m/sec.

19. The polishing method according to claim 16,

wherein the fluidizing unit is a rotating unit that rotates the processing vessel about a center of the bottom surface portion as an axis, and

in the fluidizing step, the processing vessel is rotated in the range of 5% to 50% of a critical rotational speed by the rotating unit.