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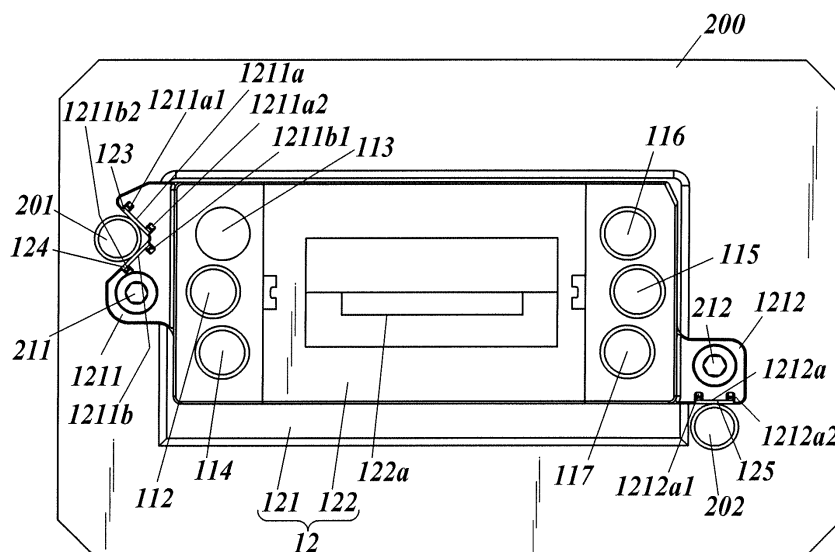
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(54) **INK JET HEAD UNIT AND METHOD FOR MANUFACTURING INK JET HEAD UNIT**

(57) Provided are an ink jet head unit that can reduce the trouble of having to accurately position and fix each ink jet head unit with respect to a fixation member, and a method for manufacturing an ink jet head unit. An ink jet head is provided with: a recording section (11) having nozzles for ejecting ink; and a recording section support member (121) that holds the recording section in a prescribed positional relationship. The recording section support member has a first contact surface 1211 a, a

second contact surface 1211b, and a third contact surface 1212a for setting a fixation position and a fixation angle with respect to a prescribed fixation member (200) in a plane parallel to a nozzle opening surface (11a) having nozzle openings, with contact plates (123 to 125) bonded to abutment surfaces of the contact surfaces for adjusting the amount of positional deviation of the recording section with respect to the recording section support member.

FIG.2A



Description

Technical Field

5 **[0001]** The present invention relates to an ink jet head unit and a method for manufacturing an ink jet head unit.

Background Art

10 **[0002]** There is a related-art ink jet recording apparatus that records an image using a plurality of ink jet head units each including nozzles for ejecting ink. The plurality of ink jet head units are aligned and mounted on a fixing member or a carriage. By using the plurality of ink jet head units, it is possible to eject ink simultaneously from a number of nozzles. This improves the recording speed and the recording resolution.

15 **[0003]** However, the greater the number of ink jet head units are, the more time and effort it takes to mount and fix the plurality of ink jet head units while efficiently adjusting the position of the ink jet head units correctly. To cope with the problem, there has been disclosed a technique that positions and fixes an ink jet head unit more easily and quickly, by determining the location and orientation of the ink jet head unit while supporting the ink jet head unit at three points using a plurality of positioning pins provided on a fixing member (PTL 1).

Citation List

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Patent Literature

[0004] PTL 1: Japanese Patent Application Publication No. 2008-296518

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Summary of Invention

Technical Problem

30 **[0005]** However, when manufacturing an ink jet head unit, the mounting position of an ink ejector having nozzle openings, that is, the arrangement position of the nozzle openings may be slightly shifted in each ink jet head unit. This slight shift may result in a reduction in quality of recorded images. Thus, when fixing the ink jet head units to a fixing member, time and effort are needed to adjust their positions individually.

35 **[0006]** An object of the present invention is to provide an ink jet head unit that allows a reduction in time and effort to accurately position and fix each ink jet head unit with respect to a fixing member, and a method for manufacturing the ink jet head unit.

Solution to Problem

40 **[0007]** In order to achieve the above-described object, an invention recited in claim 1 is an ink jet head unit including:

an ink ejector including nozzles that eject ink; and
a holder that holds the ink ejector in a predetermined positional relationship;
wherein the holder includes three abutment faces for determining a fixing position and a fixing angle with respect to a predetermined fixing member in a plane parallel to an ink ejection surface having openings of the nozzles; and
45 wherein adjustment plates that make an adjustment according to a positional shift amount of the ink ejector with respect to the holder are bonded to the respective abutment faces.

[0008] The invention recited in claim 2 is the ink jet head unit according to claim 1,
wherein each of the abutment faces has a groove in which an adhesive member is injected for bonding to a corresponding one of the adjustment plates.

50 **[0009]** The invention recited in claim 3 is the ink jet head unit according to claim 2,
wherein the groove has one end open at an edge of the abutment face, and another end closed on the abutment face.

[0010] The invention recited in claim 4 is the ink jet head unit according to any one of claims 1 to 3,
wherein each of the three abutment faces is a bottom surface of a recessed shape in which a corresponding one of the adjustment plates is at least partially embedded when bonded.

55 **[0011]** The invention recited in claim 5 is the ink jet head unit according to any one of claims 1 to 4,
wherein each of the adjustment plates has a side surface perpendicular to a corresponding one of the abutment faces, the side surface having a curved shape with no sharp corners.

[0012] The invention recited in claim 5 is the ink jet head unit according to any one of claims 1 to 5, wherein at least part of the three abutment faces and bonding surfaces of the adjustment plates for bonding to the abutment faces has a non-smooth surface.

[0013] The invention recited in claim 7 is

a method for manufacturing an ink jet head unit, the ink jet head unit including an ink ejector including nozzles that eject ink, and a holder that holds the ink ejector in a predetermined positional relationship, wherein the holder includes three abutment faces for determining a fixing position and a fixing angle with respect to a predetermined fixing member in a plane parallel to an ink ejection surface having openings of the nozzles, the method comprising:
a thickness adjusting step of bonding adjustment plates to the abutment faces, the adjustment plates making an adjustment according to a positional shift amount of the ink ejector with respect to the holder.

Advantageous Effects of Invention

[0014] According to the present invention, it is possible to reduce time and effort to accurately position each ink jet head with respect to a fixing member and fix an ink jet head unit to the fixing member.

Brief Description of Drawings

[0015]

FIG. 1 is a perspective view illustrating the external configuration of an ink jet head;
FIG. 2A is a plan view of the ink jet head;
FIG. 2B is a bottom view of the ink jet head;
FIG. 3 is an enlarged perspective view of a portion around a third contact face;
FIG. 4A is an enlarged plan view of the third contact face;
FIG. 4B is an enlarged front view of the third contact face;
FIG. 4C is an enlarged front view of the third contact face;
FIG. 5A illustrates measurement of a shift amount;
FIG. 5B illustrates measurement of a shift amount;
FIG. 5C illustrates measurement of a shift amount;
FIG. 6 is a flowchart illustrating the steps of a head mounting adjustment process;
FIG. 7A illustrates a modification of the arrangement of contact plates;
FIG. 7B illustrates a modification of the arrangement of contact plates; and
FIG. 8 is a schematic bottom view of an ink jet head unit.

Description of Embodiments

[0016] Hereinafter, embodiments of the present invention will be described with reference to the accompanying drawings.

[0017] FIG. 1 is a perspective view illustrating the external configuration of an inkjet head 1 that is an embodiment of an ink jet head unit of the present invention. FIG. 2A is a plan view of the ink jet head 1. FIG. 2B is a bottom view of the ink jet head 1.

