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OKUI et al.(10) **Pub. No.: US 2025/0262865 A1**(43) **Pub. Date: Aug. 21, 2025**(54) **LIQUID EJECTING HEAD AND LIQUID
EJECTING APPARATUS****Publication Classification**(51) **Int. Cl.***B41J 2/175* (2006.01)*B41J 3/54* (2006.01)*B41J 25/34* (2006.01)(52) **U.S. Cl.**CPC *B41J 2/175* (2013.01); *B41J 3/543*
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Feb. 16, 2024 (JP) 2024-022360

(57)

ABSTRACT

A liquid ejecting head includes a head module configured to eject a liquid in a first direction, a supply channel member, and an elastic seal member that is arranged between the head module and the supply channel member in the first direction, thereby liquid-tightly connecting a first channel orifice of the first head module and a channel orifice of the supply channel member. The head module includes a channel orifice forming member in which the first channel orifice is formed, and a chip that is arranged in the first direction relative to the channel orifice forming member. A seal area of the seal member held between the channel orifice forming member and the supply channel member does not overlap the chip as viewed in the first direction.

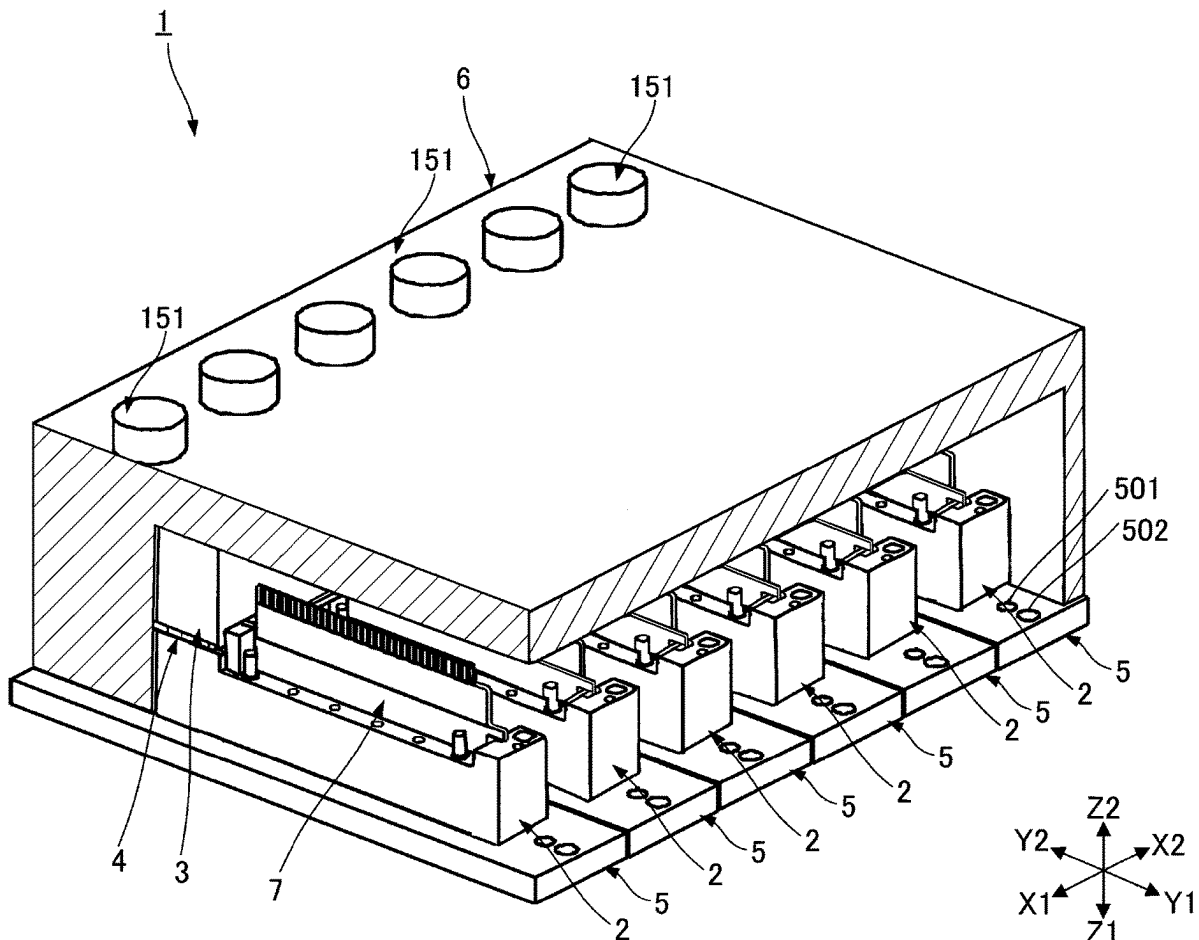


FIG. 1

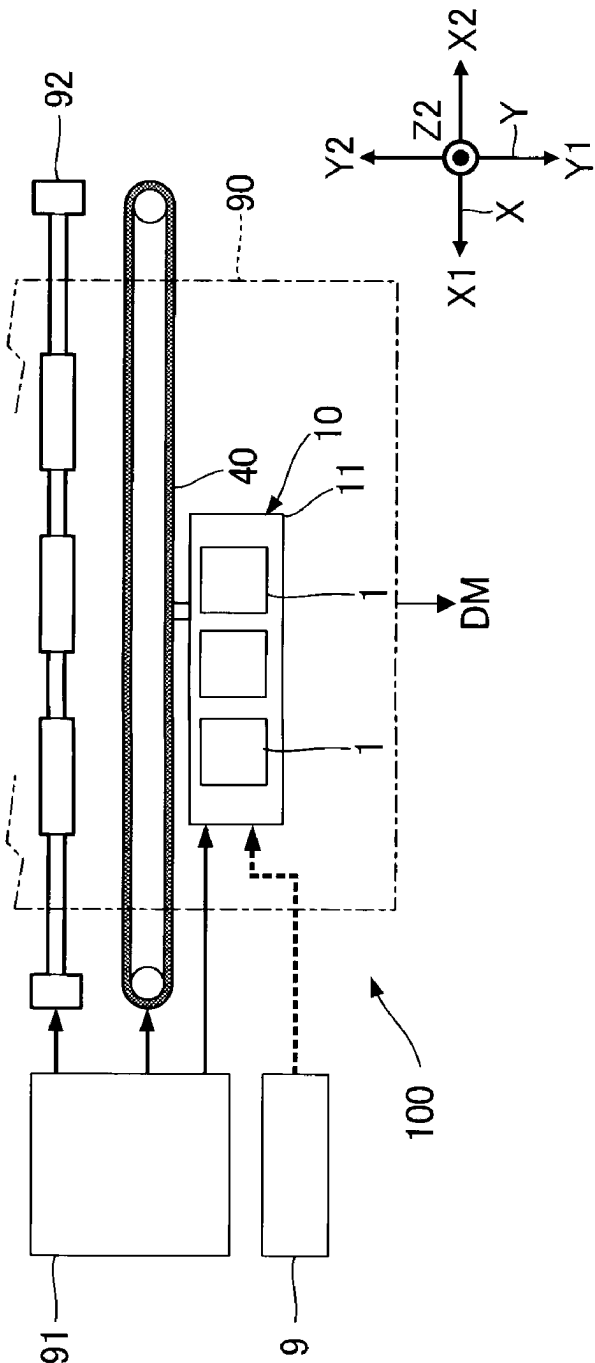
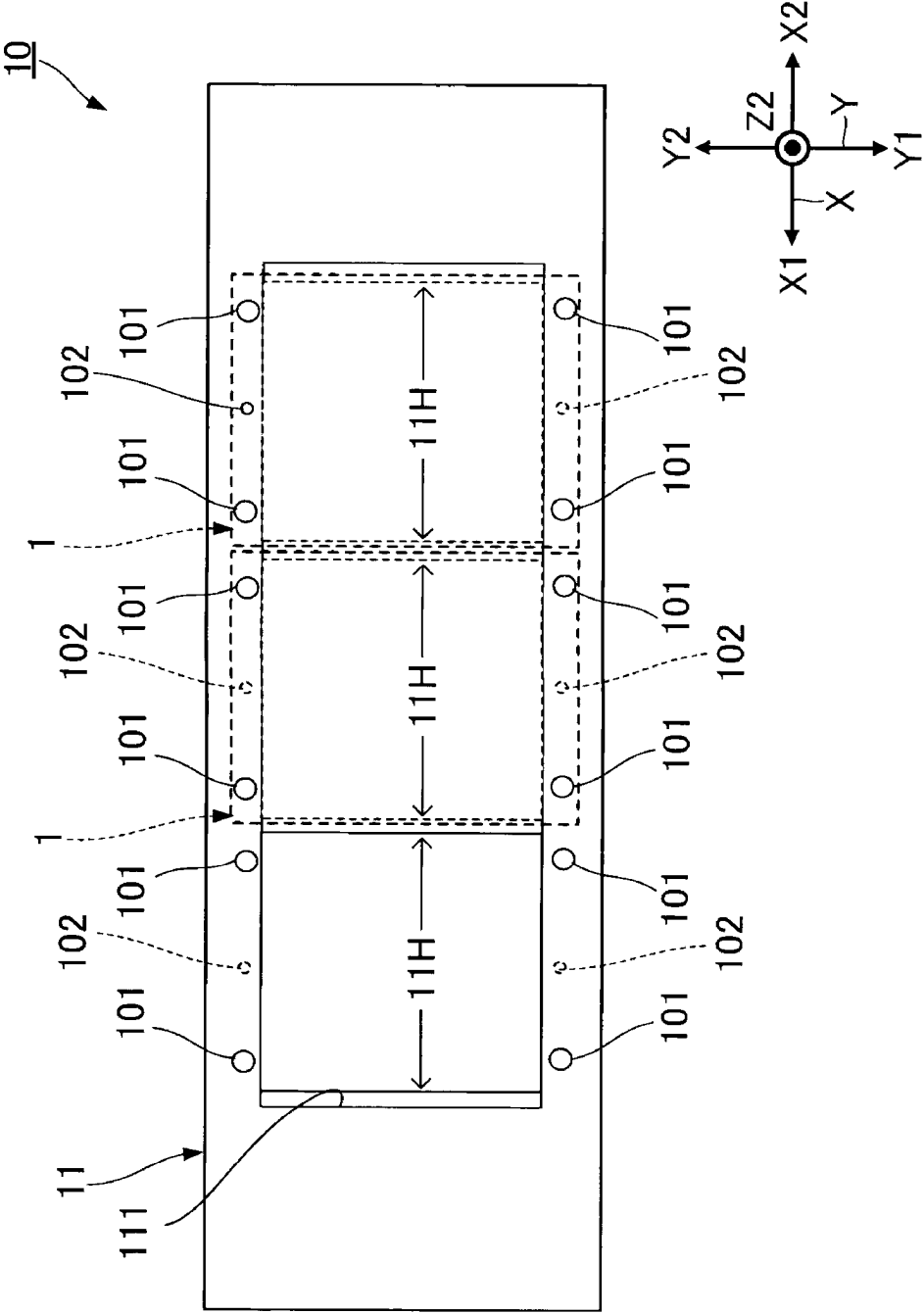
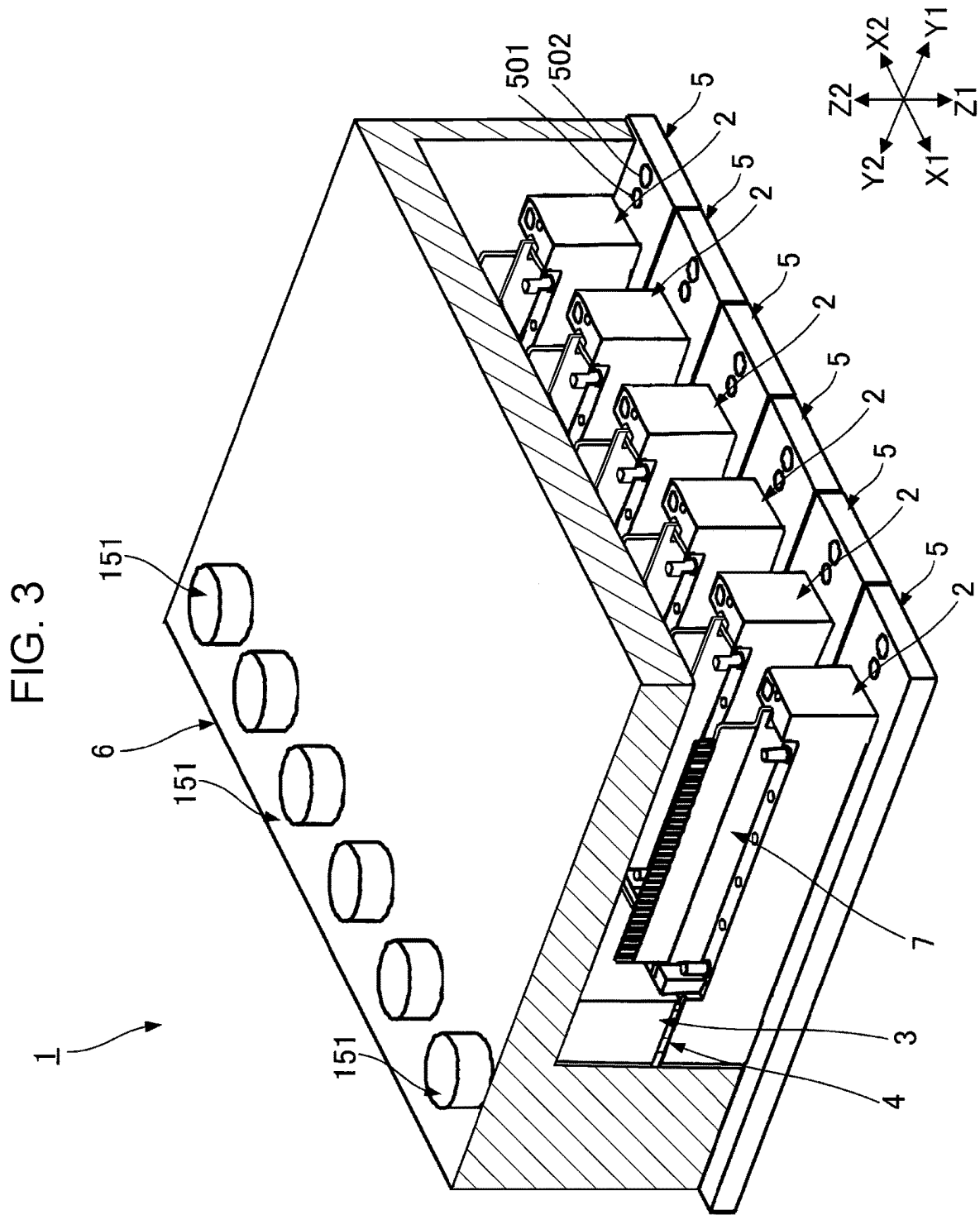


