

DESCRIPTION

Title of the Invention:

LIQUID MATERIAL DISCHARGE DEVICE

Technical Field

5 [0001] The present invention relates to a discharge device that discharges liquid material, and more specifically to a liquid material discharge device having a mechanism that decouples or couples a liquid contact portion from or to a main body.

Note that “discharge” in the present invention includes a type of a discharge method in which liquid material comes into contact with a workpiece before separating
10 from a discharge port and a type of discharge method in which liquid material comes into contact with a workpiece after separating from a discharge port.

Background Art

[0002] As conventional liquid material discharge devices, there are known devices having a structure including a main body provided with a liquid chamber
15 communicating with a nozzle, an operating shaft driven in the liquid chamber, and a reservoir provided laterally to the main body. Here, examples known as the operating shaft include: a screw that is operated to rotationally move in the liquid chamber; a plunger rod that has the same diameter as the liquid chamber and is operated to move forward while sliding against an inner peripheral surface of the liquid chamber; and a
20 rod that has a smaller diameter than the liquid chamber and is operated to move forward and backward without sliding against the inner peripheral surface of the liquid chamber (for example, a valve stem 105 in Patent Document 1).

[0003] As for the liquid material discharge devices having the above structure, during replacement work for liquid material and disposables such as nozzles or maintenance
25 work including washing and the like, a liquid contact portion and a variety of parts are detached from the main body, which would cause a fall accident of the liquid contact portion and the variety of parts. Thus, the applicant has proposed in Patent Document 2 that the fall problem is solved by providing: a holder to which a housing including a discharging member detachably coupled to a driving unit is detachably attached; and
30 a movable member that moves in an up-and-down direction along the housing while being kept attached to the housing so that the discharging member and the driving unit can be detached and attached by moving the movable member in the up-and-down direction.

Prior Art List

Patent Document

[0004] Patent Document 1: Japanese Patent Laid-Open Publication No. 2022-7035

Patent Document 2: Japanese Patent Publication No. 6452147

Summary of the Invention

5 Problems to be Solved by the Invention

[0005] Liquid material discharge devices having a structure in which a liquid contact portion is detachable from a main body have a problem of bulky size of the entire device and a problem of increased device weight because a mechanism for attaching the liquid contact portion to the main body needs to be added.

10 In addition, there is a problem in that misalignment of the liquid contact portion occurs when the liquid contact portion is attached to the main body. Especially, in a jet-type discharge device (jet-type dispenser) in which a rod (operating shaft) with a smaller diameter than a liquid chamber is moved forward and backward to discharge and eject a liquid droplet as in Patent Document 1 above, misalignment of the attachment position significantly affects discharge accuracy.

15 [0006] The present invention aims to provide a liquid material discharge device in which a liquid contact portion can be attached to a main body without misalignment while achieving a compact device size.

Means for Solving the Problems

20 [0007] A liquid material discharge device according to the present invention includes the following technical means.

[1] A liquid material discharge device that discharges liquid material by action of an operating shaft driven in a liquid chamber, the liquid material discharge device including: a main body having the operating shaft and a driving device configured to drive the operating shaft; a liquid contact portion having the liquid chamber and a liquid feed path through which liquid material is supplied to the liquid chamber; and a liquid contact portion coupling tool configured to detachably couple the liquid contact portion to the main body, wherein the liquid contact portion includes an insert portion provided with a first thread groove in at least a part of a side surface, the liquid contact portion coupling tool includes a rotating member provided with a second thread groove that threadedly engages with the first thread groove and includes a rotating member holder that rotatably supports the rotating member, and the liquid contact portion is raised and fixed to the main body by inserting a distal end of the insert portion into the rotating member and rotating the rotating member.

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[2] The liquid material discharge device according to [1], wherein the insert portion includes one or more straight grooves extending in a vertical direction in the side surface, and the rotating member holder includes one or more guides that engage with the one or more straight grooves.

5 [3] The liquid material discharge device according to [2], wherein the liquid contact portion is positioned in a horizontal direction with respect to the main body by engaging the one or more straight grooves with the one or more guides.

[4] The liquid material discharge device according to [2], wherein the rotating member has a diameter of which length is longer than a length of a short side of the main body, the rotating member holder includes a pair of rotating member holders provided along a longitudinal direction of the main body, and the rotating member is sandwiched between the pair of rotating member holders such that a side surface of the rotating member in a direction perpendicular to the longitudinal direction is exposed.