[0018] FIG. 2A also illustrates a part of a fixing member 200 to which the ink jet head 1 is mounted.

[0019] The ink jet head unit of this embodiment includes a single ink jet head 1, and the ink jet head 1 is the only component.

[0020] The ink jet head 1 includes a recorder (an ink ejector) 11 and a housing 12.

[0021] The recorder 11, which may be a head chip including nozzles for ejecting ink, is fixed such that one surface thereof (a nozzle opening surface 11a) is exposed from the bottom surface of the housing 12 as illustrated in FIG. 2B. The nozzle opening surface 11a (an ink ejection surface) includes an opening area 111a where openings of the plurality of nozzles are arranged, each of which ejects ink. In FIG. 2B, only four openings at the four corners among the plurality of nozzle openings arranged in two dimensions are illustrated. Although the other openings are not illustrated, the arrangement pattern may be appropriately set. The nozzle opening surface 11a has reference position markers 111c and 111d for nozzle arrays.

[0022] The housing 12 includes a recorder support member 121 (a holder) that supports the recorder 11 (holds the recorder 11 in a predetermined positional relationship), and a cover member 122 projecting on the upper side of the recorder support member 121. As described above, the recorder 11 is fixed and supported on the bottom surface of the recorder support member 121. The cover member 122 accommodates therein a signal wiring member and so on.

[0023] Ink channels 112 to 117 extend through the upper surface of the recorder support member 121, on both sides

of the cover member 122. The ink channels 112 and 115 are paths to supply ink to the nozzles (a nozzle group) in the opening area 111a, whereas the ink channel 113, 114, 116, and 117 are return paths of ink from the nozzle group of the opening area 111a. These channels are connected to an external ink tank or the like via a liquid feed pump or the like.

[0024] A connector 122a is disposed on the upper surface of the cover member 122. The connector 122a is configured to transmit a drive control signal related to ejection of ink from the nozzles of the recorder 11 to the recorder 11. The connector 122a is connected to a circuit board in the cover member 122 such that a drive signal generated by the circuit board is supplied to operation units (such as piezoelectric elements) of the recorder 11.

[0025] The recorder support member 121 has, at its opposite longitudinal ends, a first projection 1211 and a second projection 1212 used to align and fix the recorder 11, i.e. the nozzles, with respect to the fixing member.

[0026] As illustrated in FIG. 2B, the first projection 1211 includes a first contact face 1211a and a second contact face 1211b. Further, the first projection 1211 has a screw hole 1211c. A first contact plate 123 is bonded to the first contact face 1211a so that the first contact plate 123 contacts a first pin 201 provided on the fixing member 200 that is mounted on a carriage or another component of an ink jet recording apparatus. Meanwhile, a second contact plate 124 is bonded to the second contact face 1211b so that the second contact plate 124 contacts the first pin 201. The first contact face 1211a (a contact face of the first contact plate 123) and the second contact face 1211b (a contact face of the second contact plate 124) are perpendicular to each other in this embodiment. The ink jet head 1 is mounted and fixed to the fixing member 200 by a screw 211 inserted through the screw hole 1211c.

[0027] The second projection 1212 includes a third contact face 1212a. Further, the second projection 1212 has a screw hole 1212c. A third contact plate 125 is bonded to the third contact face 1212a so that the third contact plate 125 contacts a second pin 202 provided on the fixing member 200. The ink jet head 1 is mounted and fixed to the fixing member 200 by a screw 212 inserted through the screw hole 1212c.

[0028] The inner diameters of the screw holes 1211c and 1212c have play with respect to the screws 211 and 212 (that is, are greater than the diameters of the screws 211 and 212), respectively, such that the screws 211 and 212 can be moved and fixed within the screw holes 1211c and 1212c in accordance with adjustment of the position of the ink jet head 1 with respect to the fixing member 200.

[0029] In the following description, the first contact plate 123, the second contact plate 124, and the third contact plate 125 may also be collectively referred to as contact plates 123 to 125 (adjustment plates). Further, the first contact face 1211a, the second contact face 1211b, and the third contact face 1212a may also be collectively referred to as three abutment faces. These three abutment faces can be used to determine the fixing position and the fixing angle of the housing 12 (the recorder support member 121) with respect to the fixing member 200 (the first pin 201 and the second pin 202).

[0030] The first projection 1211 determines the position of the recorder support member 121 (that is, the recorder 11) with reference to the first pin 201. Meanwhile, the second projection 1212 determines the position (the rotational angle and orientation) of the recorder support member 121 in the rotational direction with reference to the second pin 202.

[0031] The first contact face 1211a has two grooves 1211a1 and 1211a2, and the second contact face 1211b has two grooves 1211b1 and 1211b2. The third contact face 1212a has two grooves 1212a1 and 1212a2. Each of these grooves 1211a1, 1211a2, 1211b1, 1211b2, 1212a1, and 1212a2 is used for injecting adhesive (an adhesive member).

[0032] FIG. 3 is an enlarged perspective view of a portion around the third contact face 1212a. FIGS. 4A and 4B are a plan view and a front view, respectively, illustrating the third contact face 1212a with the third contact plate 125 bonded thereto. FIG. 4C is a front view illustrating the third contact face 1212a without the third contact plate 125. The first contact face 1211a and the second contact face 1211b have the same structure as the third contact face 1212a, and therefore will not be described herein.

[0033] As illustrated in FIG. 3, the third contact face 1212a is the bottom surface of a recessed shape formed in the side surface of the second projection 1212, and has a depth substantially corresponding to a reference thickness of the third contact plate 125 (such that the third contact plate 125 is at least partially embedded therein). The third contact plate 125 is bonded to the third contact face 1212a in an embedded manner. The grooves 1212a1 and 1212a2 are open at their upper ends (at the edge of the third contact face 1212a) as illustrated in FIGS. 3, 4A, and 4C, extend downward, and are closed halfway through (on the contact face 1212a) as illustrated in FIG. 4C. The surface (hatched area) of the third contact face 1212a is formed in a shape (a non-smooth surface) having small irregularities with roughness. Thus, even when the third contact plate 125 is in contact with the third contact face 1212a, a small clearance is formed. In this embodiment, the roughness is selected such that a maximum roughness depth R_z (R_{max}) is about 6.3 μ m. However, the roughness is not limited thereto.

[0034] When adhesive is injected from the open ends of the grooves 1212a1 and 1212a2 while the third contact plate 125 is in contact with the third contact face 1212a, the adhesive not only spreads through the grooves 1212a1 and 1212a2, but also spread through the small clearance due to capillary action, so that the third contact plate 125 is bonded to the third contact face 1212a substantially across the entire surface, without a thick layer of adhesive.

[0035] The third contact plate 125 has the shape of a substantially rectangular parallelepiped, and may be formed to be slightly smaller than the size of the recess defining the third contact face 1212a. In this embodiment, the bonding

position does not have to be highly accurate in the direction parallel to the third contact face 1212a. Therefore, the third contact plate 125 can be placed in contact with the recess defining the third contact face 1212a with a margin for error, facilitating the bonding process.

[0036] The surface (side surface) of the third contact plate 125 perpendicular to the third contact face 1212a is a curved surface with four filleted corners (not having sharp corners). Thus, since the clearance between the side surface of the third contact plate 125 and the side surface of the recess defining the third contact face 1212a becomes wider at the lower end of the third contact plate 125, adhesive flowing through the clearance due to capillary action is prevented from spreading further downward.

[0037] In this embodiment, it is intended that the third contact plate 125 is bonded, with the open upper ends of the grooves 1212a1 and 1212a2 facing up in the gravity direction. In the case where the third contact plate 125 is bonded upside down, the positional relationship between the open ends and the closed ends of the grooves 1212a1 and 1212a2 may be inverted.

