CLAIMS

[Claim 1] A planar liquid film forming method of forming a planar liquid film on an application target using a jet-type discharge device having a plurality of discharge ports, wherein

the plurality of discharge ports are arranged on a straight nozzle arrangement line, and are arranged with such a distance from one another that globs of a liquid material having landed on the application target can join together to form a linear liquid film, the method comprising:

a unitary linear liquid film forming step of forming a unitary linear liquid film by discharging the liquid material such that a plurality of liquid globs simultaneously discharged from the plurality of discharge ports have no contact with one another before landing on the application target, and by letting globs of the liquid material having landed join together on the application target; and

a specific planar liquid film forming step of forming a specific planar liquid film from a plurality of unitary linear liquid films by successively executing the unitary linear liquid film forming steps while moving the jet-type discharge device and the application target relative to each other in a direction perpendicular to the nozzle arrangement line so that the plurality of unitary linear liquid films join together,

characterized in that

the plurality of discharge ports include:

a leftmost large-diameter discharge port arranged on a left end;

a rightmost large-diameter discharge port arranged on a right end; and

a small-diameter discharge port arranged halfway between the leftmost large-diameter discharge port and the rightmost large-diameter discharge port,

wherein all of the large-diameter discharge ports have a same diameter, and

wherein the unitary linear liquid film forming step includes forming the unitary linear liquid film by causing a small droplet discharged from the small-diameter discharge port to land after a plurality of large droplets discharged from the large-diameter discharge ports landing on the application target.

[Claim 2] The planar liquid film forming method according to claim 1, comprising a joined planar liquid film forming step of forming a joined planar liquid film from a plurality of specific planar liquid films by executing the specific planar liquid film forming step

multiple times to form the plurality of specific planar liquid films adjacent to one another in a direction of the nozzle arrangement line so that the plurality of specific planar liquid films join together.

[Claim 3] The planar liquid film forming method according to claim 2, wherein the joined planar liquid film forming step includes repeatedly performing a movement of the jet-type discharge device and the application target in a first direction to form a specific planar liquid film and then in a second direction that is opposite to the first direction to form a subsequent specific planar liquid film.

[Claim 4] The planar liquid film forming method according to claim 2 or 3, wherein the joined planar liquid film forming step includes forming the joined planar liquid film by letting differently shaped specific planar liquid films join together.

[Claim 5] The planar liquid film forming method according to any one of claims 2 to 4, wherein the joined planar liquid film has surface unevenness with a height of one-tenth or less of a thickness of the joined planar liquid film.

[Claim 6] A planar liquid film forming method of forming a planar liquid film on an application target using a jet-type discharge device having a plurality of discharge ports, wherein

the plurality of discharge ports are arranged on a straight nozzle arrangement line, and are arranged with such a distance from one another that globs of a liquid material having landed on the application target can join together to form a linear liquid film, the method comprising:

a unitary linear liquid film forming step of forming a unitary linear liquid film by discharging the liquid material such that a plurality of liquid globs simultaneously discharged from the plurality of discharge ports have no contact with one another before landing on the application target, and by letting globs of the liquid material having landed join together on the application target; and

a specific planar liquid film forming step of forming a specific planar liquid film from a plurality of unitary linear liquid films by successively executing the unitary linear liquid film forming steps while moving the jet-type discharge device and the application target relative to each other in a direction perpendicular to the nozzle arrangement line so that the plurality of unitary linear liquid films join together,

characterized in that

the plurality of discharge ports include:

a leftmost large-diameter discharge port arranged on a left end;

a rightmost large-diameter discharge port arranged on a right end;

at least one large-diameter discharge port arranged between the leftmost large-diameter discharge port and the rightmost large-diameter discharge port; and

a plurality of small-diameter discharge ports,

wherein all of the large-diameter discharge ports have a same diameter, and

wherein each of the small-diameter discharge ports is arranged halfway between adjacent two of the large-diameter discharge ports, and

wherein the unitary linear liquid film forming step includes forming the unitary linear liquid film by causing a small droplet discharged from the small-diameter discharge port to land after a plurality of large droplets discharged from the large-diameter discharge ports landing on the application target.

[Claim 7] The planar liquid film forming method according to claim 6, comprising a joined planar liquid film forming step of forming a joined planar liquid film from a plurality of specific planar liquid films by executing the specific planar liquid film forming step multiple times to form the plurality of specific planar liquid films adjacent to one another in a direction of the nozzle arrangement line so that the plurality of specific planar liquid films join together.

[Claim 8] The planar liquid film forming method according to claim 7, wherein the joined planar liquid film forming step includes repeatedly performing a movement of the jet-type discharge device and the application target in a first direction to form a specific planar liquid film and then in a second direction that is opposite to the first direction to form a subsequent specific planar liquid film.

[Claim 9] The planar liquid film forming method according to claim 7 or 8, wherein the joined planar liquid film forming step includes forming the joined planar liquid film by letting differently shaped specific planar liquid films join together.

[Claim 10] The planar liquid film forming method according to any one of claims 7 to 9, wherein the joined planar liquid film has surface unevenness with a height of one-tenth or less of a thickness of the joined planar liquid film.

[Claim 11] The planar liquid film forming method according to claims 1 to 10, wherein

the unitary linear liquid film forming step includes discharging the plurality of large droplets so as to form a depressed portion on a surface when the plurality of large droplets join together on the application target, and discharging the small droplet so as to land on the depressed portion.

[Claim 12] The planar liquid film forming method according to any one of claims 1 to 11, wherein the diameter of the large-diameter discharge ports is 1.2 to 2 times larger than a diameter of the small-diameter discharge port.

[Claim 13] The planar liquid film forming method according to claim 12, wherein the large-diameter discharge ports are arranged at a regular interval, and

a distance between adjacent two of the large-diameter discharge ports is 2 to 12 times larger than the diameter of the large-diameter discharge ports.

[Claim 14] The planar liquid film forming method according to any one of claims 1 to 13, wherein the liquid material has a viscosity of 1000 mPa·s or larger.

[Claim 15] A planar liquid film forming apparatus comprising:

a jet-type discharge device; and

a relative driving device configured to move the jet-type discharge device and an application target relative to each other,

wherein the jet-type discharge device comprises:

a nozzle having a plurality of discharge ports arranged on a straight nozzle arrangement line;

a liquid chamber communicating with the plurality of discharge ports via a plurality of discharge flow paths;

a plunger rod that reciprocates in the liquid chamber and is narrower than the liquid chamber; and

a control device storing an application program for implementing the planar liquid film forming method according to any one of claims 1 to 14.

[Claim 16] The planar liquid film forming apparatus according to claim 15, wherein the nozzle comprises a plurality of discharge tubes having the plurality of discharge ports, and a nozzle member having a tip portion from which the plurality of discharge tubes protrude.