15 [5] The liquid material discharge device according to [4], wherein the pair of rotating member holders have respective inner peripheral surfaces that are arc-shaped, and the one or more guides are formed on the inner peripheral surfaces.

[6] The liquid material discharge device according to [2], wherein the one or more straight grooves include a plurality of straight grooves provided to face each other, and the one or more guides include a plurality of guides that engage with the plurality of straight grooves.

[7] The liquid material discharge device according to [2], wherein the one or more straight grooves include a plurality of straight grooves, and a number of the straight grooves is greater than a number of the guides.

25 [8] The liquid material discharge device according to [2], wherein the one or more straight grooves include a first straight groove and a second straight groove that are arranged at an acute angle, a right angle, or an obtuse angle, and a horizontal angle of the liquid contact portion with respect to the main body can be adjusted by engaging one of the first and second straight grooves with the one or more guides.

30 [9] The liquid material discharge device according to [2], wherein the one or more straight grooves include first to third straight grooves that are provided at equal intervals in a half side of a lateral peripheral surface of the insert portion, and a horizontal angle of the liquid contact portion with respect to the main body can be adjusted by engaging one of the first to third straight grooves with the one or more

guides.

[10] The liquid material discharge device according to [1], wherein the insert portion includes a first side surface that is arc-shaped and in which the first thread groove is formed and a second side surface formed as a flat surface extending in a vertical direction, and the rotating member holder is the rotating member holder and includes a flat surface that comes into planar contact with the second side surface when the liquid contact portion is fixed to the main body.

[11] The liquid material discharge device according to any one of [1] to [10], wherein the insert portion has an upper end surface that is a flat surface, and the liquid contact portion coupling tool fixes the upper end surface and a bottom surface of the main body in planar contact with each other.

[12] The liquid material discharge device according to [11], wherein a first guide portion is formed on the upper end surface of the insert portion, and a second guide portion that engages with the first guide portion is formed on the bottom surface of the main body.

[13] The liquid material discharge device according to any one of [1] to [12], wherein the liquid contact portion includes a connecting tool for connecting with a reservoir and a liquid feed member in which the liquid feed path is formed.

[14] The liquid material discharge device according to [13], wherein the main body includes a reservoir holder configured to hold the reservoir connected to the connecting tool, and when thread engagement between the first thread groove and the second thread groove is released, the liquid contact portion is held by the reservoir holder via the reservoir.

[15] The liquid material discharge device according to [13] or [14], wherein, in a state where the liquid contact portion is fixed to the main body, a gap of 20 mm or less is formed between the liquid contact portion coupling tool and the liquid feed member.

[16] The liquid material discharge device according to any one of [1] to [15], wherein the liquid material discharge device is a jet-type dispenser, a screw-type dispenser, a plunger-type dispenser, or a valve-type dispenser.

Advantageous Effect of the Invention

[0008] According to the present invention, it is possible to achieve a compact device size while enabling a liquid contact portion to be attached to a main body without misalignment.

Brief Description of the Drawings

[0009] [Fig. 1] Fig. 1 is a perspective view of a liquid material discharge device according to embodiments.

[Fig. 2] Fig. 2 is a perspective view illustrating a state in which a liquid contact portion has been detached from the liquid material discharge device according to
5 embodiments.

[Fig. 3] Fig. 3 is a perspective view of a rotating member according to embodiments.

[Fig. 4] Fig. 4 is a bottom view of a housing according to embodiments.

10 [Fig. 5] Fig. 5 is a partial sectional side view of the liquid material discharge device including a sectional view of a liquid contact portion coupling tool according to embodiments.

[Fig. 6] Fig. 6 is a partial side view of the liquid material discharge device including a sectional view of the liquid contact portion coupling tool, a liquid feed
15 member, a nozzle attachment member, and a connecting tool according to embodiments.

[Fig. 7] Fig. 7 shows views for explaining an insert portion of the nozzle attachment member according to embodiments, where (a) is a plan view, (b) is a front view, and (c) is a partial sectional side view.

20 [Fig. 8] Fig. 8 is a side view for explaining an operation (1) when the liquid contact portion is detached from a main body.

[Fig. 9] Fig. 9 is a side view for explaining an operation (2) when the liquid contact portion is detached from the main body.

[Fig. 10] Fig. 10 is a side view for explaining an operation (3) when the liquid
25 contact portion is detached from the main body.

[Fig. 11] Fig. 11 is a side view for explaining an operation (1) when the liquid contact portion is attached to the main body.

[Fig. 12] Fig. 12 is a side view for explaining an operation (2) when the liquid contact portion is attached to the main body.