[0038] In this embodiment, the third contact plate 125 is symmetric in the vertical direction, the lateral direction, and the front-back direction (the side that is bonded to the third contact face 1212a and the side that is exposed), and therefore may be bonded with any orientation. Further, the first contact face 1211a, the second contact face 1211b, and the third contact face 1212a have the same shape. Therefore, the same member can be used as any of the contact plates 123 to 125.

[0039] The following describes the process of mounting the ink jet head 1 on the fixing member 200, including a method of manufacturing the ink jet head 1 according to the present embodiment.

[0040] To mount the ink jet head 1 of the present embodiment, a shift amount of the recorder support member 121 from its reference position in the case where the nozzles are placed in the correct positions is measured. Then, after making an adjustment using the contact plates 123 to 125 corresponding to the measured value, the ink jet head 1 is simply mounted on the fixing member 200. The shift amount does not have to be directly measured with respect to the fixing member 200. For example, the shift amount may be obtained by measuring a positional shift (a shift amount and a rotational angle) of the recorder support member 121 when the position of the recorder 11 (nozzles) is aligned with respect to a transparent alignment member.

[0041] FIGS. 5A to 5C illustrate examples of measurement of the shift amount.

[0042] Referring to FIG. 5A, a transparent alignment member 500 includes pins 511 and 512 having the same positional relationship and shape as the first pin 201 and the second pin 202 provided on the fixing member 200. The first contact face 1211a, the second contact face 1211b, and the third contact face 1212a of the ink jet head 1 are brought into contact with the pins 511 and 512, and the shift amounts between the alignment markers 513 and 514 and two predetermined nozzle openings are calculated. Then, the required thicknesses of the contact plates 123 and 125 are calculated based on the shift amounts. The alignment member 500 is constituted by a member that exhibits very little expansion or contraction deformation, and the measurement is preferably performed in a constant environment. The number of alignment markers and the number of nozzle openings whose positional shifts with respect to the alignment markers are measured may be any number greater than or equal to 2.

[0043] Alternatively, as illustrated in FIG. 5B, the transparent alignment member 500 may have alignment markers 501 and 502, and the ink jet head 1 may be placed from the back side such that the alignment markers 501 and 502 are aligned with the reference position markers 111c and 111d. The alignment member 500 also has reference lines 503, 504, and 505.

[0044] FIG. 5C illustrates an enlarged view of the second projection 1212 of the ink jet head 1 placed on the alignment member 500.

[0045] In FIG. 5C, the third contact face 1212a is shifted outward with respect to the reference line 505 by a width dT. Note that, instead of measuring the width dT, a scale may be marked around the reference line 505 so that the shift amount can be obtained by reading the scale. The third contact plate 125 that is thicker by a thickness corresponding to the shift amount (for adjusting the positional shift amount), that is, the width dT than the reference thickness is selected and bonded to the third contact face 1212a. Thus, the contact position between the second pin 202 and the third contact plate 125 is determined such that the nozzle arrays are placed in the correct positions (at a correct angle) with respect to the fixing member 200. The same measurement is performed on the first contact face 1211a and the second contact face 1211b, and the thicknesses of the first contact plate 123 and the second contact plate 124 are selected.

[0046] In this embodiment, the shift amounts of the first contact face 1211a, the second contact face 1211b, and the third contact face 1212a are directly measured. However, the position of another part of the recorder support member 121 may be measured, and the required thicknesses of the contact plates 123 to 125 may be calculated based on the shift amount between the measured position and the reference position.

[0047] As the contact plates 123 to 125, plates with different thicknesses in increments of 1 μm within the expected range are prepared in advance, and the contact plates 123 to 125 of the selected thicknesses are simply used. Alternatively, a contact plate of a predetermined thickness (the maximum thickness within the expected range) may be appropriately shaved to the selected thickness and then used.

[0048] Then, these contact plates 123 to 125 are bonded, and then fixed by being brought into contact with the corresponding first pin 201 and second pin 202. Accordingly, at the fixing step, the ink jet head 1 is mounted such that the nozzles are placed in the correct positions, without making adjustments.

[0049] FIG. 6 is a flowchart illustrating the steps of a head mounting adjustment process for the ink jet head 1 of the present embodiment.

[0050] At the beginning of mounting the ink jet head 1 of the present embodiment, a shift amount of the recorder support member 121 from the reference position in the case where the nozzles are placed in the correct positions is measured (step S11: shift amount measurement step). This shift amount measurement is not performed with respect to the fixing member 200. This measurement is, for example, for measuring a positional shift (a shift amount and a rotational angle) of the recorder support member 121 in the case where the position of the recorder 11 (nozzles) is aligned with respect to the transparent alignment member.

[0051] Based on these positional shift amounts, the shift amount of each of the first contact face 1211a, the second contact face 1211b, and the third contact face 1212a from the reference position is calculated. Then, the first contact plate 123, the second contact plate 124, and the third contact plate 125 each having a thickness corresponding to the shift amount is selected (step S12).

[0052] The selected first contact plate 123, the second contact plate 124, and the third contact plate 125 are bonded to the first contact face 1211a, the second contact face 1211b, and the third contact face 1212a with adhesive, respectively (step S13). The adhesive may be any adhesive that exhibits sufficient fluidity when injected into the grooves. For example, the adhesive is of a thermosetting type, and the recorder support member 121 is heated while or after injecting the adhesive into the grooves with the contact plates 123 to 125 being placed in tight contact with the contact faces by springs or the like.

[0053] The operations at steps S12 and S13 correspond to a thickness adjusting step of a method for manufacturing an ink jet head unit of the present embodiment.

[0054] After the adhesive cures, the ink jet head 1 is temporarily fixed to the fixing member 200 by the screw 211 inserted in the screw hole 1211c, with the first contact plate 123 and the second contact plate 124 kept in contact with the first pin 201. Then, the ink jet head 1 is rotated so that the third contact plate 125 contacts the second pin 202, and the ink jet head 1 is temporarily fixed to the fixing member 200 by the screw 212 inserted in the screw hole 1212c.

[0055] Finally, the ink jet head 1 is permanently fixed to the fixing member 200 by the screws 211 and 212 (step S14). Thus, the process of mounting the ink jet head 1 in the correct position ends.

[0056] With use of the first contact plate 123, the second contact plate 124, and the third contact plate 125 each corresponding to the shift amount measured in advance, the ink jet head 1 is fixed in the correct position by simply bringing the contact plates 123 to 125 into contact with the first pin 201 and the second pin 202. This eliminates the need to make adjustments again for fine alignment on the fixing member 200.

Modifications

[0057] FIGS. 7A and 7B illustrate a modification of the arrangement of the contact plates 123 to 125.

[0058] To uniquely determine the position of the ink jet head 1 with respect to the fixing member 200, the following three parameters need to be determined: two components indicating the coordinates of a predetermined position in a plane parallel to a fixing surface of the fixing member 200, and the rotational angle (direction). Accordingly, for example, as illustrated in FIG. 7A, the arrangement angles of the first contact plate 123 and the second contact plate 124 and the direction of the third contact plate 125 may appropriately be determined.

[0059] Moreover, as illustrated in FIG. 7B, the first contact plate 123 and the second contact plate 124 may be placed in contact with different pins 201a and 201b. However, as an additional pin is provided, the effect of saving space is reduced. Further, the pins may be placed in contact with the sides of the rectangle in a plan view, instead of being placed in contact with the projections.

[0060] FIG. 8 is a schematic bottom view of an ink jet head unit 100 according to another modification.