FIG. 2





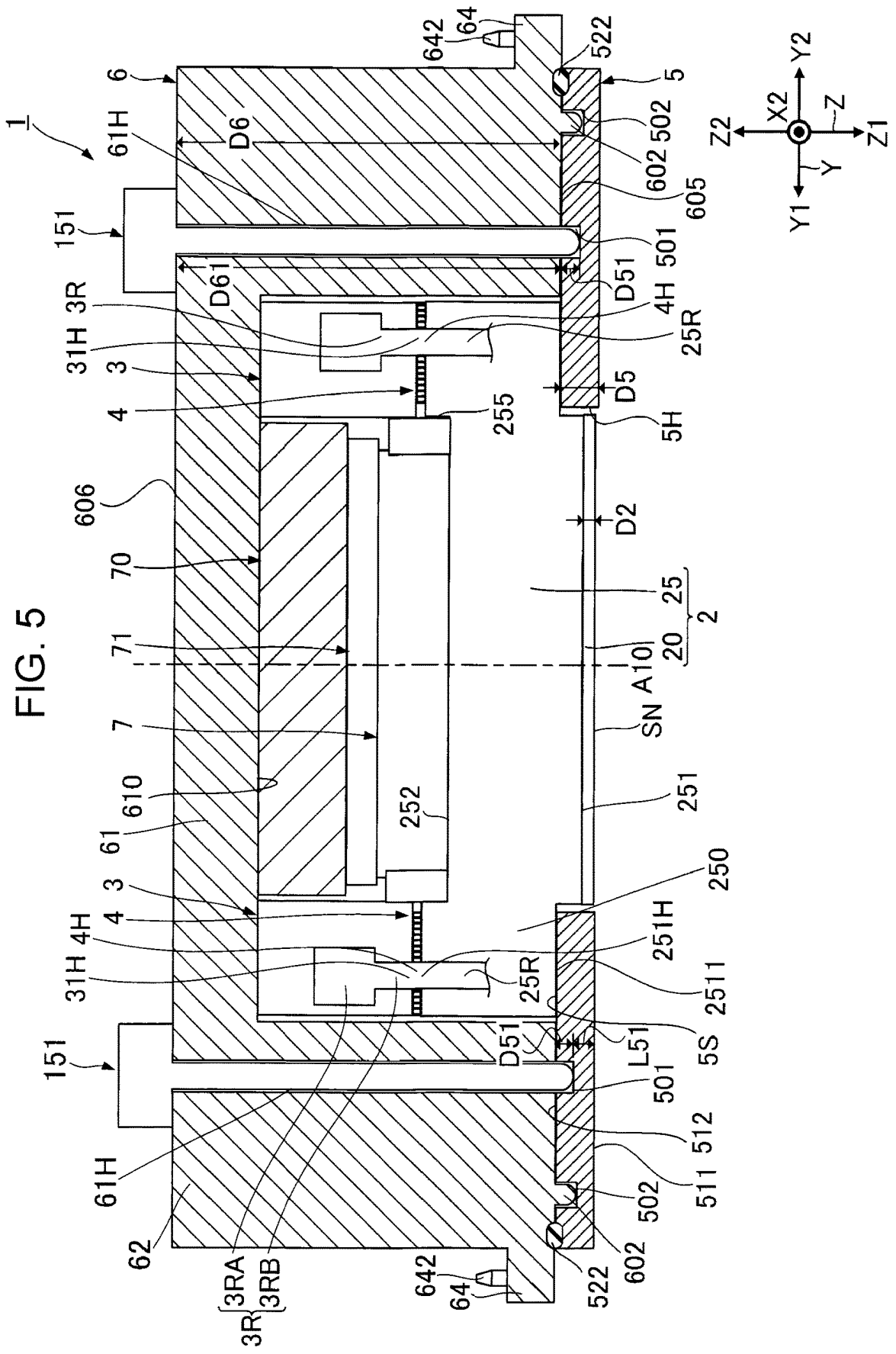


FIG. 6

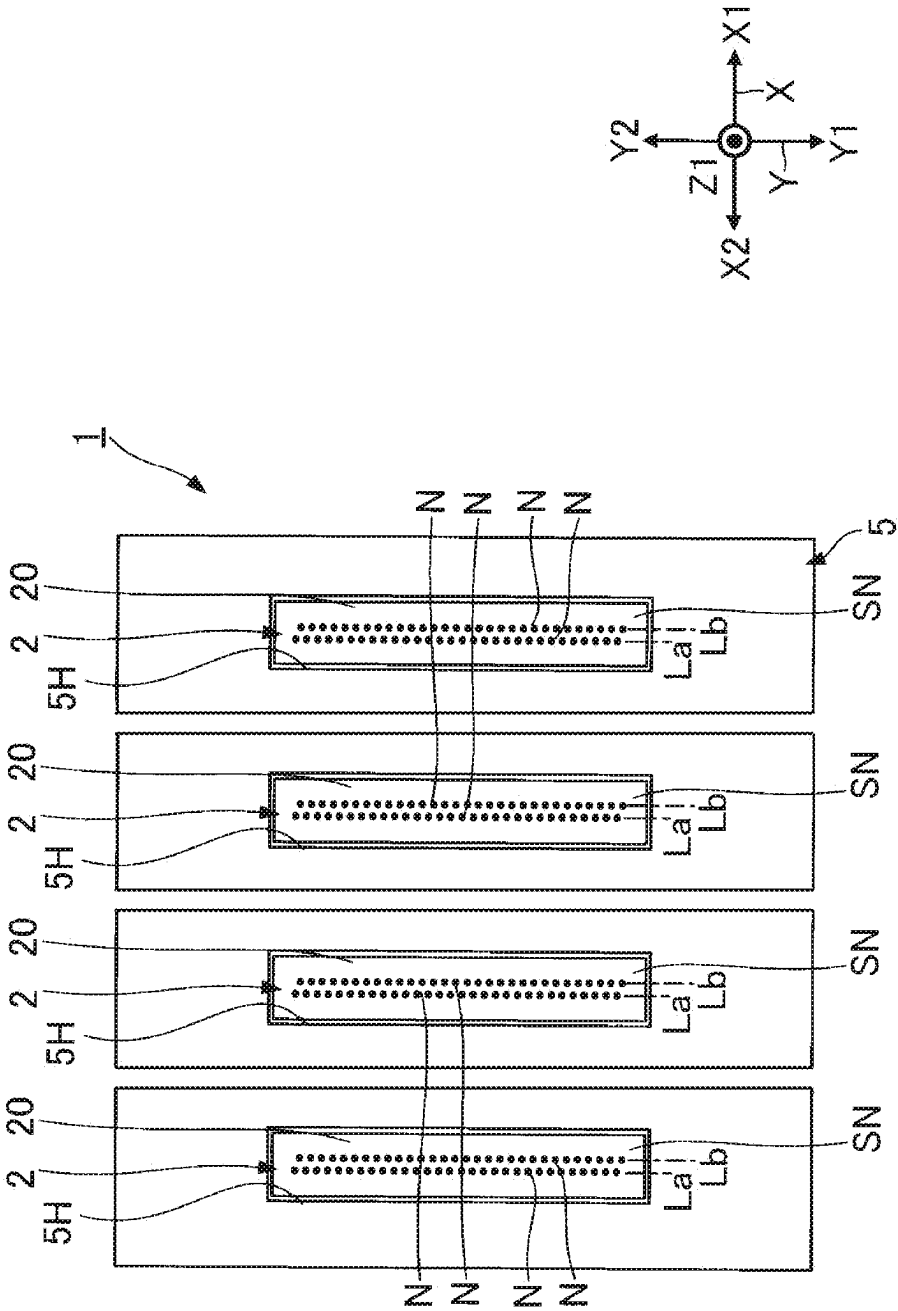


FIG. 8

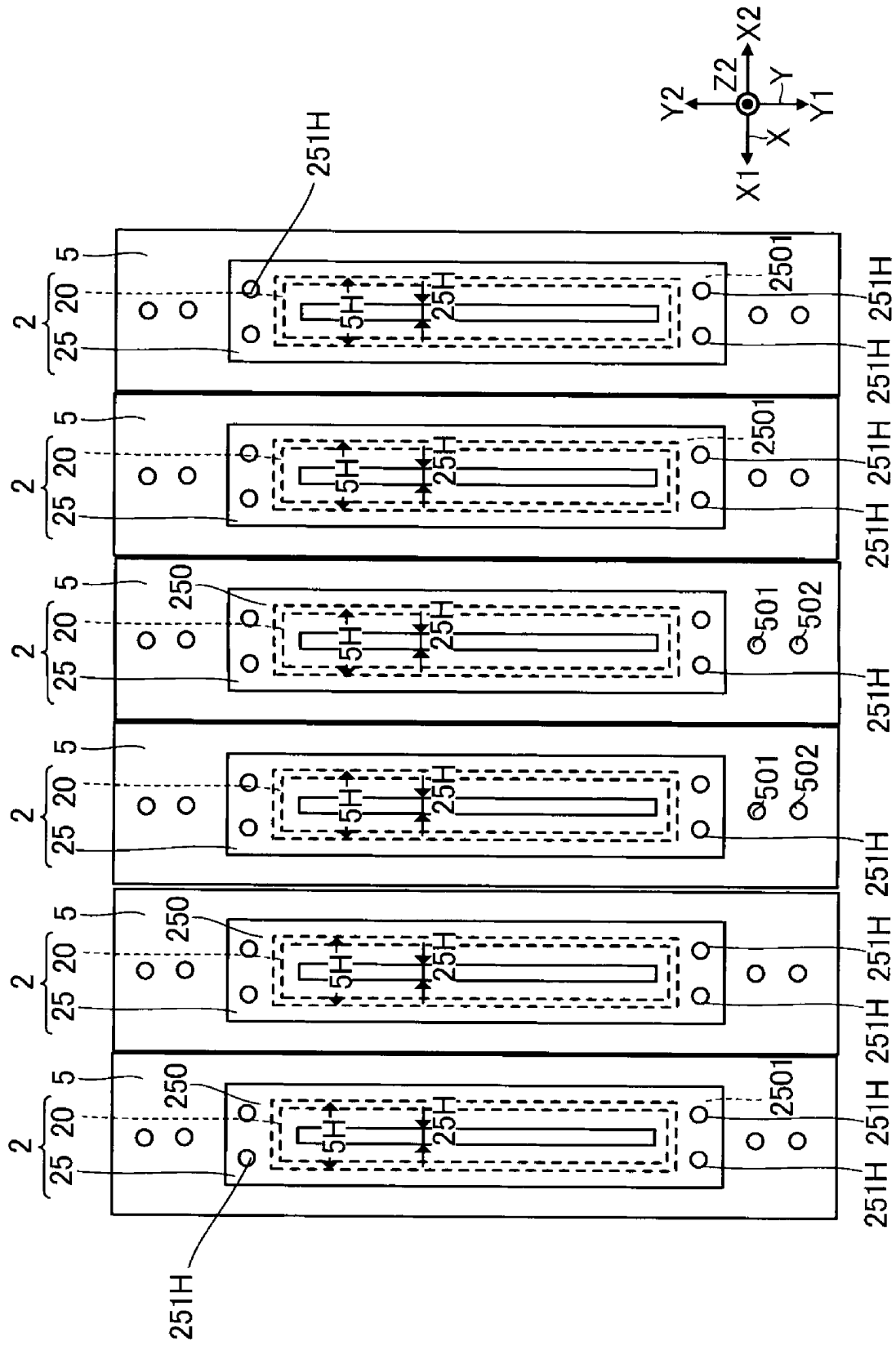


FIG. 9

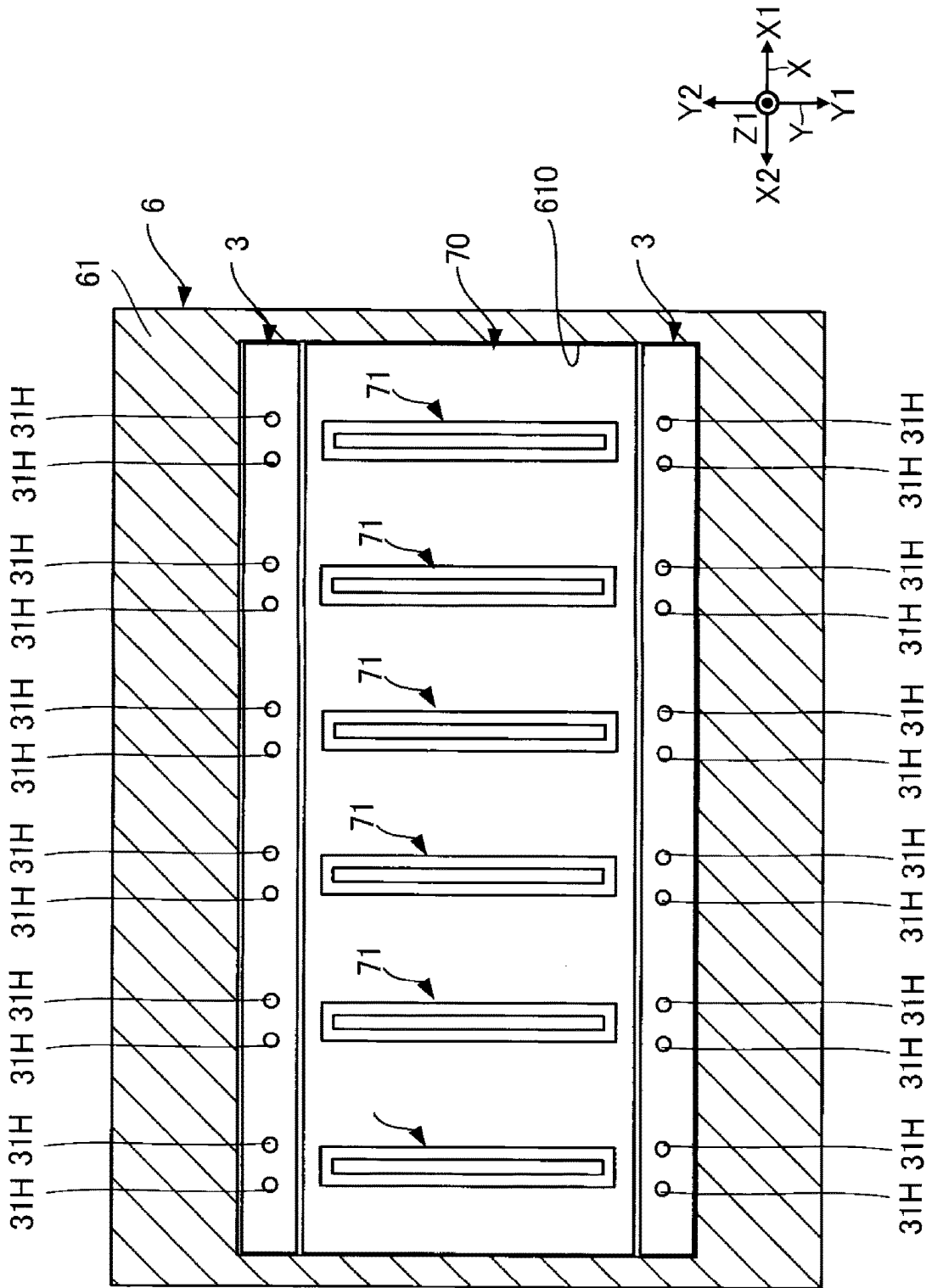


FIG. 10

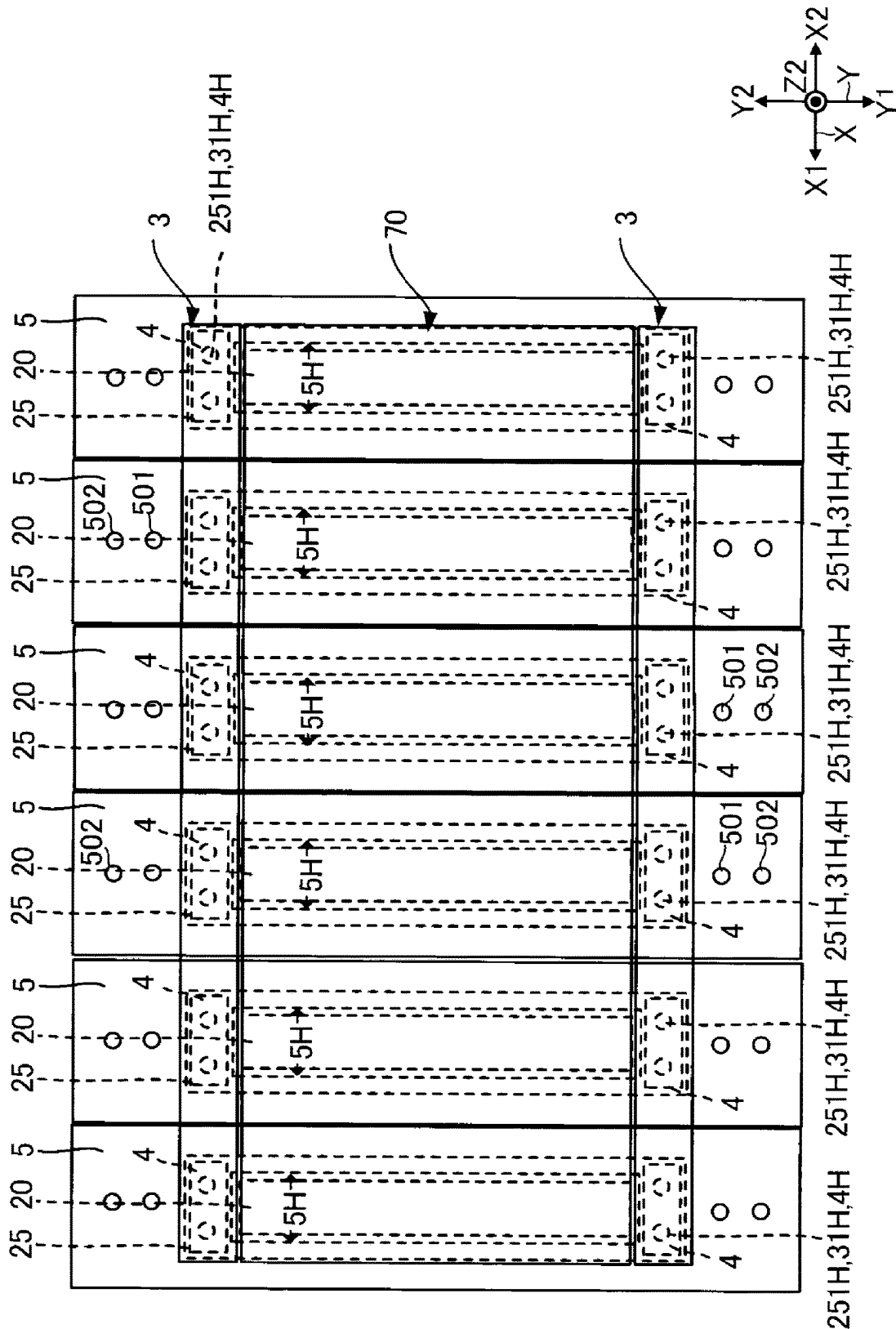


FIG. 11

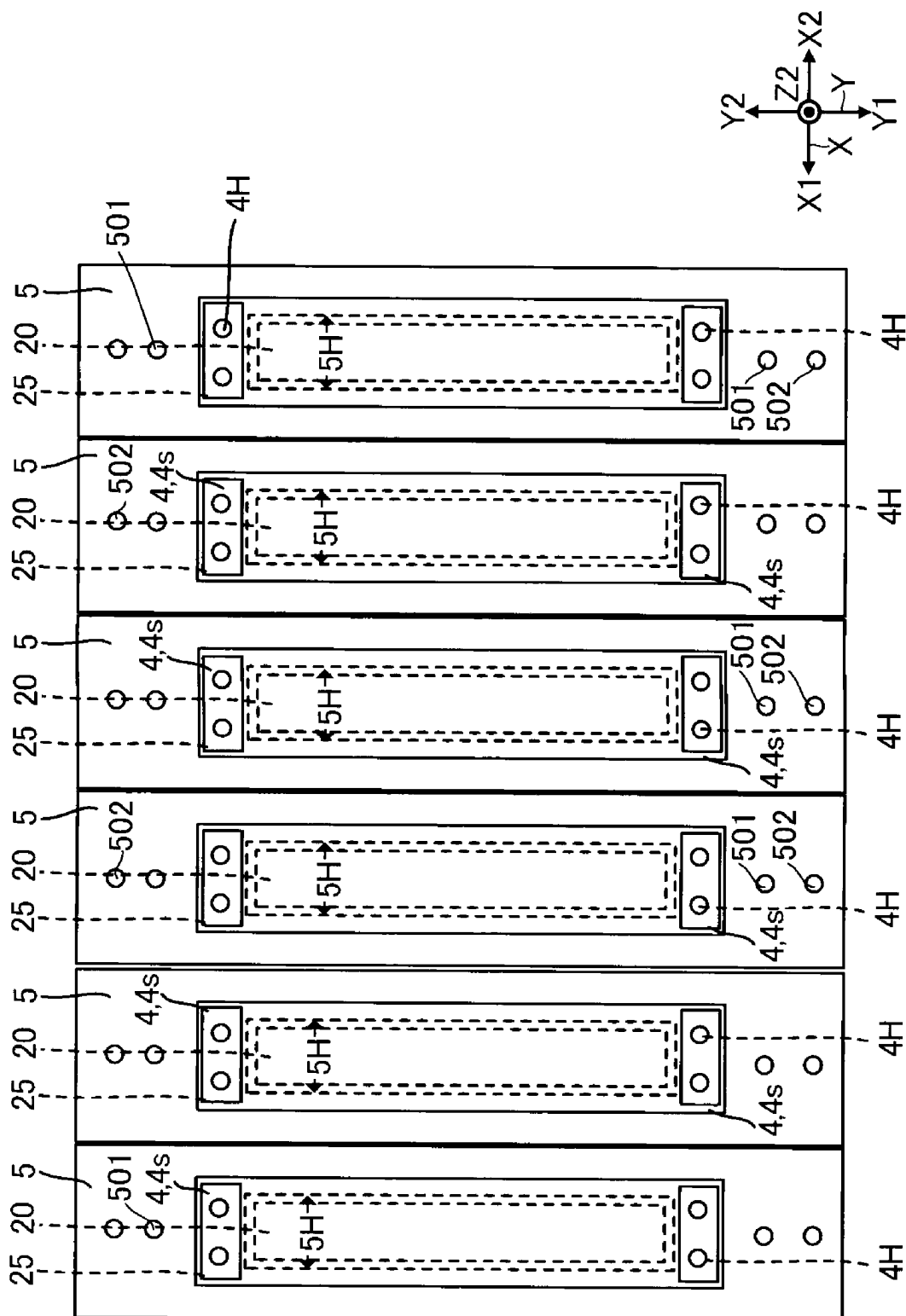


FIG. 12

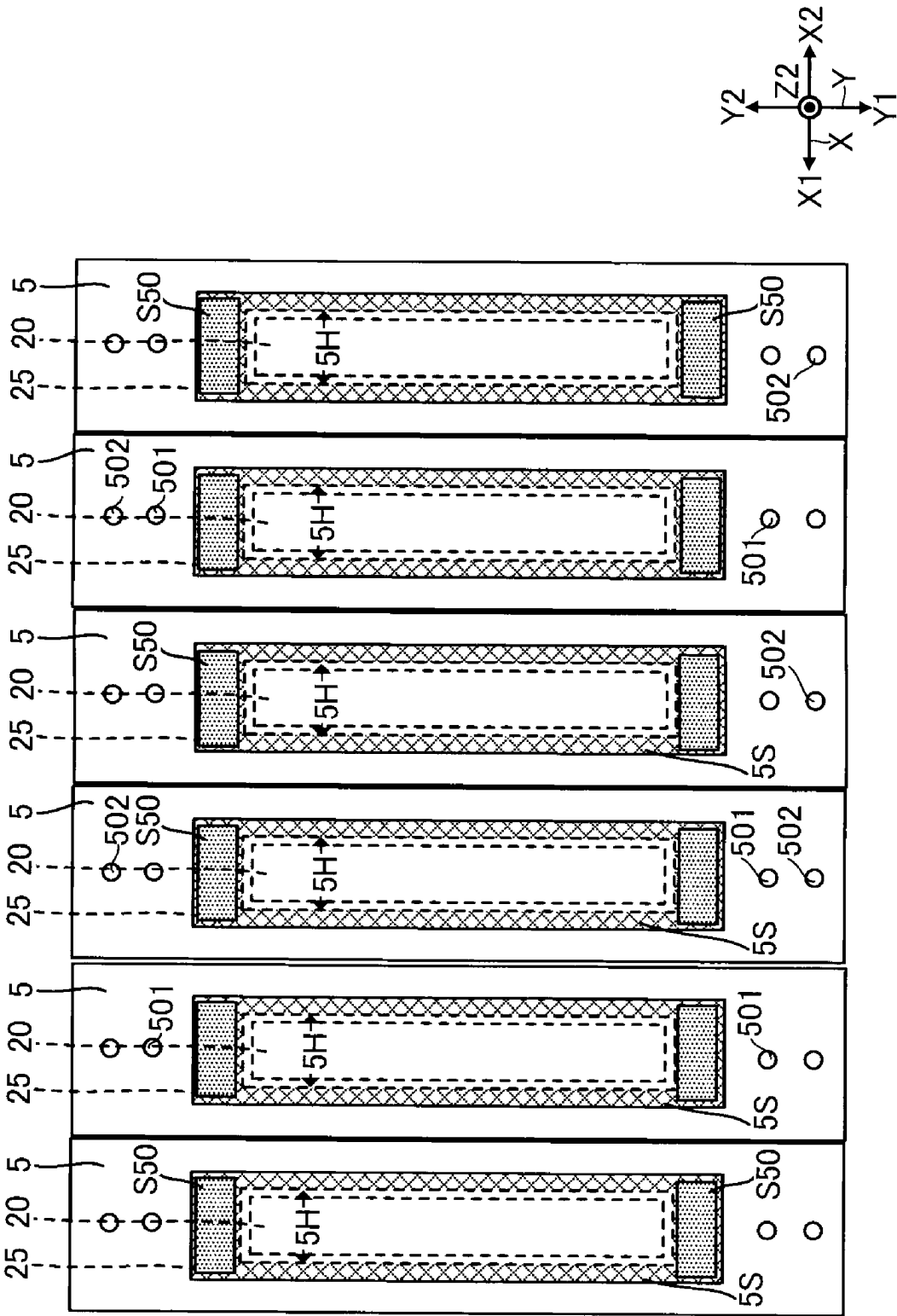


FIG. 13

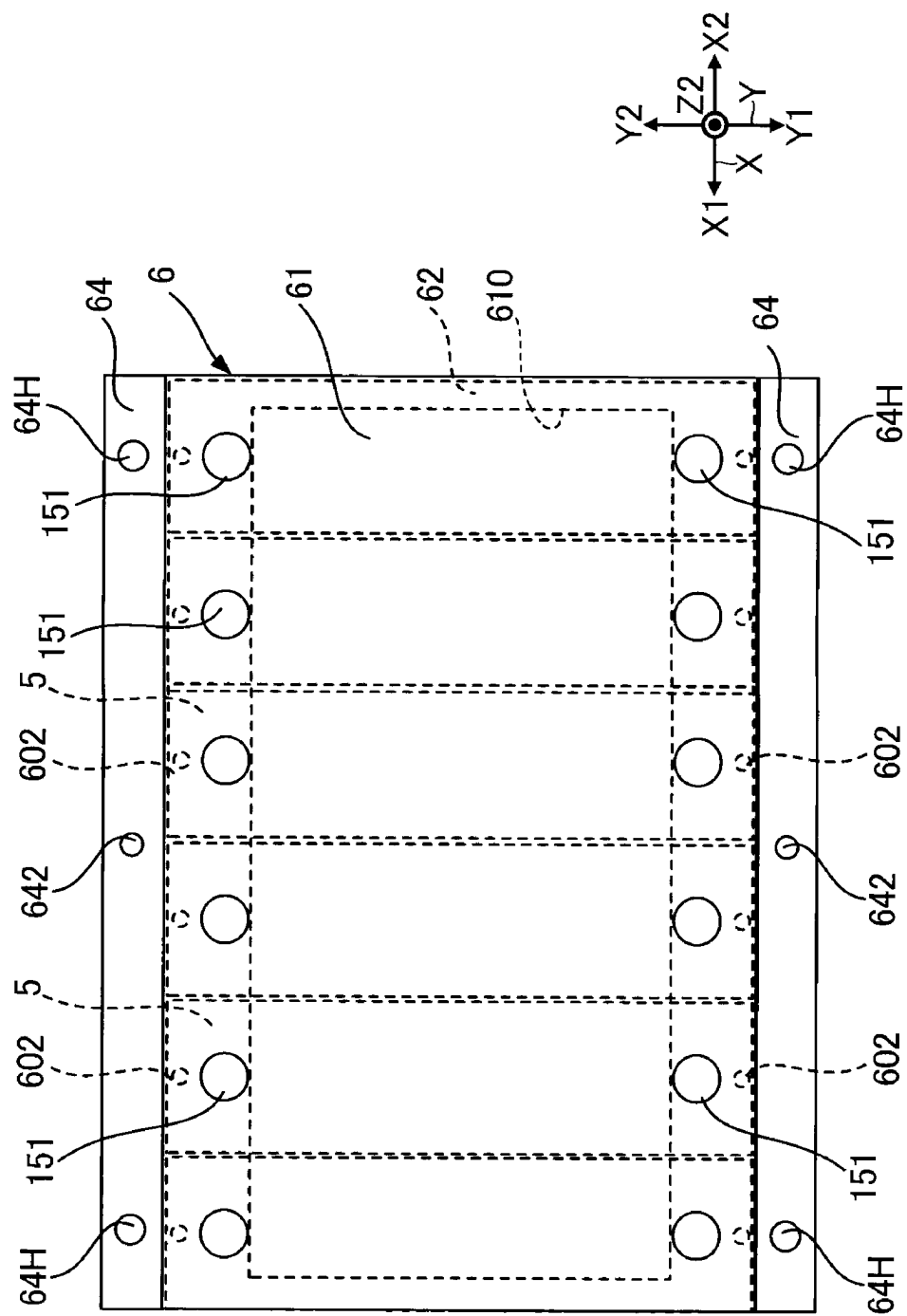


FIG. 14

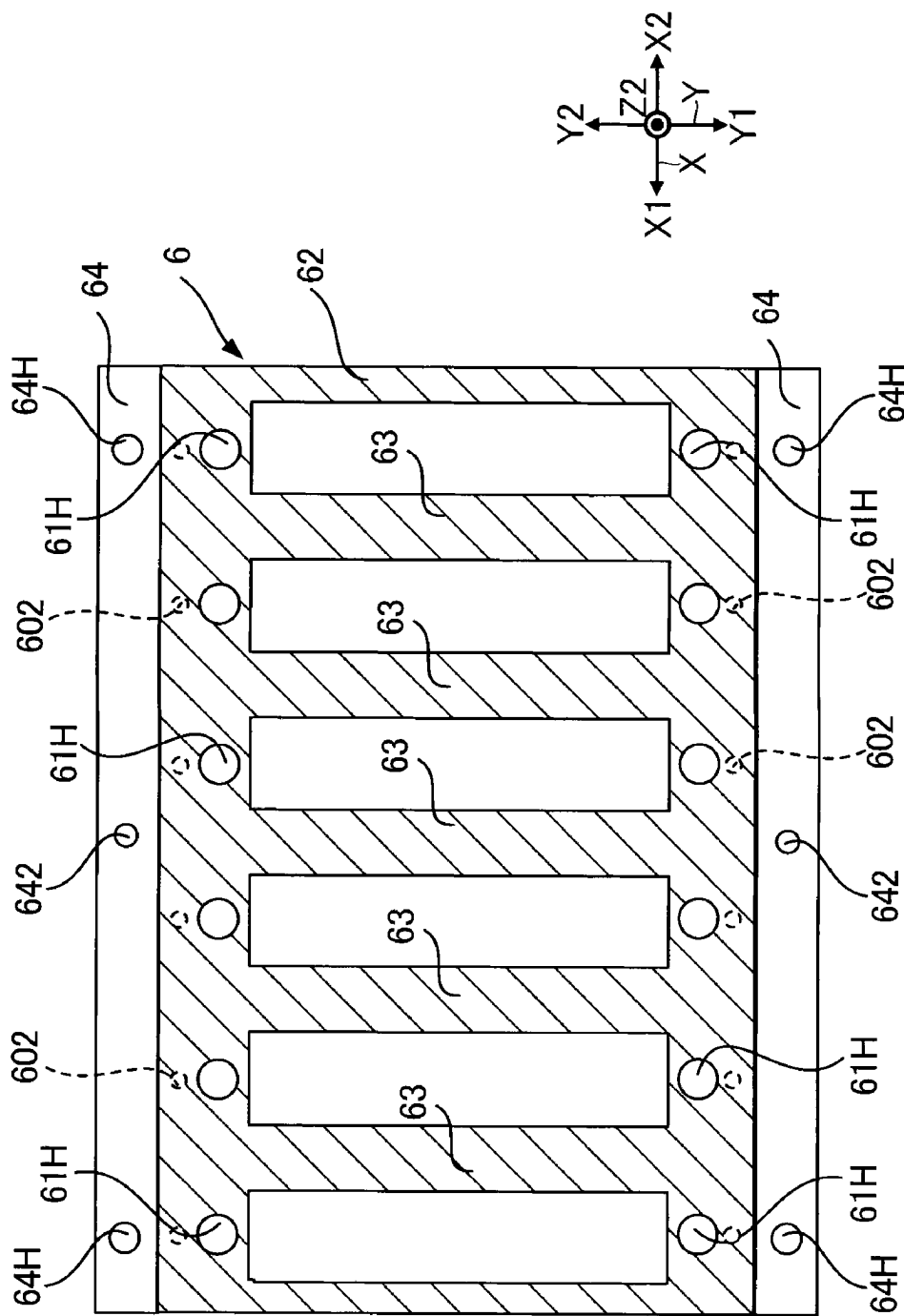