30 [Fig. 13] Fig. 13 is a partial sectional side view of what is illustrated in Fig. 12.

[Fig. 14] Fig. 14 is a side view for explaining an operation (3) when the liquid contact portion is attached to the main body.

[Fig. 15] Fig. 15 (a) is a plan view of an insert portion of a nozzle attachment

member according to a first variation, and (b) is a plan view of an insert portion of a nozzle attachment member according to a second variation.

[Fig. 16] Fig. 16 is a perspective view of a liquid contact portion coupling tool according to a third variation.

5 [Fig. 17] Fig. 17 (a) is a bottom view of a rotating member holder according to a fourth variation, (b) is a sectional side view of the rotating member holder, and (c) is a plan view of an insert portion.

[Fig. 18] Fig. 18 (a) is a bottom view of a rotating member holder according to a fifth variation, (b) is a sectional side view of the rotating member holder, and (c)
10 is a plan view of an insert portion.

Mode for Carrying out the Invention

[0010] Embodiment examples of the present invention will be described below.

<Configuration>

As illustrated in Figs. 1 and 2, a discharge device 10 according to an
15 embodiment mainly includes a main body 20 and a liquid contact portion 30, and relates to a jet-type discharge device (jet-type dispenser) that ejects liquid material from a discharge port 43 in the form of droplets.

In a housing constituting the main body 20, an operating shaft driving device 22 is disposed at a position indicated by dotted lines and moves a below-described
20 operating shaft 61 forward and backward. The operating shaft driving device 22, not illustrated, is constituted by, for example, two actuators that are arranged side-by-side in a length direction of an arm coupled to the operating shaft 61 (see Fig. 1 in Patent Document 1).

[0011] A reservoir holder 23 is provided on a top surface of the housing 21. The
25 reservoir holder 23 includes a claw portion 23a having a substantially C-shape in a top view at an end of a plate-like member, and holds a lateral peripheral surface of a reservoir 71 with the claw portion 23a. In addition, a connector 24 for connecting with a cable or the like is provided above the housing 21.

[0012] A liquid contact portion coupling tool 50 is detachably provided by screws or
30 the like on a housing bottom surface 211 of the housing 21 at the reservoir 71 side. The liquid contact portion coupling tool 50 includes a rotating member 51 and a rotating member holder 52.

As illustrated in Fig. 3, the rotating member 51, which is an annular member, has an inner peripheral surface in which a helical thread groove 511 is formed. This

groove 511 is formed to threadedly engage with a helical thread groove 324 formed in an outer peripheral surface of an insert portion 323 of a nozzle attachment member 32. A plurality of side through-holes 512 are formed in a side surface of the rotating member 51. This side through-hole 512 is used, for example, for insertion of a stick-like tool when the rotating member 51 is tightened or loosened.

[0013] Fig. 4 is a bottom view of the housing 21 according to the embodiment. As illustrated in Fig. 4, the rotating member 51 is rotatably held by the rotating member holder 52. The rotating member holder 52 includes a pair of hook-like supporting portions 521 extending toward the center of the rotating member 51, and the rotating member 51 is disposed between the supporting portions 521 and the housing bottom surface 211 such that a side surface is exposed. The pair of supporting portions 521, which are disposed along a longitudinal direction of the housing 21, sandwich the rotating member 51 to prevent it from falling. The diameter of an outer periphery of the rotating member 51 is longer than the short side of the housing 21 so that a rotating operation for attachment and detachment will be easily performed. Inner peripheral surfaces 522 of the supporting portions 521 are arc-shaped to form a space that can accommodate the insert portion 323 of the nozzle attachment member 32. A guide 523 that is a protruded portion is formed on the inner peripheral surface 522 of a supporting portion 521. The guide 523 is formed at a position where it engages with a straight groove 325 formed in the outer peripheral surface of the insert portion 323 to be described below. The guide 523 has a cylindrical shape extending in the horizontal direction, and its lateral peripheral surface at a lower side allows smooth engagement with the straight groove 325. In the embodiment, the guide 523 is provided at the center, in the top-and-bottom direction and the right-and-left direction, of the supporting portion 521 located farther from the reservoir 71. However, the guide may be provided on the supporting portion 521 located closer to the reservoir 71. As the guide 523 is provided on a movement path of the insert portion 323, it is possible to realize a mechanism that positions the liquid contact portion 30 without increasing the device size.