[0061] In the above embodiment, each ink jet head 1 (each ink jet head unit including a single ink jet head) is individually mounted on the fixing member 200. In the case where a plurality of ink jet heads 1a are mounted on the ink jet head unit 100, an adjustment for mounting the ink jet head unit 100 on the fixing member 200 can sometimes be made in the same manner. For example, in the case where the plurality of ink jet heads 1a are uniformly shifted with respect to the ink jet head unit 100 due to the characteristics of the manufacturing process such as distortions of the plurality of ink jet heads 1a with the same polarity resulting from heating, all the ink jet heads 1a can be mounted in the correct positions on the fixing member 200, by adjusting the mounting position and direction (angle) of the ink jet head unit 100 with respect to the fixing member 200.

[0062] In this embodiment, a first contact plate 123, a second contact plate 124, and a third contact plate 125 each having an appropriate thickness are bonded to a first projection 1211 and a second projection 1212 of the ink jet head unit 100 including three ink jet heads 1a. Thus, mounting in the correct position on the fixing member 200 is achieved.

[0063] As described above, the ink jet head 1 corresponding to the ink jet head unit of the present embodiment includes: the recorder 11 including nozzles that eject ink; and the recorder support member 121 that holds the recorder 11 in a predetermined positional relationship; wherein the recorder support member 121 includes three abutment faces (the first contact face 1211a, the second contact face 1211b, and the third contact face 1212a) for determining a fixing position and a fixing angle with respect to the fixing member 200 in a plane parallel to the nozzle opening surface 11a having openings of the nozzles; and wherein the contact plates 123 to 125 that makes an adjustment according to a positional shift amount of the recorder 11 with respect to the recorder support member 121 are bonded to the respective abutment faces.

[0064] Accordingly, after the contact plates 123 to 125 are bonded based on the shift amount measured in advance, the recorder support member 121 is simply fixed to the fixing member 200. Thus, there is no need to perform alignment for each ink jet head 1 in a small space on the fixing member 200. This reduces time and effort to make adjustments for alignment. Further, not only when initially fixing the plurality of ink jet heads 1 on the fixing member 200, but also every time when replacing the ink jet head 1 that is fixed to the fixing member 200, the time and effort to make adjustments on the fixing member 200 are reduced. Therefore, a replacement ink jet head 1 can easily be fixed in a correct position and at a correct angle on the fixing member 200. Furthermore, since the structural error is reduced compared to the case of fixing the ink jet head 1 to the fixing member 200 using adjustment screws, it is possible to maintain and improve the accuracy.

[0065] Further, even when measuring the positional shift amount on the fixing member 200, measurement can be performed individually for each ink jet head 1a, with the neighboring ink jet heads 1a and other elements not fixed. Therefore, measurement is relatively easy. Moreover, since adhesive is used for bonding, it is possible to save time and effort to make adjustments again such as when screws come loose after start of use.

[0066] Further, there is no need to provide a mechanism such as a screw on the fixing member 200 for adjusting the position of the recorder support member 121 with respect to the fixing member 200. Therefore, the nozzles can be correctly arranged while saving space.

[0067] Further, the three abutment faces have the grooves 1211a1, 1211a2, 1211b1, 1211b2, 1212a1, and 1212a2 in which adhesive is injected for bonding to the contact plates 123 to 125. Since the contact plates 123 to 125 are fixed by injecting adhesive into these grooves, it is possible to prevent a layer of adhesive with a substantial thickness from being formed between the abutment faces and the contact plates 123 to 125, and hence to prevent the contact positions with the first pin 201 and the second pin 202 from being shifted.

[0068] Further, each of the grooves 1211a1, 1211a2, 1211b1, 1211b2, 1212a1, and 1212a2 has one end open at an edge of the corresponding abutment face, and the other end closed on the corresponding abutment face. Thus, it is possible to easily inject adhesive into each groove, and to prevent the injected adhesive from flowing out of the bonding surface from the groove before the injected adhesive cures.

[0069] Further, each of the three abutment faces is a bottom surface of a recessed shape in which a corresponding one of the contact plates 123 to 125 is at least partially embedded when bonded. Due to this shape, the contact plates 123 to 125 do not greatly extend outside the housing 12. This reduces the risk of the contact plates 123 to 125 from coming off when an unexpected force is applied. Moreover, since the contact plates 123 to 125 do not extend outside, it is possible to save space.

[0070] Further, each of the contact plates 123 to 125 has a side surface perpendicular to the corresponding abutment face, and the side surface is a curved surface with no sharp corners. When each of the contact plates 123 to 125 is embedded in the corresponding recess as described above, adhesive is likely to flow out before curing in the clearance between each of the contact plates 123 to 125 and the side surface of the corresponding recess. Thus, the continuously increasing clearance can prevent the adhesive from flowing out of the bonding area due to capillary action.

[0071] Further, at least part of the three abutment faces and bonding surfaces of the contact plates 123 to 125 for bonding to the abutment faces (in the present embodiment, the three abutment faces) has a non-smooth surface with small irregularities. With this configuration, adhesive injected into the grooves 1211a1, 1211a2, 1211b1, 1211b2, 1212a1, and 1212a2 flows through the small clearances in the abutment faces due to capillary action. Therefore, it is possible to achieve more stable bonding in a large area on each abutment face, without caring about the thickness of adhesive.

[0072] Further, the method of manufacturing an ink jet head unit according to the present embodiment includes: a thickness adjusting step of bonding the contact plates 123 to 125, which makes an adjustment according to a positional shift amount of the recorder 11 with respect to the recorder support member 121, to the three abutment faces.

[0073] According to this method, a shift amount is first measured, and then the contact plates 123 to 125 corresponding to the shift amount are bonded. Thus, there is no need to adjust the nozzle position again when fixing the ink jet head 1 to the fixing member 200, and hence the fixing member 200 does not need to have a structure for position adjustment. Therefore, it is possible to fix the ink jet head 1 with high accuracy while saving space. Moreover, the position can be easily adjusted compared to the case where the position is adjusted in the small space on the fixing member 200. Even when measuring the positional shift amount on the fixing member 200, measurement can be performed individually for each ink jet head, with the neighboring ink jet heads not fixed. Therefore, measurement is relatively easy. Furthermore,

since the structural error is reduced compared to the case of fixing the ink jet head 1 using adjustment screws, it is possible to maintain and improve the accuracy.

[0074] The present invention is not limited to the embodiment described above, and various modifications may be made.

[0075] For example, in the above embodiment, the recorder support member 121 holds the recorder 11 at all sides (four sides) such that the nozzle opening surface 11a is exposed from the bottom surface. However, the recorder support member 121 may be configured to support the recorder 11 at one to three sides, or hold the surface of the recorder 11 opposite to the nozzle opening surface 11a.

[0076] Further, in the above embodiment, each of the contact plates 123 to 125 is a flat plate formed in the shape of a substantially rectangular parallelepiped that has a side surface with no sharp corners. However, each of the contact plates 123 to 125 may be formed in the shape having a smoother curved surface such as a cylindrical shape, a polygonal shape with five or more corners, or a substantially trapezoidal shape whose corners are not at 90 degrees. In the case where the contact face is not the bottom surface of a recessed shape and there is no risk that adhesive flows out, each of the contact plates 123 to 125 may be formed in the shape of a simple rectangular parallelepiped that is not chamfered.

[0077] Further, in the above embodiment, each of the grooves 1211a1, 1211a2, 1211b1, 1211b2, 1212a1, and 1212a2 is open at one end and closed at the other end. However, each of these grooves may be closed at both ends. In this case, adhesive is injected into the grooves with their upper ends open, and then the contact plates 123 to 125 are placed in contact from the upper side and thus can be bonded. Moreover, two grooves are provided in each abutment face. However, the present invention is not limited thereto. One groove or three or more grooves may be provided.

