SUMMARY

[0004]

However, the above mentioned inventions have a problem that a blank area is generated between the injection nozzles due to the uniform arrangement of the injection nozzles and uniformly spraying a liquid containing fine bubbles (for example, microbubbles) onto a sprayed target object (for example, a substrate) to be sprayed cannot be realized.

[0005]

In view of the above problems, the present technology desirably provides a nozzle and a substrate cleaning device capable of improving uniformity when a liquid containing fine bubbles is sprayed on a sprayed target object (for example, a substrate) to be sprayed.

[0006]

A nozzle of one embodiment is a nozzle for generating fine bubbles, the nozzle comprising: a hollow housing; and a plurality of plates provided in the housing and partitioning the housing into a plurality of spaces, wherein an upper face or a side face of the housing is provided with an inflow port into which a gas-dissolved liquid flows and which communicates with an uppermost space of the spaces partitioned by a first plate of the plurality of plates, each of the plurality of plates is provided with a plurality of through-holes, and a lower face of the housing is provided with a slit communicating with a lowermost space of the spaces partitioned by a second plate of the plurality of plates.

[0006a]

A nozzle of another embodiment comprises a header pipe to which a gas-dissolved liquid is supplied; a plurality of fine bubble generation nozzles for generating and discharging a liquid containing fine bubbles from the gas-dissolved liquid supplied from the header pipe; and a rectifier means that is provided with a slit and discharges the liquid discharged from the plurality of fine bubble generation nozzles from the slit.

[0007]

A substrate cleaning device of one embodiment includes the nozzle described above.

BRIEF DESCRIPTION OF DRAWINGS

[0008]

FIG. 1A is a schematic configuration diagram of a substrate cleaning device according to a first embodiment.

FIG. 1B is a schematic perspective view of a nozzle according to the first embodiment.

FIG. 2A is a schematic perspective view of the nozzle 1 when the piping 4 is removed.

FIG. 2B is an arrow view viewed from an arrow A1 in FIG. 2A.

FIG. 2C is a cross-sectional view of the longitudinal section B in FIG. 2A.

FIG. 2D is a longitudinal sectional view of a first modification of the first embodiment.

FIG. 2E is a longitudinal sectional view of a second modification of the first embodiment.

FIG. 2F is a schematic view illustrating a process of assembling a part of the nozzle 1a2 according to the second modification of the first embodiment when the spacers 184b and 194b are separate bodies.

FIG. 2G is a schematic view illustrating a process of assembling a part of the nozzle 1a2 according to the second

CLAIMS

1. A nozzle for generating fine bubbles, the nozzle comprising:

a hollow housing; and

a plurality of plates provided in the housing and partitioning the housing into a plurality of spaces, wherein

an upper face or a side face of the housing is provided with an inflow port into which a gas-dissolved liquid flows and which communicates with an uppermost space of the spaces partitioned by a first plate of the plurality of plates,

each of the plurality of plates is provided with a plurality of through-holes, and

a lower face of the housing is provided with a slit communicating with a lowermost space of the spaces partitioned by a second plate of the plurality of plates.

2. The nozzle according to claim 1, wherein

the second plate is provided below the first plate of the plurality of plates, and

the second plate has a larger number of through-holes than the first plate, and/or has through-holes smaller than and equal to the first plate.

3. The nozzle according to claim 1 or 2, further comprising

a heating means that heats the housing or the gas-dissolved liquid.

4. The nozzle according to claim 3, wherein

the heating means is an electric heating member provided in the housing.

5. The nozzle according to claim 3, wherein

the heating means is an infrared ray irradiator for irradiating the housing with infrared rays.

6. The nozzle according to claim 3, wherein

the heating means is a medium flowing in the housing and having a predetermined temperature or higher.

7. The nozzle according to claim 3, wherein

the heating means is a medium flowing through a surface of the housing and having a predetermined temperature or higher.

8. The nozzle according to any one of claims 1 to 7, wherein

the slit is provided along a longitudinal direction of the housing.

9. A nozzle comprising:

a header pipe to which a gas-dissolved liquid is supplied;

a plurality of fine bubble generation nozzles for generating and discharging a liquid containing fine bubbles from the gas-dissolved liquid supplied from the header pipe; and

a rectifier means that is provided with a slit and discharges the liquid discharged from the plurality of fine bubble generation nozzles from the slit.

10. A substrate cleaning device comprising

the nozzle according to any one of claims 1 to 9.