[0014] Fig. 5 is a partial side view of the liquid material discharge device 10 including a sectional view of the liquid contact portion coupling tool 50 according to the embodiment. As illustrated in Fig. 5, when the liquid contact portion 30 is attached to the main body 20, the reservoir 71 is disposed upright laterally to the housing 21. An annular insert portion upper end surface 323a is fixed in planar contact with the

housing bottom surface 211. A gap G is provided between a bottom surface of the rotating member holder 52 and the nozzle attachment member 32 as well as a second liquid feed member 312 to keep a non-contact relationship at all times. This gap G ensures contact between the insert portion upper end surface 323a and the housing bottom surface 211. The liquid contact portion 30 is positioned in a state where the flat insert portion upper end surface 323a is in planar contact with the flat housing bottom surface 211, which allows the liquid contact portion 30 to be attached without misalignment. In order to achieve the compact device size, the gap G is preferably set to 20 mm or less, for example, within a range of 1 to 10 mm or 0.5 to 5 mm.

[0015] Fig. 6 is a partial side view of the liquid material discharge device 10 including a sectional view of the liquid contact portion coupling tool 50, a liquid feed member 31, the nozzle attachment member 32, and a connecting tool 33 according to the embodiment. As illustrated in Fig. 6, the nozzle attachment member 32 includes an attachment portion 321 extending downward, a trunk portion 322 located at the middle in the top-and-bottom direction, and the cylindrical insert portion 323 extending upward. A through-hole extending in the top-and-bottom direction is formed in the nozzle attachment member 32, and is sectioned by an annular seal 63 into a liquid chamber 62 and an upper space 64. Liquid material filling the liquid chamber 62 does not reach the upper space 64 due to blocking by the seal 63. The operating shaft 61 that is driven in the liquid chamber 62 is inserted through the seal 63. As the operating shaft 61 is a stick-like member (rod) having a smaller diameter than the liquid chamber 62 and is free of sliding resistance with respect to the liquid chamber 62, it can be reciprocated at a higher rate by the operating shaft driving device 22.

[0016] A nozzle member 41 having a nozzle 42 is detachably attached to the attachment portion 321 of the nozzle attachment member 32. A valve seat 44 provided with a through-hole at its center is disposed between a lower end of the attachment portion 321 and an inner bottom surface of the nozzle member 41. The valve seat 44 can be easily replaced by detaching the nozzle member 41 from the attachment portion 321 of the nozzle attachment member 32.

[0017] The trunk portion 322 of the nozzle attachment member 32 has a side surface to which the liquid feed member 31 having a liquid feed path 34 is detachably coupled. The liquid chamber 62 has a side surface provided with an end of the liquid feed path 34, and communicates with the reservoir 71 via the liquid feed path 34.

The liquid feed member 31 includes a first liquid feed member 311 in which

a liquid feed path 34a is formed and the second liquid feed member 312 in which a liquid feed path 34b is formed. The first liquid feed member 311 and the second liquid feed member 312 are detachably coupled to each other, and can be disassembled for maintenance of the liquid feed path 34. The first liquid feed member 311 includes a
 5 connecting tool holder 311a extending upward, and the connecting tool 33 is rotatably held by the connecting tool holder 311a. The reservoir 71 is detachably connected to the connecting tool 33.

[0018] Fig. 7 is a figure illustrating the insert portion 323 of the nozzle attachment member 32 alone, where (a) is a plan view, (b) is a front view, and (c) is a partial
 10 sectional side view. As illustrated in Fig. 7 (a) and (b), a top surface of the insert portion 323 is an annular flat surface. As illustrated in Fig. 7 (b), an upper portion 323b of the insert portion 323 has a smaller diameter than a lower portion 323c so as to be easily inserted into the rotating member 51 and the rotating member holder 52. As illustrated in Fig. 7 (b) and (c), the helical thread groove 324 and the straight groove
 15 325 extending in the vertical direction across the helical thread groove 324 are formed in at least a part of the outer peripheral surface (lateral peripheral surface) of the insert portion 323. As illustrated in Fig. 7 (c), while the straight groove 325 is open at an upper end, it is provided with a groove bottom surface 325a at a lower end. Note that the straight groove 325 may be open at the lower end instead of having the groove
 20 bottom surface 325a. The straight groove 325 engages with the guide 523 of the rotating member holder 52, thereby achieving an effect of positioning in a rotation direction (horizontal direction) when the liquid contact portion 30 is attached and an effect of preventing unnecessary rotation when the liquid contact portion 30 is raised.

