CLAIMS

[Claim 1] A liquid material discharge device comprising:

a valve stem having a valve element provided at a tip portion, and a contact portion;

a liquid chamber in which the valve element moves forward and backward;

a nozzle communicating with the liquid chamber;

a valve seat having a hole via which the liquid chamber and the nozzle communicate with each other;

an arm that is in separable contact with the valve stem; and

a valve driving device configured to move the valve element forward to and backward from the valve seat by causing the arm to pivot;

wherein the liquid material discharge device further comprising a coupling device that is attached and fixed to the arm, and couples the valve stem with the arm,

wherein the coupling device includes a pressing portion that presses the contact portion against the arm, and

wherein the pressing portion is constituted by a plate-like elastic body.

[Claim 2] The liquid material discharge device according to claim 1, wherein the arm has a reception portion where the contact portion of the valve stem is disposed, and

when the arm pivots, the contact portion of the valve stem rolls on the reception portion.

[Claim 3] The liquid material discharge device according to claim 2, wherein the reception portion is formed in a top surface of the arm,

wherein the arm includes a through-hole through which the valve stem is inserted, the through-hole being provided in the reception portion,

wherein the contact portion is wider than the valve stem, and has a flat top surface and a rounded bottom surface.

[Claim 4] The liquid material discharge device according to claim 2, wherein the reception portion of the arm is formed in a bottom surface of the arm,

wherein the contact portion is wider than the valve stem, and has a flat bottom surface and a rounded top surface.

[Claim 5] The liquid material discharge device according to claim 4, wherein the

pressing portion includes a cutout portion in which the valve stem is disposed.

[Claim 6] A liquid material discharge device comprising:

a valve stem having a valve element provided at a tip portion, and a contact portion;

a liquid chamber in which the valve element moves forward and backward;

a nozzle communicating with the liquid chamber;

a valve seat having a hole via which the liquid chamber and the nozzle communicate with each other;

an arm that is in separable contact with the valve stem; and

a valve driving device configured to move the valve element forward to and backward from the valve seat by causing the arm to pivot;

wherein the liquid material discharge device further comprising a coupling device that is attached and fixed to the arm, and couples the valve stem with the arm, and

wherein the coupling device includes a pressing portion that presses the contact portion against the arm, a locking portion extending in a same direction as the pressing portion, and a connecting portion connecting the locking portion with the pressing portion, and wherein the arm is held between the locking portion and the pressing portion.

[Claim 7] The liquid material discharge device according to claim 6, wherein the locking portion includes a vertex portion that is in contact with the arm.

[Claim 8] The liquid material discharge device according to claim 7, wherein the arm includes a depressed portion that receives the vertex portion of the locking portion.

[Claim 9] The liquid material discharge device according to claim 6, wherein the locking portion includes at least two vertex portions that are in contact with the arm, and a depressed portion located between the at least two vertex portions,

wherein the arm includes a protruded portion received in the depressed portion of the locking portion.

[Claim 10] The liquid material discharge device according to claim 6, wherein the pressing portion includes a vertex portion that is in contact with the contact portion.

[Claim 11] The liquid material discharge device according to any one of claims 6 to 10, comprising a fastening member that fastens the coupling device to the arm,

wherein the connecting portion includes a hole through which the fastening member is inserted.

[Claim 12] A liquid material discharge device comprising:

a valve stem having a valve element provided at a tip portion, and a contact portion;

a liquid chamber in which the valve element moves forward and backward;

a nozzle communicating with the liquid chamber;

a valve seat having a hole via which the liquid chamber and the nozzle communicate with each other;

an arm that is in separable contact with the valve stem; and

a valve driving device configured to move the valve element forward to and backward from the valve seat by causing the arm to pivot;

wherein the liquid material discharge device further comprising a coupling device that is attached and fixed to the arm, and couples the valve stem with the arm,

wherein the coupling device includes a pressing portion that presses the contact portion against the arm, and

wherein the coupling device includes a fixing portion continuous with the pressing portion, and a fastening member that fixes the fixing portion to the arm.

[Claim 13] The liquid material discharge device according to claim 12, wherein the fixing portion extends in a direction substantially perpendicular to the pressing portion and is fixed to a tip portion of the arm with the fastening member.

[Claim 14] The liquid material discharge device according to claim 12, wherein the fastening member is fixed to a top surface or a bottom surface of the arm.

[Claim 15] The liquid material discharge device according to any one of claims 12 to 14, wherein the pressing portion includes a vertex portion that is in contact with the contact portion.

[Claim 16] The liquid material discharge device according to claim 15, wherein the vertex portion of the pressing portion is located at an end of the pressing portion.

[Claim 17] The liquid material discharge device according to any one of claims 12 to 16, comprising an axle portion that pivotally fixes the coupling device to the arm.

[Claim 18] A liquid material discharge device comprising:

a valve stem having a valve element provided at a tip portion, and a contact portion;

a liquid chamber in which the valve element moves forward and backward;

a nozzle communicating with the liquid chamber;

a valve seat having a hole via which the liquid chamber and the nozzle communicate with each other;

an arm that is in separable contact with the valve stem; and

a valve driving device configured to move the valve element forward to and backward from the valve seat by causing the arm to pivot;

wherein the liquid material discharge device further comprising a coupling device that is attached and fixed to the arm, and couples the valve stem with the arm,

wherein the coupling device includes a pressing portion that presses the contact portion against the arm, and

wherein the pressing portion is constituted by a pair of bridges provided on the arm.

[Claim 19] The liquid material discharge device according to claim 18, wherein the pressing portion includes plate-like elastic bodies having depressed portions,

wherein the contact portion includes a first contact portion that is in contact with the arm, and second contact portions that project from the valve stem and are pressed by the depressed portions of the pair of bridges.

[Claim 20] The liquid material discharge device according to claim 18, wherein the pressing portion includes round-bar-like elastic bodies,

wherein the contact portion has a rounded top surface and a rounded bottom surface.

[Claim 21] A liquid material discharge device comprising:

a valve stem having a valve element provided at a tip portion, and a contact portion;

a liquid chamber in which the valve element moves forward and backward;

a nozzle communicating with the liquid chamber;

a valve seat having a hole via which the liquid chamber and the nozzle communicate with each other;

an arm that is in separable contact with the valve stem; and

a valve driving device configured to move the valve element forward to and backward from the valve seat by causing the arm to pivot;

wherein the liquid material discharge device further comprising a coupling device that is attached and fixed to the arm, and couples the valve stem with the arm,

wherein the coupling device includes a pressing portion that presses the contact

portion against the arm,

wherein the valve stem includes a narrow portion forming a stepped portion, and

wherein the pressing portion presses the stepped portion.

[Claim 22] The liquid material discharge device according to any one of claims 1 to 21, wherein the valve driving device includes a piezoelectric actuator.

[Claim 23] The liquid material discharge device according to any one of claims 1 to 22, wherein the valve driving device is configured to move the valve element forward to discharge a droplet from the nozzle.