FIG 19

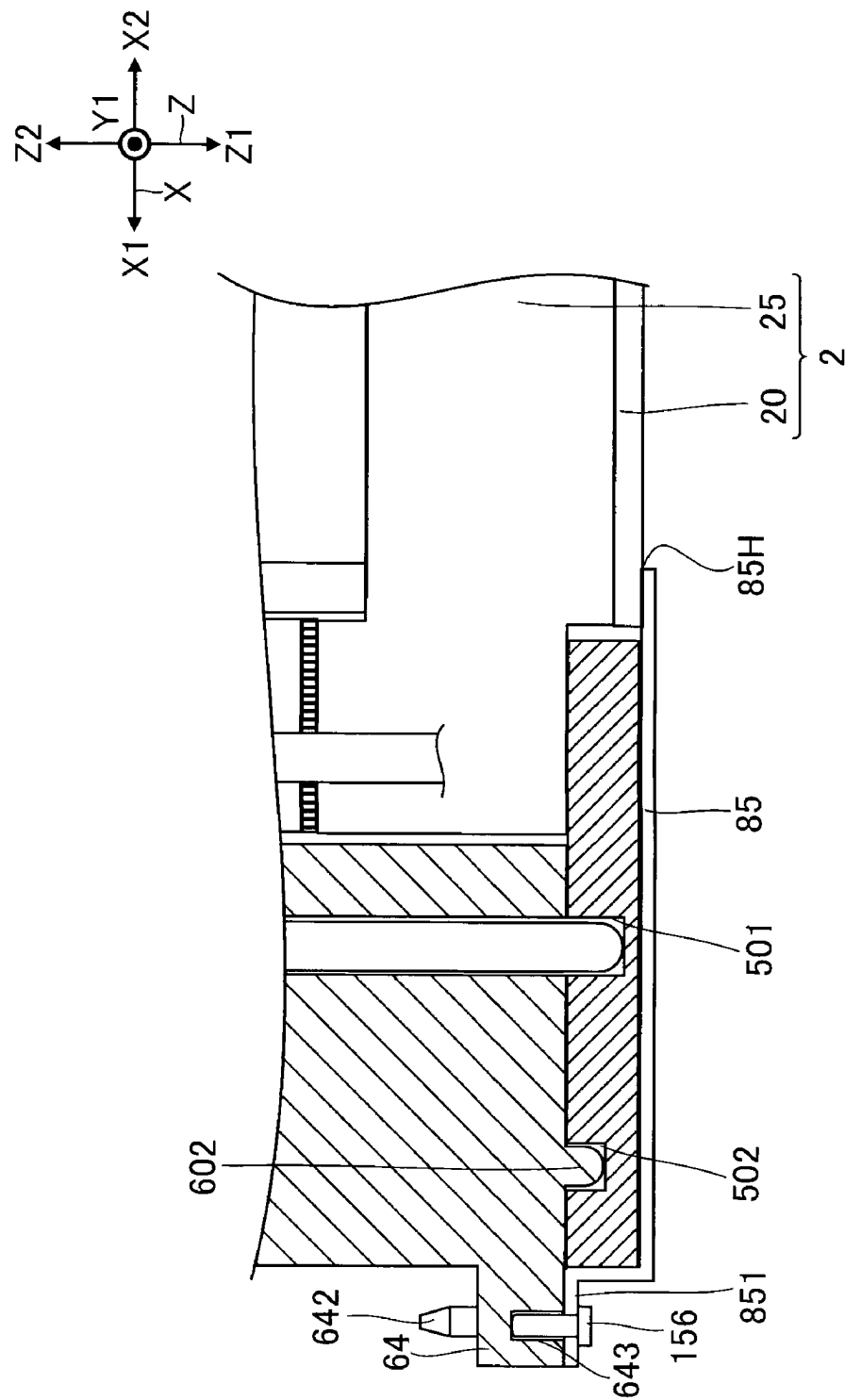


FIG. 20

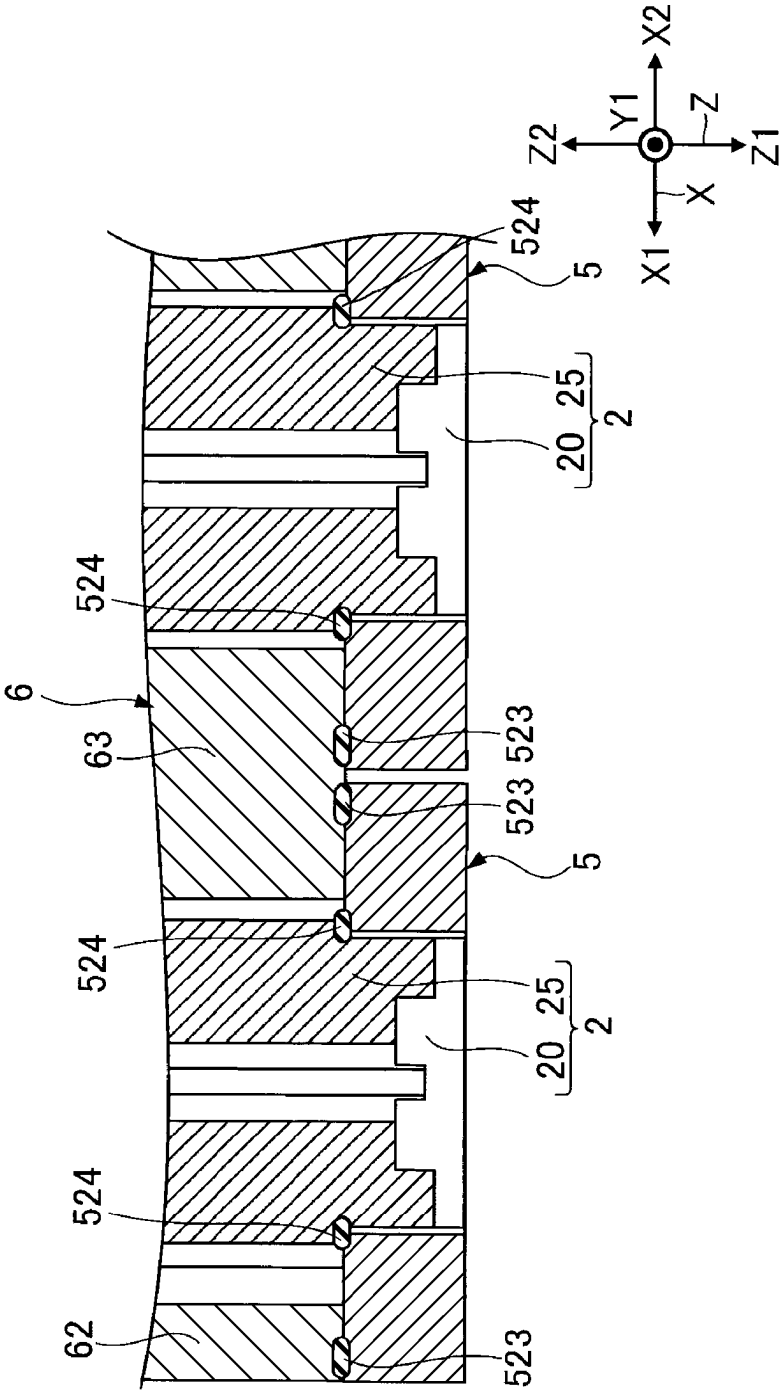


FIG. 21

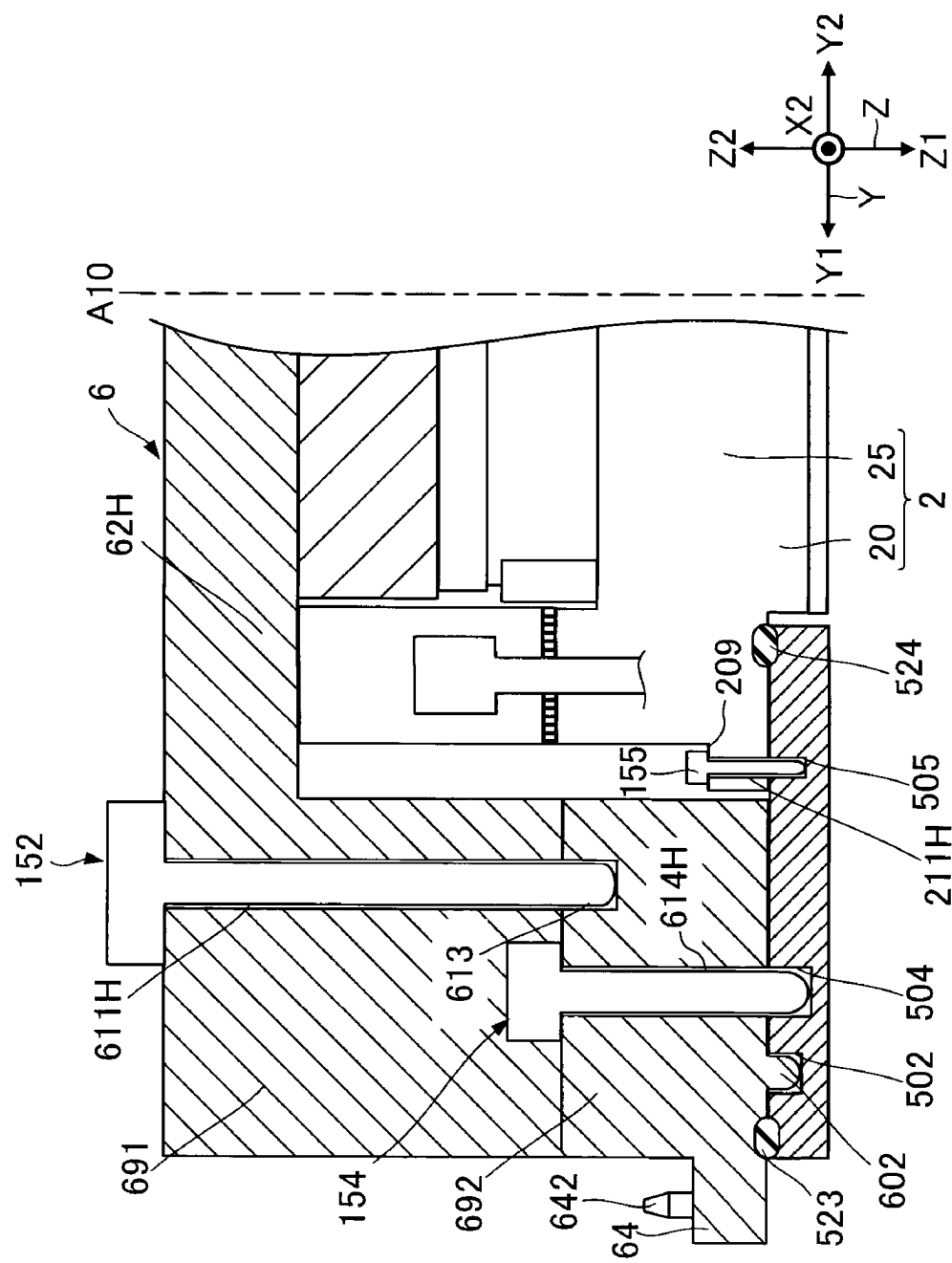


FIG. 22

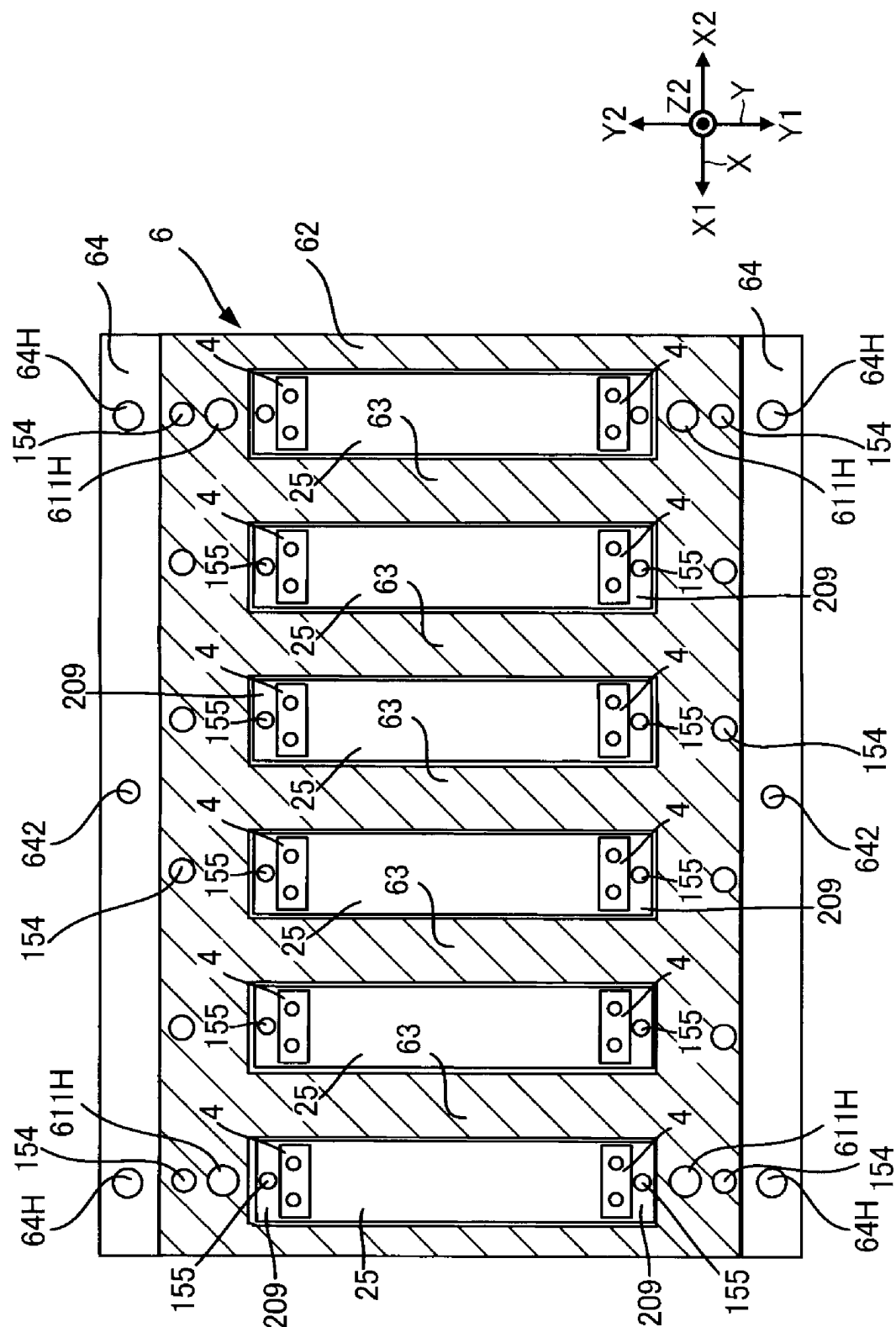


FIG 23

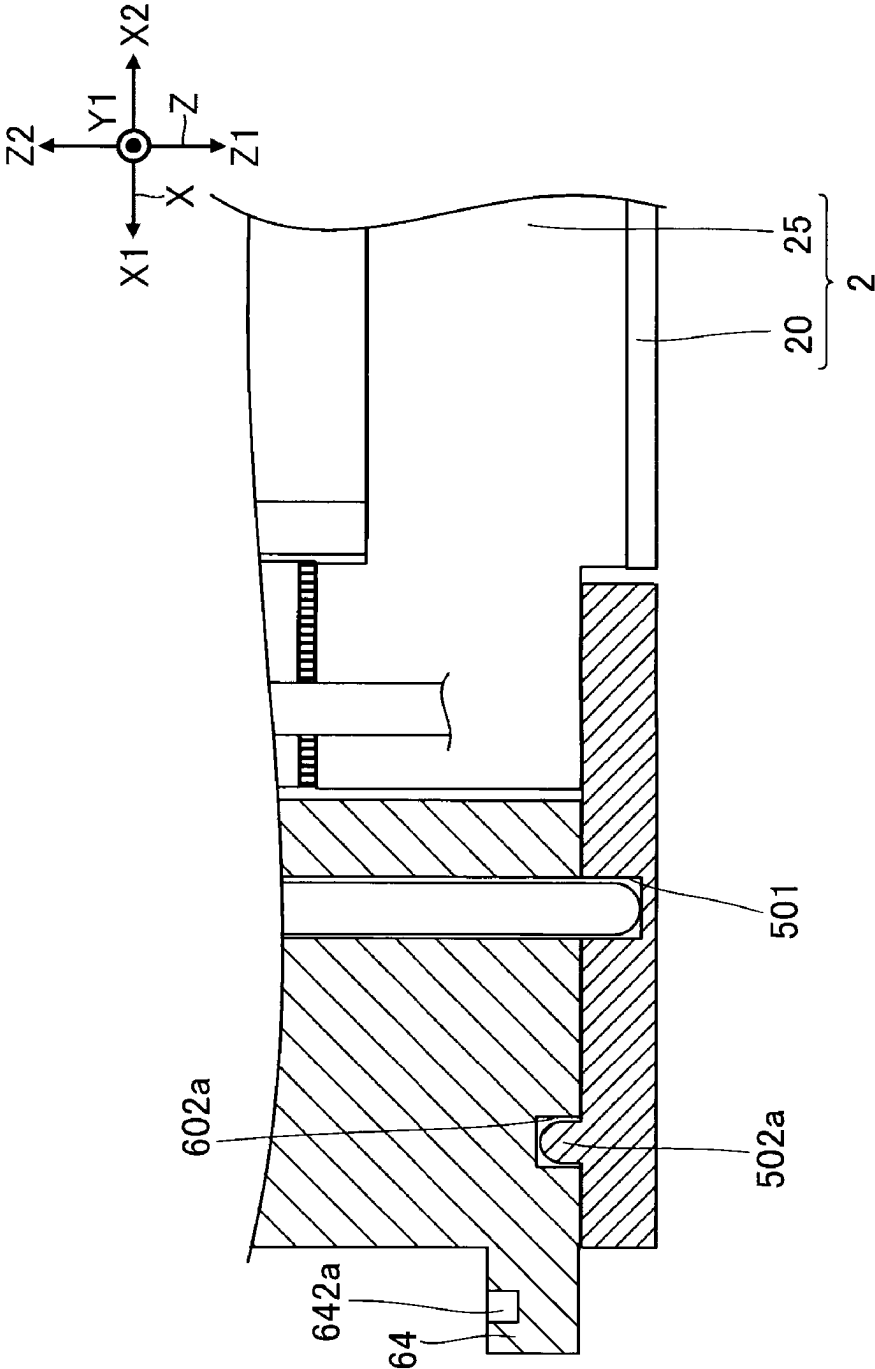


FIG. 24

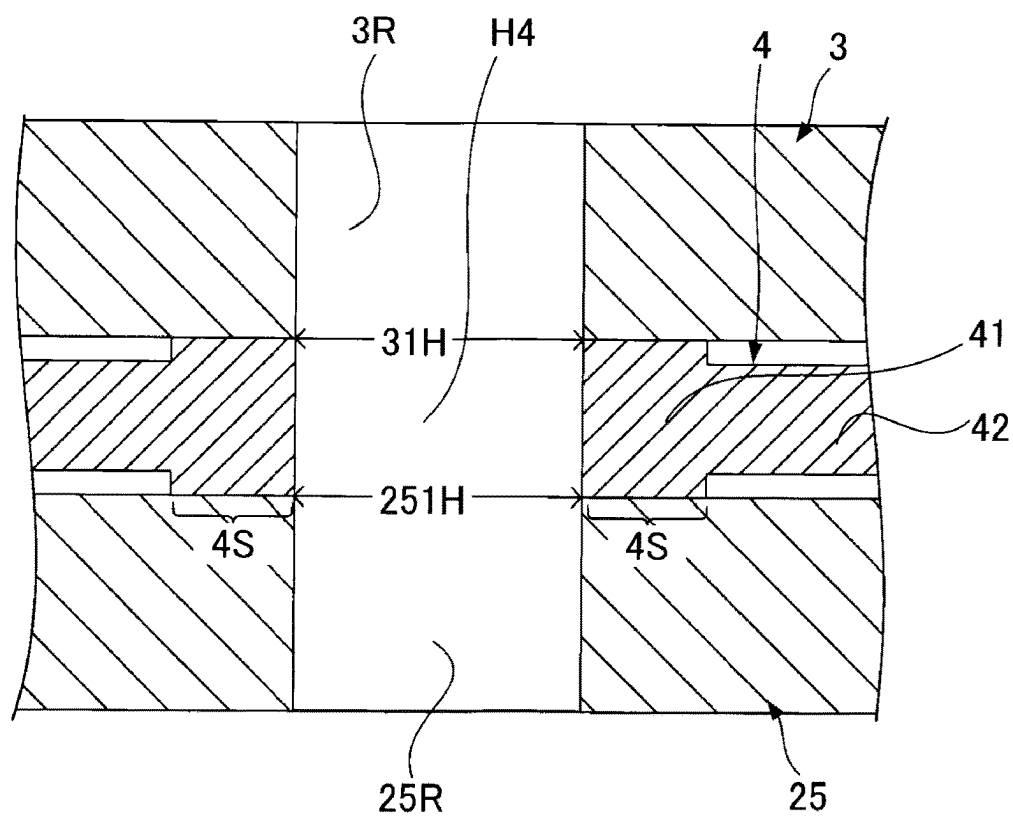


FIG. 25

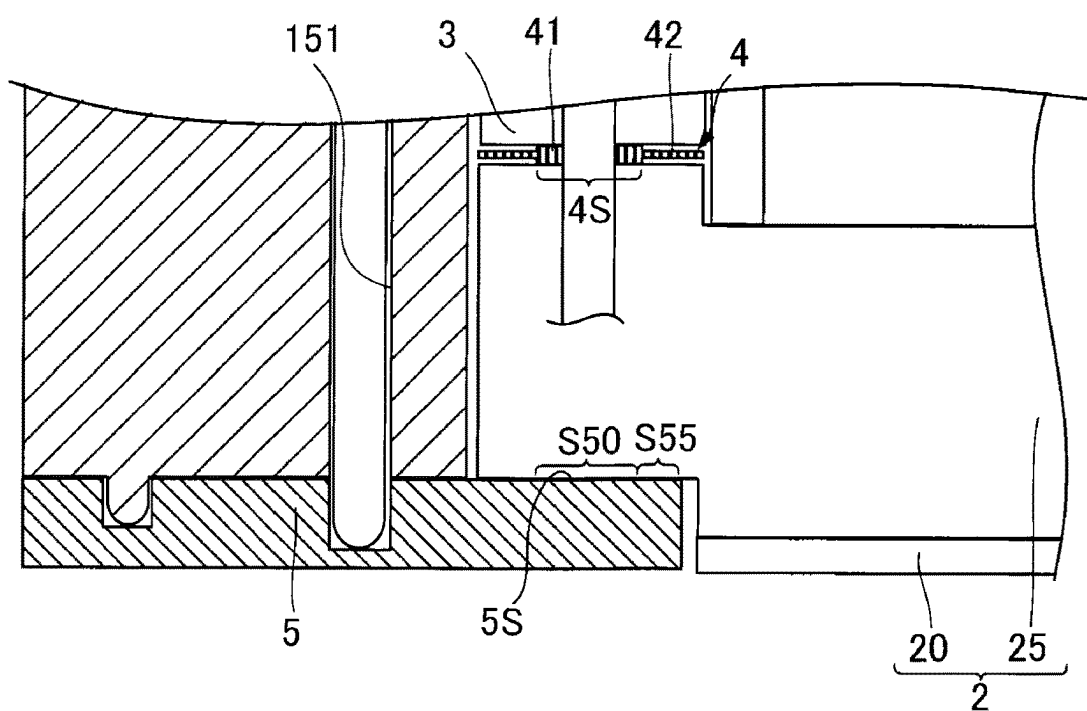


FIG. 26

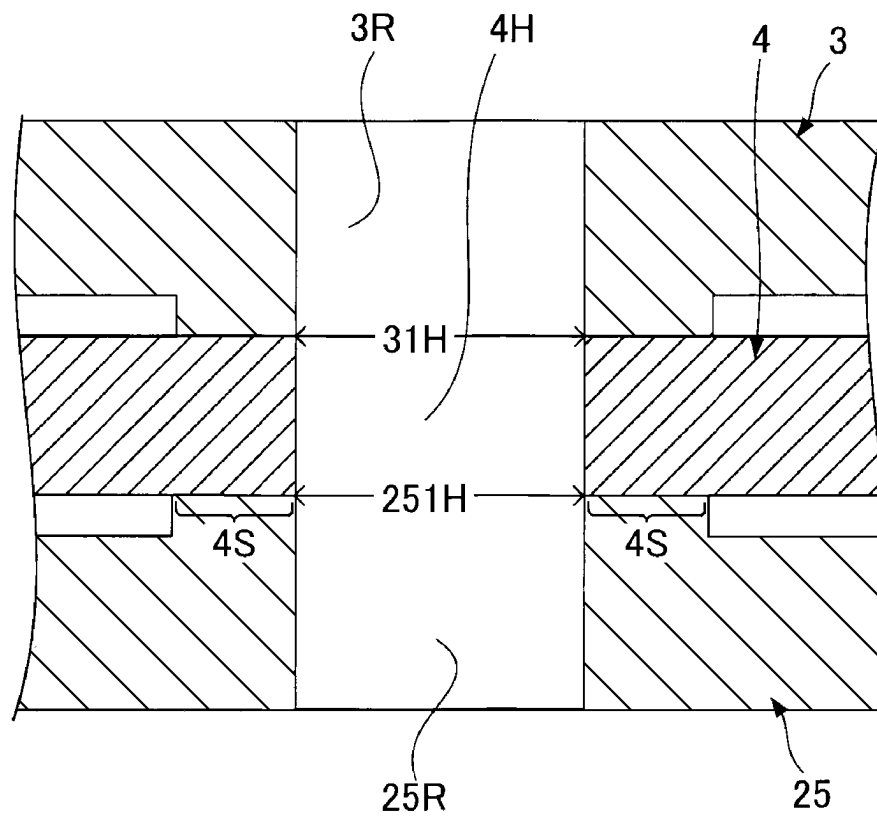
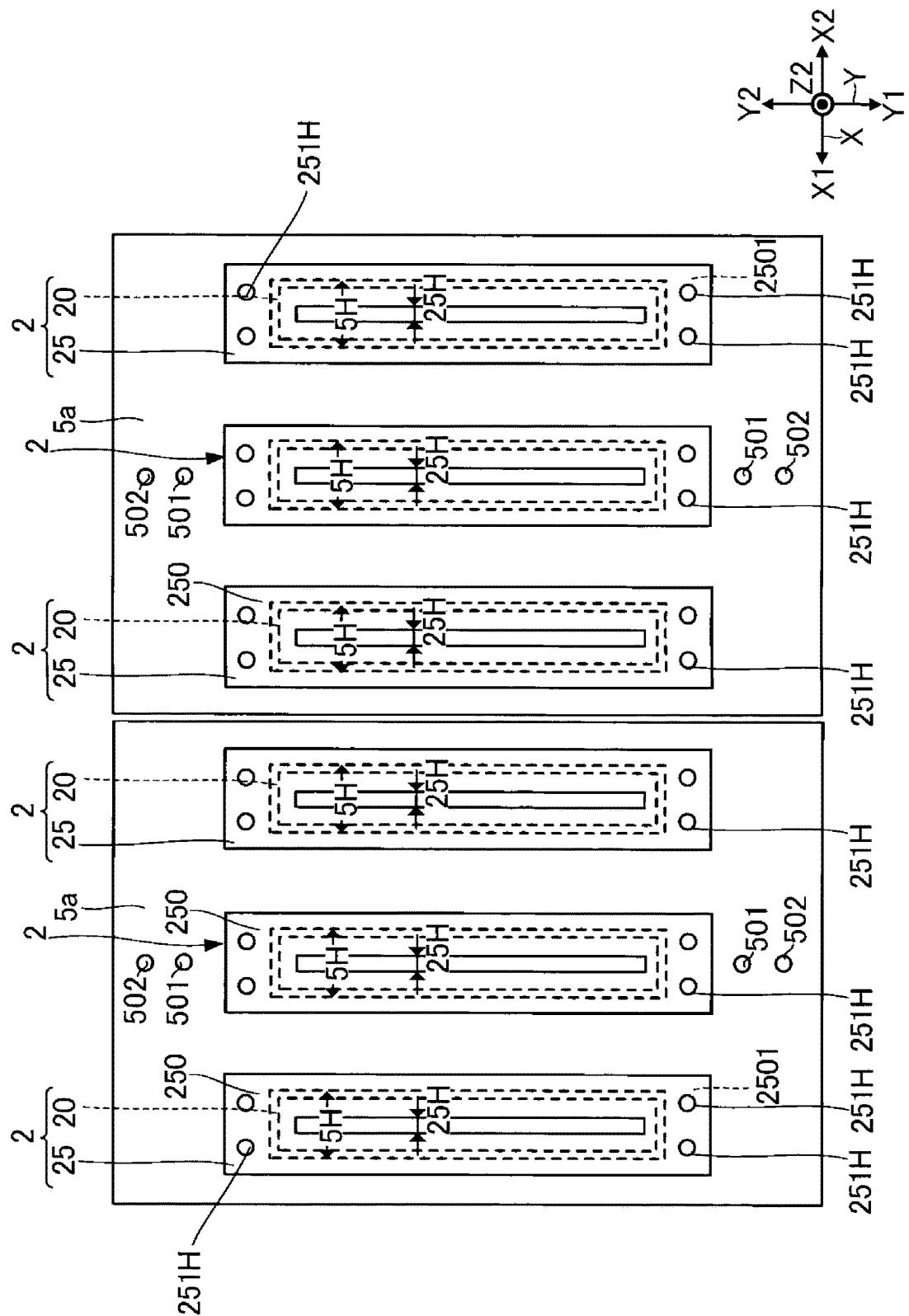