[0019] <Detachment Operation>

25 Operations when the liquid contact portion 30 is detached from the main body 20 will be described with reference to Figs. 8 to 10.

By rotating the rotating member 51 in a loosening direction, the liquid contact portion 30 moves downward by action of the helical grooves 324, 511 (see Fig. 8). By further rotating the rotating member 51 in the loosening direction, the liquid contact
 30 portion 30 moves further downward and the engagement between the helical grooves 324, 511 is released (see Fig. 9). When the engagement between the helical grooves 324, 511 is released, by moving the reservoir 71 downward along the reservoir holder 23, the liquid contact portion 30 can be detached from the main body 20 as illustrated in Fig. 10. From another perspective, even when the engagement between the helical

grooves 324, 511 is released, the claw portion 23a of the reservoir holder 23 keeps hold of the reservoir 71, which prevents the liquid contact portion 30 from falling even if a hand holding the liquid contact portion 30 slips.

Thus, detachment of the liquid contact portion 30 from the main body 20 requires only rotating the rotating member 51 in a loosening direction and does not require preparing a special tool.

[0020] <Attachment Operation>

Operations when the liquid contact portion 30 is attached to the main body 20 will be described with reference to Figs. 11 to 14.

The insert portion 323 is inserted into the inner peripheral surface of the rotating member 51 in a state where the operating shaft 61 is inserted in the seal 63 and in a positional relationship where the guide 523 engages with the straight groove 325 (see Fig. 11). By rotating the rotating member 51 in a tightening direction in this state, the liquid contact portion 30 moves upward by action of the helical grooves 324, 511 (see Fig. 12). Fig. 13 is a partial sectional side view of what is illustrated in Fig. 12. As illustrated in Fig. 13, during attachment of the liquid contact portion 30, the guide 523 engages with the straight groove 325, which prevents the liquid contact portion 30 from turning. By further rotating the rotating member 51 in the tightening direction, the liquid contact portion 30 moves further upward and is positioned when the annular upper end surface 323a of the insert portion 323 comes into planar contact with the housing bottom surface 211 (see Fig. 14).

Thus, attachment of the liquid contact portion 30 to the main body 20 requires only rotating the rotating member 51 in the tightening direction and does not require preparing a special tool.

[0021] According to the liquid contact portion coupling tool 50 of the present embodiment described above, the nut-like rotating member 51 and the rotating member holder 52 supporting it can realize a coupling mechanism that does not increase the device size.

When the liquid contact portion 30 is attached, the annular upper end surface 323a of the insert portion 323 comes into planar contact with the housing bottom surface 211 for positioning, which results in excellent fixity and no misalignment.

By engaging the straight groove 325 with the guide 523, it is possible to attach the liquid contact portion 30 to the main body 20 while keeping the position in the rotation direction correctly determined.

Further, since the liquid contact portion 30 can be detached and attached only by rotating the rotating member 51, the burden of disassembly and assembly work for maintenance can be reduced.

[0022] <First Variation>

Fig. 15 (a) is a plan view of an insert portion 1323 according to a first variation.

The insert portion 1323 illustrated in Fig. 15 (a) includes an insert portion upper end surface 1323a that is an annular flat surface and a helical thread groove 424 formed in a side surface of the insert portion 1323 as in the insert portion 323 illustrated in Fig. 7. Further, a through-hole provided in the insert portion 1323 is also divided into a liquid chamber 62 and an upper space 64 by a seal 63 as in the insert portion 323 illustrated in Fig. 7. The insert portion 1323 according to the first variation differs from the insert portion 323 in that a pair of straight grooves 1325a and 1325b are provided opposite to each other. In the first variation, a rotating member holder 52 also includes a pair of guides (not illustrated) at positions corresponding to the straight grooves 1325a and 1325b. According to the first variation, engagement between the plurality of guides and the straight grooves 1325a, 1325b makes it possible to perform appropriate positioning in the rotation direction when a liquid contact portion 30 is attached and to prevent the liquid contact portion 30 from rotating when the liquid contact portion 30 is raised.

[0023] <Second Variation>

Fig. 15 (b) is a plan view of an insert portion 2323 according to a second variation.