[0078] Further, in the above embodiment, each abutment face has a non-smooth surface with small irregularities. However, at least part of each abutment face may be a smooth surface. Alternatively, in place of or in addition to the non-smooth surface structure, a greater number of grooves may be provided, or grooves of a complicated shape with meandering, bending, branching, or the like may be provided.

[0079] Further, in the above embodiment, the shift amount of the housing 12 based on the nozzle arrays with respect to the fixing member 200 is measured at a place not on the fixing member 200. However, the shift amount may be measured on the fixing member 200.

[0080] Further, in the above embodiment, a single contact plate having a required thickness is bonded to each abutment face. However, a set of a plurality of contact plates each having a predetermined thickness may be bonded to achieve a required thickness.

[0081] Further, in the above embodiment, the same member can be used as any of the contact plates 123 to 125. However, the size or thickness range may be individually specified. Each of the contact plates 123 to 125 does not have to be symmetric in the front-back direction or the vertical direction. For example, the contact faces of the contact plates 123 to 125 may have non-smooth smooth surfaces, instead of the three abutment faces.

[0082] Further, the configuration, structure, material, operation content, and so on described in the above embodiments may be modified within the scope of the present invention.

Industrial Applicability

[0083] The present is applicable to an ink jet head unit and a method for manufacturing an ink jet head unit.

Reference Signs List

[0084]

1, 1a	ink jet head
11	recorder
11a	nozzle opening surface
111a	opening area
111c	reference position marker
112 - 117	ink channel
12	housing
121	recorder support member
122	cover member
122a	connector
123	first contact plate
124	second contact plate
125	third contact plate
100	ink jet head unit
200	fixing member

	201	first pin
	201a, 201b	pin
	202	second pin
	500	alignment member
5	501, 502, 513, 514	alignment marker
	503 - 505	reference line
	511, 512	pin
	1211	first projection
	1211a	first contact face
10	1211a1, 1211a2	groove
	1211b	second contact face
	1211b1, 1211b2	groove
	1211c	screw hole
	1212	second projection
15	1212a	third contact face
	1212a1, 1212a2	groove
	1212c	screw hole

20 Claims

1. An ink jet head unit comprising:

an ink ejector including nozzles that eject ink; and
a holder that holds the ink ejector in a predetermined positional relationship;
wherein the holder includes three abutment faces for determining a fixing position and a fixing angle with respect
to a predetermined fixing member in a plane parallel to an ink ejection surface having openings of the nozzles; and
wherein adjustment plates that make an adjustment according to a positional shift amount of the ink ejector
with respect to the holder are bonded to the respective abutment faces.

2. The ink jet head unit according to claim 1, wherein each of the abutment faces has a groove in which an adhesive
member is injected for bonding to a corresponding one of the adjustment plates.

3. The ink jet head unit according to claim 2, wherein the groove has one end open at an edge of the abutment face,
and another end closed on the abutment face.

4. The ink jet head unit according to any one of claims 1 to 3, wherein each of the three abutment faces is a bottom
surface of a recessed shape in which a corresponding one of the adjustment plates is at least partially embedded
when bonded.

5. The ink jet head unit according to any one of claims 1 to 4, wherein each of the adjustment plates has a side surface
perpendicular to a corresponding one of the abutment faces, the side surface having a curved shape with no sharp
corners.

6. The ink jet head unit according to any one of claims 1 to 5, wherein at least part of the three abutment faces and
bonding surfaces of the adjustment plates for bonding to the abutment faces has a non-smooth surface.

7. A method for manufacturing an ink jet head unit, the ink jet head unit including an ink ejector including nozzles that
eject ink, and a holder that holds the ink ejector in a predetermined positional relationship, wherein the holder
includes three abutment faces for determining a fixing position and a fixing angle with respect to a predetermined
fixing member in a plane parallel to an ink ejection surface having openings of the nozzles, the method comprising:
a thickness adjusting step of bonding adjustment plates to the abutment faces, the adjustment plates making an
adjustment according to a positional shift amount of the ink ejector with respect to the holder.