FIG. 27



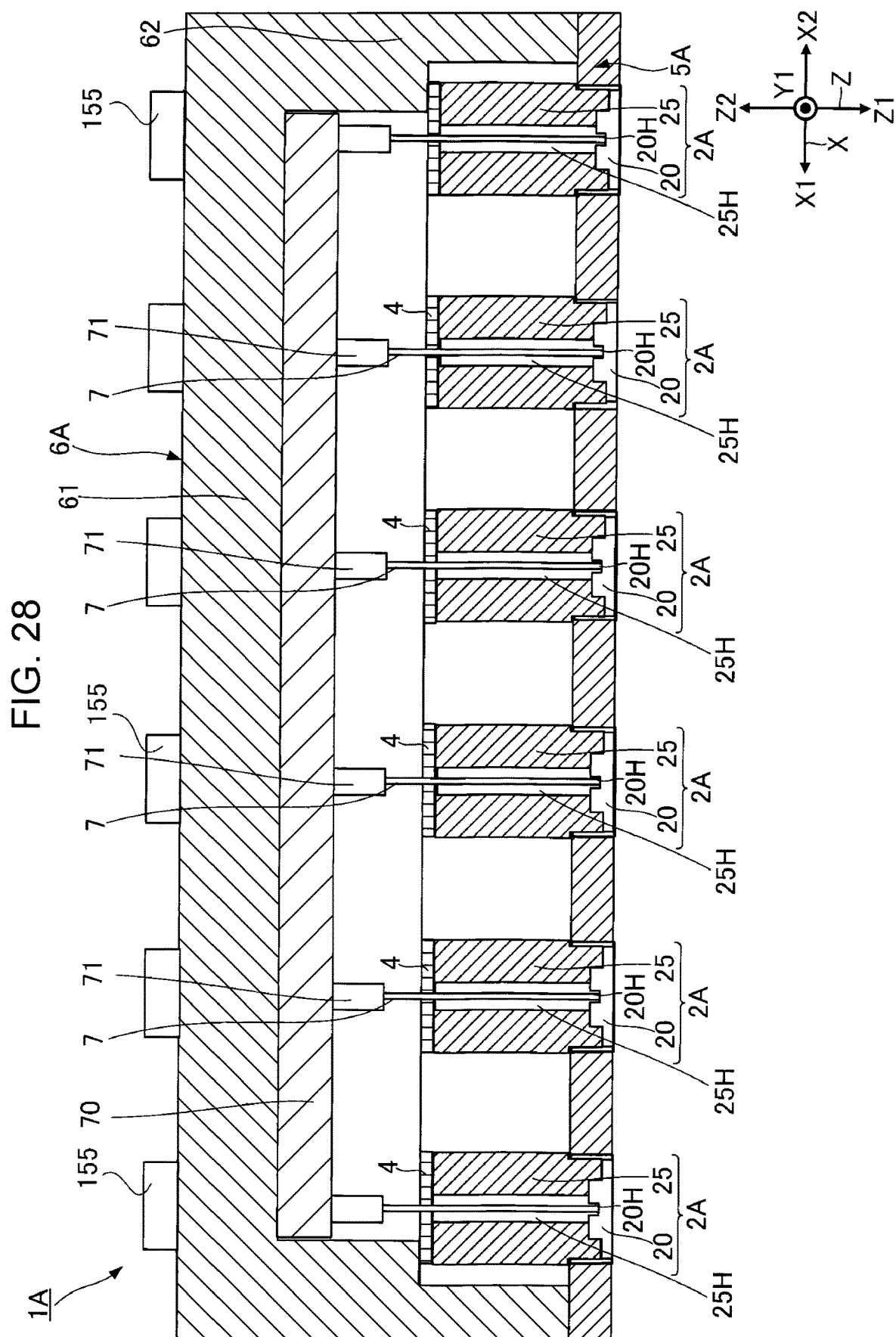


FIG. 29

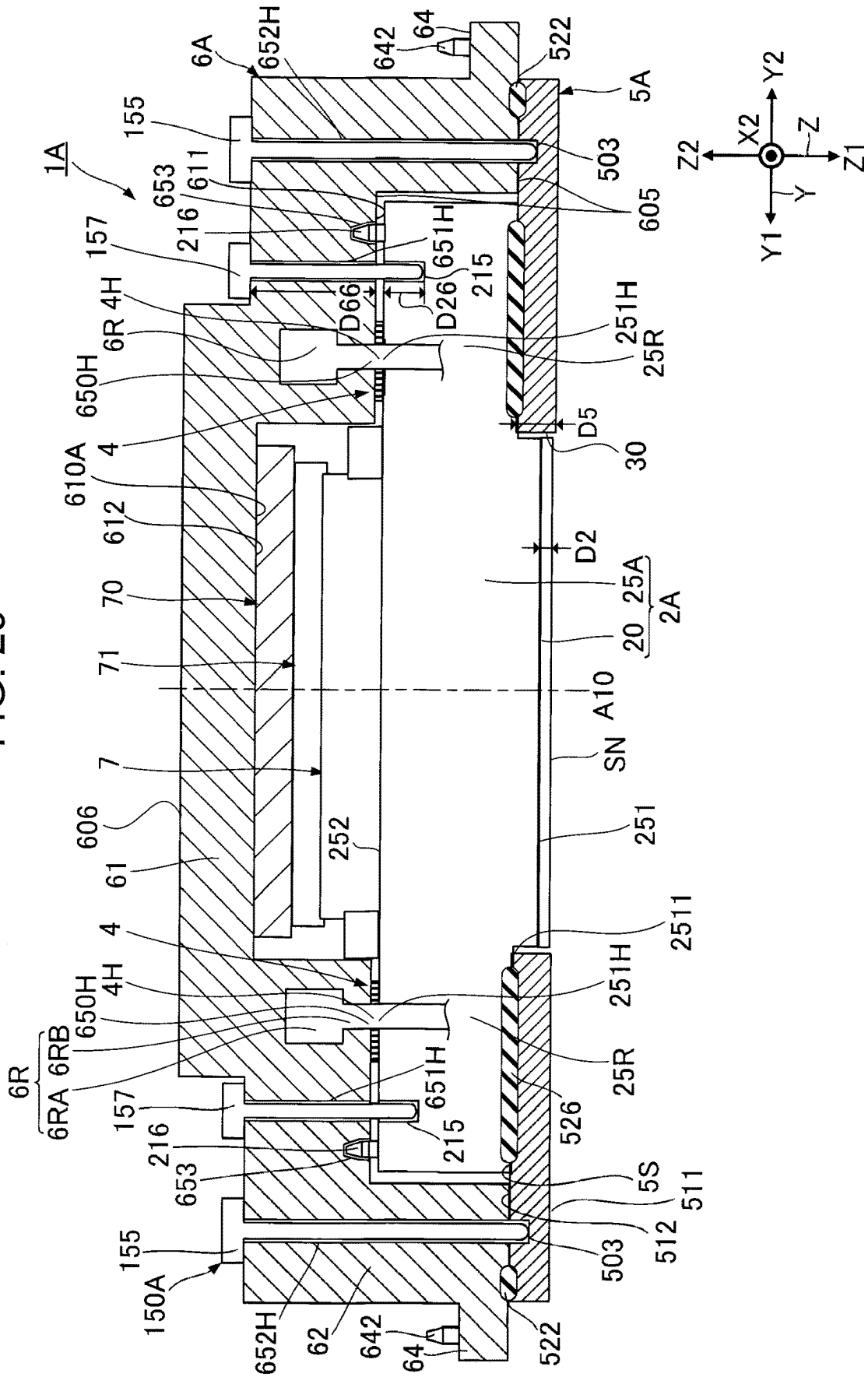


FIG. 30

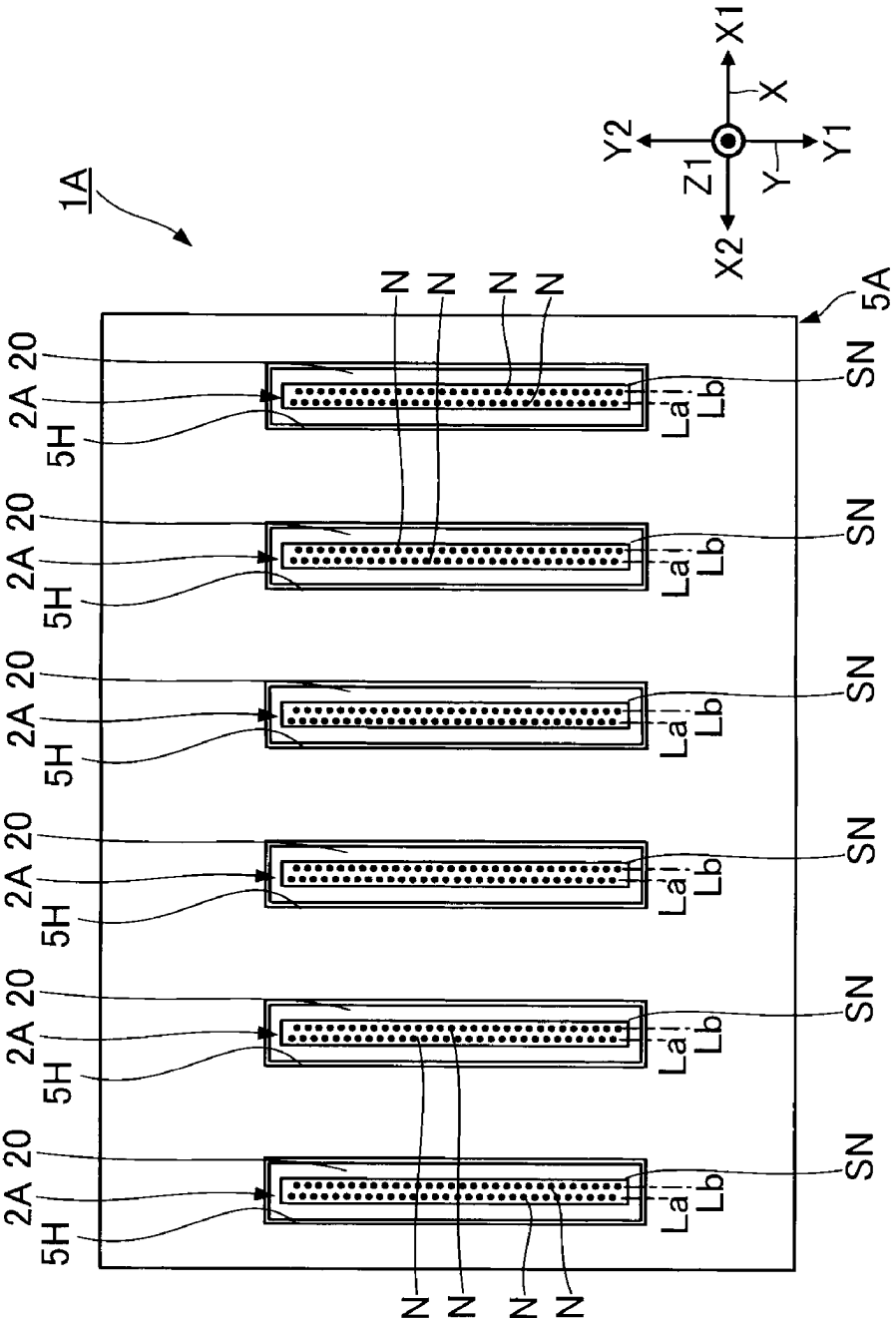


FIG. 31

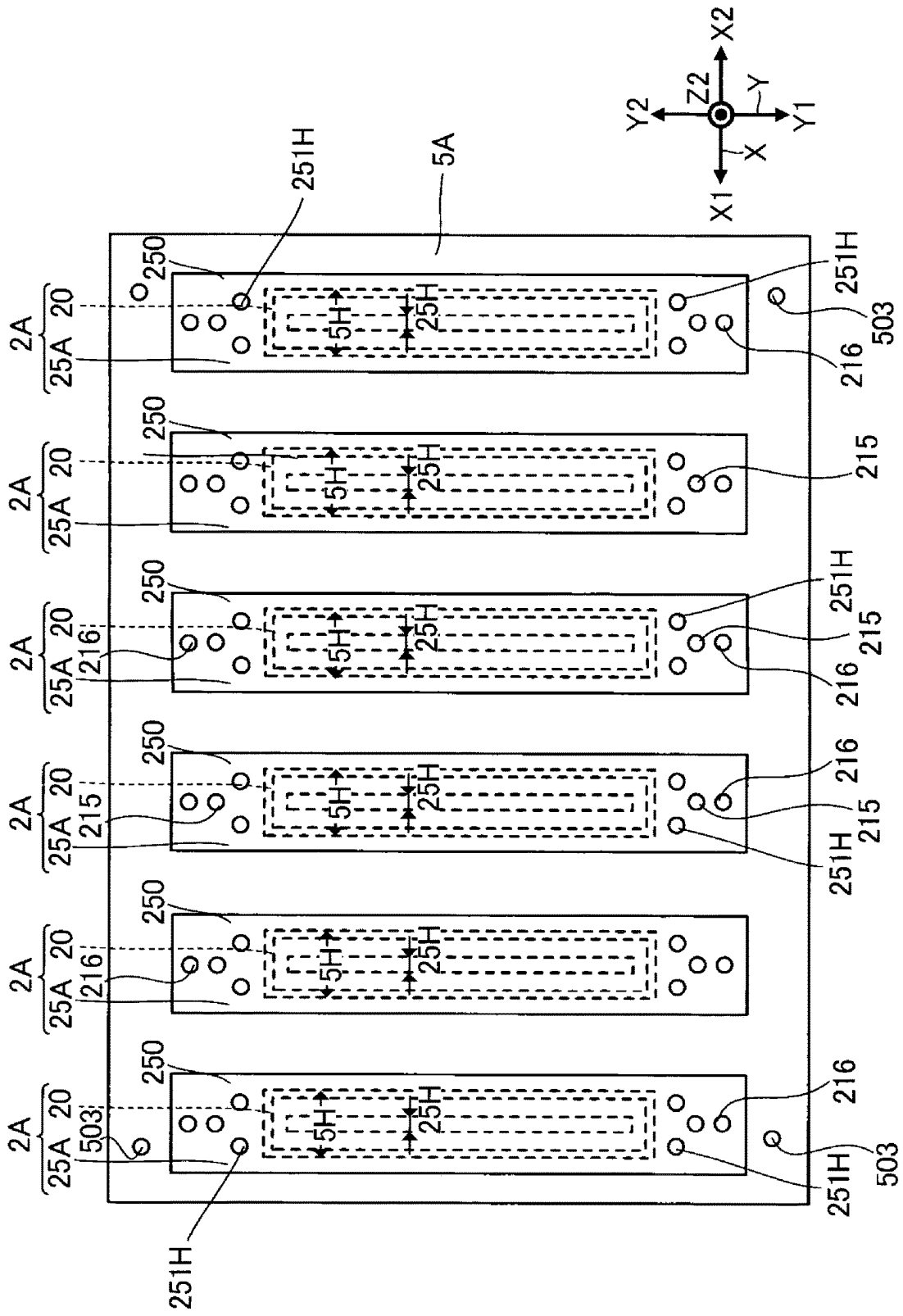


FIG. 32

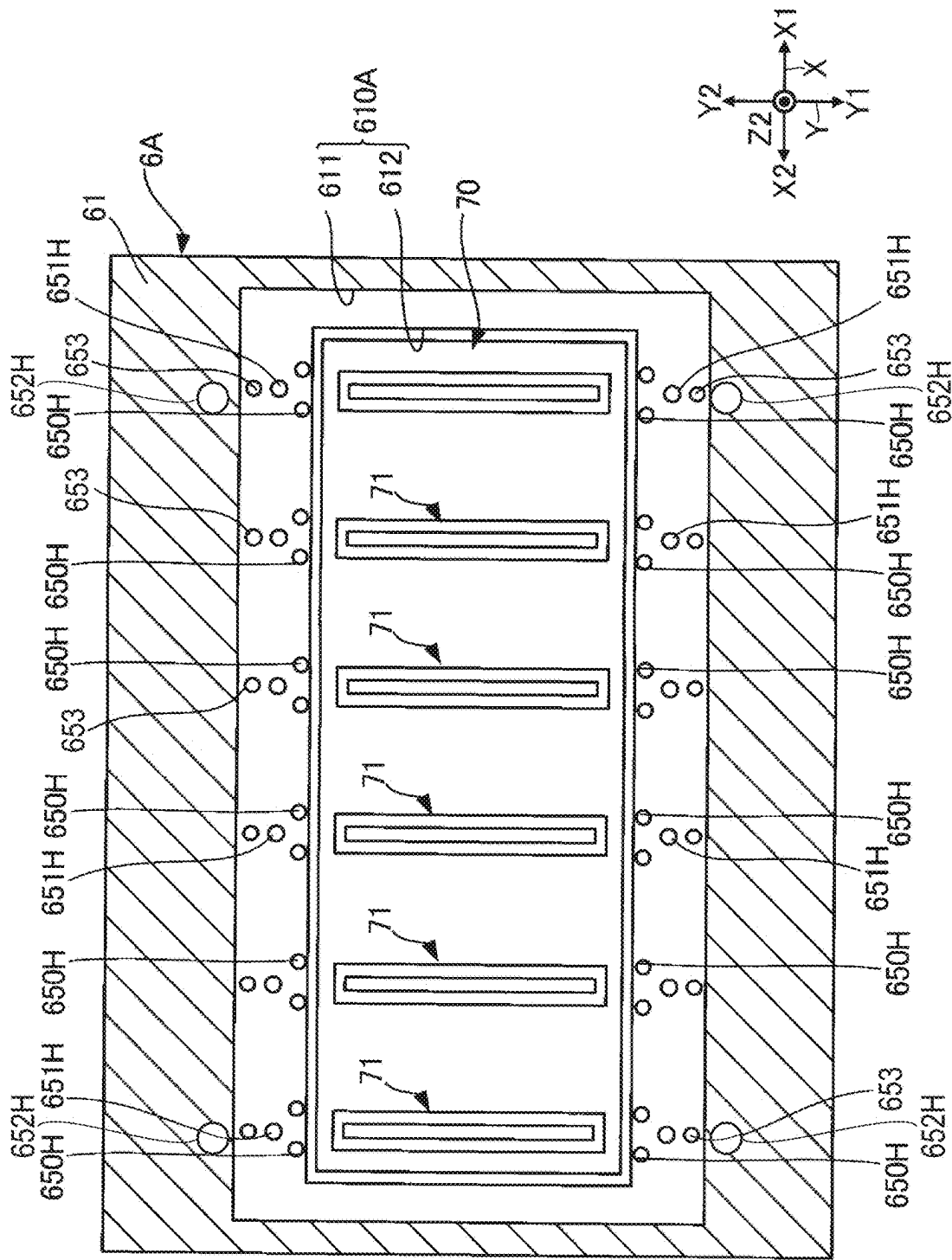


FIG. 33

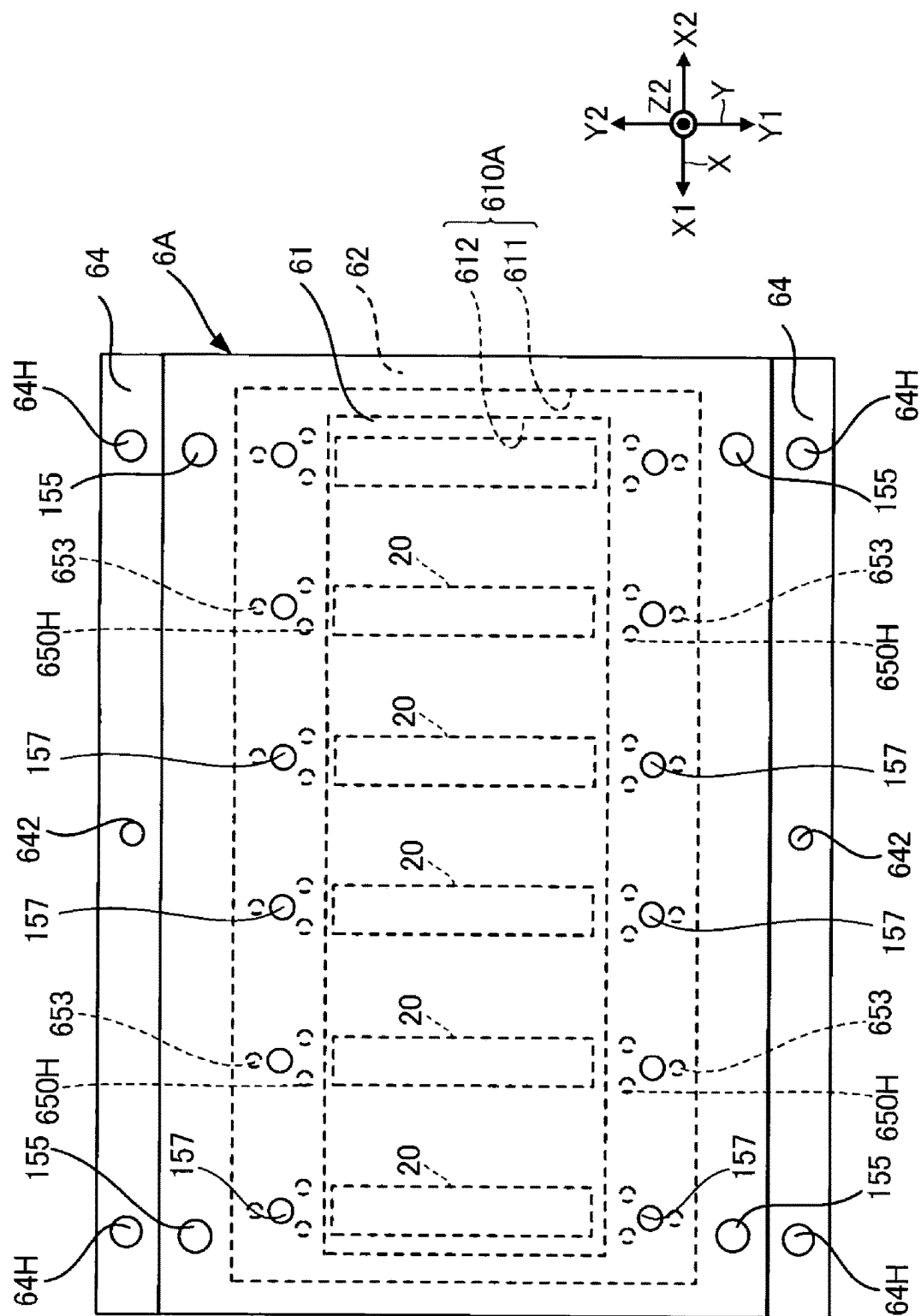


FIG. 35

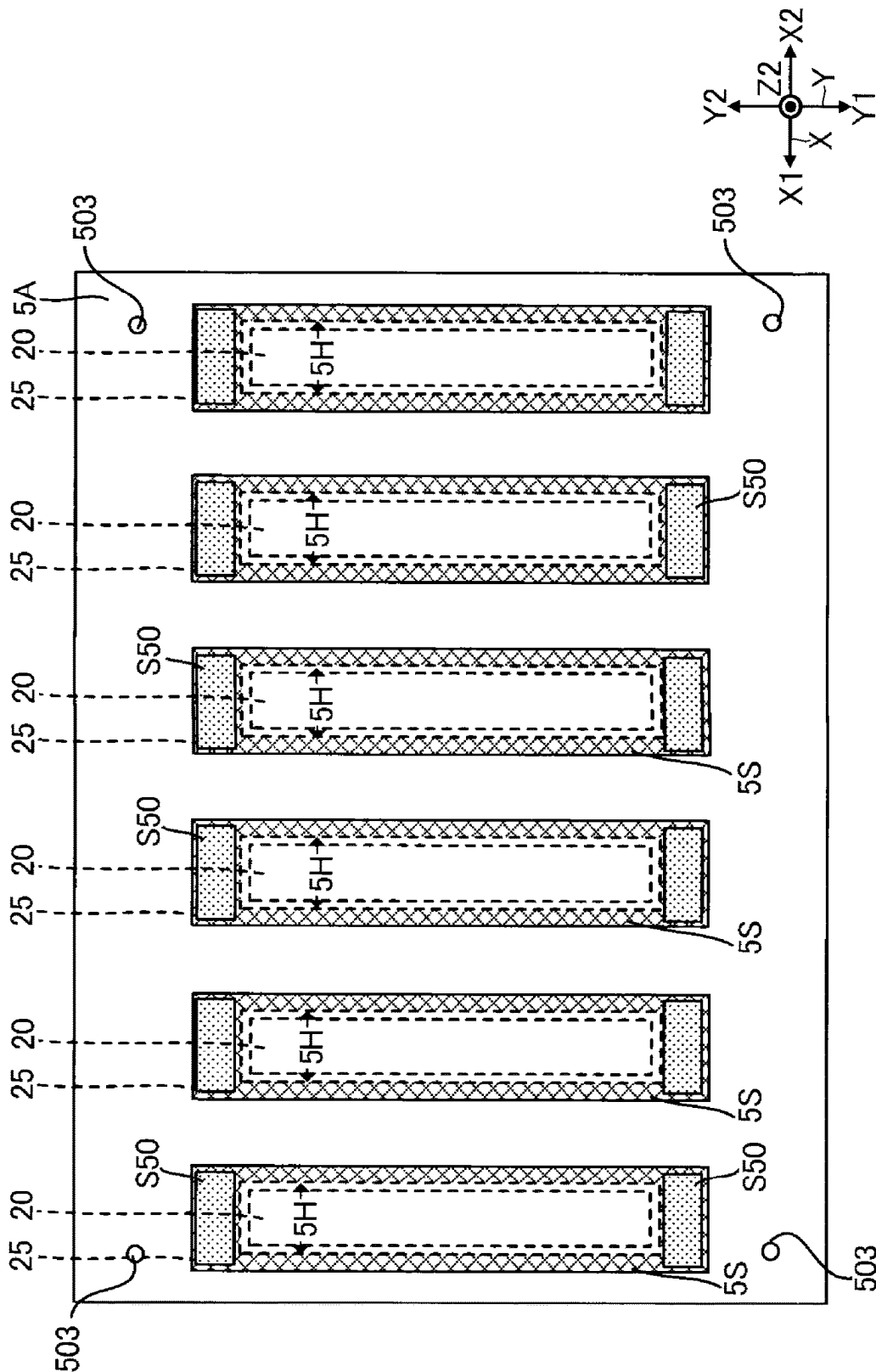


FIG. 36

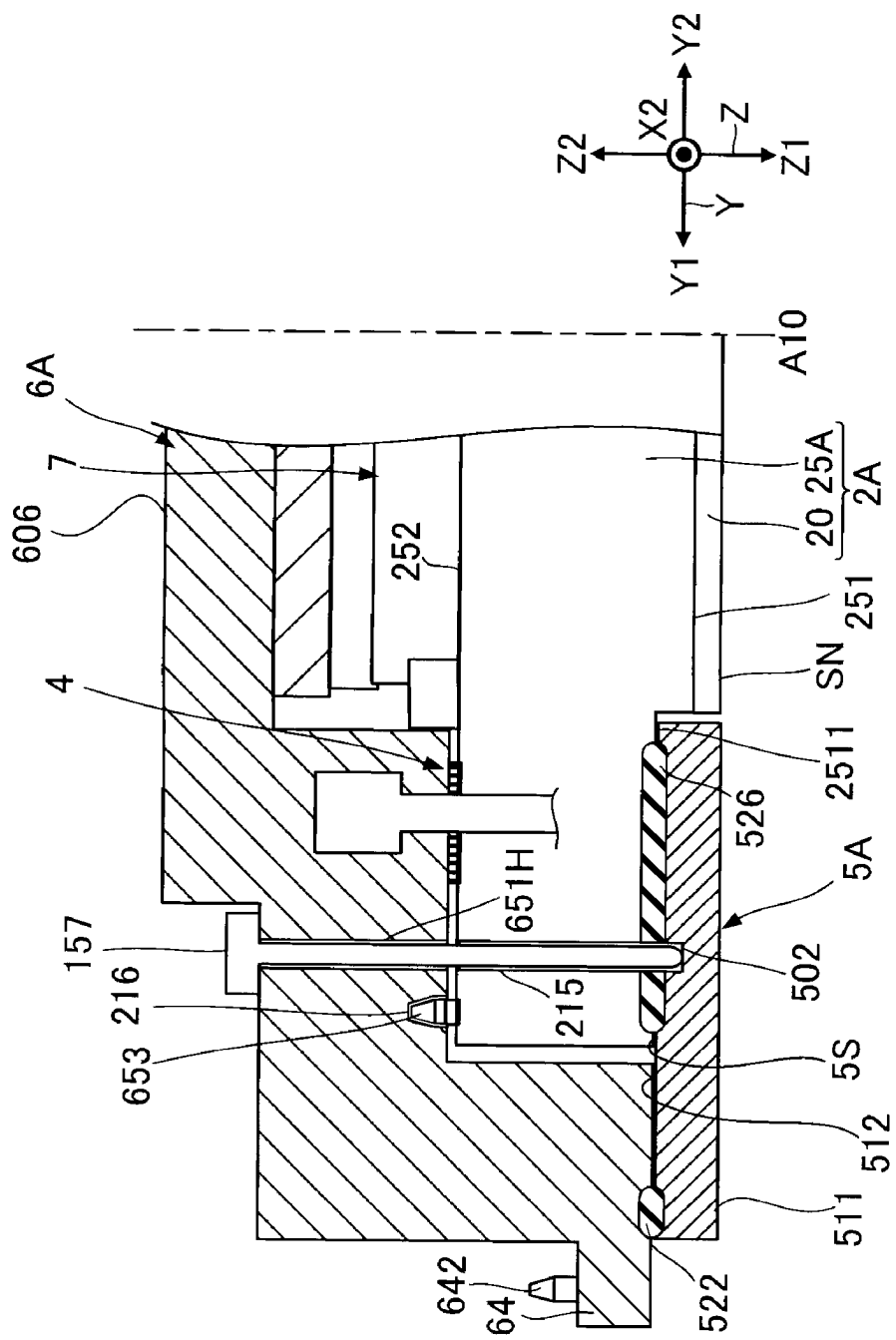


FIG. 38

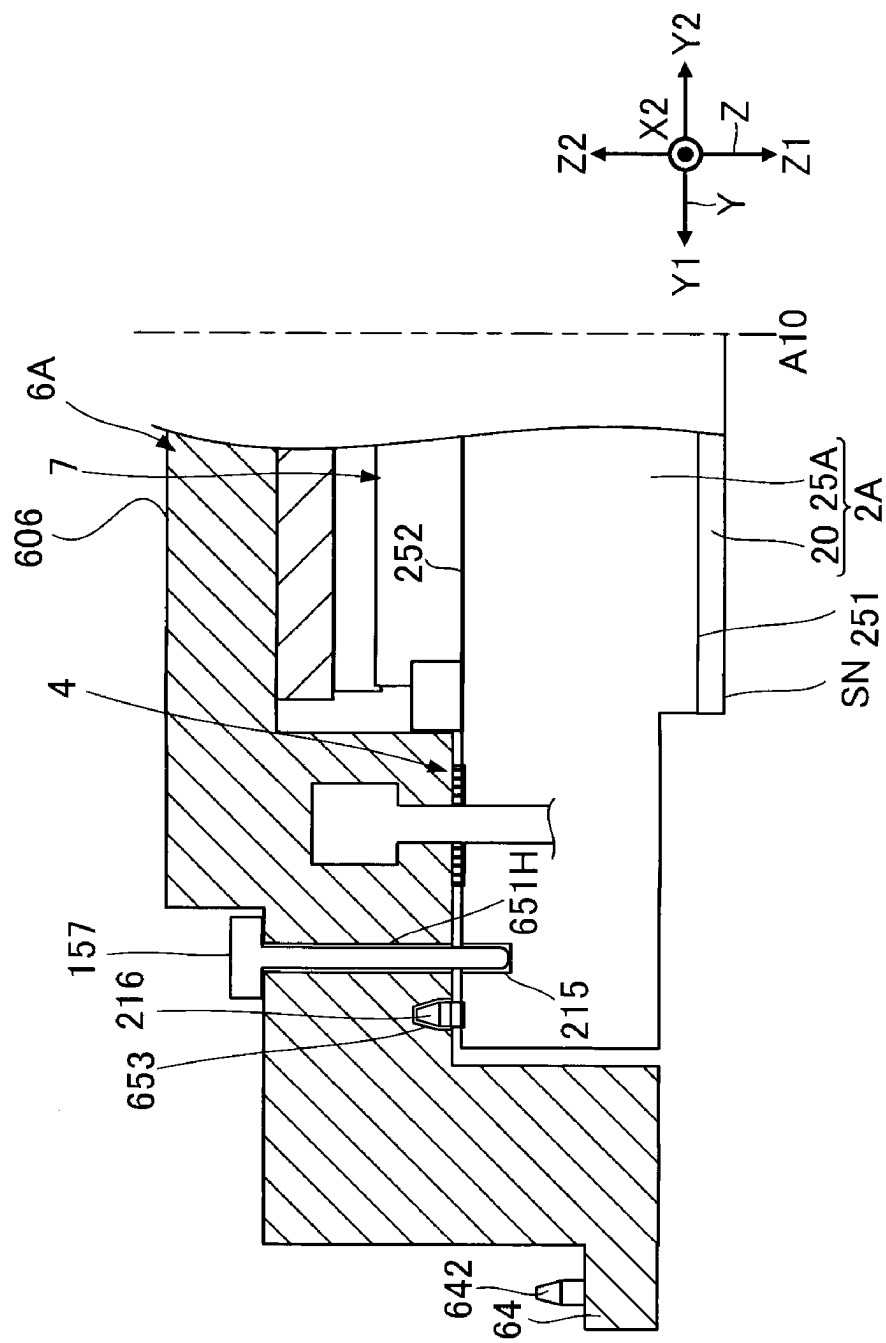


FIG. 42

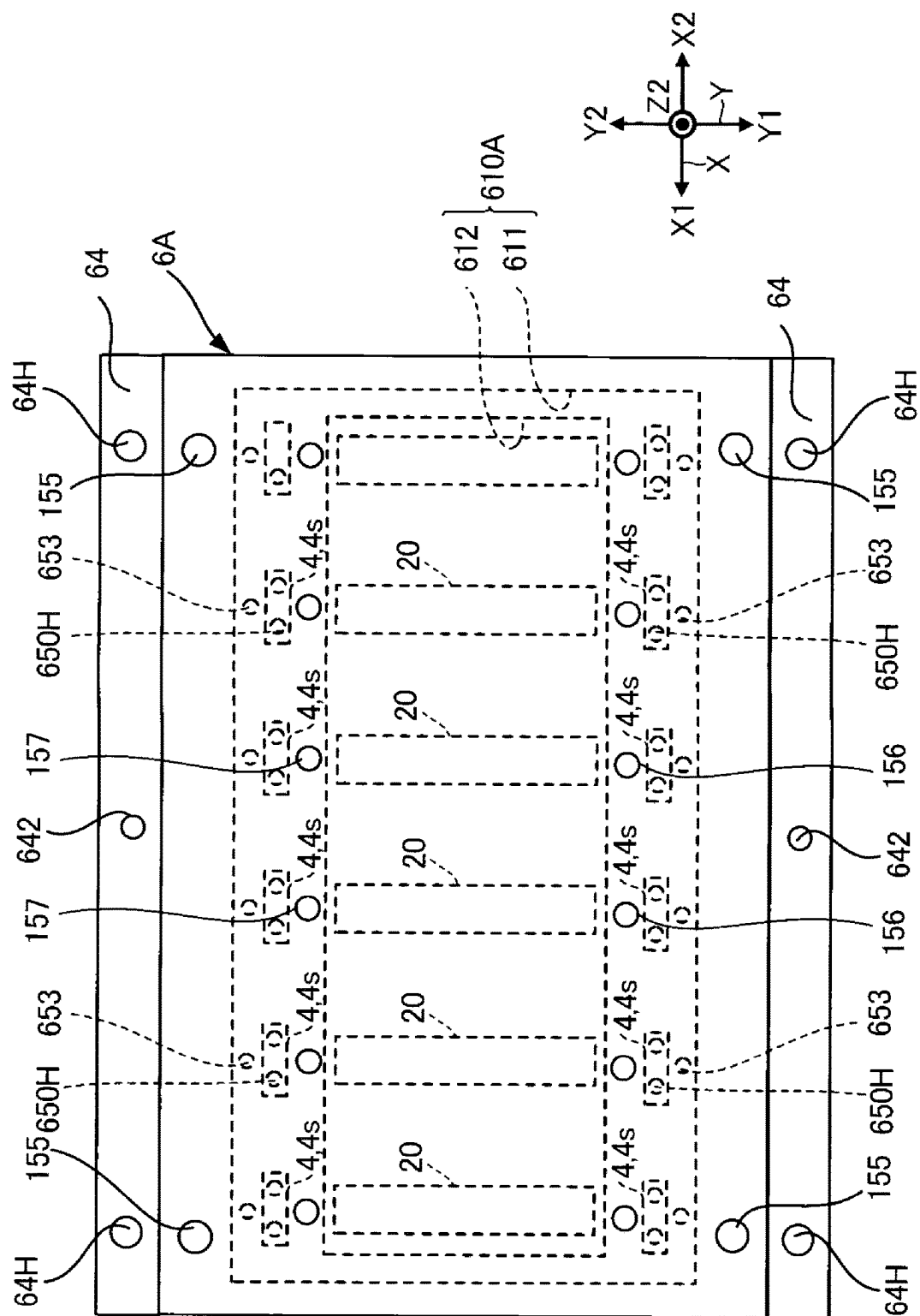
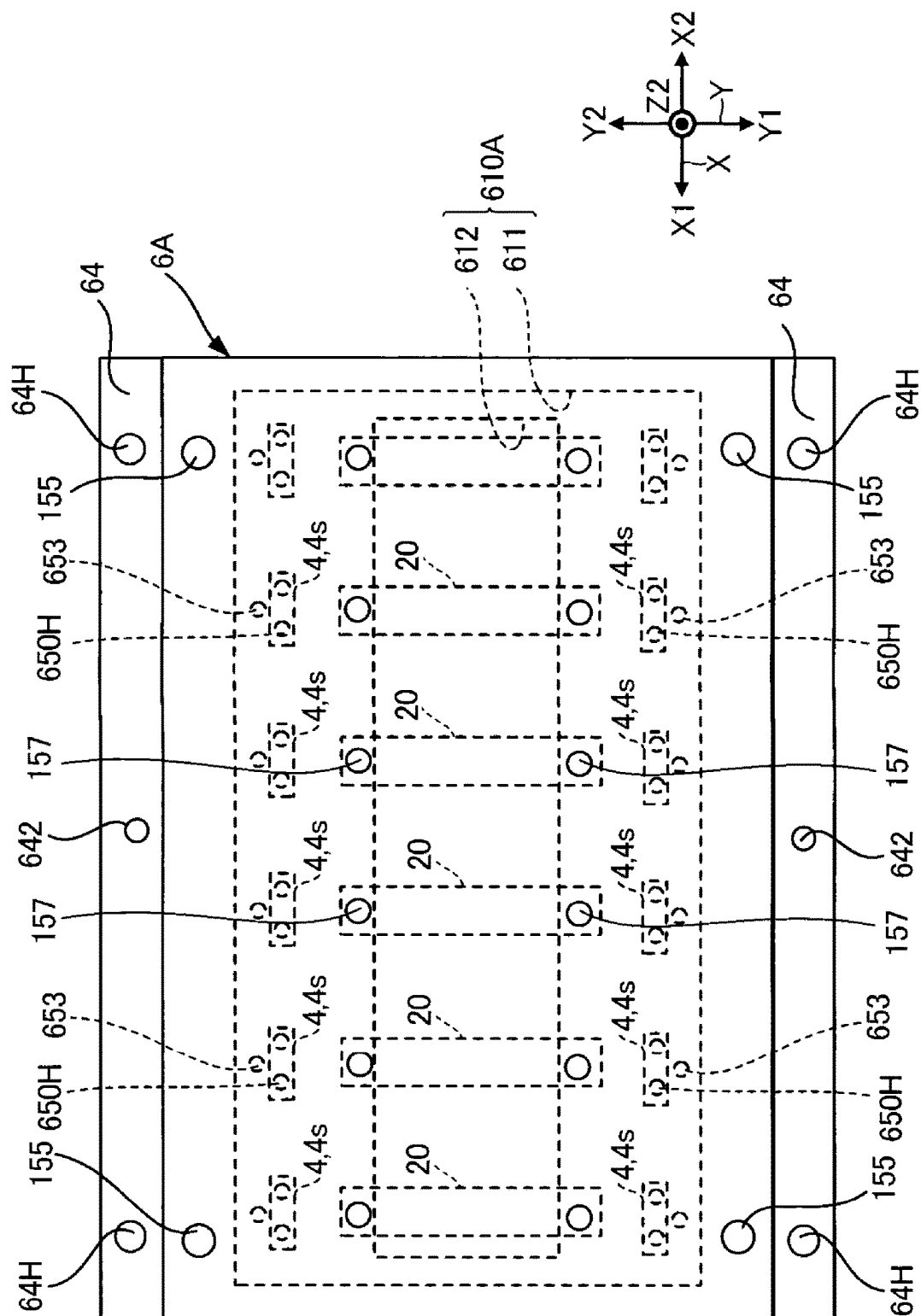


FIG. 44



LIQUID EJECTING HEAD AND LIQUID EJECTING APPARATUS

[0001] The present application is based on, and claims priority from JP Application Serial Number 2024-022360, filed Feb. 16, 2024, the disclosure of which is hereby incorporated by reference herein in its entirety.

BACKGROUND

1. Technical Field

[0002] The present disclosure relates to a liquid ejecting head and a liquid ejecting apparatus.

2. Related Art

[0003] Heretofore, there have been proposed liquid ejecting apparatuses each including a liquid ejecting head to eject liquids such as inks to media such as print sheets. A liquid ejecting head described in JP-A-2015-226988 includes a printing element unit (head module) including a printing element substrate having ejection orifices for ejecting a liquid and a support member to which the printing element substrate is fixed, and a channel unit (supply channel member) including a liquid supply channel for supplying the liquid to the printing element unit, in which the printing element unit and the channel unit are liquid-tightly connected together in a channel-forming manner with an elastic member (seal member) interposed in between.

[0004] In the liquid ejecting head in which the liquid-tight channel is formed with the elastic seal member interposed between the head module and the supply channel member, there is a risk of the reliability of the head module decreasing due to a reaction force of the elastic member.

SUMMARY

[0005] A liquid ejecting head according to an aspect of the present disclosure includes: a first head module that ejects a liquid in a first direction; a supply channel member that supplies the liquid to the first head module; and a first seal member that is arranged between the first head module and the supply channel member in the first direction, thereby liquid-tightly connecting a first channel orifice of the first head module and a channel orifice of the supply channel member. The first head module includes a channel orifice forming member in which the first channel orifice is formed, and a chip that is arranged in the first direction relative to the channel orifice forming member. A seal area of the first seal member held between the channel orifice forming member and the supply channel member does not overlap the chip as viewed in the first direction.

[0006] A liquid ejecting apparatus according to an aspect of the present disclosure includes a plurality of the liquid ejecting heads and a unit base to which the plurality of liquid ejecting heads are fixed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is a schematic diagram illustrating a structural example of a liquid ejecting apparatus according to a first embodiment.

[0008] FIG. 2 is a plan view illustrating a liquid ejecting head illustrated in FIG. 1.

[0009] FIG. 3 is a perspective cross-sectional view of the liquid ejecting head illustrated in FIG. 2.

[0010] FIG. 4 is a cross-sectional view of the liquid ejecting head illustrated in FIG. 3 viewed in a direction along an X axis.

[0011] FIG. 5 is a cross-sectional view of the liquid ejecting head illustrated in FIG. 3 viewed in a direction along a Y axis.