The insert portion 2323 illustrated in Fig. 15 (b) differs from the insert portion 323 illustrated in Fig. 7 in that five straight grooves 2325a to 2325e are provided at equal intervals in a left half side, and the rest of the configuration is the same. The insert portion 2323 of the second variation is used in engagement with one guide 523 illustrated in Figs. 2 and 4. When the reservoir 71 is disposed on a longitudinal axis of the housing 21 as in Fig. 1, the straight groove 2325c may be engaged with the guide 523. Unlike this, by engaging the straight groove 2325b or 2325d with the guide 523, the position of the reservoir 71 can be oriented at 45 degrees relative to the longitudinal axis of the housing 21. Similarly, by engaging the straight groove 2325a or 2325e with the guide 523, the position of the reservoir 71 can be oriented at 90 degrees relative to the longitudinal axis of the housing 21. According to the insert portion 2323 of the second variation, in a case where there is a constraint on placement

space or the like for the liquid material discharge device 10, the position of the reservoir 71 can be easily adjusted by combining a straight groove selected from the straight grooves 2325a, 2325b, 2325d, and 2325e with the guide 523.

[0024] Although an insert portion including five straight grooves is illustrated in the second variation, the number of straight grooves is not limited to five, and any number of straight grooves (for example, two, three, four, seven, eight, nine, or ten) can be provided. In other words, if the insert portion includes a first straight groove and a second straight groove that are arranged at an acute angle, a right angle, or an obtuse angle, the horizontal angle of the liquid contact portion with respect to the main body can be adjusted. Further, if the insert portion includes first to third straight grooves that are provided at equal intervals in a half side of the lateral peripheral surface, the horizontal angle of the liquid contact portion with respect to the main body can be adjusted in three stages. Also in the second variation, a plurality of guides 523 (for example, two) may be provided and the plurality of straight grooves may be engaged with the plurality of guides 523 when in use.

[0025] <Third Variation>

Fig. 16 is a perspective view of a liquid contact portion coupling tool 650 according to a third variation.

The liquid contact portion coupling tool 650 according to the third variation includes a rotating member 651 and a rotating member holder 652.

The rotating member 651 is the same as the rotating member 51 illustrated in Fig. 3. The rotating member 651 is rotatably held by the rotating member holder 652. The rotating member holder 652 differs from the rotating member holder 52 illustrated in Fig. 3 only in that a guide 623 has a different shape. The guide 623 that is a protruded portion is formed on an inner peripheral surface 622 of a supporting portion 6521 of the rotating member holder 652. The guide 623 is formed at a position where it engages with a straight groove 325 formed in an outer peripheral surface of an insert portion 323. The guide 523 has an elliptic cylindrical shape extending in the horizontal direction and is disposed such that its longitudinal axis coincides with the vertical direction, and thus its lateral peripheral surface at a lower side allows smooth engagement with the straight groove 325. In the embodiment, the guide 623 is provided at the center in the right-and-left direction of the supporting portion 6521 located farther from the reservoir 71. As the guide 623 is provided on a movement path of the insert portion 323, the rotating member holder 652 has the same size as the rotating

member holder 52 illustrated in Fig. 3. Although the third variation example discloses a mode in which one guide 623 is provided, a plurality of guides may be provided as in the first and second variations.

[0026] <Fourth Variation>

Fig. 17 (a) is a bottom view of a rotating member holder 752 according to a fourth variation, (b) is a sectional side view, and (c) is a plan view of an insert portion. The same components as those in the embodiment are denoted by the same reference symbols and explanations thereof are omitted.

As illustrated in Fig. 17 (a) and (b), the rotating member holder 752 according to the fourth variation includes hook-like supporting portions 721a, 721b that sandwich a rotating member 51. The supporting portion 721a includes an inner peripheral surface 722a that is arc-shaped as in the supporting portion 621 illustrated in Fig. 4. On the other hand, the supporting portion 721b provided to face the supporting portion 721a includes a supporting portion guide surface 722b that is a flat surface.

[0027] As illustrated in Fig. 17 (c), an insert portion 723 that is inserted into a space formed by the supporting portions 721a, 721b includes a first side surface 724 that is arc-shaped and in which a thread groove is formed and a second side surface (insert portion guide surface) 725 formed as a flat surface extending in the vertical direction. The insert portion guide surface 725 is provided at a position where it comes into planar contact with the supporting portion guide surface 722. By attaching a liquid contact portion in a state where the insert portion guide surface 725 is in planar contact with the supporting portion guide surface 722b of the supporting portion, it is possible to perform appropriate positioning of the liquid contact portion and to prevent the liquid contact portion from rotating when the liquid contact portion is raised.

[0028] <Fifth Variation>

Fig. 18 (a) is a bottom view of a housing bottom surface 711 according to a fifth variation, (b) is a sectional side view, and (c) is a plan view of an insert portion. The same components as those in the embodiment are denoted by the same reference symbols and explanations thereof are omitted.