FIG.1

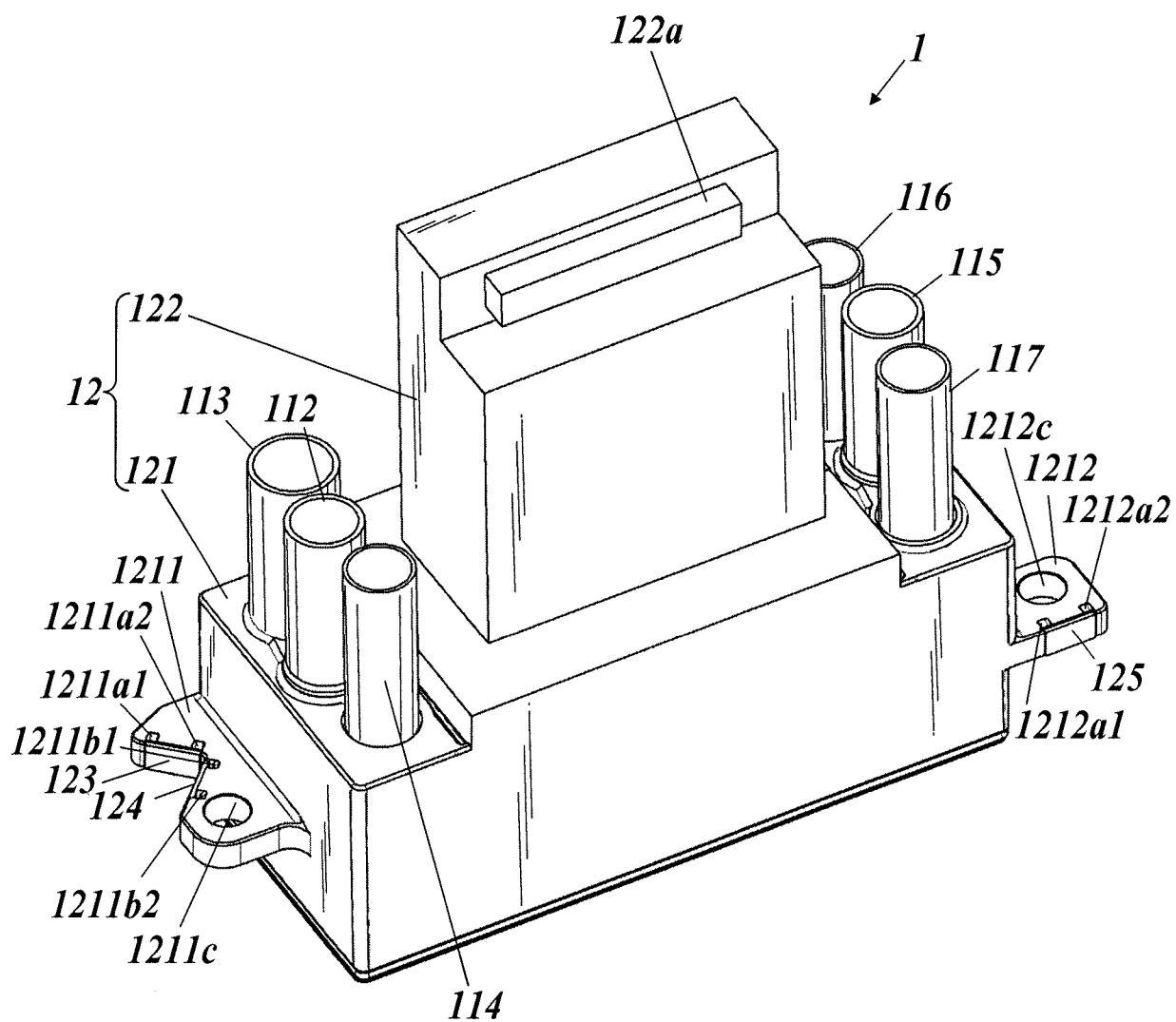


FIG.2A

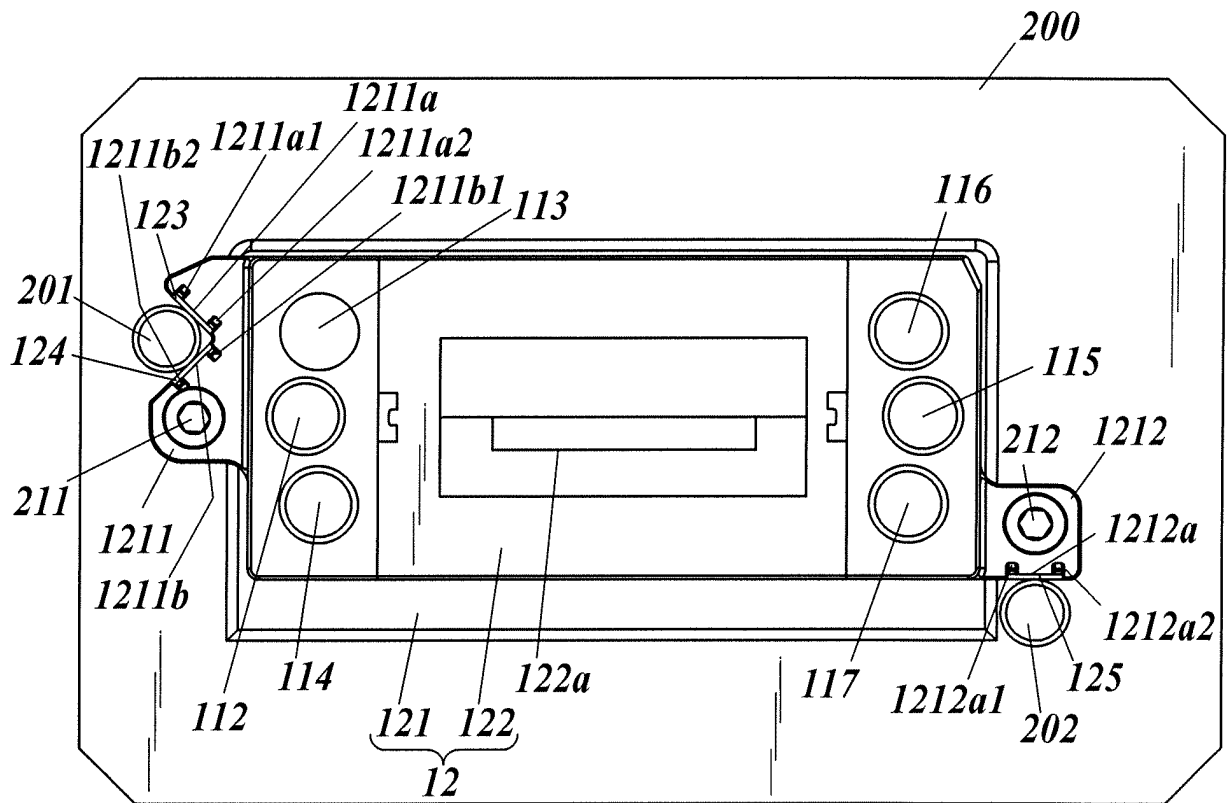


FIG.2B

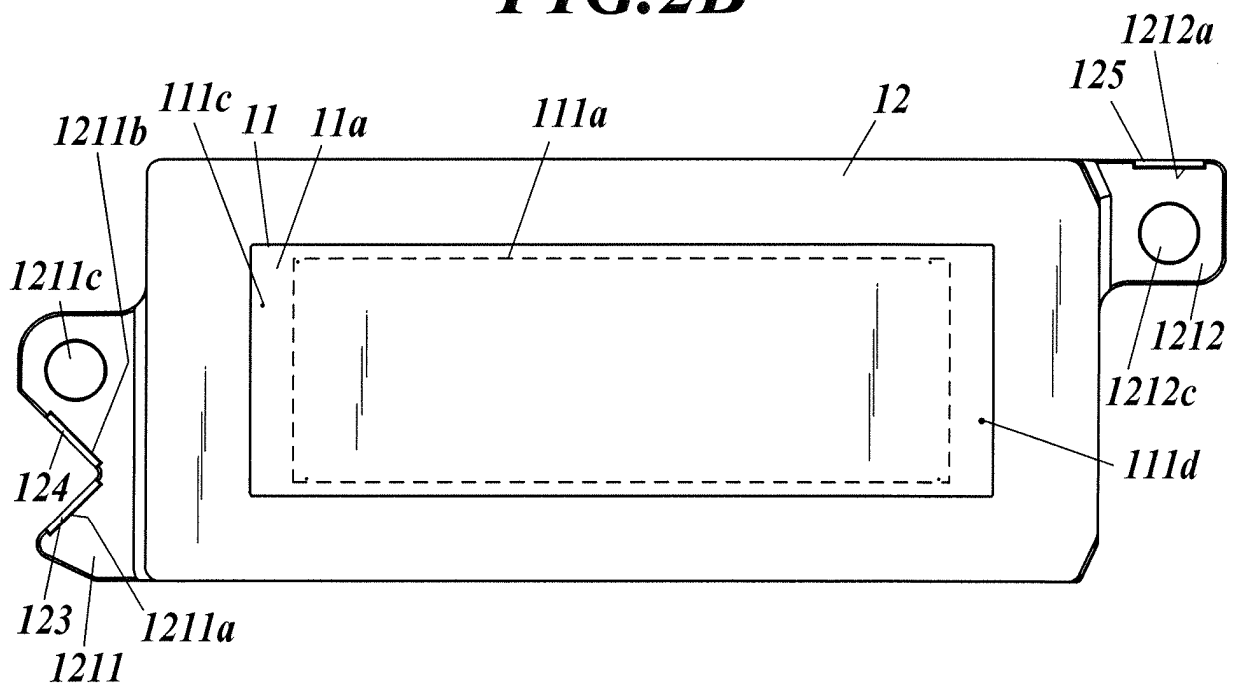


FIG.3

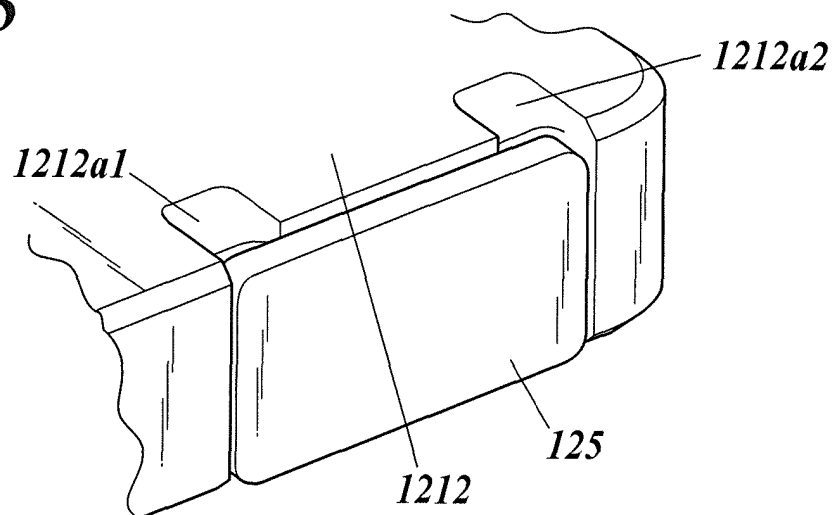


FIG.4A

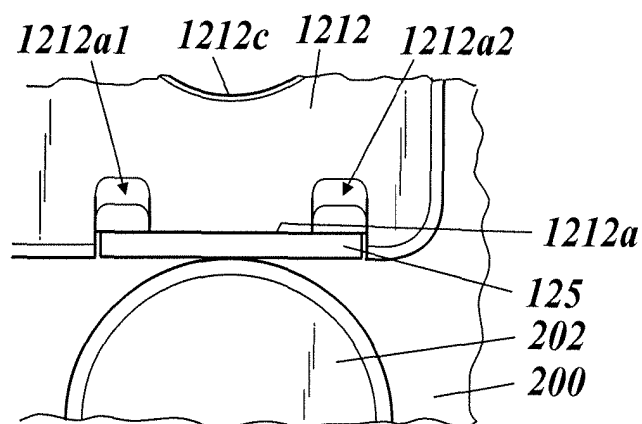


FIG.4B

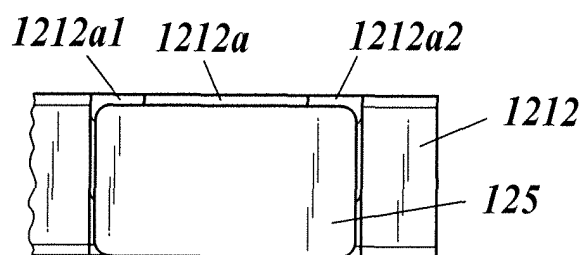


FIG.4C

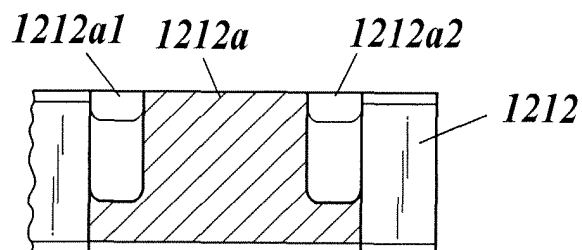


FIG.5A

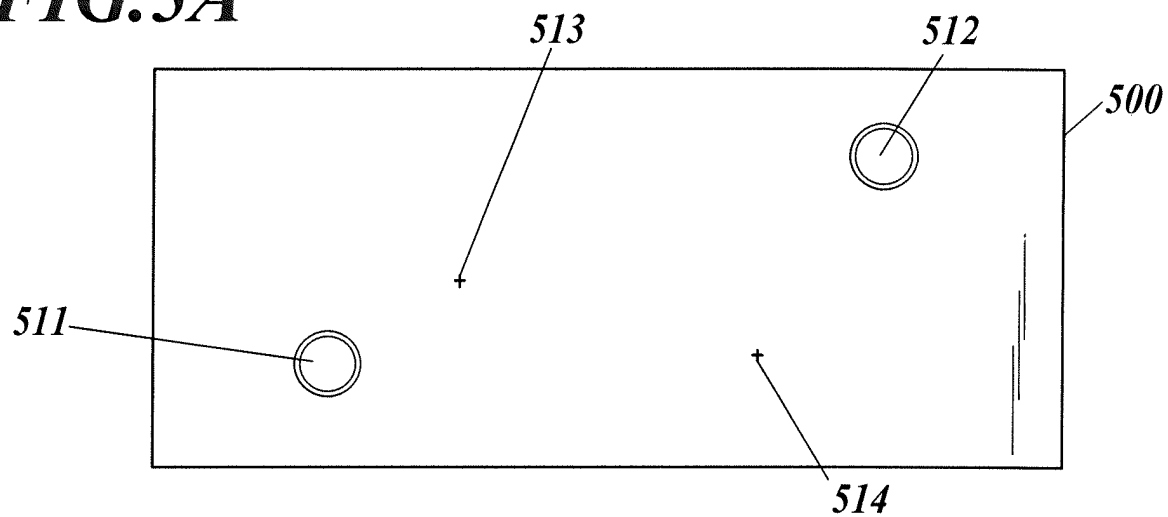


FIG.5B

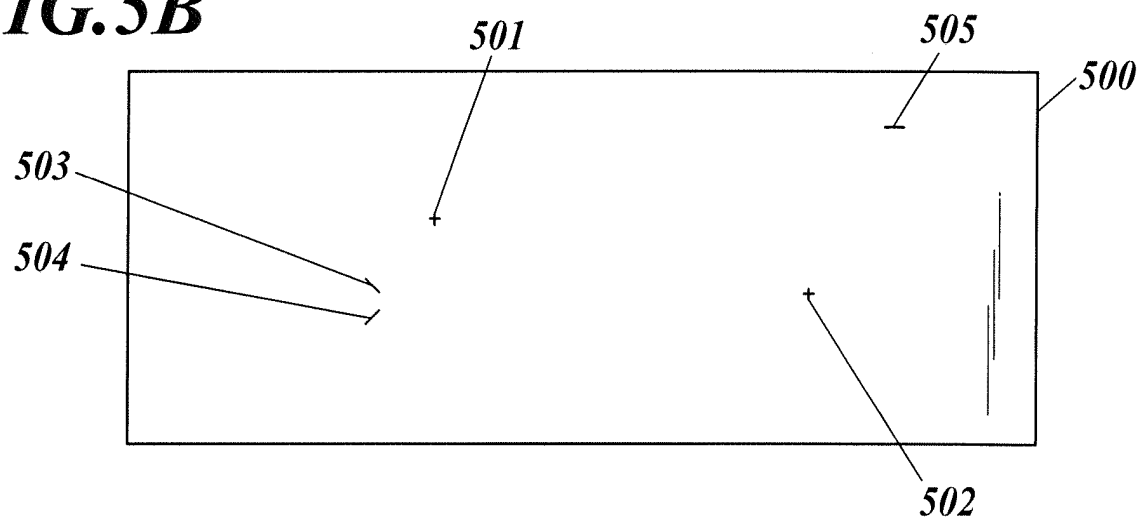


FIG.5C

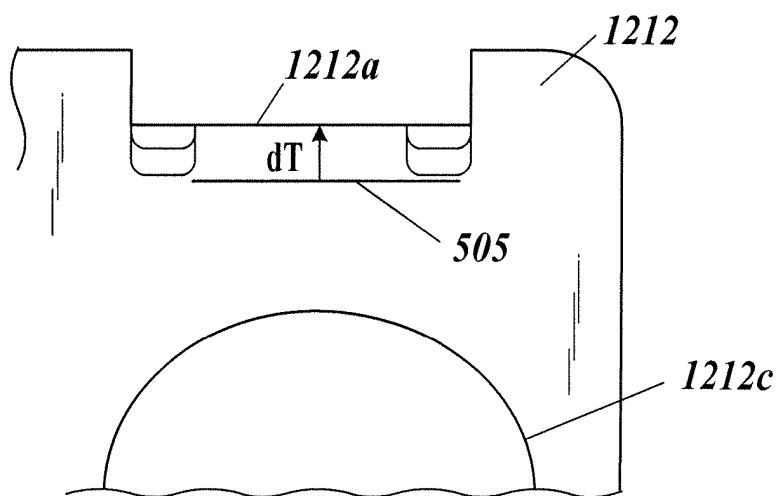


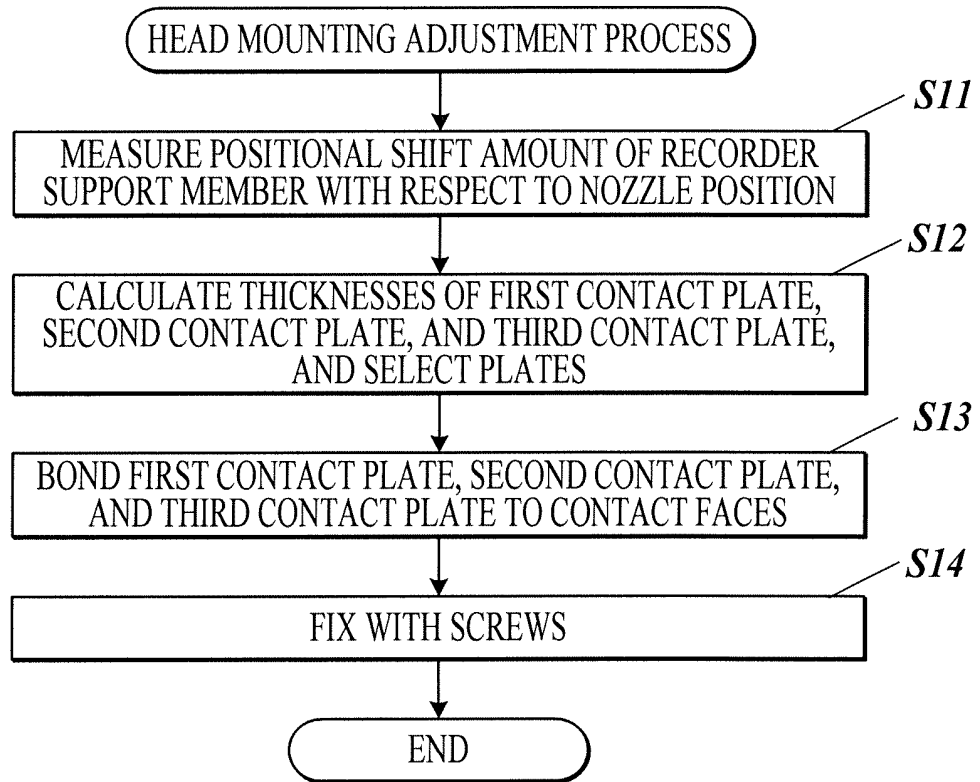
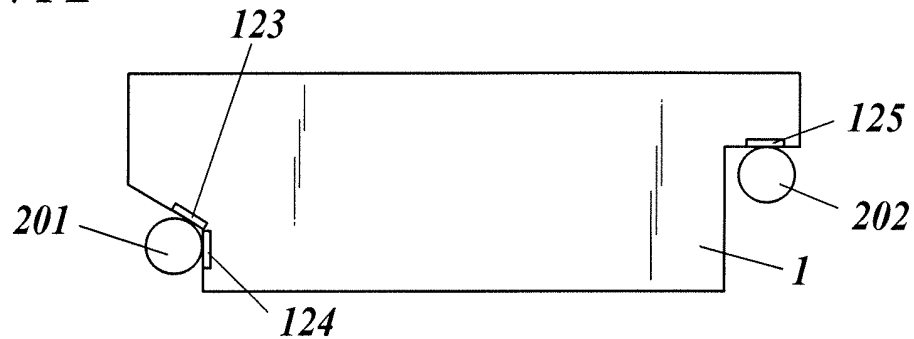
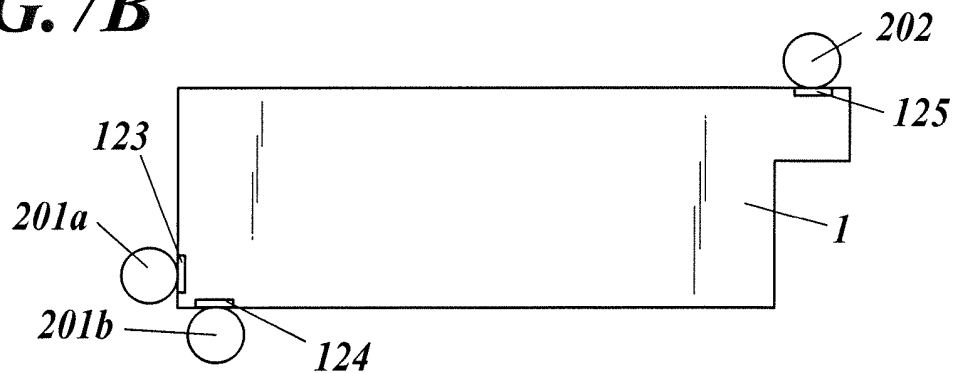
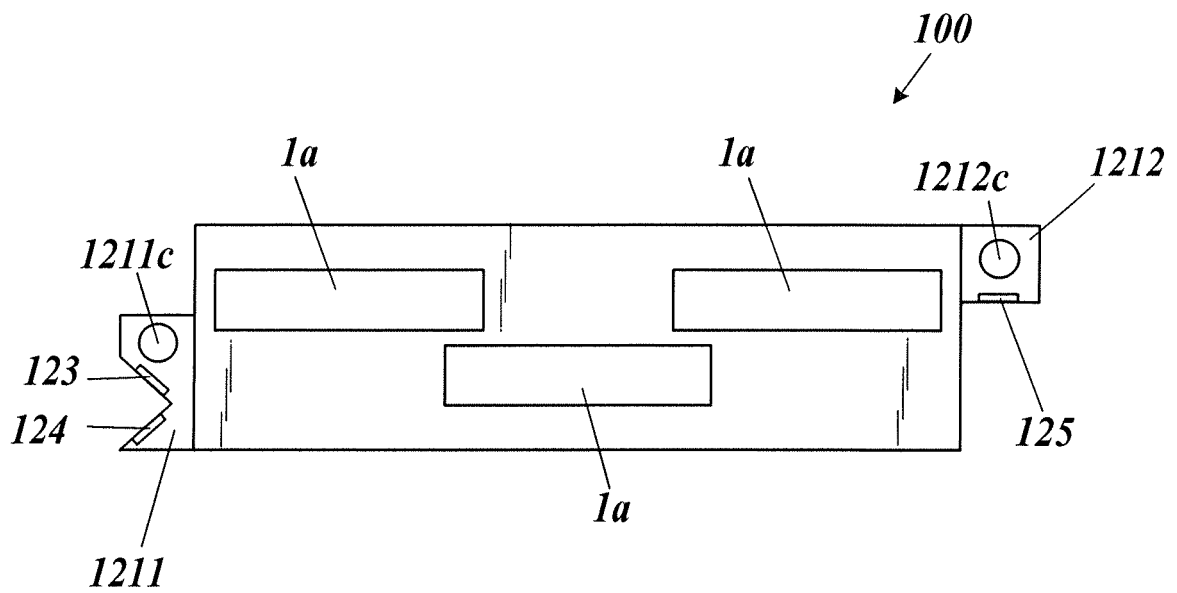
FIG. 6**FIG. 7A****FIG. 7B**

FIG.8



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/008463

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. B41J2/01 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. B41J2/01

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2010-167607 A (SEIKO EPSON CORP.) 05 August 2010, entire text, all drawings & US 2010/0182377 A1, entire text, all drawings	1-7
A	JP 2011-168012 A (RICOH CO., LTD.) 01 September 2011, entire text, all drawings (Family: none)	1-7
A	JP 2014-195924 A (TORAY ENGINEERING CO.) 16 October 2014, entire text, all drawings (Family: none)	1-7
A	JP 2009-184290 A (SII PRINTEK INC.) 20 August 2009, entire text, all drawings (Family: none)	1-7
A	JP 2013-159040 A (DAINIPPON SCREEN MFG. CO., LTD.) 19 August 2013, entire text, all drawings (Family: none)	1-7
A	US 6394568 B1 (HEWLETT-PACKARD COMPANY) 28 May 2002, entire text, all drawings (Family: none)	1-7



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search
28 March 2018 (28.03.2018)Date of mailing of the international search report
10 April 2018 (10.04.2018)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

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Patent documents cited in the description

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