[0012] FIG. 6 is an underside view of the liquid ejecting head illustrated in FIG. 3.

[0013] FIG. 7 is a cross-sectional view of a chip included in a head module illustrated in FIG. 4.

[0014] FIG. 8 is a topside view of channel orifice forming members included in the head modules illustrated in FIG. 5.

[0015] FIG. 9 is an underside view of supply channel members illustrated in FIG. 5.

[0016] FIG. 10 is a topside view of the supply channel members illustrated in FIG. 5.

[0017] FIG. 11 is a topside view of seal members illustrated in FIG. 5.

[0018] FIG. 12 is a topside view of support members illustrated in FIG. 5.

[0019] FIG. 13 is a topside view of an upper portion of a holder illustrated in FIG. 5.

[0020] FIG. 14 is a view illustrating a lower portion of the holder illustrated in FIG. 5.

[0021] FIG. 15 is a cross-sectional view of a part of a liquid ejecting head in a first modification.

[0022] FIG. 16 is a cross-sectional view of a part of the liquid ejecting head in the first modification.

[0023] FIG. 17 is a topside view of the liquid ejecting head in the first modification.

[0024] FIG. 18 is a cross-sectional view of a part of a liquid ejecting head in a second modification.

[0025] FIG. 19 is a cross-sectional view of a part of the liquid ejecting head in the second modification.

[0026] FIG. 20 is a cross-sectional view of a part of a liquid ejecting head in a third modification.

[0027] FIG. 21 is a cross-sectional view of a part of the liquid ejecting head in the third modification.

[0028] FIG. 22 is a view illustrating a second member included in a holder in the third modification.

[0029] FIG. 23 is a cross-sectional view of a part of a liquid ejecting head in a fifth modification.

[0030] FIG. 24 is a cross-sectional view illustrating a seal member and its surrounding area in a sixth modification.

[0031] FIG. 25 is a cross-sectional view of a part of a liquid ejecting head in the sixth modification.

[0032] FIG. 26 is a cross-sectional view illustrating a seal member and its surrounding area in a seventh modification.

[0033] FIG. 27 is a topside view of support members in an eighth modification.

[0034] FIG. 28 is a cross-sectional view of a liquid ejecting head according to a second embodiment viewed in the direction along the Y axis.

[0035] FIG. 29 is a cross-sectional view of the liquid ejecting head according to the second embodiment viewed in the direction along the X axis.

[0036] FIG. 30 is an underside view of the liquid ejecting head illustrated in FIG. 28.

[0037] FIG. 31 is a topside view of channel orifice forming members included in a head module illustrated in FIG. 28.

[0038] FIG. 32 is an underside view of a holder and a relay substrate illustrated in FIG. 28.

[0039] FIG. 33 is a topside view of the holder illustrated in FIG. 28.

[0040] FIG. 34 is a topside view of seal members illustrated in FIG. 28.

[0041] FIG. 35 is a topside view of a support member illustrated in FIG. 28.

[0042] FIG. 36 is a cross-sectional view of a part of a liquid ejecting head in a ninth modification.

[0043] FIG. 37 is a cross-sectional view of a part of a liquid ejecting head in a tenth modification.

[0044] FIG. 38 is a cross-sectional view of a part of a liquid ejecting head in an eleventh modification.

[0045] FIG. 39 is a cross-sectional view of a part of a liquid ejecting head in a twelfth modification.

[0046] FIG. 40 is a cross-sectional view of a part of a liquid ejecting head in a thirteenth modification.

[0047] FIG. 41 is a cross-sectional view of a part of a liquid ejecting head in a fifteenth modification.

[0048] FIG. 42 is a topside view of the liquid ejecting head in the fifteenth modification.

[0049] FIG. 43 is a cross-sectional view of a part of a liquid ejecting head in a sixteenth modification.

[0050] FIG. 44 is a topside view of the liquid ejecting head in the sixteenth modification.

DESCRIPTION OF EMBODIMENTS

[0051] Hereinafter, preferred embodiments of the present disclosure will be described with reference to the accompanying drawings. In the drawings, the dimensions and scale of each component are illustrated differently from actual ones as appropriate, and some parts of the drawings are schematically illustrated to facilitate understanding. The scope of the present disclosure is not limited to the following embodiments unless particularly limited in the following description. A phrase “an element β on an element γ ” means not only a structure in which the element γ and the element β are in direct contact with each other, but also a structure in which the element γ and the element β are out of direct contact with each other. A phrase “an element Y and an element β are equal to each other” means that the element γ and the element β are substantially equal to each other, including a measurement error, a manufacturing error, or the like. A phrase “an element γ and an element β are the same as each other” means that the element γ and the element β are substantially the same as each other, including a measurement error, a manufacturing error, or the like.

1. First Embodiment

1-1. Overall Structure of Liquid Ejecting Apparatus 100

[0052] FIG. 1 is a schematic diagram illustrating a structural example of a liquid ejecting apparatus 100 according to a first embodiment. The following description will be given by using an X axis, a Y axis, and a Z axis, which are orthogonal to each other, as needed for convenience of description. Moreover, one of directions along the X axis is referred to as an X1 direction, and the direction opposite to the X1 direction is referred to as an X2 direction. Similarly, one of directions along the Y axis is referred to as a Y1 direction, and the direction opposite to the Y1 direction is referred to as a Y2 direction. One of directions along the Z axis is referred to as a Z1 direction, and the direction opposite to the Z1 direction is referred to as a Z2 direction. The Z1 direction is equivalent to a “first direction”. The Z2

direction is equivalent to “a second direction opposite to the first direction”. A side in the Z1 direction relative to a certain point in is referred to as a “lower side or underside”, whereas a side in the Z2 direction relative to the certain point is referred to as an “upper side or topside”. A view seen in the Z1 direction or the Z2 direction is referred to as a “plan view”.

[0053] As illustrated in FIG. 1, the liquid ejecting apparatus 100 includes a liquid reservoir section 9, a control unit 91, a transport section 92, a head unit 10, and a movement mechanism 40.

[0054] The liquid reservoir section 9 is a container for storing the ink. Examples of specific modes of the liquid reservoir section 9 include a cartridge removably mounted on the liquid ejecting apparatus 100, a bag-shaped ink pack formed of a flexible film, an ink tank refillable with the ink, and so on. The type of the ink stored in the liquid reservoir section 9 is not particularly limited and may be any type of ink.

[0055] The control unit 91 controls operations of elements in the liquid ejecting apparatus 100. The control unit 91 includes, for example, a processor circuit such as a central processing unit (CPU) or a field programmable gate array (FPGA) and a storage circuit such as a semiconductor memory, and controls the operations of the elements in the liquid ejecting apparatus 100.

[0056] The transport section 92 transports a medium 90 in a direction DM under the control of the control unit 91. In the present embodiment, the direction DM is the Y1 direction. In the example illustrated in FIG. 1, the transport section 92 includes a transport roller that is long along the X axis, and a motor that rotates the transport roller. The transport section 92 is not limited to a structure using the transport roller, and may have a structure using, for example, a drum or an endless belt that transports the medium 90 while adsorbing the medium 90 on its outer circumferential surface by electrostatic force or the like.

[0057] The movement mechanism 40 includes a transport belt to which a unit base 11 of the head unit 10 is fixed, and reciprocates the head unit 10 in the X1 and X2 directions under the control of the control unit 91. The head unit 10 ejects the ink supplied from the liquid reservoir section 9 to the medium 90 in the Z1 direction from each of multiple nozzles N under the control of the control unit 91. As a result of concurrent operations of the head unit 10 ejecting the ink and the movement mechanism 40 moving the head unit 10, an image is formed with the ink on a surface of the medium 90.

[0058] The number and layout of the multiple liquid ejecting heads 1 included in the head unit 10 are not limited to those in the example illustrated in FIG. 1 and may be determined as needed. In a case where the head unit 10 is configured to be able to circulate the ink, the head unit 10 may be connected to the liquid reservoir section 9 via a circulation mechanism for circulating the ink in the head unit 10.

1-2. Head Unit 10

[0059] FIG. 2 is a plan view illustrating the head unit 10 illustrated in FIG. 1. As illustrated in FIG. 2, the head unit 10 includes the unit base 11 and the multiple liquid ejecting heads 1. The multiple liquid ejecting heads 1 are fixed to the unit base 11. The unit base 11 is a member that holds the multiple liquid ejecting heads 1. In the example illustrated,

the number of liquid ejecting heads **1** for the unit base **11** is not particularly limited and may be any number equal to or more than 1.

[0060] The unit base **11** is, for example, a plate-shaped member whose thickness direction is a direction along the Z axis. The unit base **11** is provided with a dented portion **111**. The dented portion **111** is a recess provided in the unit base **11**. The bottom surface of the dented portion **111** is provided with multiple through holes **11H**. The planar shape of each through hole **11H** is, for example, a rectangular shape. The through hole **11H** is provided for each liquid ejecting head **1**. A part of the liquid ejecting head **1** is inserted into each through hole **11H**. In FIG. 2, one of the liquid ejecting heads **1** arranged in the unit base **11** is omitted from the illustration for the purpose of presenting the through hole **11H**.

[0061] The unit base **11** is also provided with four mounting holes **101** and two third alignment portions **102** for each through hole **11H**. The four mounting holes **101** and the two third alignment portions **102** are provided outside the through hole **11H** in the plan view. Here, the numbers and the layout of the mounting holes **101** and the third alignment portions **102** are not limited to those illustrated in FIG. 2, but may be determined as needed.

[0062] The mounting holes **101** are provided, for example, near four corners of the through hole **11H** in the plan view. The mounting holes **101** are used to mount the liquid ejecting head **1** on the unit base **11**. For example, the mounting holes **101** pass through the unit base **11** along the thickness direction.

[0063] For example, each of the third alignment portions **102** is provided between the two mounting holes **101** arranged in the direction along the X axis while being apart from these mounting holes **101**. The third alignment portions **102** are used to position each liquid ejecting head **1** in mounting the liquid ejecting head **1** onto the unit base **11**. Each third alignment portion **102** is, for example, a bottomed slot opened in a surface of the unit base **11** facing in the Z1 direction. Each third alignment portion **102** may be regarded as a dented portion formed in the surface of the unit base **11** facing in the Z1 direction.

[0064] Here, the mounting holes **101** do not have to pass through the unit base **11** in the thickness direction. Likewise, the third alignment portions **102** may pass through the unit base **11** in the thickness direction. The shape of the unit base **11** is not limited to the plate shape, and may be a box shape.

[0065] As described above, the liquid ejecting apparatus **100** includes the multiple liquid ejecting heads **1** and the unit base **11** to which the multiple liquid ejecting heads **1** are fixed. Such liquid ejecting apparatus **100** includes the liquid ejecting heads **1** to be described later. As will be described later, the multiple liquid ejecting heads **1** can be each detachably mounted on the unit base **11**, and are configured such that alignment of the multiple liquid ejecting heads **1** with high precision can be achieved. For this reason, even if any of the multiple liquid ejecting heads **1** is replaced, the liquid ejecting apparatus **100** is capable of keeping the print quality from deteriorating.

1-3. Liquid Ejecting Head 1

[0066] FIG. 3 is a perspective cross-sectional view of the liquid ejecting head **1** illustrated in FIG. 2. FIG. 4 is a cross-sectional view of the liquid ejecting head **1** illustrated in FIG. 3 viewed in the direction along the X axis. FIG. 5 is a cross-sectional view of the liquid ejecting head **1** illus-

trated in FIG. 3 viewed in the direction along the Y axis. As illustrated in FIG. 5, in the present embodiment, the liquid ejecting head **1** has a structure approximately symmetrical about a central imaginary plane A10 along an X-Z plane. However, the liquid ejecting head **1** may have a structure other than the structure symmetrical about the central imaginary plane A10. In FIG. 3, partition walls **63** of a holder **6** to be described later are omitted from the illustration.

[0067] As illustrated in any of FIGS. 3 to 5, the liquid ejecting head **1** includes multiple head modules **2**, two supply channel members **3**, seal members **4**, multiple support members **5**, the holder **6**, multiple wiring substrates **7**, and a relay substrate **70**. In the present embodiment, one support member **5** is provided for each head module **2**. As illustrated in FIG. 4, each head module **2** and the corresponding support member **5** form a sub-unit **15**.

1-3A. Head Module 2

[0068] In the example in FIG. 4, the multiple head modules **2** are six head modules **2**. The number of head modules **2** is not limited to six, but may be any number of one to five or seven or more. Accordingly, the liquid ejecting head **1** may have a structure including only one head module **2**.

[0069] In the present embodiment, the multiple head modules **2** are next to each other along the X axis. As illustrated in FIGS. 3 and 5, each head module **2** is long along the Y axis. Each head module **2** ejects the ink in the Z1 direction. Each head module **2** includes a chip **20** and a channel orifice forming member **25**. The chip **20** is arranged in the Z1 direction relative to the channel orifice forming member **25**.

[0070] FIG. 6 is an underside view of the liquid ejecting head **1** illustrated in FIG. 3. As illustrated in FIG. 6, each head module **2** includes multiple nozzles **N** to eject the ink. The multiple nozzles **N** are arrayed along the Y axis. The multiple nozzles **N** are divided into a nozzle array La and a nozzle array Lb arranged side by side while being spaced out along the X axis. Each of the nozzle array La and the nozzle array Lb is a set of multiple nozzles **N** arrayed linearly along the Y axis. A surface of the head module **2** in which the orifices of the multiples nozzles **N** are formed is referred to as a nozzle surface SN. The nozzle surface SN is a surface of the chip **20** of the head module **2** facing in the Z1 direction. Alternatively, for example, the multiple nozzles **N** may be arrayed in a direction crossing the X axis and the Y axis as viewed in the Z1 direction.

1-3Aa. Chip 20

[0071] FIG. 7 is a cross-sectional view of the chip **20** included in the head module **2** illustrated in FIG. 4. The chip **20** has a structure in which elements related to the nozzles **N** of the nozzle array La are arranged in plane symmetry with elements related to the nozzles **N** of the nozzle array Lb. In the following description, the elements for the nozzle array La will be mainly described and description of the elements for the nozzle array Lb will be omitted if unnecessary. In addition, the nozzle array La and the nozzle array Lb will be referred to as a nozzle array L below if there is no need to distinguish between them.

[0072] As illustrated in FIG. 7, the chip **20** of each head module **2** includes, for example, a communication plate **202**, a pressure chamber substrate **203**, a vibration plate **204**, a nozzle plate **201**, a cover **206**, multiple driver elements **E**, and a sealing substrate **205**.

[0073] Each of the communication plate 202, the pressure chamber substrate 203, the vibration plate 204, the nozzle plate 201, and the cover 206 is a plate-shaped member that is long along the Y axis. The pressure chamber substrate 203 is provided on a surface of the communication plate 202 facing in the Z2 direction. The nozzle plate 201 and the cover 206 are provided on a surface of the communication plate 202 facing in the Z1 direction. For example, these members are fixed to each other with an adhesive.

[0074] The nozzle plate 201 is a plate-shaped member in which the multiple nozzles N are formed. The nozzle plate 201 is the outermost member in the Z1 direction in the head module 2. A surface of the nozzle plate 201 facing in the Z1 direction serves as the nozzle surface SN. Each of the multiple nozzles N is a circular through hole to eject the ink. For example, the nozzle plate 201 is produced by processing a single crystal substrate of silicon (Si) with semiconductor manufacturing techniques such as photolithography and etching.

[0075] In the communication plate 202, multiple narrowed portions R1, multiple communication channels R2, a communication space Ra, and a common channel Rb are formed. Each of the narrowed portions R1 and the communication channels R2 is a through hole extended in the Z1 direction and formed for each nozzle N. The communication channels R2 coincide with the respective nozzles N in the plan view. The communication space Ra is a cavity formed in a shape long along the Y axis. The communication space Ra extends along the Y axis. The common channel Rb communicates with the communication space Ra and overlaps the communication space Ra in the plan view. The common channel Rb extends along the Y axis. The common channel Rb communicates with the multiple narrowed portions R1. The communication space Ra communicates with a space Rc included in the channel orifice forming member 25.

[0076] The communication space Ra, the common channel Rb, and the space Rc form a common space R provided in common to the multiple nozzles N. The common space R functions as a reservoir of the ink. The ink stored in the common space R is distributed to the narrowed portions R1 and is supplied to and filled in multiple pressure chambers C concurrently.

[0077] In the pressure chamber substrate 203, the multiple pressure chambers C are formed. Each of the pressure chambers C is a space located between the communication plate 202 and the vibration plate 204 and formed by wall surfaces of the pressure chamber substrate 203. One pressure chamber C is formed for each nozzle N. The pressure chamber C is a long space extended along the X axis. The multiple pressure chambers C are arrayed along the Y axis.

[0078] The communication plate 202 and the pressure chamber substrate 203 are each produced by, for example, processing a semiconductor substrate such as a single crystal substrate of silicon.

[0079] The vibration plate 204 elastically deformable is mounted on top of the pressure chamber C. The vibration plate 204 is stacked on the pressure chamber substrate 203 and is in contact with a surface of the pressure chamber substrate 203 opposite to the communication plate 202. The vibration plate 204 is a rectangular plate-shaped member that is long along the Y axis in the plan view. The pressure chamber C communicates with the nozzle N through the communication channel R2 and communicates with the communication space Ra through the narrowed portion R1.

Therefore, the pressure chamber C communicates with the nozzle N via the communication channel R2 and communicates with the communication space Ra via the narrowed portion R1. A channel dedicated to each nozzle N is formed by the nozzle N, the communication channel R2, the pressure chamber C, and the narrowed portion R1. For convenience of description, the pressure chamber substrate 203 and the vibration plate 204 are drawn as separate substrates in FIG. 7, but are actually stacked in a single silicon substrate.

[0080] The driver element E for each pressure chamber C is formed on a surface of the vibration plate 204 opposite to the pressure chamber C. The driver element E is a piezoelectric element in a shape long along the X axis in the plan view. The driver element E includes, for example, a pair of electrodes and a piezoelectric body provided between the pair of electrodes. Instead, the driver element E may be an electrothermal transducer element to generate thermal energy.

[0081] The sealing substrate 205 is a structural body to protect the multiple driver elements E. The sealing substrate 205 is fixed to a surface of the vibration plate 204 with, for example, an adhesive. The multiple driver elements E are stored inside a dented portion formed in a surface of the sealing substrate 205 facing the vibration plate 204. Moreover, a through hole 20H into which the wiring substrate 7 to be described later is to be inserted is provided in the sealing substrate 205.

[0082] The cover 206 is a thin metallic plate forming a wall surface of the common channel Rb. The cover 206 has a thickness approximately equal to the thickness of the nozzle plate 201. The planar shape of the cover 206 is, for example, a frame shape surrounding the nozzle plate 201. A mold 207 made of a resin is provided between the cover 206 and the nozzle plate 201. The surface of the cover 206 facing in the Z1 direction constitutes a part of the nozzle surface SN.

[0083] In this chip 20, when the driver element E contracts due to energization, the vibration plate 204 is bent and deflected in the direction that reduces the volume of the pressure chamber C, and the pressure in the pressure chamber C increases, causing an ink droplet to be ejected from the nozzle N. In this process, the pressure is also transmitted toward the narrowed portion R1 from the pressure chamber C, and the ink also flows into the common channel Rb through the narrowed portion R1. After ink ejection, the driver element E returns to its original position. At this time, the ink in the region from the nozzle N to the common channel Rb also vibrates. Then, as soon as the meniscus of the nozzle N is restored, the ink is supplied from the narrowed portion R1. Through the above series of operations, the ink is ejected from the nozzle N.

[0084] Although the chip 20 in the present embodiment includes all the elements illustrated in FIG. 3, the chip 20 may include only some of the elements or may include additional elements.

[0085] The chip 20 has, for example, a monolithic structure, is a member thinner than the channel orifice forming member 25, and is, for example, a component having a thickness of smaller than 3000 μm . The chip 20 may be a component having a thickness of 1500 μm or smaller or 1000 μm or smaller. The thickness of the chip 20 may be $\frac{1}{2}$ or smaller of the length of the short side of the chip 20 as viewed in the direction along the Z axis, which is the

thickness direction of the chip 20. The chip 20 may include only at least one component among from the nozzle plate 201, the pressure chamber substrate 203, the communication plate 202 or the driver elements E, and the sealing substrate 205. The chip 20 preferably includes at least the nozzle plate 201, more preferably further includes the pressure chamber substrate 203, and particularly preferably further includes the communication plate 202. Furthermore, at least one component among from the nozzle plate 201, the pressure chamber substrate 203, the communication plate 202 or the pressure chamber substrate 203 on which the driver elements E are stacked, and the sealing substrate 205 may be regarded as the chip 20. The chip 20 may be not only a stack of silicon substrates manufactured by MEMS, but also a stack of ceramic sheets or thin plates made of metals or the like, or a stack in which thin plate-shaped members made of the aforementioned materials are stacked.

1-3Ab. Channel Orifice Forming Member 25

[0086] As illustrated in FIGS. 5 and 7, the channel orifice forming member 25 is arranged in the Z2 direction relative to the chip 20. The channel orifice forming member 25 and the chip 20 are fixed to each other with, for example, an adhesive. The channel orifice forming member 25 and the chip 20 are aligned with each other with high precision in advance. The channel orifice forming member 25 includes, for example, a channel for supplying the ink to the chip 20.

[0087] For example, the channel orifice forming member 25 is preferably a member having a thickness of 3000 μm or greater, more preferably a member having a thickness of 5000 μm or greater, and even more preferably a member having a thickness of 8000 μm or greater. The channel orifice forming member 25 may be formed of a single member or a stack of multiple members. The channel orifice forming member 25 may contain a resin or a metal.

[0088] As illustrated in FIG. 5, a length of the channel orifice forming member 25 in the direction along the Z axis, that is, the thickness of the channel orifice forming member 25, is greater than a thickness D2 of the chip 20. The thickness of the channel orifice forming member 25 mentioned herein is a thickness at a position coinciding with a seal area 4S to be described later, as viewed in the Z1 direction. In other words, the chip 20 is thinner than the channel orifice forming member 25. The channel orifice forming member 25 includes a surface 251 facing in the Z1 direction and a surface 252 facing in the Z2 direction.

[0089] FIG. 8 is a topside view of the channel orifice forming members 25 of the head modules 2 illustrated in FIG. 5. As illustrated in FIG. 8, the planar shape of the channel orifice forming member 25 is larger than the planar shape of the chip 20. In other words, as viewed in the Z1 direction, the chip 20 is smaller in outer profile than the channel orifice forming member 25. As viewed in the Z1 direction, the channel orifice forming member 25 is arranged so as to overlap the chip 20 and cover the chip 20.

[0090] As illustrated in FIGS. 5 and 8, the channel orifice forming member 25 includes a flange portion 250 to be fixed to the support member 5 to be described later. The planar shape of the flange portion 250 is a rectangular frame shape surrounding an opening 5H of the support member 5 to be described later. As illustrated in FIG. 5, a surface of the flange portion 250 facing in the Z1 direction is a supported surface 2511 supported by the support member 5 to be described later. Since the planar shape of the flange portion

250 is the rectangular frame shape surrounding the opening 5H, the planar shape of the supported surface 2511 is similarly a rectangular frame shape surrounding the opening 5H. The supported surface 2511 is located in the Z2 direction relative to the chip 20. Accordingly, the supported surface 2511 is located in the Z2 direction relative to the nozzle plate 201.

[0091] In addition, as illustrated in FIG. 8, a through hole 25H is provided to the channel orifice forming member 25. The wiring substrate 7 to be described later is to be inserted into the through hole 25H. The through hole 25H is provided at a central portion of the channel orifice forming member 25 in the plan view. In reference to FIG. 7, the through hole 25H coincides with the through hole 20H of the sealing substrate 205 in the plan view.

[0092] As illustrated in FIGS. 5 and 7, a channel 25R is formed inside the channel orifice forming member 25. The channel 25R is provided to supply the ink to the chip 20. As illustrated in FIG. 7, the space Rc is formed on the chip 20 side of the channel 25R, that is, downstream of the channel 25R. The channel 25R and the space Rc communicate with each other.

[0093] As illustrated in FIG. 5, multiple channel orifices 251H are provided on the side of the channel 25R of the channel orifice forming member 25, the side opposite to the chip 20, that is, the upstream side of the channel 25R. Each of the channel orifices 251H is a cavity end of the channel 25R in the Z2 direction. The channel orifice 251H is an orifice for a channel-forming connection between the channel 25R of the channel orifice forming member 25 of the head module 2 and a channel 3R of the supply channel member 3 to be described later. As illustrated in FIGS. 5 and 8, the multiple channel orifices 251H are provided in the flange portion 250 of the channel orifice forming member 25. The channel orifices 251H are arranged outside the chip 20 as viewed in the Z1 direction. In the present embodiment, two channel orifices 251H are provided for each nozzle array L.

1-3B. Supply Channel Member 3

[0094] As illustrated in FIGS. 3 to 5, the supply channel members 3 are arranged in the Z2 direction relative to the multiple head modules 2. Each supply channel member 3 is provided in common to the multiple head modules 2. As illustrated in FIG. 5, the supply channel member 3 includes a single channel 3R. The channel 3R supplies the ink to the head modules 2 and distributes the ink to the head modules 2. The channel 3R is a common channel provided in common to the multiple head modules 2, and includes a common portion 3RA extended along the X axis and multiple branched portions 3RB branched off from the common portion 3RA and extended in the Z1 direction. Although not illustrated, the supply channel member 3 is provided with a channel joint for connecting to a supply channel outside the liquid ejecting head 1 in order that the supply channel member 3 can communicate with the liquid reservoir section 9. This channel joint not illustrated is exposed to outside of the liquid ejecting head 1 through, for example, a not-illustrated opening formed in the holder 6.

[0095] Instead, the supply channel member 3 may include multiple channels 3R communicating with the multiple head modules 2. Specifically, instead of the channel 3R including the common portion 3RA communicating with the multiple

head modules 2, the supply channel member 3 may include the multiple channels 3R communicating with the respective multiple head modules 2.

[0096] As illustrated in FIG. 5, channel orifices 31H are provided on the head module 2 side of each channel 3R, that is, the downstream side of the channel 3R. Each channel orifice 31H is a cavity end of the channel 3R in the Z1 direction. The channel orifices 31H are provided corresponding to the foregoing channel orifices 251H.

[0097] FIG. 9 is an underside view of the supply channel members 3 illustrated in FIG. 5. FIG. 10 is a topside view of the supply channel members 3 illustrated in FIG. 5. As illustrated in FIGS. 9 and 10, each supply channel member 3 is a long member extended in the X axis direction. As illustrated in FIG. 9, the two supply channel members 3 are arranged inside the dented portion 610 of the holder 6 to be described later. The two supply channel members 3 are arranged so as to sandwich the relay substrate 70 to be described later as viewed in the Z2 direction. The multiple channel orifices 31H included in each of the supply channel members 3 are spaced out from each other and arrayed along the X axis.

[0098] As illustrated in FIG. 10, each supply channel member 3 overlaps the multiple head modules 2 as viewed in the Z1 direction. Each supply channel member 3 is provided in common to the multiple head modules 2. Specifically, as viewed in the Z1 direction, each supply channel member 3 overlaps the flange portions 250 of the multiple channel orifice forming members 25. As viewed in the Z1 direction, the multiple channel orifices 31H coincide with the foregoing multiple channel orifices 251H on a one-to-one basis. In addition, as viewed in the Z1 direction, each supply channel member 3 is arranged at a position different from the multiple chips 20 so as not to overlap the chips 20. As viewed in the Z1 direction, each supply channel member 3 overlaps some of the multiple seal members 4 to be described below.

1-3C. Seal Member 4

[0099] As illustrated in FIGS. 3 to 5, the seal members 4 are provided between the head modules 2 and the supply channel members 3 in the Z1 direction. The seal members 4 are provided for each head module 2. The seal members 4 are elastic. The seal members 4 are made of an elastic material such as elastomer, for example. In the present embodiment, the length of the seal member 4 along the Z axis, that is, the thickness of the seal member 4, is constant. The thickness of the seal member 4 is smaller than the thicknesses of the channel orifice forming member 25 and the supply channel member 3. The seal member 4 is squeezed between the head module 2 and the supply channel member 3.

[0100] FIG. 11 is a topside view of the seal members 4 illustrated in FIG. 5. In the example illustrated in FIG. 11, two seal members 4 are provided for each head module 2. The two seal members 4 are provided at both longitudinal ends of one head module 2. Each seal member 4 has a rectangular shape as viewed in the Z1 direction. Each seal member 4 overlaps the flange portion 250 included in the channel orifice forming member 25 of the head module 2 as viewed in the Z1 direction. On the other hand, in the present embodiment, the seal members 4 are provided at positions different from the chips 20 as viewed in the Z1 direction. In

other words, the seal members 4 do not overlap the chips 20 as viewed in the Z1 direction.

[0101] As illustrated in FIGS. 5 and 11, each seal member 4 includes two communication orifices 4H. As illustrated in FIG. 5, each communication orifice 4H is provided corresponding to one of the channel orifices 251H of the channel orifice forming members 25 and one of the channel orifices 31H of the supply channel members 3. As illustrated in FIG. 10, the communication orifice 4H coincides with both the channel orifice 31H and the channel orifice 251H as viewed in the Z1 direction. As illustrated in FIG. 5, the communication orifice 4H is connected to the channel 25R via the channel orifice 251H. The communication orifice 4H is connected to the channel 3R via the channel orifice 31H. Thus, the channel 25R and the channel 3R communicate with each other through the communication orifice 4H. Specifically, the channel 25R and the channel 3R communicate with each other through the communication orifice 4H with the seal member 4 squeezed between the channel orifice forming member 25 and the supply channel member 3.

[0102] The seal member 4 including such communication orifices 4H is a member for liquid-tightly connecting the channel orifices 251H of the head module 2 and the channel orifices 31H of the supply channel member 3. The ink flowing in the channels 3R of the supply channel members 3 flows into the channels 25R of the channel orifice forming members 25 via the communication orifices 4H and is supplied to the dedicated channels included in the chips 20 via the common spaces R.

[0103] As illustrated in FIG. 11, the seal member 4 has a seal area 4S. In the present embodiment, the entire area of the seal member 4 serves as the seal area 4S. The seal area 4S is an area of the seal member 4 that is in contact with both the channel orifice forming member 25 and the supply channel member 3 and held between the channel orifice forming member 25 and the supply channel member 3. The seal area 4S is an area squeezed with application of a load from the channel orifice forming member 25 and the supply channel member 3 so as to liquid-tightly connect the channel orifices 251H and the channel orifices 31H. In other words, even an area of the seal member 4 located between the channel orifice forming member 25 and the supply channel member 3 is not included in the seal area 4S if the area is not squeezed with application of the load from both members, and does not actually contribute to the liquid-tight connection between the channel orifice 251H and the channel orifice 31H.

