Claims

1. A liquid material discharging apparatus comprising:

a liquid chamber which communicates with a discharging port and to which a liquid material is supplied;

a plunger whose rear end portion has a piston and whose front end portion moves forward and rearward inside the liquid chamber;

an elastic body which applies a biasing force to the plunger; and

a pressurizing chamber in which the piston is arranged and to which compressed gas is supplied,

wherein the liquid material is discharged through the discharging port by causing the plunger to move forward fast,

wherein the elastic body biases the plunger in a rearward movement direction, and

wherein the compressed gas supplied to the pressurizing chamber applies a driving force to the piston to cause the plunger to move forward, and the air pressure of the pressurizing chamber can be adjusted.

2. The liquid material discharging apparatus according to Claim 1, further comprising:

a stroke adjustment mechanism which comes into contact

with the piston and adjusts the most rearward movement position of the piston.

3. The liquid material discharging apparatus according to Claim 1 or 2, further comprising:

a position determining mechanism which includes a contact portion disposed in the plunger and a position determining member opposing the contact portion, and which determines the most forward movement position of the plunger.

4. The liquid material discharging apparatus according to Claim 3,

wherein the contact portion comprises a convex member disposed in a forward movement direction of the piston, and the position determining member comprises a wall surface opposing the piston of the pressurizing chamber.

5. The liquid material discharging apparatus according to Claim 3, further comprising:

a distance adjustment mechanism which adjusts a distance between the position determining member and the pressurizing chamber.

6. The liquid material discharging apparatus according to Claim 5,

wherein the contact portion comprises a convex member disposed in a forward movement direction of the piston.

7. The liquid material discharging apparatus according to Claim 5,

wherein the plunger has a rod portion connecting the piston and the front end portion, and the contact portion is disposed in the rod portion.

8. The liquid material discharging apparatus according to any one of Claims 1 to 7, further comprising:

a biasing force adjustment mechanism which includes a moving member holding the elastic body by opposing the piston and a position adjustment mechanism adjusting a position of the moving member, and which adjusts a biasing force of the elastic body.

9. The liquid material discharging apparatus according to any one of Claims 1 to 8, further comprising:

a pressure intensifier which intensifies a pressure of the compressed gas to be supplied to the pressurizing chamber; and

a pressure regulator which reduces a pressure of the compressed gas whose pressure is intensified by the pressure intensifier, to be a desired pressure, and which supplies the

compressed gas to the pressurizing chamber.

10. The liquid material discharging apparatus according to Claim 9,

wherein a buffer tank is disposed in a flow path which allows the pressure intensifier and the pressurizing chamber to communicate with each other.

11. The liquid material discharging apparatus according to any one of Claims 1 to 10, further comprising:

a flow valve which controls a flow rate of the compressed gas ejected from the pressurizing chamber.

12. The liquid material discharging apparatus according to any one of Claims 1 to 11,

wherein the pressurizing chamber is divided into two air-tight spaces by the piston; and

wherein the liquid material discharge apparatus further includes a flow valve which controls a flow rate of gas flowing in the pressurizing chamber when the piston rises.

13. A liquid material discharge method of using a liquid material discharging apparatus that includes a liquid chamber which communicates with a discharging port and to which a liquid material is supplied; a plunger whose rear end portion has a

piston and whose front end portion moves forward and rearward inside the liquid chamber; an elastic body which applies a biasing force to the plunger; and a pressurizing chamber in which the piston is arranged and to which compressed gas is supplied, the method comprising:

a filling process of causing the plunger to move in a rearward movement direction by ejecting the compressed gas inside the pressurizing chamber; and

a discharging process of causing the plunger to move forward at a desired speed by supplying the compressed gas which is adjusted to have a desired pressure to the pressurizing chamber.

14. The liquid material discharge method according to Claim 13,

wherein the liquid material discharge apparatus further includes a position determining mechanism which includes a contact portion disposed in the plunger and a position determining member opposing the contact portion, and which determines the most forward movement position of the plunger: and

wherein the liquid material is discharged in a droplet state after applying inertia force to the liquid material by causing the plunger to move forward in a state where the front end portion of the plunger and an inner wall of the liquid

chamber are not in contact with each other.

15. The liquid material discharge method according to Claim 14,

wherein the discharging process comprises:

a process of extruding the liquid material having an amount required for forming a desired droplet from the discharging port by causing the plunger to move forward to the most forward movement position where the plunger is not in contact with the liquid chamber; and

a process of forming a very small amount of droplets after dividing the liquid material extruded from the discharging port by subsequently causing the plunger to move rearward.

16. The liquid material discharge method according to any one of Claims 13 to 15,

wherein the liquid material discharge apparatus further includes a pressure intensifier which intensifies a pressure of the compressed gas to be supplied to the pressurizing chamber, and a pressure regulator which reduces a pressure of the compressed gas whose pressure is intensified by the pressure intensifier, to be a desired pressure, and which supplies the compressed gas to the pressurizing chamber; and

wherein the discharging process comprises a process of supplying the compressed gas whose pressure has been regulated.

17. The liquid material discharge method according to Claim 16,

wherein a buffer tank is disposed in a flow path which allows the pressure intensifier and the pressurizing chamber to communicate with each other.

18. The liquid material discharge method according to any one of Claims 13 to 17,

wherein the liquid material discharge apparatus further includes a flow valve which controls a flow rate of the compressed gas ejected from the pressurizing chamber; and

wherein the filling process comprises a process of controlling the flow rate of the compressed gas ejected from the pressurizing chamber.

19. The liquid material discharge method according to any one of Claims 13 to 18,

wherein the pressurizing chamber is divided into two air-tight spaces by the piston; and

wherein the liquid material discharge apparatus further includes a flow valve which controls a flow rate of gas flowing in the pressurizing chamber when the piston rises; and

wherein the filling process comprises a process of controlling the flow rate of the gas flowing into the

pressurizing chamber.