As illustrated in Fig. 18 (a) and (b), in a housing 710, an operating shaft 61 extends downward from the center position of a rotating member holder 52 of the housing bottom surface 711 as in the housing 21 of the embodiment. A first guide portion 761 that is a protruded portion extending downward from the housing bottom

surface 711 is provided at a housing center side of the operating shaft 61 and laterally thereto. Although the illustrated first guide portion 761 has a circular outer periphery in a bottom view, it may have an outer periphery of another shape, for example, polygonal or elliptical shape. The first guide portion 761 may have a rounded tip portion so as to easily engage with a below-described second guide portion.

[0029] As illustrated in Fig. 18 (c), an upper end surface 823a of an insert portion 823 that comes into contact with the housing bottom surface 711 is provided with a second guide portion 824 that is a recessed portion at a position corresponding to the first guide portion 761. When the rotating member 51 is rotated and the annular upper end surface 823a of the insert portion 823 comes into planar contact with the housing bottom surface 711, the first guide portion 761 engages with the second guide portion 824 of the insert portion. Positioning by engagement between the first guide portion 761 and the second guide portion 824 makes it possible to perform appropriate positioning when a liquid contact portion is attached and to more effectively prevent the liquid contact portion from rotating when the liquid contact portion is raised. In the illustrated example, although a configuration where a straight groove 825 of the insert portion 823 engages with a guide (not illustrated) that is a protruded portion provided on an inner peripheral surface of a supporting portion 521 is disclosed, the straight groove 825 and the guide on the inner peripheral surface of the supporting portion 521 may not necessarily be provided.

[0030] Any combination of the first to third variations can be applied to the configuration of the fifth variation. Here, in a case where the reservoir 71 is disposed at a position rotated a predetermined angle from the longitudinal axis of the housing 21 as in the second variation, the upper end surface of the insert portion needs to be provided with a plurality of second guide portions depending on an implemented rotation mode. Further, the housing bottom surface 711 may be provided with a first guide portion that is a recessed portion, and the upper end surface of the insert portion 823 may be provided with a second guide portion that is a protruded portion to engage with the first guide portion.

[0031] Preferred embodiment examples of the present invention have been described above. However, the technical scope of the present invention is not limited to the descriptions of the above-described embodiments. Various alterations and modifications can be applied to the above-described embodiment examples, and such altered or modified modes also fall within the technical scope of the present invention.

[0032] For example, an operating shaft may be a screw of a screw-type dispenser that is operated to rotationally move in a liquid chamber, a plunger rod of a plunger-type dispenser that is operated to move forward while sliding against an inner peripheral surface of a liquid chamber (metering hole), or a valve rod of a valve-type dispenser that opens and closes a communication port in a liquid chamber bottom surface communicating with a nozzle.

[0033] An outer periphery of a rotating member (51, 651) may be knurled for slip resistance or may be marked with a character, graphic, symbol, or the like for visualization of the number of rotations. Further, an outer periphery of a rotating member (51, 651) may have a shape other than a circle. For example, a rotating member may be configured to have a polygonal outer periphery so that the number of rotations is visualized and operability is improved.

List of Reference Symbols

[0034] 10: liquid material discharge device / 20: main body / 21: housing / 22: operating shaft driving device / 23: reservoir holder / 24: connector / 30: liquid contact portion / 31: liquid feed member / 32: nozzle attachment member / 33: connecting tool / 34: liquid feed path / 41: nozzle member / 42: nozzle / 43: discharge port / 50: liquid contact portion coupling tool / 51: rotating member / 52: rotating member holder / 61: operating shaft (rod) / 62: liquid chamber / 63: seal / 64: upper space / 71: reservoir (syringe) / 72: adapter / 211: housing bottom surface / 311: first liquid feed member / 312: second liquid feed member / 321: attachment portion / 322: trunk portion / 323: insert portion / 324: thread groove (insert portion) / 325: straight groove / 511: thread groove (rotating member) / 512: side surface through-hole / 521: supporting portion / 522: inner peripheral surface of supporting portion / 523: guide / 651: rotating member / 652: rotating member holder / 710: housing / 711: housing bottom surface / 721: supporting portion / 722: supporting portion guide surface / 724: first side surface / 725: second side surface (insert portion guide surface) / 752: rotating member holder / 761: first guide portion / 823: insert portion / 824: second guide portion / 825: straight groove