[0104] As illustrated in FIG. 11, the seal members 4 are provided at the positions different from the chips 20 as viewed in the Z1 direction, and accordingly the seal areas 4S are provided at the positions different the chips 20 as viewed in the Z1 direction. In other words, the seal areas 4S do not overlap the chip 20 as viewed in the Z1 direction. Since the seal areas 4S do not overlap the chips 20 as viewed in the Z1 direction, the reaction force of the seal members 4 is less likely to act on the chips 20 than if they overlap the chips 20. As a result, the reliability of the head modules 2 can be improved.

[0105] As described above, the channel 25R and the channel 3R communicate with each other through the communication orifice 4H with the seal member 4 squeezed between the channel orifice forming member 25 and the supply channel member 3. The reaction force of the

squeezed seal member 4 may apply stress to the chip 20, and cause warping or the like of the chip 20. In this way, if the reaction force of the seal member 4 acts on the chip 20, the reliability of the head module 2 may deteriorate due to the occurrence of an undesirable phenomenon such, for example, as displacement of the nozzles N as a result of deformation of the nozzle plate 201, a change in ejection characteristics as a result of deformation of the pressure chamber substrate 203 and the communication plate 202, or a breakage of any of members constituting the chip 20 if the members include a silicon substrate or ceramic sheet.

[0106] In the present embodiment, the seal areas 4S of the seal members 4 do not overlap the chips 20 as viewed in the Z1 direction. For this reason, it is possible to keep the reaction force of the seal members 4 from acting on the chips 20 while keeping the sealing performance of the seal members 4 from decreasing. Thus, the reliability of the head modules 2 can be improved.

[0107] As described above, the liquid ejecting head 1 includes the multiple head modules 2. For example, the leftmost head module 2 in FIG. 11 is referred to as a “first head module 2a”. The next head module 2 to the right of the first head module 2a is referred to as a “second head module 2b”. In this case, the channel orifices 251H of the first head module 2a are referred to as “first channel orifices 251Ha” and the channel orifices 251H of the second head module 2b are referred to as “second channel orifices 251Hb”. The seal members 4 corresponding to the first head module 2a are referred to as “first seal members 4a” and the seal members 4 corresponding to the second head module 2b are referred to as “second seal members 4b”. The first seal members 4a are held between the first head module 2a and the supply channel members 3, thereby liquid-tightly connecting the first channel orifices 251Ha of the first head module 2a and the channel orifices 31H of the supply channel members 3. Similarly, the second seal members 4b are held between the second head module 2b and the supply channel members 3, thereby liquid-tightly connecting the second channel orifices 251Hb of the second head module 2b and the channel orifices 31H of the supply channel members 3. Both the first head module 2a and the second head module 2b eject the ink supplied from the supply channel members 3.

[0108] The seal areas 4S of the first seal members 4a do not overlap the chip 20 included in the first head module 2a as viewed in the Z1 direction. Similarly, the seal areas 4S of the second seal members 4b do not overlap the chip 20 included in the second head module 2b as viewed in the Z1 direction. Further, the seal members 4 corresponding to the multiple head modules 2 included in the liquid ejecting head 1 do not overlap the chips 20 as viewed in the Z1 direction. As a result, in the multiple head modules 2, it is possible to keep the reaction force of the seal members 4 from acting on the chips 20 while keeping the sealing performance of the seal members 4 from decreasing. Thus, the reliability of the liquid ejecting head 1 can be improved.

[0109] As illustrated in FIG. 10, none of the communication orifices 4H, the channel orifices 251H, and the channel orifices 31H overlaps the chips 20 as viewed in the Z1 direction. All of the communication orifices 4H, the channel orifices 251H, and the channel orifices 31H are arranged outside the chips 20 as viewed in the Z1 direction. Specifically, the communication orifices 4H and the channel orifices 251H and 31H are arranged on both longitudinal sides of each chip 20 as viewed in the Z1 direction. For this

reason, the seal areas 4S of the seal members 4 which liquid-tightly seal the channels 25R and 3R as described above can be arranged outside the chips 20. Accordingly, as described above, the reaction force of the seal members 4 can be kept from affecting the chips 20.

[0110] In addition, each of the seal areas 4S is arranged in the Y1 direction or the Y2 direction, which is a longitudinal direction of the head module 2, relative to the chip 20 as viewed in the Z1 direction. Since the seal areas 4S are arranged in the longitudinal directions relative to the chips 20, none of the seal areas 4S is arranged between the adjacent chips 20. This can avoid an increase in the distance between the adjacent chips 20 due to the seal area 4S if provided. For this reason, the print quality is less likely to be affected.

[0111] However, the seal areas 4S may be arranged, relative to the chips 20, in directions in which the multiple head modules 2 are arrayed, that is, the short side directions of the head modules 2. The seal members 4 may be provided, relative to the chips 20, in the directions in which the multiple head modules 2 are arrayed, that is, the short-side directions of the head modules 2.

1-3D. Support Member 5

[0112] The support member 5 illustrated in FIGS. 4 to 6 is a member that supports the head module 2. The support members 5 are provided for the head modules 2 on a one-to-one basis. The support member 5 is a plate-shaped member that is long along the Y axis while a thickness direction thereof is a direction along the Z axis. The support member 5 is arranged in the Z1 direction relative to the channel orifice forming member 25. The support member 5 is a member that sandwiches the seal members 4 and the channel orifice forming member 25 between itself and the supply channel members 3. As illustrated in FIG. 5, the support member 5 includes a surface 511 facing in the Z1 direction and a surface 512 facing in the Z2 direction. The support member 5 is a member that does not include any channel through which the ink flows.

[0113] Each support member 5 and the corresponding head module 2 are fixed to each other with an adhesive. The sub-unit 15 including each support member 5 is fixed to the holder 6 to be described later in a detachably-attached manner. Specifically, the support member 5 is not bonded with an adhesive or the like. For this reason, the sub-units 15 are replaceable on a per-sub-unit 15 basis. The support member 5 and the head module 2 are fixed to each other with an adhesive.

[0114] For this reason, for example, in the case where one or some of the multiple head modules 2 included in the head unit 10 are broken, the sub-units 15 including the broken head modules 2 are replaced with other sub-units 15 including unbroken head modules 2, so that the liquid ejecting head 1 can be recycled.

[0115] Further, the channel-forming connections between the head module 2 and the supply channel members 3 are not made with an adhesive, but are made with the seal members 4. For this reason, in the above-described replacement of the head module 2, the channel-forming connections between the head module 2 and the supply channel members 3 can be disconnected easily. This facilitates the replacement of the head module 2.

[0116] Here, it is preferable to fix each support member 5 and the corresponding head module 2 to each other with an

adhesive, but the head module 2 may be configured to be detachable from the support member 5 with decomposition of the adhesive.

[0117] The support member 5 is made of, for example, a metal. The support member 5 is made of a metal such, for example, as aluminum or stainless steel. The support member 5 has stiffness sufficient to support the head module 2.

[0118] The support member 5 is provided with the opening 5H. The opening 5H is a hole passing through the support member 5 in the thickness direction. The opening 5H is provided for exposing a part of the head module 2 to the outside. Specifically, as illustrated in FIG. 6, the chip 20 is exposed from the opening 5H. Accordingly, the multiple nozzles N are exposed from the opening 5H.

[0119] FIG. 12 is a topside view of the support members 5 illustrated in FIG. 5. As illustrated in FIGS. 5 and 12, the support member 5 includes a support area 5S. The support area 5S is a part of the surface 512 of the support member 5 facing in the Z2 direction. In FIG. 12, the support areas 5S are hatched for facilitating understanding. In the example of FIG. 12, each support area 5S has a rectangular frame shape as viewed in the Z1 direction.

[0120] As illustrated in FIG. 5, the support area 5S is an area that is in contact with the channel orifice forming member 25 and directly supports the channel orifice forming member 25. The support area 5S is in contact with the supported surface 2511 of the channel orifice forming member 25. As illustrated in FIG. 12, the support area 5S includes areas S50 coinciding with the seal areas 4S as viewed in the Z1 direction. In FIG. 12, the areas S50 are dotted.

[0121] Since the support area 5S includes the areas S50 coinciding with the seal areas 4S as viewed in the Z1 direction, the support member 5 vertically receives the reaction force of the seal members 4. Therefore, the support member 5 can firmly support the seal areas 4S of the seal members 4 between itself and the supply channel members 3. Accordingly, the support member 5 can particularly effectively alleviate the reaction force of the seal members 4.

[0122] Moreover, a part of the above-described surface 251 of the channel orifice forming member 25 facing in the Z1 direction includes the supported surface 2511. The supported surface 2511 is supported by being in contact with the support member 5 while surrounding the opening 5H of the support member 5 as viewed in the Z1 direction. Specifically, as described above, the flange portion 250 of the channel orifice forming member 25 includes the supported surface 2511, and the head module 2 is held by the support member 5 with the supported surface 2511 put in contact with the support area 5S of the support member 5. When the channel orifice forming member 25 is supported by the support member 5 as described above, the load of the seal members 4 can be distributed. As a result, the channel orifice forming member 25 can be made less likely to be broken.

[0123] Here, the contact between the supported surface 2511 and the support area 5S means not only a direct contact between them and but also a connection between them via an adhesive, an elastic bushing, or the like. Accordingly, the channel orifice forming member 25 may be in direct contact with the support member 5 or may be in indirect contact with the support member 5 via another member such as an adhesive or a bushing. The flange portion 250 may have a shape other than the rectangular frame shape in the plan view. For example, the flange portions 250 in rectangular

shapes may be provided in both of the Y1 and Y2 directions relative to the opening 5H in the plan view.

[0124] The thickness of the flange portion 250, that is, the length along the Z1 direction, is preferably greater than the thickness of the part of the channel orifice forming member 25 arranged inside the opening 5H. In addition, the thickness of the flange portion 250 is preferably $\frac{1}{2}$ or greater of the maximum thickness of the channel orifice forming member 25. Such a thickness relationship keeps the strength of the flange portion 250 from decreasing, and makes it easier for the flange portion 250 to ensure the strength in receiving the reaction force of the seal members 4.

[0125] Moreover, as illustrated in FIG. 5, the thickness D5 of the support member 5 in the Z1 direction is greater than the thickness D2 of the chip 20 in the Z1 direction. This can reduce a risk of the support member 5 being deformed due to the reaction force of the seal members 4.

[0126] The thickness D5 of the support member 5 is preferably two or more times and more preferably three or more times greater than the thickness D2 of the chip 20. This can further reduce the risk of the support member 5 being deformed due to the reaction force of the seal members 4. However, the thickness D5 may be equal to or smaller than the thickness D2.

[0127] From the same viewpoint, the thickness D5 of the support member 5 is preferably 1 mm or greater and more preferably 2 mm or greater. In order to further enhance the strength of the support member 5, the thickness D5 may be 3 mm or greater, 5 mm or greater, or 6 mm or greater. On the other hand, from the viewpoint of an increase in the distance between the medium 90 and the nozzle surface SN, that is, a paper gap, the thickness D5 of the support member 5 is preferably 10 mm or smaller, and more preferably 7 mm or smaller.

[0128] As illustrated in FIG. 5, in addition to the chip 20, the part of the channel orifice forming member 25 is arranged in the opening 5H of the support member 5. In other words, the part of the channel orifice forming member 25 is inserted in the opening 5H of the support member 5. In the case where the support member 5 exists, the paper gap may increase depending on how great the thickness D5 of the support member 5 is. Specifically, if the thickness D5 of the support member 5 is excessively great, the surface of the chip 20 facing in the Z1 direction may be retracted in the Z2 direction from the surface of the support member 5 facing in the Z1 direction. The increase in the above distance may result in a decrease in the accuracy of ink impact positions on the medium 90.

[0129] In the present embodiment, as described above, in addition to the chip 20, the part of the channel orifice forming member 25 is arranged in the opening 5H. Thus, even if the thickness D5 of the support member 5 is increased in order to further enhance the strength of the support member 5, the paper gap may be prevented from increasing.

[0130] Further, the surface of the nozzle plate 201 facing in the Z1 direction, namely, the nozzle surface SN, in the chip 20 is approximately flush with the surface 511 of the support member 5 facing in the Z1 direction. In other words, the nozzle surface SN and the surface 511 of the support member 5 facing in the Z1 direction are located at the same Z-axial position. In this case, the paper gap can be kept from increasing as compared with the case where the nozzle surface SN is retracted in the Z2 direction from the surface

511 of the support member **5** facing in the **Z1** direction. Moreover, it is easy to collectively wipe the surface **511** of the support member **5** facing in the **Z1** direction and the nozzle surface **SN**.

[0131] The nozzle surface **SN** and the surface **511** of the support member **5** facing in the **Z1** direction being approximately flush with each other means not only a case where they are completely flush with each other, but also a case where they have a step formed in between to the extent including a manufacturing error or the like.

[0132] Instead, the nozzle surface **SN** and the surface **511** of the support member **5** facing in the **Z1** direction do not have to be approximately flush with each other. The nozzle surface **SN** and the surface **511** of the support member **5** facing in the **Z1** direction may be located at different **Z**-axial positions or may have a step formed in between. In this case, from the viewpoint of ease of wiping, the distance between the nozzle surface **SN** and the surface **511** of the support member **5** facing in the **Z1** direction is preferably 100 μm or smaller and more preferably 50 μm or smaller.

[0133] The support member **5** described above is fixed to the holder **6** to be described later in a detachably-attached manner. For example, when the support member **5** is detached from the holder **6**, the head module **2** and the wiring substrate **7** to be described later are detached together with the support member **5** from the holder **6**. The liquid ejecting head **1** in the present embodiment is configured such that the precision of alignment of the multiple head modules **2** may not decrease in the case where each head module **2** is detached from and reattached to the holder **6**.

[0134] As illustrated in FIGS. **5** and **12**, each support member **5** has two first alignment portions **502** and two fixing slots **501**. The first alignment portions **502** are used for the purpose of positioning the support member **5** with respect to the holder **6** or other purposes. The fixing slots **501** are used for fixing the support member **5** to the holder **6**.

[0135] The first alignment portions **502** are provided on the surface **512** of the support member **5** facing in the **Z2** direction. In the present embodiment, the first alignment portions **502** are bottomed slots opened in the surface **512** of the support member **5** facing in the **Z2** direction. Each first alignment portion **502** is a dented portion provided in the surface **512** of the support member **5** facing in the **Z2** direction and may be regarded as a recess formed in the surface **512**. The two first alignment portions **502** are provided on both sides of the opening **5H** in the longitudinal direction of the support member **5**. One of the two first alignment portions **502** is located in the **Y1** direction relative to the opening **5H**, whereas the other is located in the **Y2** direction relative to the opening **5H**.

[0136] The fixing slots **501** are provided in the surface **512** of the support member **5** facing in the **Z2** direction. The fixing slots **501** are bottomed slots provided in the surface **512** of the support member **5** facing in the **Z2** direction. Each fixing slot **501** is a dented portion provided in the surface **512** of the support member **5** facing in the **Z2** direction and may be regarded as a recess formed in the surface **512**. The two fixing slots **501** are provided on both sides of the opening **5H** in the longitudinal direction of the support member **5**. One of the two fixing slots **501** is located in the **Y1** direction relative to the opening **5H**, whereas the other is located in the **Y2** direction relative to the opening **5H**.

[0137] Each of the fixing slots **501** is provided away from the corresponding first alignment portion **502** and the open-

ing **5H**. Each fixing slot **501** located in the **Y1** direction relative to the opening **5H** is closer to the opening **5H** than the first alignment portion **502** located in the **Y1** direction relative to the opening **5H** is. Similarly, each fixing slot **501** located in the **Y2** direction relative to the opening **5H** is closer to the opening **5H** than the first alignment portion **502** located in the **Y2** direction relative to the opening **5H** is. The first alignment portions **502**, the fixing slots **501**, and the opening **5H** are arranged along the longitudinal direction of the support member **5**.

[0138] The minimum distance between the fixing slot **501** and the opening **5H** is shorter than the minimum distance between the first alignment portion **502** and the opening **5H**, but may be longer than the latter distance. Further, the first alignment portions **502**, the fixing slots **501**, and the opening **5H** do not have to be arranged along the longitudinal direction of the support member **5**. For example, the first alignment portions **502** may be provided on both sides of the opening **5H** along the **X** axis.

1-3E. Holder 6

[0139] As illustrated in FIGS. **3** to **5**, the holder **6** is a case where to store the multiple head modules **2** and the supply channel members **3**. The holder **6** has a box shape having a dented portion **610** opened in the **Z1** direction. The multiple head modules **2** and the supply channel members **3** are arranged in a storage space in the dented portion **610** of the holder **6**. In other words, the storage space for storing the module head modules **2** and the supply channel members **3** may be regarded as a space formed by the holder **6** and the multiple support members **5**.

[0140] The relay substrate **70** is arranged on a bottom surface of the dented portion **610** of the holder **6**. The bottom surface is a surface of the dented portion **610** of the holder **6** facing in the **Z1** direction. The holder **6** is made of a metal such, for example, as aluminum or stainless steel. Although not illustrated in detail, the holder **6** is provided with an opening to which a wiring member outside the liquid ejecting head **1** for electrically connecting the relay substrate **70** to the control unit **91** is to be inserted.

[0141] The holder **6** includes a flat plate portion **61**, a sidewall **62**, multiple partition walls **63**, and two flange portions **64**. The flat plate portion **61**, the sidewall **62**, the multiple partition walls **63**, and the two flange portions **64** are formed integrally. The flat plate portion **61** is a portion in a flat plate shape along an **X-Y** plane, and is located in the **Z2** direction relative to the supply channel members **3**. The sidewall **62** is a portion extended in the **Z1** direction from an outer edge of the flat plate portion **61**. A planar shape of the sidewall **62** is a rectangular frame shape. As illustrated in FIG. **4**, the multiple partition walls **63** are arranged between the multiple head modules **2**. Each partition wall **63** extends along the **Y** axis. The partition walls **63** and the head modules **2** are alternately arranged along the **X** axis.

[0142] FIG. **13** is a topside view of an upper portion of the holder **6** illustrated in FIG. **5**. FIG. **14** is a view illustrating a lower portion of the holder **6** illustrated in FIG. **5**. As illustrated in FIGS. **4** and **13**, the multiple partition walls **63** are not provided in the upper portion of the holder **6**. In contrast, as illustrated in FIGS. **4** and **14**, the multiple partition walls **63** are provided in the lower portion of the holder **6**. A portion of the holder **6** provided with the multiple partition walls **63** may be regarded as the lower portion of the holder **6**, whereas a portion of the holder **6** not provided

with the multiple partition walls **63** may be regarded as the upper portion of the holder **6**.

[0143] As illustrated in FIG. 4, the multiple partition walls **63** exist in an area where the multiple head modules **2** are provided. The multiple partition walls **63** are located in the Z1 direction relative to the Z-axial center of the holder **6**. A portion of the holder **6** extended in the Z2 direction from the Z-axial center is not provided with the multiple partition walls **63** so as to allow the supply channel members **3** arranged therein.

[0144] As illustrated in FIGS. 5 and 14, for each support member **5**, the holder **6** includes two second alignment portions **602** and two first fixing holes **61H**. As described above, the support member **5** can be detachably attached to the holder **6**. The second alignment portions **602** are used for the purpose of positioning the support member **5** with respect to the holder **6** or other purposes. The first fixing holes **61H** are used to fix the support member **5** to the holder **6**.

[0145] The second alignment portions **602** are provided in a surface **605** of the holder **6** facing in the Z1 direction. In the present embodiment, the second alignment portions **602** are protrusions protruding in the Z1 direction from the surface **605** of the holder **6** facing in the Z1 direction. As illustrated in FIG. 13, each second alignment portions **602** is provided in the Y1 direction or the Y2 direction relative to the dented portion **610** as viewed in the Z1 direction. The two second alignment portions **602** are provided corresponding to the foregoing two first alignment portions **502** and coincide with the two first alignment portions **502** as viewed in the Z1 direction. Accordingly, the multiple second alignment portions **602** are provided for the multiple first alignment portions **502** on a one-to-one basis.

[0146] Each first fixing hole **61H** is a hole passing through the holder **6** in the Z1 direction. Each first fixing hole **61H** is provided in the Y1 direction or the Y2 direction relative to the dented portion **610** as viewed in the Z1 direction. The two first fixing holes **61H** are provided corresponding to the foregoing two fixing slots **501** and coincide with the two fixing slots **501** as viewed in the Z1 direction.

[0147] Each first fixing hole **61H** located in the Y1 direction relative to the dented portion **610** is closer to the dented portion **610** than the second alignment portion **602** located in the Y1 direction relative to the dented portion **610** is. Similarly, each first fixing hole **61H** located in the Y2 direction relative to the dented portion **610** is closer to the dented portion **610** than the second alignment portion **602** located in the Y2 direction relative to the dented portion **610** is. Each first fixing hole **61H** and its adjacent second alignment portion **602** are spaced out and arranged along the Y axis.

[0148] The minimum distance between the first fixing hole **61H** and the dented portion **610** is shorter than the minimum distance between the second alignment portion **602** and the dented portion **610**, but may be longer than the latter distance. Further, the second alignment portion **602** and the first fixing hole **61H** do not have to be arranged along the longitudinal direction of the support member **5**.

[0149] The second alignment portions **602** are press-fitted into the foregoing first alignment portions **502** to position the support member **5** with respect to the holder **6**. The first alignment portions **502** and the second alignment portions

602 are provided on a per-support member **5** basis, in other words, for each head module **2** held by the support member **5**.

[0150] The provision of the first alignment portions **502** and the second alignment portions **602** described above enables easy positioning for attaching each support member **5** to the holder **6**. Moreover, since the first alignment portions **502** and the second alignment portions **602** are provided on the per-support member **5** basis, the alignment of the multiple support members **5** with the holder **6** can be made with high precision.

[0151] As described above, each support member **5** holds the head module **2**. Accordingly, the provision of the first alignment portions **502** and the second alignment portions **602** enables each head module **2** fixed to the support member **5** to be positioned with respect to the holder **6**. Further, since the first alignment portions **502** and the second alignment portions **602** are provided on the per-support member **5** basis, the alignment of the multiple head modules **2** with the holder **6** can be made with high precision. That is, the multiple head modules **2** can be aligned with each other on the per-support member **5** with respect to the holder **6**. For this reason, in order to replace only some of the multiple head modules **2**, there is no need to realign all the head modules **2**.

[0152] Moreover, the multiple head modules **2** can be aligned with each other with high precision in the simple method including press-fitting the second alignment portions **602** into the first alignment portions **502**. This allows only a desired head module **2** to be replaced easily among the multiple head module **2**. This makes it easy to recycle the liquid ejecting head **1** by replacing the head module **2**.

[0153] The multiple second alignment portions **602** are arranged on the surface **605** of the holder **6** facing in the Z1 direction. As described above, the first alignment portions **502** are arranged in the surface **512** of the support member **5** facing in the Z2 direction opposite to the Z1 direction. Then, each head module **2** is supported by the surface **512** of the support member **5** facing in the Z2 direction. The arrangement of the first alignment portions **502**, the second alignment portions **602**, and the head module **2** as described above enables easy attachment and detachment from below the holder **6** for replacing only the sub-unit **15** including the support member **5** and the head module **2** as a replacement target. In order to attach a sub-unit **15** including an unbroken head module **2** to the holder **6** again as a replacement for a sub-unit **15** of a replacement target, it is only necessary to make the channel-forming connections between the head module **2** as the replacement and the supply channel members **3**, and to electrically connect the wiring substrate **7** attached to the head module **2** as the replacement to the relay substrate **70**. Therefore, there is no need to make the channel-forming connections between the head modules **2** other than the replacement target and the supply channel members **3**, and to electrically connect their wiring substrates **7** to the relay substrate **70**. Thus, the attachment and detachment work for repairing the liquid ejecting head **1** can be simplified.

[0154] Moreover, the supply channel members **3** and the wiring substrates **7** are arranged on the bottom surface of the dented portion **610** of the holder **6** and the support members **5** holding the head modules **2** are arranged so as to cover the opening of the dented portion **610**. This makes it easy to shorten the distance between the head modules **2** and the

supply channel members 3, and also makes it easy to shorten the length of the wiring substrates 7.

[0155] In the present embodiment, the first alignment portions 502 are the bottomed slots provided in the surface of the support member 5 facing in the Z2 direction and recessed in the Z1 direction as described above. For this reason, the first alignment portions 502 are not exposed to the outside of the support member 5. The first alignment portions 502 are not provided in the surface of the support member 5 facing in the Z1 direction. Therefore, it is possible to prevent mist or the like of the ink ejected from the nozzles N from adhering to the first alignment portions 502.

[0156] The above-described supply channel members 3 are arranged in the Z2 direction relative to the multiple head modules 2, and overlap the multiple head modules 2 as viewed in the Z1 direction. In the structure in which the multiple head modules 2 are arranged below the supply channel members 3, the first alignment portions 502 are provided in the surface of the support member 5 facing in the Z2 direction. This structure enables easy attachment and detachment for only a sub-unit 15 of a replacement target from below the holder 6 and the supply channel member 3. Therefore, there is no need to disconnect the channel-forming connections between the sub-units 15 other than the replacement target and the supply channel members 3, which simplifies the attachment and detachment work.

[0157] Here, the holder 6 and the supply channel member 3 are separate members but may be integrated. Instead, a part of the supply channel member 3 may be a part of the holder 6.

[0158] A fixing member 151 is inserted into the first fixing hole 61H and the fixing slot 501. The support member 5 is fixed to the holder 6 with the fixing members 151. As illustrated in FIGS. 3, 4, and 13, the fixing members 151 are provided on a per-support member 5 basis. In the present embodiment, two fixing members 151 are provided for one support member 5.

[0159] The multiple fixing members 151 fix each of the multiple support members 5 to the holder 6 in a detachably-attached manner. Thus, the fixing members 151 can be considered to fix the head modules 2 to the supply channel members 3 by fixing the support members 5 to the holder 6.

[0160] Each fixing member 151 is inserted in the Z1 direction into the first fixing hole 61H as a through hole and the fixing slot 501 as a recess in this order. Thus, a part of the fixing member 151 is exposed from a surface 606 of the holder 6 facing in the Z2 direction, but the fixing member 151 is not exposed from the surface 511 of the support member 5 facing in the Z1 direction. Thus, the fixing member 151 is protected from adhesion and solidification of ink mist. This makes it possible to prevent the fixing member 151 from becoming difficult to remove from the holder 6 and the support member 5 due to the adhesion of the mist.

[0161] The depth D61 of the first fixing hole 61H is greater than the depth D51 of the fixing slot 501. Each of the first fixing hole 61H and the fixing slot 501 is formed along the Z1 direction. The depths D61 and D51 are defined as depths along the Z1 direction.

[0162] The sub-unit 15 is small in size and difficult for a user to grasp. The depth D61 of the first fixing hole 61H is greater than the depth D51 of the fixing slot 501, in other words, the depth D51 of the fixing slot 501 is smaller than the depth D61 of the first fixing hole 61H, so that even if the

sub-unit 15 is difficult to grasp, the press-fit of the sub-unit 15 in the holder 6 can be easily released.

[0163] For example, after the fixing members 151 are removed from the first fixing holes 61H, long rod-shaped members are inserted into the first fixing holes 61H and the support member 5 is pressed in the Z1 direction by these members. As a result, the press-fit of the support member 5 in the holder 6 can be released easily. The use of the first fixing holes 61H as holes for releasing the press-fit makes it possible to easily release the press-fit of the support member 5 in the holder 6. In the case where the depth D6 of the holder 6 is greater than the depth D5 of the support member 5, the support member 5 can be more easily detached from the holder 6 than in the case where the depth D6 is smaller than the depth D5.

[0164] The distance L51 from the bottom surface of the fixing slot 501 to the surface 511 of the support member 5 facing in the Z1 direction is greater than the depth D51 of the fixing slot 501. In the case where the distance L51 is greater than the depth D51, the support member 5 is less likely to be deformed in the process of releasing the press-fit of the support member 5 in the holder 6 than in the case where the distance L51 is smaller than the depth D5.

[0165] However, the distance L51 may be smaller than the depth D51. In this case, the distance L51 is made as small as possible while the depth D51 necessary for positioning is reserved, so that the thickness D5 of the support member 5 can be easily reduced. When the thickness D5 is reduced, an increase in the paper gap can be suppressed.

[0166] In the present embodiment, the fixing members 151 are screws. Accordingly, female threads are formed on inner circumferential wall surfaces forming the fixing slots 501. When the fixing members 151 are the screws, the fixing of the support member 5 to the holder 6 can be easily released by rotating and unscrewing the screws. When the fixing members 151 are the screws, the support member 5 can be fixed to the holder 6 in the detachably-attached manner without using an adhesive.

[0167] However, the fixing member 151 may be a member other than the screw. For example, the fixing member 151 may include an L-shaped or T-shaped pin with its tip end in the Z1 direction bent at a right angle and an elastic member such as a leaf spring or coil spring, and be configured to fix the support member 5 to the holder 6 by using the elastic force of the elastic member.

[0168] As described above, the fixing member 151 may have any structure as long as the fixing member 151 can fix the holder 6 and the support member 5 to each other.

[0169] Moreover, as illustrated in FIGS. 5 and 13, for example, the two fixing members 151 are provided for each support member 5. As viewed in the Z1 direction, the fixing members 151 are arranged so as not to overlap the chip 20 and so as to sandwich the seal areas 4S between the chip 20 and the fixing members 151.

[0170] In the case where the fixing members 151 do not overlap the chip 20 as viewed in the Z1 direction, the load generated for fixing with the fixing members 151 is less likely to be applied to the chip 20 than in the case where the fixing members 151 overlap the chip 20. Moreover, as viewed in the Z1 direction, the seal member 4 is arranged between the fixing member 151 and the chip 20, so that the distance of the chip 20 from the fixing member 151 can be increased by the dimension of the seal member 4. This also

makes the load generated for fixing with the fixing members 151 unlikely to be applied to the chip 20.

[0171] As illustrated in FIG. 13, the holder 6 includes multiple fourth alignment portions 642. The multiple fourth alignment portions 642 are provided in the flange portions 64. As illustrated in FIG. 5, the fourth alignment portions 642 are protrusions protruding in the Z2 direction from surfaces of the flange portions 64 facing in the Z2 direction. The multiple fourth alignment portions 642 are provided corresponding to the multiple third alignment portions 102 included in the unit base 11 illustrated in FIG. 2 on a one-to-one basis.

