CLAIMS

1. A seal structure of a valve device comprising a fluid chamber having an outflow hole and an inflow hole, and a needle of which fore end reciprocates in the fluid chamber,

the seal structure comprising a seal and the needle inserted through the seal,

wherein the seal comprises a main body made of an elastic body having a needle fitting insertion hole formed for the needle to be inserted and fit into, and a flange portion (104, 105) made of an elastic body annularly extending from the main body in a radial direction outward, and

wherein an end opening diameter (D_3) of the needle fitting insertion hole on an outflow-hole side is smaller than an end opening diameter (D_2) of the needle fitting insertion hole on a side opposite to the outflow hole, and the end opening diameter (D_3) on the outflow-hole side and the end opening diameter (D_2) on the side opposite to the outflow hole are both smaller than a diameter (D_1) of the needle.

2. The seal structure according to Claim 1, wherein the main body and the flange portion are integrally formed.

3. The seal structure according to Claim 1 or 2, wherein the needle fitting insertion hole

(a) comprises a first diameter, a second diameter, and a stepped portion,

(b) has a cross section where an inner periphery surface is tapered,

(c) has a cross section where an inner periphery surface curves convexly inward, or

(d) has a cross section where an inner periphery surface curves convexly outward.

4. The seal structure according to any of Claims 1 to 3, wherein an outer periphery portion (105) of the flange portion has a protrusion formed on at

least one side out of an outflow-hole side and a side opposite to the outflow hole.

5. The seal structure according to any of Claims 1 to 4, wherein the flange portion (104, 105) extends in a radial direction outward from a position nearer to an end portion on the side opposite to the outflow hole than to an end portion on the outflow-hole side.

6. The seal structure according to any of Claims 1 to 4, wherein the flange portion (104, 105) extends in a radial direction outward from an end portion of the main body on the side opposite to the outflow hole.

7. A seal structure of a valve device comprising a fluid chamber having an outflow hole and an inflow hole, and a needle of which fore end reciprocates in the fluid chamber,

the seal structure comprising a seal and a housing in which the fluid chamber is formed,

wherein the seal comprises a main body made of an elastic body having a needle fitting insertion hole formed for the needle to be inserted and fit into, and a flange portion (104, 105) made of an elastic body annularly extending from the main body in a radial direction outward,

wherein the main body of the seal is configured to be narrower than the fluid chamber,

wherein an end opening diameter (D_3) of the needle fitting insertion hole on an outflow-hole side is smaller than an end opening diameter (D_2) of the needle fitting insertion hole on a side opposite to the outflow hole,

wherein the housing comprises a first housing member (207) comprising the fluid chamber, and a second housing member (206) comprising a driving chamber (204) that is wider than the needle and through which the needle is to be inserted,

wherein at least one of the first housing member (207) and the second housing member (206) comprises a stepped portion (215) in contact with a surface of the flange portion, the surface being adjacent to an outer

periphery edge of the flange portion,

wherein the first housing member (207) and the second housing member (206) are coupled with each other in a state where an outer periphery portion (105) of the flange portion is pressed therebetween, and

wherein an inner periphery portion (104) of the flange portion, when the needle reciprocates, deforms accordingly to keep a positional relationship between the needle and the main body unchanged.

8. The seal structure according to Claim 7, wherein an end opening diameter (D_3) of the needle fitting insertion hole on an outflow-hole side and an end opening diameter (D_2) of the needle fitting insertion hole on a side opposite to the outflow hole are both smaller than a diameter (D_1) of the needle.

9. A valve device comprising:

a seal;

a fluid chamber having an outflow hole and an inflow hole;

a needle of which fore end reciprocates in the fluid chamber;

a housing in which the fluid chamber is formed; and

a needle driving device that cause the needle to reciprocate;

wherein the valve device ejects fluid, supplied to the inflow hole, from the outflow hole,

wherein the seal comprises a main body made of an elastic body having a needle fitting insertion hole formed for the needle to be inserted and fit into, and a flange portion (104, 105) made of an elastic body annularly extending from the main body in a radial direction outward,

wherein

the main body of the seal is narrower than the fluid chamber, and

the needle fitting insertion hole is narrower than the needle, and one end opening diameter (D_3) of the needle fitting insertion hole is smaller than another end opening diameter (D_2) of the needle fitting insertion hole,

wherein the housing comprises a first housing member (207)

comprising the fluid chamber, and a second housing member (206) comprising a driving chamber (204) that is wider than the needle and through which the needle is inserted,

wherein at least one of the first housing member (207) and the second housing member (206) comprises a stepped portion (215) in contact with a surface of the flange portion, the surface being adjacent to an outer periphery edge of the flange portion,

wherein the first housing member (207) and the second housing member (206) are coupled with each other in a state where an outer periphery portion (105) of the flange portion is pressed therebetween, and

wherein an inner periphery portion (104) of the flange portion, when the needle reciprocates, deforms accordingly to keep a positional relationship between the needle and the main body unchanged.

10. The valve device according to Claim 9, wherein

the needle driving device comprises an actuator, and

the valve device further comprises a stroke adjustment mechanism that adjusts a stroke of the needle.

11. A fluid discharge device comprising:

the valve device according to Claim 9 or 10;

a reservoir fluidically connected to the inflow hole;

a nozzle having a discharge port fluidically connected to the outflow hole; and

a valve control device that controls operation of the valve device.

12. The fluid discharge device according to Claim 11, wherein the reservoir is a reservoir for a liquid material.

13. The fluid discharge device according to Claim 12, wherein the fluid discharge device is a jet type discharge device that discharges and flies a liquid droplet from the discharge port by moving the needle forward to collide against a valve seat that is an inlet portion of the outflow hole or by moving the needle forward and stopping the needle immediately before colliding

against the valve seat.

14. An application device comprising:

the fluid discharge device according to any of Claims 11 to 13;

a stage on which an application target is placed;

a relative driving device that moves the fluid discharge device and the stage relative to one another; and

a stage control device that controls operation of the relative driving device.