end surface 313a side of inner lid 313. A gas flow is introduced from a surface opposite thereto to collide with the liquid flow. A gas-liquid mixed fluid flow advances to spout portion 316 while circulating around an inner surface of annular portion 324, and thereby atomization of the liquid in gas-liquid mixer 315 is promoted. Therefore, it is possible to provide a spraying apparatus capable of spraying a liquid having a small particle diameter, which is quickly vaporized and has little wetting or the like.

SUMMARY

[0005] spraying apparatus comprising:

a spraying apparatus main body that has a liquid flow passage and a gas flow passage;

a liquid introduction portion that is on a central axis of the spraying apparatus main body, is disposed at a tip of a cylindrical portion forming the liquid flow passage on an inside thereof, and covers an opening of the cylindrical portion;

a gas-liquid spout portion that is disposed at a tip of the spraying apparatus main body, covers the liquid introduction portion, and covers an opening of the gas flow passage;

an annular gas introduction portion that is positioned between the liquid introduction portion and the gas-liquid spout portion, and is in contact with the liquid introduction portion and the gas-liquid spout portion;

a liquid inlet that is provided at at least one place in a position distant from the central axis of an end surface of the liquid introduction portion on a downstream side, communicates with a gas-liquid mixer surrounded by the liquid introduction portion, the gas introduction portion, and the gas-liquid spout portion, and allows a liquid flow flowing through the liquid flow passage to enter the gas-liquid mixer;

a first gas inlet passage that is provided at at least one place of the annular gas introduction portion so as to communicate with the gas flow passage and the gas-liquid mixer, and allows a gas flow flowing through the gas flow passage to enter the gas-liquid mixer;

a second gas inlet passage that is provided on a downstream side of the first gas inlet passage of the gas introduction portion, communicates with the gas flow passage and the gas-liquid mixer, and has a second gas inlet having an area of predetermined area ratio with respect to the flow passage

cross-sectional area of the first gas inlet passage; and
a spout that is provided in the gas-liquid spout portion, communicates with the gas-liquid mixer, and spouts an atomized liquid in the gas-liquid mixer,
wherein the liquid inlet is formed of a through hole on an end surface of the liquid introduction portion along the central axis, and allows the liquid flow flowing through the liquid flow passage to pass through the hole to enter the gas-liquid mixer,
wherein the first gas inlet passage is formed of a first gap that is formed to extend along a direction intersecting a direction of the central axis between the liquid introduction portion and an end portion of the gas introduction portion on an upstream side, and communicates with the gas flow passage and the gas-liquid mixer,
wherein the second gas inlet passage is formed of a second gap that is formed to extend along a direction of the central axis between an inner surface of the gas-liquid spout portion and an outer surface of the gas introduction portion and communicates with the gas flow passage, and a third gap that is formed to extend along a direction intersecting the direction of the central axis between the gas-liquid spout portion and an end portion of the gas introduction portion on a downstream side, and communicates with the second gap and the gas-liquid mixer.A spraying apparatus includes a spraying apparatus main body, a liquid introduction portion, a gas-liquid spout portion, a gas introduction portion, a liquid inlet, a first gas inlet passage, a second gas inlet passage, and a spout.

The spraying apparatus main body has a liquid flow passage and a gas flow passage.

The liquid introduction portion is on a central axis of the spraying apparatus main body, is disposed at a tip of a cylindrical portion forming the liquid flow passage on an inside thereof, and covers an opening of the cylindrical portion.

The gas-liquid spout portion is disposed at a tip of the spraying apparatus main body, covers the liquid introduction portion, and covers an opening of the gas flow passage.

The gas introduction portion has an annular shape, is positioned

between the liquid introduction portion and the gas-liquid spout portion, and is in contact with the liquid introduction portion and the gas-liquid spout portion.

The liquid inlet is provided at at least one place in a position distant from the central axis of an end surface of the liquid introduction portion on a

What is claimed:

1. A spraying apparatus comprising:

a spraying apparatus main body that has a liquid flow passage and a gas flow passage;

a liquid introduction portion that is on a central axis of the spraying apparatus main body, is disposed at a tip of a cylindrical portion forming the liquid flow passage on an inside thereof, and covers an opening of the cylindrical portion;

a gas-liquid spout portion that is disposed at a tip of the spraying apparatus main body, covers the liquid introduction portion, and covers an opening of the gas flow passage;

an annular gas introduction portion that is positioned between the liquid introduction portion and the gas-liquid spout portion, and is in contact with the liquid introduction portion and the gas-liquid spout portion;

a liquid inlet that is provided at at least one place in a position distant from the central axis of an end surface of the liquid introduction portion on a downstream side, communicates with a gas-liquid mixer surrounded by the liquid introduction portion, the gas introduction portion, and the gas-liquid spout portion, and allows a liquid flow flowing through the liquid flow passage to enter the gas-liquid mixer;

a first gas inlet passage that is provided at at least one place of the annular gas introduction portion so as to communicate with the gas flow passage and the gas-liquid mixer, and allows a gas flow flowing through the gas flow passage to enter the gas-liquid mixer;

a second gas inlet passage that is provided on a downstream side of the first gas inlet passage of the gas introduction portion, communicates with the gas flow passage and the gas-liquid mixer, and has a second gas inlet having an area of predetermined area ratio with respect to the flow passage cross-sectional area of the first gas inlet passage; and

a spout that is provided in the gas-liquid spout portion, communicates with the gas-liquid mixer, and spouts an atomized liquid in the gas-liquid mixer,

wherein the liquid inlet is formed of a through hole on an end surface of the liquid introduction portion along the central axis, and allows the liquid flow flowing through the liquid flow passage to pass through the hole to enter the gas-liquid mixer,

wherein the first gas inlet passage is formed of a first gap that is formed to extend along a direction intersecting a direction of the central axis between the liquid introduction portion and an end portion of the gas introduction

portion on an upstream side, and communicates with the gas flow passage and the gas-liquid mixer,
wherein the second gas inlet passage is formed of a second gap that is formed to extend along a direction of the central axis between an inner surface of the gas-liquid spout portion and an outer surface of the gas introduction portion and communicates with the gas flow passage, and a third gap that is formed to extend along a direction intersecting the direction of the central axis between the gas-liquid spout portion and an end portion of the gas introduction portion on a downstream side, and communicates with the second gap and the gas-liquid mixer.

2.The spraying apparatus of Claim 1, wherein the predetermined area ratio is a ratio of a sum of areas of the
second gas inlets of the second gas inlet passages to a sum of flow passage cross-sectional areas of the first gas inlet passages, and is 0.25 times or more and 2.5 times or less.