[0172] Each of the fourth alignment portions 642 is press-fitted into one of the multiple third alignment portions 102 provided to the unit base 11, thereby positioning the liquid ejecting head 1 with respect to the unit base 11. This makes it possible to improve the precision of alignment of the multiple liquid ejecting heads 1 with the unit base 11.

[0173] In addition, the flange portions 64 are provided with mounting slots 64H. The mounting slots 64H correspond to the mounting holes 101 of the unit base 11. Each of the mounting slots 64H is a bottomed slot opened in the surface of the flange portion 64 facing in the Z2 direction and is, for example, a screw slot for mounting the liquid ejecting head 1 to the unit base 11 with a member such as a screw. The flange portions 64 are fixed to the unit base 11 with not-illustrated members such as screws inserted into the mounting holes 101 and the mounting slots 64H in this order and then tightened. As a result, the liquid ejecting head 1 is fixed to the unit base 11.

1-3F. Wiring Substrate 7, Relay Substrate 70, and Connector 71

[0174] As illustrated in FIG. 4, the wiring substrate 7 is provided for each head module 2. The wiring substrate 7 is inserted into the through hole 20H of the chip 20 and the through hole 25H of the channel orifice forming member 25. The wiring substrate 7 is joined to the vibration plate 204. The wiring substrate 7 protrudes from the vibration plate 204 in the Z2 direction. The wiring substrate 7 is a mounting component in which multiple wiring lines for electrically connecting the chip 20 and the relay substrate 70 are formed. The wiring substrate 7 is, for example, a flexible substrate such as a flexible printed circuit (FPC) or a chip on film (COF), or a rigid substrate. From the wiring substrate 7, each driver element E is supplied with a driving signal and a reference voltage for driving the driver element E.

[0175] The relay substrate 70 is fixed to the bottom surface of the dented portion 610 in the surface 605 facing in the Z1 direction of the flat plate portion 61 of the holder 6. The relay substrate 70 has a flat plate shape, and is fixed to the holder 6 with an adhesive or the like. The relay substrate 70 is electrically connected to the control unit 91. Multiple connectors 71 are equipped in the relay substrate 70. The multiple connectors 71 are provided for the multiple wiring substrates 7 on a one-to-one basis. An end portion of the wiring substrate 7 provided with multiple terminals is inserted into each connector 71 in a removably-inserted manner. In other words, it is preferable that wiring substrate 7 be formed of a rigid body in order to facilitate insertion and removal of the end portion of the wiring substrate 7 into and from the connector 71. In the case where the wiring substrate 7 is formed of a flexible substrate, it is desirable to bond a rigid body to the flexible substrate to support the flexible

substrate. When the end portion of the wiring substrate 7 is inserted into the connector 71, the wiring substrate 7 is electrically connected to the control unit 91 via the relay substrate 70.

[0176] The relay substrate 70 is electrically connected to the multiple head modules 2. The relay substrate 70 is arranged in the Z2 direction, which is opposite to the Z1 direction, relative to the multiple head modules 2, and overlaps the multiple head modules 2 as viewed in the Z1 direction. The first alignment portions 502 are provided on the surface of the support member 5 facing in the Z2 direction. This arrangement enables easy attachment and detachment for only the sub-unit 15 of the replacement target from below the holder 6 and the relay substrate 70. Therefore, there is no need to disconnect the electric connections of the sub-units 15 other than the replacement target, which simplifies the attachment and detachment work.

[0177] In the process of attaching only the sub-unit 15 as a replacement to the holder 6 from below the holder 6 as described above, the wiring substrate 7 is moved in the Z2 direction from below the connector 71 to the connector 71. Then, the wiring substrate 7 is inserted into the connector 71. As a result, the wiring substrate 7 is electrically connected to the relay substrate 70.

1-3G. Bushing

[0178] As illustrated in FIG. 4, bushings 521 are provided between the multiple support members 5. Each bushing 521 fills a gap formed between the adjacent support members 5. For example, as viewed in the Z1 direction, the bushing 521 has a shape long along the Y axis between the adjacent support members 5. As illustrated in FIG. 5, bushings 522 are arranged between the holder 6 and the support member 5. Specifically, the bushings 522 are arranged between the holder 6 and both longitudinal ends of the support member 5. Each of the bushings 521 and 522 is made of, for example, an elastic resin material.

[0179] The provision of the bushings 521 and 522 makes it possible to reduce a risk of ink mist or the like entering the storage space inside the dented portion 610 of the holder 6 from the outside of the liquid ejecting head 1.

2. Modifications

[0180] The first embodiment described above as the example may be modified in various manners. Examples of specific modifications applicable to the above-described first embodiment will be described below. Any two or more modifications selected from the following examples may be combined as appropriate unless they are mutually inconsistent.

2-1. First Modification

[0181] FIGS. 15 and 16 are cross-sectional views of parts of a liquid ejecting head 1 in a first modification. FIG. 17 is a topside view of the liquid ejecting head 1 in the first modification.

[0182] In the first modification illustrated in FIG. 15, bushings 523 are provided. Although not illustrated in details, each bushing 523 has a rectangular frame shape along an outer periphery of the support member 5 as viewed in the Z1 direction. These bushings 523 can prevent ink mist or the like from entering the space in the dented portion 610

of the holder 6. Here, the multiple bushings 523 may be integrally formed as a common member provided in common to the multiple support members 5.

[0183] As illustrated in FIG. 16, in the first modification, the support member 5 and the head module 2 are sealed with molds formed of adhesives 531 and 532. The adhesive 531 forms the mold that seals the channel orifice forming member 25 and the support member 5. The adhesive 531 overlaps the seal member 4 as viewed in the Z1 direction. The adhesive 532 forms the mold that seals the chip 20 and the support member 5. Although not illustrated in details, the adhesive 531 is provided in a rectangular frame shape surrounding the opening 5H as viewed in the Z1 direction. The adhesive 532 is provided along an inner peripheral wall of the opening 5H. These adhesives 531 and 532 can prevent ink mist or the like from entering the space in the dented portion 610 of the holder 6.

[0184] The holder 6 of the liquid ejecting head 1 in the first modification includes a first member 691 and a second member 692. The first member 691 and the second member 692 are formed as separate members. The first member 691 is equivalent to the upper portion of the holder 6 in the first embodiment described above. Accordingly, the first member 691 includes the flat plate portion 61 and a part of the sidewall 62. The second member 692 is equivalent to the lower portion of the holder 6 in the first embodiment described above. The second member 692 includes a part of the sidewall 62 and the multiple partition walls 63.

[0185] The first member 691 is provided with multiple fixing holes 611H and 612H. The second member 692 is provided with multiple fixing slots 613 and fixing holes 614H. The multiple fixing slots 613 correspond to the multiple fixing holes 611H on a one-to-one basis, and coincide with the multiple fixing holes 611H as viewed in the Z1 direction. The fixing holes 611H and 612H are holes passing through the first member 691 in the thickness direction. The fixing holes 611H do not overlap the dented portion 610 as viewed in the Z1 direction. The fixing holes 612H overlap the dented portion 610 as viewed in the Z1 direction. The fixing holes 614H pass through the second member 692 in the thickness direction. The fixing holes 614H do not overlap the dented portion 610 as viewed in the Z1 direction. The fixing holes 614H are provided for each support member 5. The fixing slots 613 are bottomed slots opened on a surface of the second member 692 facing in the Z2 direction.

[0186] In the first modification, each supply channel member 3 is provided with fixing slots 321. The fixing slots 321 are bottomed slots opened on a surface of the supply channel member 3 facing in the Z2 direction. The fixing slot 321 is provided for each fixing hole 612H and coincides with the fixing hole 612H as viewed in the Z1 direction.

[0187] In the first modification, the support member 5 is provided with fixing slots 504. The fixing slots 504 are bottomed slots opened in the surface 512 of the support member 5 facing in the Z2 direction. The fixing slot 504 is provided for each fixing hole 614H and coincides with the fixing hole 614H as viewed in the Z1 direction.

[0188] The liquid ejecting head 1 in the first modification includes a fixing member group 150. The fixing member group 150 includes multiple fixing members 152, 153, and 154.

[0189] The fixing member 152 is inserted into the fixing hole 611H and the fixing slot 613 in this order. The fixing

member 152 fixes the first member 691 and the second member 692 to each other. The fixing member 153 is inserted into the fixing hole 612H and the fixing slot 321 in this order. The fixing member 153 fixes the first member 691 and the supply channel member 3 to each other. The fixing member 154 is inserted into the fixing hole 614H and the fixing slot 504 in this order. The fixing member 154 fixes the second member 692 and the support member 5 to each other. [0190] As illustrated in FIG. 17, for example, the multiple fixing members 152 are provided near the corners of the holder 6 having a rectangular shape as viewed in the Z1 direction. For example, the multiple fixing members 153 are provided near the corners of the holder 6 having the rectangular shape as viewed in the Z1 direction. The fixing members 154 are provided on a per-support member 5 basis. [0191] The fixing member group 150 fixes the support members 5 to the holder 6, and indirectly fixes the multiple head modules 2 to the holder 6. With the multiple fixing members 153 provided, the supply channel members 3 are not bonded to the holder 6 but are fixed to the holder 6 in a detachably-attached manner. Thus, in addition to the sub-units 15, the supply channel members 3 are also replaceable. [0192] The fixing members 152, 153, and 154 are, for example, screws, but may be other members such as L-shaped or T-shaped pins described above.

[0193] It is preferable that the fixing member 152 be longer than the fixing member 154 and that the fixing member 152 and the fixing member 154 have male threads with the same outer profile and the same pitch. First, the fixing members 152 are removed from the fixing slots 613, and thereby the first member 691 is detached from the second member 692. Next, the fixing members 154 are removed from the fixing slots 504. After that, the fixing members 152, which are longer than the fixing members 154, are fastened to the fixing slots 504, so that the support member 5 can be moved in the Z1 direction relative to the second member 692. Therefore, the press-fit of the second alignment portions 602 in the first alignment portions 502 can be easily released.

2-2. Second Modification

[0194] FIGS. 18 and 19 are cross-sectional views of parts of a liquid ejecting head 1 in a second modification. The liquid ejecting head 1 in the second modification in FIGS. 18 and 19 includes a cover 85. The cover 85 is fixed to the flange portions 64 of the holder 6.

[0195] The cover 85 is provided in common to the multiple support members 5, and covers parts of the multiple support members 5 except for the openings 5H. The cover 85 is a plate-shaped member and is made of, for example, a metal. The cover 85 is located in the Z1 direction relative to the multiple support members 5, and is in contact with the multiple support members 5. The cover 85 includes multiple opening portions 85H. The multiple opening portions 85H are provided for the nozzle surfaces SN of the multiple head modules 2 on a one-to-one basis, and expose the nozzle surfaces SN.

[0196] Moreover, the cover 85 covers sidewall surfaces of the multiple support members 5. A part of the cover 85 includes a flange 851 in contact with a surface of each flange portion 64 facing in the Z2 direction. In the flange 851, a through hole to which a mounting screw 156 is to be inserted is formed. In the flange portion 64, a thread slot 643 is formed which coincides with the above through hole as

viewed in the Z1 direction. The thread slot 643 is a bottomed slot opened in the surface of the flange portion 64 facing in the Z1 direction. The cover 85 is fixed to the flange portions 64 with the mounting screws 156 inserted and tightened in the thread slots 643 in a state where the cover 85 is in contact with the multiple support member 5.

[0197] The cover 85 thus provided reduces the entry of ink mist into the dented portion 610 of the holder 6.

2-3. Third Modification

[0198] FIGS. 20 and 21 are cross-sectional views of parts of a liquid ejecting head 1 in a third modification. FIG. 22 is a view illustrating the second member 692 included in the holder 6 in the third modification. Hereinafter, mainly different points from those in the first modification will be described.

[0199] In the third modification illustrated in FIG. 20, bushings 524 are provided. Although not illustrated in details, each bushing 524 has a rectangular frame shape surrounding the opening 5H of the support member 5 as viewed in the Z1 direction. These bushings 524 can prevent ink mist or the like from entering the space in the dented portion 610 of the holder 6.

[0200] As illustrated in FIGS. 21 and 22, each channel orifice forming member 25 in the third modification includes flanges 209. The flanges 209 are provided in the Y1 direction and the Y2 direction relative to the chip 20 as viewed in the Z1 direction. As illustrated in FIG. 21, each flange 209 is provided with a fixing hole 211H. The support member 5 is provided with a fixing slot 505 corresponding to the fixing hole 211H. The fixing slot 505 is a bottomed slot opened in the surface of the support member 5 facing in the Z2 direction. The fixing slot 505 is provided corresponding to the fixing hole 211H and coincides with the fixing hole 211H as viewed in the Z1 direction.

[0201] The fixing member group 150 in the third modification includes multiple fixing members 155, 152, and 154. The fixing member 155 is inserted into the fixing hole 211H and the fixing slot 505 in this order. The fixing member 155 fixes the channel orifice forming member 25 and the support member 5 to each other. The fixing members 155 are provided on a per-support member 5 basis.

[0202] The fixing member group 150 fixes the support members 5 to the holder 6 and the head modules 2 to the support members 5, and thus indirectly fixes the multiple head modules 2 to the holder 6. Since the multiple fixing members 155 are provided, each head module 2 is fixed to the support member 5 without using an adhesive or the like. For this reason, the head module 2 can be easily attached to and detached from the support member 5. If the fixing members 155 are screws in particular, the head module 2 can be particularly easily attached to and detached from the support member 5. However, the fixing members 155 may be, for example, L-shaped or T-shaped pins or the like. In the case where the head module 2 is fixed to the support member 5 with the fixing members 155, misalignment of the multiple head modules 2 can be reduced as compared to the case of the fixing with an adhesive.

[0203] The bushing 524, the support member 5, the head module 2, and the seal member 4 described above overlap each other as viewed in the Z1 direction. This structure reduces the risk of the flange 209 being deformed due to the reaction force of the seal member 4 as compared with the case where they do not overlap each other.

2-5. Fifth Modification

[0204] FIG. 23 is a cross-sectional view of a part of a liquid ejecting head 1 in a fifth modification. In the liquid ejecting head 1 in the fifth modification illustrated in FIG. 23, a first alignment portion 502a is a pin protruding in the Z2 direction from the surface of the support member 5 facing in the Z2 direction. A second alignment portion 602a is a bottomed slot opened in the surface of the holder 6 facing in the Z1 direction. The second alignment portion 602a is a dented portion, in other words, a recess, formed in the holder 6 in the Z2 direction. In the second alignment portion 602a, the first alignment portion 502a is press-fitted to position the support member 5 with respect to the holder 6.

[0205] Even such first alignment portion 502a and second alignment portion 602a also enable easy positioning for attaching each support member 5 to the holder 6 as in the first embodiment. Moreover, the alignment of the multiple support members 5 with the holder 6 can be made with high precision. Thus, the alignment of the multiple head modules 2 with the holder 6 can be made with high precision. In addition, in order to replace only some of the multiple head modules 2, there is no need to realign all the head modules 2.

[0206] As described in the first embodiment and the fifth modification, the multiple head modules 2 can be aligned with each other with high precision in the simple method including press-fitting either the second alignment portions 602 or the first alignment portions 502 into the other alignment portions.

[0207] The fourth alignment portion 642a is a bottomed slot opened in the surface of the flange portion 64 facing in the Z2 direction. The fourth alignment portion 642a is a dented portion, in other words, a recess, formed in the flange portion 64 in the Z1 direction. Although not illustrated, a third alignment portion 102 in this case is formed as a protrusion provided to the unit base 11. In the fourth alignment portion 642a, the above third alignment portion 102 is press-fitted to position the liquid ejecting head 1 with respect to the unit base 11. Therefore, it is possible to improve the precision of alignment of the multiple liquid ejecting heads 1 with the unit base 11.

2-6. Sixth Modification

[0208] FIG. 24 is a cross-sectional view of a seal member 4 and its surrounding area in a sixth modification. FIG. 25 is a cross-sectional view of a part of a liquid ejecting head 1 in the sixth modification. In the sixth modification illustrated in FIG. 24, the thickness of the seal member 4 is not constant. The seal member 4 in the sixth modification includes a thick portion 41 and a thin portion 42. The thick portion 41 is located near an inner wall surface forming the communication orifice 4H and is thicker than the thin portion 42. The thin portion 42 is located outside the thick portion 41.

[0209] In the case of the sixth modification, the thick portion 41 in the seal member 4 has the seal area 4S. The thick portion 41 is in contact with the channel orifice forming member 25 and the supply channel member 3, and is held between the channel orifice forming member 25 and the supply channel member 3.

[0210] As illustrated in FIG. 25, the fixing member 151 for fixing the head module 2 and the supply channel member 3

is arranged so as not to overlap the chip 20 and so as to sandwich the seal area 4S between the fixing member 151 and the chip 20 as viewed in the Z1 direction. Moreover, the support area 5S includes an area S55 arranged between the seal area 4S and the chip 20 as viewed in the Z1 direction. This structure can reduce the influence of the reaction force of the seal member 4 on the chip 20 as compared with the case where the support area 5S does not include the area S55.

2-7. Seventh Modification

[0211] FIG. 26 is a cross-sectional view of a seal member 4 and its surrounding area in a seventh modification. In the seventh modification illustrated in FIG. 26, the seal member 4 includes a portion out of contact with both the supply channel member 3 and the channel orifice forming member 25. In the seventh modification, a portion of the seal member 4 near the communication orifice 4H serves as the seal area 4S. As described above, depending on the shapes of the supply channel member 3 and the channel orifice forming member 25, the seal member 4 may include a portion that is out of contact with both the supply channel member 3 and the channel orifice forming member 25 and that is not held between the supply channel member 3 and the channel orifice forming member 25. In the seal member 4, the portion held between the supply channel member 3 and the channel orifice forming member 25 serves as the seal area 4S.

2-8. Eighth Modification

[0212] FIG. 27 is a topside view of support members 5a in an eighth modification. In the eighth modification illustrated in FIG. 27, one support member 5a holds multiple head modules 2. In this way, one support member 5a does not necessarily have to hold one head module 2. In this case, one support member 5a includes multiple openings 5H corresponding to the multiple head modules 2. In this case, the support member 5a serves as a reference for positioning the multiple head modules 2. In the example illustrated, one support member 5a supports three head modules 2. In other words, the support member 5a is provided for every three head modules 2. Two first alignment portions 502 are provided for each support member 5a. Thus, the two first alignment portions 502 are provided in common to the three head modules 2. The support member 5a serves as the reference for positioning the three head modules 2. Two fixing slots 501 are also provided for each support member 5a. Thus, the two fixing slots 501 are provided in common to the three head modules 2.

[0213] In the eighth modification, one support member 5a holds multiple head modules 2. In other words, one support member 5a holds two or more head modules 2. For example, two or more head modules 2 to be replaced at similar timings are held by one support member 5a. Thus, the two or more head modules 2 to be replaced at the similar timings may be collectively replaced, which facilitates the replacement work.

[0214] In the eighth modification, for example, the support member 5a preferably holds multiple head modules 2 to eject the same type of liquid among the multiple head modules 2. This makes it possible to collectively replace head modules 2 having similar life spans, such as head modules 2 to eject a type of liquid whose ejection frequency

is high (for example, a black ink, a white ink, a pre-treatment liquid such as a reaction liquid to coagulate pigments contained in an ink, a post-treatment liquid such as an overcoat liquid, or the like). As a result, the workability for replacement is improved. However, the two or more head modules 2 held by one support member 5a may eject different types of inks. One head module 2 may be capable of ejecting one type of ink or two or more types of inks.

3. Second Embodiment

[0215] Hereinafter, a second embodiment of the present disclosure will be described. In the embodiment to be described below as an example, the same elements as those in the first embodiment in terms of actions or functions will be designated with the reference signs used for the description of the first embodiment, and detailed description thereof will be omitted if unnecessary.

3-1. Liquid Ejecting Head 1A

[0216] FIG. 28 is a cross-sectional view of a liquid ejecting head 1A in a second embodiment viewed in the direction along the Y axis. FIG. 29 is a cross-sectional view of the liquid ejecting head 1A in the second embodiment viewed in the direction along the X axis.

[0217] As illustrated in FIGS. 28 and 29, the liquid ejecting head 1A includes multiple head modules 2A, seal members 4, a support member 5A, a holder 6A, multiple wiring substrates 7, a relay substrate 70, and a fixing member group 150A.

[0218] In the second embodiment, the two supply channel members 3 in the first embodiment are not provided and the holder 6A has the function of the two supply channel members 3 in the first embodiment, that is, the function of the common channel member. In other words, the holder 6A is an example of the “supply channel member”. In addition, one support member 5A holds the multiple head module 2A. In the second embodiment, the head modules 2A and the support member 5A are not fixed to the holder 6A with an adhesive but are detachably attached to the holder 6A.

3-1A. Head Module 2A

[0219] In the second embodiment, the multiple head modules 2A are provided in the same manner as in the first embodiment. Each head module 2A in the second embodiment includes a chip 20 and a channel orifice forming member 25A.

[0220] FIG. 30 is an underside view of the liquid ejecting head 1A illustrated in FIG. 28. As illustrated in FIG. 30, each head module 2A includes multiple nozzles N to eject the ink as in the first embodiment. The nozzles N are exposed from the opening 5H of the support member 5A to be described later.

[0221] FIG. 31 is a topside view of the channel orifice forming members 25A included in the head module 2A illustrated in FIG. 28. As illustrated in FIG. 31, also in the present embodiment, the planar shape of the channel orifice forming member 25A is larger than the planar shape of the chip 20 as in the first embodiment. In other words, as viewed in the Z1 direction, the chip 20 is smaller in outer profile than the channel orifice forming member 25A.

[0222] As illustrated in FIGS. 29 and 31, the channel orifice forming member 25A in the present embodiment includes a flange portion 250 to be fixed to the support

member 5A as in the first embodiment. Then, a surface of the flange portion 250 facing in the Z1 direction is a supported surface 2511 supported by the support member 5A. The planar shape of the flange portion 250 and the planar shape of the supported surface 2511 are rectangular frame shapes surrounding the opening 5H. The channel orifice forming member 25A in the present embodiment includes a channel 25R therein as in the first embodiment. A cavity end of the channel 25R in the Z1 direction serves as each channel orifice 251H.

[0223] As illustrated in FIGS. 29 and 31, each channel orifice forming member 25A includes two fixing slots 215 and two first alignment portions 216. The head module 2A including the channel orifice forming member 25A can be detachably attached to the holder 6A. The first alignment portions 216 are used for the purpose of positioning the head module 2A with respect to the holder 6A or other purposes. The fixing slots 215 are used to fix the head module 2A to the holder 6A.

[0224] The first alignment portions 216 are provided on a surface 252 of the channel orifice forming member 25A facing in the Z2 direction. The surface 252 is also a surface of the head module 2A facing in the Z2 direction. In the present embodiment, the first alignment portions 216 are protrusions protruding in the Z2 direction from the surface 252 of the channel orifice forming member 25A facing in the Z2 direction. The two first alignment portions 216 are provided on both longitudinal sides of the channel orifice forming member 25A across the opening 5H of the support member 5A. One of the two first alignment portions 216 is located in the Y1 direction relative to the opening 5H, whereas the other is located in the Y2 direction relative to the opening 5H.

[0225] The fixing slots 215 are provided in the surface 252 of the channel orifice forming member 25A facing in the Z2 direction. The fixing slots 215 are bottomed slots opened in the surface 252 of the channel orifice forming member 25A facing in the Z2 direction. Each fixing slot 215 is a dented portion provided in the surface 252 of the channel orifice forming member 25A facing in the Z2 direction and may be regarded as a recess formed in the surface 252. The two fixing slots 215 are provided on both longitudinal sides of the channel orifice forming member 25A across the through hole 25H, that is, both longitudinal sides thereof across the opening 5H of the support member 5A. One of the two fixing slots 215 is located in the Y1 direction relative to the opening 5H, whereas the other is located in the Y2 direction relative to the opening 5H.

[0226] Each fixing slot 215 located in the Y1 direction relative to the opening 5H is closer to the opening 5H than the first alignment portion 216 located in the Y1 direction relative to the opening 5H is. Similarly, each fixing slot 215 located in the Y2 direction relative to the opening 5H is closer to the opening 5H than the first alignment portion 216 located in the Y2 direction relative to the opening 5H is. The first alignment portions 216 and the fixing slots 215 do not overlap the opening 5H as viewed in the Z1 direction. The distance from the opening 5H increases in the order of the two channel orifices 251H, the fixing slot 215, and the first alignment portion 216. Among them, the two channel orifices 251H are located closest to the opening 5H.

[0227] The minimum distance between the fixing slot 215 and the opening 5H is shorter than the minimum distance between the first alignment portion 216 and the opening 5H,

but may be longer than the latter distance. Further, the first alignment portions 216, the fixing slots 215, and the opening 5H are arranged along the longitudinal direction of the support member 5A, but do not have to be arranged along the longitudinal direction. For example, the first alignment portions 216 may be provided on both sides of the opening 5H along the X axis.

3-1B. Holder 6A

[0228] The holder 6A illustrated in FIGS. 28 and 29 holds and stores the multiple head modules 2A and includes a common channel to supply and distribute the ink to the multiple head modules 2A. The holder 6A is provided in common to the multiple head module 2A.

[0229] As illustrated in FIG. 29, the holder 6A includes channels 6R. Each channel 6R supplies the ink to each of the head modules 2A and distributes the ink to the head modules 2A. The channel 6R is a common channel provided in common to the multiple head modules 2A. Accordingly, the holder 6A includes supply channel members including the channels 6R serving as the common channels. Each channel 6R is the common channel provided in common to the multiple head modules 2 and includes a common portion 6RA extended along the X axis and multiple branched portions 6RB branched off from the common portion 6RA and extended in the Z1 direction. Although not illustrated, the holder 6A is provided with a channel joint for connecting to a supply channel outside the liquid ejecting head 1 so as to communicate with the liquid reservoir section 9. This channel joint not illustrated is exposed to outside of the liquid ejecting head 1 through, for example, a not-illustrated opening formed in the holder 6A.

[0230] The holder 6A may include multiple channels 6R communicating with the multiple head modules 2. Specifically, instead of the channel 6R including the common portion 6RA communicating with the multiple head modules 2, the holder 6A may include the multiple channels 6R communicating with the respective multiple head modules 2.

[0231] A head module 2A side, in other words, a downstream side of the channel 6R is provided with channel orifices 650H. Each channel orifice 650H is a cavity end of the channel 6R in the Z1 direction. The channel orifices 650H are provided corresponding to the channel orifices 251H of the head module 2A. Each channel orifice 650H is an orifice for a channel-forming connection between the channel 25R of the head module 2A and the channel 6R of the holder 6A.

[0232] FIG. 32 is an underside view of the holder 6A and the relay substrate 70 illustrated in FIG. 28. FIG. 33 is a topside view of the holder 6A illustrated in FIG. 28. As illustrated in FIGS. 29 and 32, a dented portion 610A of the holder 6A includes a first dented portion 611 and a second dented portion 612. As illustrated in FIG. 29, the second dented portion 612 is formed in a bottom surface of the first dented portion 611. The opening area of the second dented portion 612 is smaller than the opening area of the first dented portion 611. Accordingly, the dented portion 610A includes a step surface. The relay substrate 70 is arranged on the bottom surface of the dented portion 610A, more specifically, on the bottom surface of the second dented portion 612.

[0233] As illustrated in FIG. 29, the holder 6A includes two fixing holes 651H, two fixing holes 652H, and two

second alignment portions **653**. The fixing holes **651H** are used to fix the head module **2A** to the holder **6A**. The fixing holes **652H** are used to fix the support member **5A** to the holder **6A**. The second alignment portions **653** are used to position the head module **2A** with respect to the holder **6A**. **[0234]** Each fixing hole **651H** is a hole passing through the holder **6A** in the **Z1** direction. The two fixing holes **651H** are provided for each head module **2A**. Each fixing hole **651H** is provided in the **Y1** direction or the **Y2** direction relative to the second dented portion **612** as viewed in the **Z1** direction. The two fixing holes **651H** are provided corresponding to the above-described two fixing slots **215** and coincide with the two fixing slots **215** as viewed in the **Z1** direction. The fixing holes **651H** do not overlap the chip **20** but overlap the channel orifice forming member **25A** as viewed in the **Z1** direction. An opening end of each fixing hole **651H** in the **Z1** direction is opened on the bottom surface of the first dented portion **611** as viewed in the **Z1** direction.

[0235] Each fixing hole **652H** is a hole passing through the holder **6A** in the **Z1** direction. The multiple fixing holes **652H** are, for example, four fixing holes **652H**, and are respectively provided at four corners of the rectangular holder **6A** as viewed in the **Z1** direction. The fixing holes **652H** are provided corresponding to fixing slots **503** of the support member **5A** and coincide with the fixing slots **503** as viewed in the **Z1** direction.

[0236] The second alignment portions **653** are provided in a surface **605** of the holder **6A** facing in the **Z1** direction. The two second alignment portions **653** are provided for each head module **2A**. In the present embodiment, the second alignment portions **653** are bottomed slots opened in the surface **605** of the holder **6A** facing in the **Z1** direction, specifically, the bottom surface of the first dented portion **611**. In other words, the second alignment portions **653** are dented portions formed in the bottom surface of the first dented portion **611**. Each second alignment portion **653** is provided in the **Y1** direction or the **Y2** direction relative to the second dented portion **612** as viewed in the **Z1** direction. The two second alignment portions **653** are provided corresponding to the above-described two first alignment portions **216** and coincide with the first alignment portions **216** as viewed in the **Z1** direction. Accordingly, the multiple second alignment portions **653** are provided for the multiple first alignment portions **216** on a one-to-one basis.

[0237] As viewed in the **Z1** direction, the fixing holes **651H** are closest to the opening **5H** and the fixing holes **652H** are farthest from the opening **5H** among the fixing holes **651H**, the second alignment portions **653**, and the fixing holes **652H**. The distances from the opening **5H** to the fixing holes **651H**, the second alignment portions **653**, and the fixing holes **652H** may be equal to or different from each other.

3-1C. Seal Member 4

[0238] As illustrated in FIGS. **28** and **29**, the seal members **4** are provided between each head module **2A** and the holder **6A** in the **Z1** direction. The seal members **4** are squeezed by the head module **2A** and the holder **6A**.

[0239] FIG. **34** is a topside view of the seal members **4** illustrated in FIG. **28**. In the present embodiment, two seal members **4** are provided for each head module **2A** as in the first embodiment. The two seal members **4** overlap the flange portion **250** of the channel orifice forming member

25A. The seal members **4** are provided at positions different from the chip **20** as viewed in the **Z1** direction. In other words, the seal members **4** do not overlap the chip **20** as viewed in the **Z1** direction.