CLAIMS

[Claim 1] A liquid material discharge device that discharges liquid material by action of an operating shaft driven in a liquid chamber, the liquid material discharge device comprising:

a main body having the operating shaft and a driving device configured to drive the operating shaft;

a liquid contact portion having the liquid chamber and a liquid feed path through which liquid material is supplied to the liquid chamber; and

a liquid contact portion coupling tool configured to detachably couple the liquid contact portion to the main body,

wherein the liquid contact portion includes an insert portion provided with a first thread groove in at least a part of a side surface,

the liquid contact portion coupling tool includes a rotating member provided with a second thread groove that threadedly engages with the first thread groove and includes a rotating member holder that rotatably supports the rotating member, and

the liquid contact portion is raised and fixed to the main body by inserting a distal end of the insert portion into the rotating member and rotating the rotating member.

[Claim 2] The liquid material discharge device according to Claim 1, wherein the insert portion includes one or more straight grooves extending in a vertical direction in the side surface, and

the rotating member holder includes one or more guides that engage with the one or more straight grooves.

[Claim 3] The liquid material discharge device according to Claim 2, wherein the liquid contact portion is positioned in a horizontal direction with respect to the main body by engaging the one or more straight grooves with the one or more guides.

[Claim 4] The liquid material discharge device according to Claim 2, wherein the rotating member has a diameter of which length is longer than a length of a short side of the main body,

the rotating member holder includes a pair of supporting portions provided along a longitudinal direction of the main body, and

the rotating member is sandwiched between the pair of supporting portions such that a side surface of the rotating member in a direction perpendicular to the

longitudinal direction is exposed.

[Claim 5] The liquid material discharge device according to Claim 4, wherein the pair of supporting portions have respective inner peripheral surfaces that are arc-shaped, and the one or more guides are formed on at least one of the inner peripheral surfaces.

[Claim 6] The liquid material discharge device according to Claim 2, wherein the one or more straight grooves include a plurality of straight grooves provided to face each other, and

the one or more guides include a plurality of guides that engage with the plurality of straight grooves.

[Claim 7] The liquid material discharge device according to Claim 2, wherein the one or more straight grooves include a plurality of straight grooves, and

a number of the straight grooves is greater than a number of the guides.

[Claim 8] The liquid material discharge device according to Claim 2, wherein the one or more straight grooves include a first straight groove and a second straight groove that are arranged at an acute angle, a right angle, or an obtuse angle, and

a horizontal angle of the liquid contact portion with respect to the main body can be adjusted by engaging one of the first and second straight grooves with the one or more guides.

[Claim 9] The liquid material discharge device according to Claim 2, wherein the one or more straight grooves include first to third straight grooves that are provided at equal intervals in a half side of a lateral peripheral surface of the insert portion, and

a horizontal angle of the liquid contact portion with respect to the main body can be adjusted by engaging one of the first to third straight grooves with the one or more guides.

[Claim 10] The liquid material discharge device according to Claim 1, wherein the insert portion includes a first side surface that is arc-shaped and in which the first thread groove is formed and a second side surface formed as a flat surface extending in a vertical direction, and

the rotating member holder is the rotating member holder and includes a flat surface that comes into planar contact with the second side surface when the liquid contact portion is fixed to the main body.

[Claim 11] The liquid material discharge device according to Claim 1, wherein the insert portion has an upper end surface that is a flat surface, and

the liquid contact portion coupling tool fixes the upper end surface and a bottom surface of the main body in planar contact with each other.

[Claim 12] The liquid material discharge device according to Claim 11, wherein a first guide portion is formed on the upper end surface of the insert portion, and

5 a second guide portion that engages with the first guide portion is formed on the bottom surface of the main body.

[Claim 13] The liquid material discharge device according to Claim 1, wherein the liquid contact portion includes a connecting tool for connecting with a reservoir and a liquid feed member in which the liquid feed path is formed.

10 [Claim 14] The liquid material discharge device according to Claim 13, wherein the main body includes a reservoir holder configured to hold the reservoir connected to the connecting tool, and

when thread engagement between the first thread groove and the second thread groove is released, the liquid contact portion is held by the reservoir holder via the
15 reservoir.

[Claim 15] The liquid material discharge device according to Claim 13, wherein, in a state where the liquid contact portion is fixed to the main body, a gap of 20 mm or less is formed between the liquid contact portion coupling tool and the liquid feed member.

20 [Claim 16] The liquid material discharge device according to any one of Claims 1 to 15, wherein the liquid material discharge device is a jet-type dispenser, a screw-type dispenser, a plunger-type dispenser, or a valve-type dispenser.