[0240] Each of communication orifices **4H** of each seal member **4** is provided corresponding to one of the channel orifices **251H** of the channel orifice forming member **25A** and one of the channel orifices **650H** of the holder **6A**. The communication orifice **4H** coincides with both the channel orifice **650H** and the channel orifice **251H** as viewed in the **Z1** direction. The seal member **4** is squeezed between the channel orifice forming member **25A** and the holder **6A** to allow the channel **25R** and the channel **6R** to communicate with each other via the communication orifices **4H**. The seal member **4** is a member for liquid-tightly connecting the channel orifices **251H** of the head module **2A** and the channel orifices **650H** of the holder **6A**.

[0241] As illustrated in FIG. **33**, in the present embodiment, the seal member **4** has a seal area **4S** as in the first embodiment. The entire area of the seal member **4** serves as the seal area **4S**. The seal area **4S** is an area of the seal member **4** that is in contact with both the channel orifice forming member **25A** and the holder **6A** and is held between the channel orifice forming member **25A** and the holder **6A**. The seal area **4S** is an area that receives a load from the channel orifice forming member **25A** and the holder **6A** so as to liquid-tightly connect the channel orifices **251H** and the channel orifices **650H**.

[0242] In the present embodiment, the seal members **4** are provided at the positions different from the chip **20** as viewed in the **Z1** direction, and accordingly the seal areas **4S** are provided at the positions different from the chip **20** as viewed in the **Z1** direction as in the first embodiment. In other words, the seal areas **4S** do not overlap the chip **20** as viewed in the **Z1** direction. Thus, it is possible to produce the same effects as in the first embodiment.

[0243] In the present embodiment, for example, the left-most head module **2A** in FIG. **34** is referred to as a “first head module **2a**”. The next head module **2A** to the right of the first head module **2a** is referred to as a “second head module **2b**”. In this case, the seal members **4** corresponding to the first head module **2a** are referred to as “first seal members **4a**” and the seal members **4** corresponding to the second head module **2b** are referred to as “second seal members **4b**”. The first seal members **4a** are held between the first head module **2a** and the holder **6A**, thereby liquid-tightly connecting the first channel orifices **251Ha** of the first head module **2a** and the corresponding channel orifices **650H**. Similarly, the second seal members **4b** are held between the second head module **2b** and the holder **6A**, thereby liquid-tightly connecting the second channel orifices **251Hb** of the second head module **2b** and the corresponding channel orifices **650H**. Both the first head module **2a** and the second head module **2b** eject the ink supplied from the holder **6A** including the supply channel members.

[0244] Then, none of the communication orifices **4H**, the channel orifices **251H**, and the channel orifices **650H** overlaps the chip **20** as viewed in the **Z1** direction. The communication orifices **4H**, the channel orifices **251H**, and the channel orifices **650H** are arranged outside the chip **20** as viewed in the **Z1** direction. For this reason, the seal areas **4S** of the seal members **4** which liquid-tightly seal the channels

25R and 6R as described above may be arranged outside the chip 20. Thus, it is possible to produce the same effects as in the first embodiment.

[0245] In addition, each of the seal areas 4S is arranged in the Y1 direction or the Y2 direction, which is the longitudinal direction of the head module 2A, relative to the chip 20 as viewed in the Z1 direction. Thus, it is possible to produce the same effects as in the first embodiment.

3-1D. Support Member 5A

[0246] The support member 5A illustrated in FIGS. 28 and 29 is a member that supports the multiple head modules 2A. The support member 5A is provided in common to the multiple head modules 2A but may be provided individually for the respective head modules 2A. The support member 5A is a plate-shaped member that is long along the Y axis while a thickness direction thereof is a direction along the Z axis. The support member 5A is arranged in the Z1 direction relative to the multiple channel orifice forming members 25A. The support member 5A is a member that does not include any channel through which the ink flows. The support member 5A is fixed to the holder 6A in a detachably-attached manner.

[0247] FIG. 35 is a topside view of the support member 5A illustrated in FIG. 28. As illustrated in FIGS. 29 and 35, the support member 5A includes multiple support areas 5S. In FIG. 35, the support areas 5S are hatched and areas S50 are dotted for facilitating understanding. As illustrated in FIG. 29, the support area 5S is in contact with the supported surface 2511 of the channel orifice forming member 25A. As illustrated in FIG. 35, each support area 5S includes the areas S50 overlapping the seal areas 4S as viewed in the Z1 direction. Thus, it is possible to produce the same effects as in the first embodiment.

[0248] As in the first embodiment, the supported surface 2511 of the channel orifice forming member 25A is supported by being in contact with the support member 5A while surrounding the opening 5H of the support member 5A as viewed in the Z1 direction. Specifically, the head module 2A is held by the support member 5A with the supported surface 2511 put in contact with the support area 5S of the support member 5A. Thus, it is possible to produce the same effects as in the first embodiment.

[0249] Moreover, also in the present embodiment, the thickness D5 of the support member 5A in the Z1 direction is larger than the thickness D2 of the chip 20 in the Z1 direction as in the first embodiment. Thus, it is possible to produce the same effects as in the first embodiment.

[0250] The relationship between the thickness D5 and the thickness D2 and the specific numeric value of the thickness D5 are the same as in the first embodiment.

[0251] In addition, also in the present embodiment, as illustrated in FIG. 29, in addition to the chip 20, a part of the channel orifice forming member 25A is arranged in the opening 5H of the support member 5A as in the first embodiment. Thus, it is possible to produce the same effects as in the first embodiment.

[0252] Also in the present embodiment, the nozzle surface SN of the chip 20 is approximately flush with the surface 511 of the support member 5A facing in the Z1 direction as in the first embodiment.

[0253] As illustrated in FIGS. 29 and 35, the support member 5A includes the multiple fixing slots 503. The fixing slots 503 are used to fix the support member 5A to the holder

6A. As illustrated in FIG. 29, the fixing slots 503 are provided in the surface 512 of the support member 5A facing in the Z2 direction. Each fixing slot 503 is a bottomed slot provided in the surface 512 of the support member 5A facing in the Z2 direction. Each fixing slot 503 is a dented portion provided in the surface 512 of the support member 5A facing in the Z2 direction and may be regarded as a recess formed in the surface 512.

[0254] The support member 5A, the above-described holder 6A, and the multiple head modules 2A can be detachably attached to each other. It is possible to detach the support member 5A from the holder 6A and individually detach each of the head modules 2 from the holder 6A. In the process of detaching each of the head modules 2A from the holder 6A, the wiring substrate 7 attached to the head module 2A is detached from the connector 71. Thus, each of the head modules 2A can be detached individually from the holder 6A. Therefore, it is possible to recycle the liquid ejecting head 1 by replacing each of the head modules 2A.

[0255] The first alignment portions 216 of the above-described channel orifice forming member 25A are press-fitted into the above-described second alignment portions 653 to position the head module 2A with respect to the holder 6A. The first alignment portions 216 and the second alignment portions 653 are provided on a per-holder 6A basis, in other words, for each of the head modules 2A held by the support member 5A.

[0256] The provision of the first alignment portions 216 and the second alignment portions 653 described above enables easy positioning for attaching each head module 2A to the holder 6A. Moreover, since the first alignment portions 216 and the second alignment portions 653 are provided for each head module 2A, it is possible to align the multiple head modules 2A with each other with high precision. For this reason, in order to replace only some of the multiple head modules 2A, there is no need to realign all the head modules 2A.

[0257] Moreover, the multiple head modules 2A can be aligned with each other with high precision in the simple method including press-fitting the first alignment portions 216 into the second alignment portions 653. This allows only a desired head module 2A to be replaced easily among the multiple head module 2A. This makes it easy to repair the liquid ejecting head 1A.

[0258] Moreover, since each head module 2A is provided with the alignment portions, the support member 5A can be formed of a single member common to the multiple head modules 2A unlike the first embodiment. Accordingly, the number of components can be reduced as compared with the first embodiment.

[0259] The channel orifices 650H and the channel orifices 251H correspond to each other as described above. Specifically, the channel orifices 650H and the channel orifices 251H coincide with each other in the direction in which the first alignment portions 216 or the second alignment portions 653 are press-fitted into the other alignment portions, namely, in the direction along the Z axis. In other words, the direction in which the channel orifices 650H and the channel orifices 251H coincide with each other is the same as the direction in which the first alignment portions 216 are press-fitted into the second alignment portions 653. For this reason, in the process of attaching the head module 2A to the holder 6A, the channel-forming connections between the channels 6R and the channels 25R can be easily made with

high precision. In the positioning of the head module 2A with respect to the holder 6A, the highly-precise positioning for the channel-forming connections can be performed simultaneously and easily.

[0260] Moreover, the multiple second alignment portions 653 are arranged in the surface 605 of the holder 6A facing in the Z1 direction, specifically, the bottom surface of the first dented portion 611. The first alignment portions 216 are arranged on the surface 252 of the support member 5A facing in the Z2 direction opposite to the Z1 direction.

[0261] This arrangement of the first alignment portions 216 and the second alignment portions 653 makes it possible to easily attach or detach only a head module 2A of a replacement target from below the holder 6A. For this reason, when a new head module 2A as a replacement for a head module 2A to be replaced is attached to the holder 6A again, it is only necessary to make channel-forming connections of the new head module 2A to the holder 6A. Therefore, there is no need to make channel-forming connections of the head modules 2A other than the replacement target to the holder 6A. Thus, the attachment and detachment work for repairing the liquid ejecting head 1A can be simplified.

[0262] The relay substrate 70 is arranged in the Z2 direction relative to the multiple head modules 2A, and overlaps the multiple head modules 2A as viewed in the Z1 direction. The first alignment portions 216 are provided on the surface 252 of the channel orifice forming member 25A facing in the Z2 direction. This structure enables easy attachment and detachment for only the head module 2A of the replacement target from below. Therefore, there is no need to disconnect the electric connections of the head modules 2A other than the replacement target, which simplifies the attachment and detachment work.

[0263] The wiring substrate 7 is arranged on the bottom surface of the dented portion 610A of the holder 6A. In this case, a length of the head module 2A and the wiring substrate 7 can be more easily reduced than in the case where the wiring substrate 7 is arranged on the surface 606 of the holder 6A facing in the Z2 direction. In the present embodiment, the first alignment portions 216 are the protrusions provided on the surface 252 as described above. For this reason, the first alignment portions 216 are not exposed to the nozzle surface SN side. This makes it possible to prevent ink mist or the like from adhering to the first alignment portions 216.

[0264] The holder 6A is regarded as including the common channel member including one or more channels 6R communicating with the multiple head modules 2A as described above. The holder 6A including the common channel member is arranged in the Z2 direction relative to the multiple head modules 2A and overlaps the multiple head modules 2A as viewed in the Z1 direction. The first alignment portions 216 are provided on the surface 252 of the channel orifice forming member 25A facing in the Z2 direction. This structure enables easy attachment and detachment for only the head module 2A of the replacement target from below. Therefore, there is no need to disconnect the channel-forming connections between the holder 6A and the head modules 2A other than the replacement target, which simplifies the attachment and detachment work.

[0265] In addition, as described above, the first alignment portions 216 are provided on the surface of the channel orifice forming member 25A opposite to the surface pro-

vided with the chip 20, that is, the surface 252 facing in the Z2 direction. The first alignment portions 216 do not overlap the chip 20 as viewed in the Z1 direction. This arrangement of the first alignment portions 216 makes it possible to, in the process of press-fitting the first alignment portions 216 into the second alignment portions 653 of the holder 6A, prevent the load due to the press-fit from acting on the chip 20.

[0266] Moreover, the holder 6A includes the first dented portion 611 whose bottom surface is the surface in which the multiple second alignment portions 653 are arranged as described above. Here, the bottom surface of the dented portion 610A includes the bottom surface of the first dented portion 611 and the bottom surface of the second dented portion 612. The support member 5A is fixed in contact with an outer peripheral wall of the dented portion 610A, that is, the surface 605 of the holder 6A facing in the Z1 direction. Then, the support member 5A includes the multiple openings 5H for exposing the respective multiple head modules 2A to the outside as described above.

[0267] When the support member 5A is thus provided, the support member 5A allows the nozzle surface SN serving as the ink ejection surface to be exposed and prevents ink mist from entering the inside of the dented portion 610A of the holder 6A.

3-1E. Fixing Member Group 150A

[0268] As illustrated in FIG. 29, the fixing member group 150A includes multiple fixing members 155 and multiple fixing members 157.

[0269] The fixing members 155 fix the support member 5A to the holder 6A. Each fixing member 155 is inserted into the fixing hole 652H as the through hole and the fixing slot 503 as the dented portion in this order. For this reason, the fixing member 155 is not exposed to the nozzle surface SN side. Meanwhile, a part of the fixing member 155 is exposed from the surface 606 of the holder 6A facing in the Z2 direction.

[0270] For example, after the fixing members 155 are removed from the fixing holes 652H, long rod-shaped members are inserted into the fixing holes 652H and the support member 5A is pressed in the Z1 direction by these members. In this way, the press-fit of the support member 5A in the holder 6A can be released easily. More specifically, the press-fit of the support member 5A in the holder 6A can be easily released by using the fixing holes 652H as holes for releasing the press-fit.

[0271] The fixing members 157 directly fix the head module 2A to the holder 6A. Each fixing member 157 is inserted into the fixing hole 651H as the through hole and the fixing slot 215 as the dented portion in this order. For this reason, the fixing member 157 is not exposed to the surface of the liquid ejecting head 1A facing in the Z1 direction, specifically, the nozzle surface SN side. Meanwhile, a part of the fixing member 157 is exposed from the surface 606 of the holder 6A facing in the Z2 direction. Since the fixing members 157 are not exposed on the nozzle surface SN side, the fixed members 157 are protected from adhesion and solidification of ink mist. This makes it possible to prevent the fixing members 157 from becoming difficult to remove from the holder 6A and the head module 2A due to the adhesion of the mist.

[0272] For example, after the fixing members 157 are removed from the fixing holes 651H, long rod-shaped members are inserted into the fixing holes 651H, and the head

module 2A is pressed in the Z1 direction by these members. In this way, the press-fit of the head module 2A in the holder 6A can be released easily. More specifically, the press-fit of the head module 2A in the holder 6A can be easily released by using the fixing holes 651H as holes for releasing the press-fit.

[0273] A depth D66 of the fixing hole 651H is greater than a depth D26 of the fixing slot 215. In the case where the depth D66 is greater than the depth D26, the channel orifice forming member 25A is detached from the holder 6A more easily than in the case where the depth D66 is smaller than the depth D26.

[0274] As illustrated in FIG. 33, for example, the multiple fixing members 155 are provided near the corners of the rectangular holder 6A as viewed in the Z1 direction. The multiple fixing members 157 are provided on the per-head module 2A basis. Specifically, two fixing members 157 are provided for each head module 2A. One of the two fixing members 157 is located in the Y1 direction relative to the head module 2A, whereas the other is located in the Y2 direction relative to the head module 2A as viewed in the Z1 direction.

[0275] Both the fixing members 155 and 157 are preferably screws. Accordingly, for example, female threads are formed on wall surfaces forming the fixing holes 651H, the fixing holes 652H, the fixing slots 215, and the fixing slots 503. When the fixing members 155 and 157 are the screws, the fixing of the support member 5A and the multiple head modules 2A to the holder 6A can be easily released by rotating and unscrewing the screws. When the fixing members 155 and 157 are the screws, the multiple head modules 2A and the support member 5A can be attached to and detached from the holder 6A as needed without using an adhesive.

[0276] The fixing members 155 and 157 may be members other than the screws, and may be L-shaped or T-shaped pins as in the first embodiment.

[0277] As viewed in the Z1 direction, the fixing members 155 and 157 are arranged so as not to overlap the chip 20 and so as to sandwich the seal areas 4S between the chip 20 and the fixing members 155 and 157.

[0278] In the case where the fixing members 155 and 157 do not overlap the chip 20 as viewed in the Z1 direction, the load generated for fixing with the fixing members 155 and 157 is less likely to be applied to the chip 20 than in the case where the fixing members 155 and 157 overlap the chip 20. Moreover, as viewed in the Z1 direction, the seal member 4 is arranged between the fixing members 155 and 157 and the chip 20, so that the distances of the chip 20 from the fixing members 155 and 157 can be made longer by the dimension of the seal member 4. This also makes the load generated for fixing with the fixing members 155 and 157 unlikely to be applied to the chip 20.

3-1F. Bushing

[0279] As illustrated in FIG. 29, a bushing 526 is arranged between each channel orifice forming member 25A and the support member 5A. Although not illustrated in details, the bushing 526 has a rectangular frame shape along an outer periphery of the channel orifice forming member 25A as viewed in the Z1 direction. The bushing 526 is made of, for example, an elastic elastomer. The provision of the bushing 526 makes it possible to reduce a risk of ink mist or the like

entering the storage space inside the dented portion 610A of the holder 6A from the outside of the liquid ejecting head 1A.

4. Modifications

[0280] The second embodiment described above as the example may be modified in various manners. Examples of specific modifications applicable to the above-described second embodiment will be described below. Any two or more modifications selected from the following examples may be combined as appropriate unless they are mutually inconsistent.

4-1. Ninth Modification

[0281] FIG. 36 is a cross-sectional view of a part of a liquid ejecting head 1A in a ninth modification. The fixing member 157 in the ninth modification illustrated in FIG. 36 fixes the support member 5A in addition to the holder 6A and the head module 2A. In the ninth modification, the fixing members 155 are omitted. According to the ninth modification, the number of fixing members can be reduced as compared with the second embodiment. Thus, according to the ninth modification, the head module 2A can be attached to and detached from the holder 6A by using a smaller number of fixing members than in the first embodiment.

4-2. Tenth Modification

[0282] FIG. 37 is a cross-sectional view of a part of a liquid ejecting head 1A in a tenth modification. In the tenth modification illustrated in FIG. 37, the holder 6A does not include the second dented portion 612. The dented portion 610A of the holder 6A in the tenth modification does not have the step surface. The dented portion 610A is a storage space for storing the relay substrate 70.

[0283] The support member 5A in the tenth modification includes a bottom plate portion 51 and a sidewall 52. The bottom plate portion 51 has a plate shape and has the same structure as the support member 5A in the first embodiment. The sidewall 52 is a frame-shaped portion protruding from an outer edge of the bottom plate portion 51 in the Z2 direction. The support member 5A has a dented portion 510. An inside of the dented portion 510 forms a storage space for storing the multiple head modules 2A.

[0284] The shapes of the holder 6A and the support member 5A are not particularly limited as described above, but may be any shapes as appropriate. One or both of the holder 6A and the support member 5A form the space for storing the head modules 2A.

[0285] The holder 6A in the tenth modification is provided with a fourth alignment portion 642. The fourth alignment portion 642 is provided on the surface 606 of the holder 6A facing in Z2 direction.

[0286] In the tenth modification, for example, each head module 2A is fixed to the support member 5A with an adhesive or the like. For this reason, the head module 2A can be detached from the holder 6A by removing the fixing members 155 and then melting the adhesive with heat. In other words, even when the head module 2A is fixed to the support member 5A with the adhesive, the head module 2A can be considered to be fixed to the support member 5A in the detachably-attached manner if the head module 2A can be separated from the support member 5A by melting the adhesive with heat or doing the like.

4-3. Eleventh Modification

[0287] FIG. 38 is a cross-sectional view of a part of a liquid ejecting head 1A in an eleventh modification. In the eleventh modification illustrated in FIG. 38, the support member 5A is omitted. According to the eleventh modification, the number of components can be reduced as compared with the second embodiment. Since the support member 5A is omitted, the head module 2A can be attached to and detached from the holder 6A more easily than in the second embodiment.

[0288] The fixing members 157 directly fix the head module 2A to the holder 6A. The fixing members 157 do not overlap the chip 20 as viewed in the Z1 direction. Even when the liquid ejecting head 1A does not include the support member 5A, the above arrangement makes it possible to make the reaction force of the seal member 4 unlikely to be transmitted to the chip 20.

4-4. Twelfth Modification

[0289] FIG. 39 is a cross-sectional view of a part of a liquid ejecting head 1A in a twelfth modification. The liquid ejecting head 1A in the twelfth modification illustrated in FIG. 39 includes a holder 8. The holder 8 includes a first holder 81 and a second holder 82. The first holder 81 is the same as the holder 6A in the second embodiment except that the flange portions 64 are omitted.

[0290] The second holder 82 is the same as the support member 5A in the second embodiment except for the following elements. As viewed in the Z1 direction, the second holder 82 includes portions extended more in the Y1 direction and the Y2 direction than the first holder 81. The extended portions are provided with fourth alignment portions 824. The fourth alignment portion 824 has the same structure as the fourth alignment portion 642 in the second embodiment, and is press-fitted into the third alignment portion 102 of the unit base 11.

[0291] The second holder 82 also includes multiple fixing slots 821 and multiple second alignment portions 822. Two fixing slots 821 are provided for each head module 2A. One of the two fixing slots 821 is located in the Y1 direction relative to the chip 20, whereas the other is located in the Y2 direction relative to the chip 20 as viewed in the Z1 direction. Each fixing slot 821 is a slot opened in a surface 512 of the second holder 82 facing in the Z2 direction. The fixing slot 821 may be referred to as a dented portion formed in the surface 512 of the second holder 82 facing in the Z2 direction. The head module 2A includes fixing holes 218H corresponding to the fixing slots 821. Each fixing hole 218H is a hole passing through the channel orifice forming member 25A of the head module 2A.

[0292] Two second alignment portions 822 are provided for each head module 2A. One of the two second alignment portions 822 is located in the Y1 direction relative to the chip 20, whereas the other is located in the Y2 direction relative to the chip 20 as viewed in the Z1 direction. Each second alignment portion 822 is a slot opened in the surface 512 of the second holder 82 facing in the Z2 direction. The second alignment portion 822 is a dented portion formed in the surface 512 of the second holder 82 facing in the Z2 direction and may be regarded as a recess formed in the surface 512.

[0293] In addition, the head module 2A includes first alignment portions 217 corresponding to the second align-

ment portions 822. The first alignment portions 217 are protrusions protruding in the Z1 direction from the surface 251 of the channel orifice forming member 25A facing in the Z1 direction. The first alignment portions 217 are press-fitted into the second alignment portions 822. Thus, the head module 2A is positioned with respect to the holder 8 including the second holder 82.

[0294] A fixing member 158 is inserted into the fixing hole 218H and the fixing slot 821 in this order. The fixing member 158 is, for example, a screw, and female threads are formed on inner wall surfaces forming the fixing hole 218H and the fixing slot 821. The head module 2A is fixed to the second holder 82 with the fixing members 158 inserted and screwed in the fixing holes 218H and the fixing slots 821. The first holder 81 and the second holder 82 are fixed to each other with the fixing members 155 as in the case of the support member 5A and the holder 6A in the second embodiment.

[0295] The second holder 82 of the holder 8 includes multiple openings 5H as in the support member 5A. From the multiple openings 5H, the respective multiple head modules 2A are exposed to the outside. Then, a part of the channel orifice forming member 25A is inserted into each of the openings 5H. For this reason, with the second holder 82 including the multiple openings 5H, an increase in the paper gap can be suppressed as in the case of the support member 5A in the second embodiment. In addition, there is no need to reduce the thickness of the second holder 82 in order to suppress the increase in the paper gap. Accordingly, the stiffness of the second holder 82 can be kept from decreasing.

4-6. Thirteenth Modification

[0296] FIG. 40 is a cross-sectional view of a part of a liquid ejecting head 1A in a thirteenth modification. In the thirteenth modification illustrated in FIG. 40, the fixing holes 218H, the fixing slots 821, and the fixing members 158 are omitted as compared with the twelfth modification. In the thirteenth modification, the support member 5A and the holder 6A may be fixed to each other with the fixing members 155 so as to sandwich the seal members 4 and the head modules 2A in between.

[0297] The second holder 82 and the head modules 2A may be fixed with an adhesive or the like. In the case where the second holder 82 and the head modules 2A are fixed with the adhesive, the second holder 82 and the head modules 2A can be considered to be fixed in the detachably-attached manner if each of the head modules 2A can be separated from the second holder 82 by, for example, melting the adhesive with heat.

4-7. Fifteenth Modification

[0298] FIG. 41 is a cross-sectional view of a part of a liquid ejecting head 1A in a fifteenth modification. FIG. 42 is a topside view of the liquid ejecting head 1A in the fifteenth modification. In the fifteenth modification illustrated in FIG. 41, a positional relationship of the fixing members 157 and the seal members 4 with the chip 20 is different. The minimum distance between the fixing member 157 and the chip 20 is shorter than the minimum distance between the seal member 4 and the chip 20.

[0299] As illustrated in FIG. 42, the fixing members 157 are arranged between the chips 20 and the seal areas 4S so

as not to overlap the chips **20** as viewed in the **Z1** direction. This arrangement is likely to generate the reaction force outside the fixing members **157** as viewed from the chips **20**. Therefore, the reaction force of the seal members **4** can be made particularly unlikely to be transmitted to the chips **20**.

4-8. Sixteenth Modification

[0300] FIG. **43** is a cross-sectional view of a part of a liquid ejecting head **1A** in a sixteenth modification. FIG. **44** is a topside view of the liquid ejecting head **1A** in the sixteenth modification. In the sixteenth modification illustrated in FIGS. **43** and **44**, the fixing members **157** overlap the chips **20** as viewed in the **Z1** direction. Even when the fixing members **157** overlap the chips **20** as viewed in the **Z1** direction, the presence of the support member **5A** may reduce the influence of the reaction force of the seal members **4** on the chips **20** as compared with the case where the support member **5A** is absent.

5. Other Modifications

[0301] The embodiments and the modifications described above as the examples may be modified in various manners. Examples of specific modifications applicable to the above-described embodiments and modifications will be described below. Any two or more modifications selected from the following examples may be combined as appropriate unless they are mutually inconsistent.

[0302] In the above description, the seal members **4** are provided for each head module **2**, but a single seal member **4** may be provided in common to the multiple head modules **2**.

[0303] The “first alignment portion” and the “second alignment portion” are not limited to the structures described in the above embodiments and modifications, as long as one of these portions is press-fitted into the other.

[0304] In the above embodiments, the serial type of liquid ejecting apparatus **100** is described as the example, but the liquid ejecting apparatus may be of a line type in which the multiple nozzles **N** in the head unit **10** are distributed across the entire width of the medium **90**.

[0305] The “liquid ejecting apparatus” may be used in a variety of apparatuses, including facsimile machines and copy machines, in addition to apparatuses dedicated to printing. The use of the liquid ejecting apparatus is not limited to printing. For example, a liquid ejecting apparatus to eject a solution of a pigment may be used as a manufacturing apparatus to form color filters of display devices such as liquid display panels. Instead, a liquid ejecting apparatus to eject a solution of a conductive material may be used as a manufacturing apparatus to form wiring and electrodes for relay substrates. Alternatively, a liquid ejecting apparatus to eject a solution of an organic substance related to living organisms may be used as a manufacturing apparatus to produce, for example, bio chips.

[0306] The present disclosure is described above based on the preferred embodiments, but should not be limited to the above embodiments. The structure of each component of the present disclosure may be replaced with any structure having the same function as in the above embodiments, or any structure may be added as needed.

What is claimed is:

1. A liquid ejecting head comprising:

a first head module configured to eject a liquid in a first direction;

a supply channel member for supplying the liquid to the first head module; and

a first seal member that is arranged between the first head module and the supply channel member in the first direction, thereby liquid-tightly connecting a first channel orifice of the first head module and a channel orifice of the supply channel member, wherein

the first head module includes a channel orifice forming member in which the first channel orifice is formed, and a chip that is arranged in the first direction relative to the channel orifice forming member, and

a seal area of the first seal member held between the channel orifice forming member and the supply channel member does not overlap the chip as viewed in the first direction.

2. The liquid ejecting head according to claim 1, wherein the chip is thinner than the channel orifice forming member and is smaller in outer profile than the channel orifice forming member as viewed in the first direction, and

the first channel orifice is arranged outside the chip as viewed in the first direction.

3. The liquid ejecting head according to claim 1, further comprising a metallic support member that is arranged in the first direction relative to the channel orifice forming member, and that sandwiches the first seal member and the channel orifice forming member between the supply channel member and the support member, wherein

the support member supports the channel orifice forming member with a support area of the support member including an area that overlaps the seal area as viewed in the first direction.

4. The liquid ejecting head according to claim 3, wherein a thickness of the support member in the first direction is greater than a thickness of the chip in the first direction.

5. The liquid ejecting head according to claim 3, wherein the support member includes an opening from which the first head module is exposed to outside, and

a part of the channel orifice forming member is arranged in the opening of the support member.

6. The liquid ejecting head according to claim 3, further comprising a fixing member that fixes the first head module and the supply channel member to each other, wherein

the fixing member is arranged so as not to overlap the chip as viewed in the first direction and so as to sandwich the seal area between the chip and the fixing member, and the support area includes an area arranged between the seal area and the chip as viewed in the first direction.

7. The liquid ejecting head according to claim 1, further comprising a fixing member that fixes the first head module and the supply channel member to each other, wherein

the fixing member is arranged between the chip and the seal area so as not to overlap the chip as viewed in the first direction.

8. The liquid ejecting head according to claim 3, wherein the support member includes an opening from which the first head module is exposed to outside, and

a part of a surface of the channel orifice forming member facing in the first direction is supported by being in

contact with the support member so as to surround the opening of the support member.

9. The liquid ejecting head according to claim 3, further comprising a fixing member that fixes the first head module and the supply channel member to each other, wherein the fixing member overlaps the chip as viewed in the first direction.

10. The liquid ejecting head according to claim 1, further comprising a fixing member that directly fixes the first head module and the supply channel member in a detachably-attached manner, wherein

the fixing member does not overlap the chip as viewed in the first direction.

11. The liquid ejecting head according to claim 1, wherein the seal area is arranged in a longitudinal direction of the first head module relative to the chip as viewed in the first direction.

12. The liquid ejecting head according to claim 1, further comprising:

a second head module configured to eject the liquid supplied from the supply channel member; and

an elastic second seal member that is arranged between the second head module and the supply channel member, thereby liquid-tightly connecting a second channel orifice of the second head module and a channel orifice of the supply channel member, wherein

the second head module includes a channel orifice forming member in which the second channel orifice is formed, and a chip that is arranged in the first direction relative to the channel orifice forming member of the second head module, and

a seal area of the second seal member held between the channel orifice forming member and the supply channel member does not overlap the chip of the second head module as viewed in the first direction.

13. A liquid ejecting apparatus comprising:

a plurality of the liquid ejecting heads according to claim 1; and

a unit base to which the plurality of liquid ejecting heads are fixed.

* * * * *