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(71) Applicant: **Seiko Epson Corporation**
Tokyo 160-8801 (JP)

(72) Inventor: **WANIBE, Akihisa**
Suwa-shi, Nagano 392-8502 (JP)

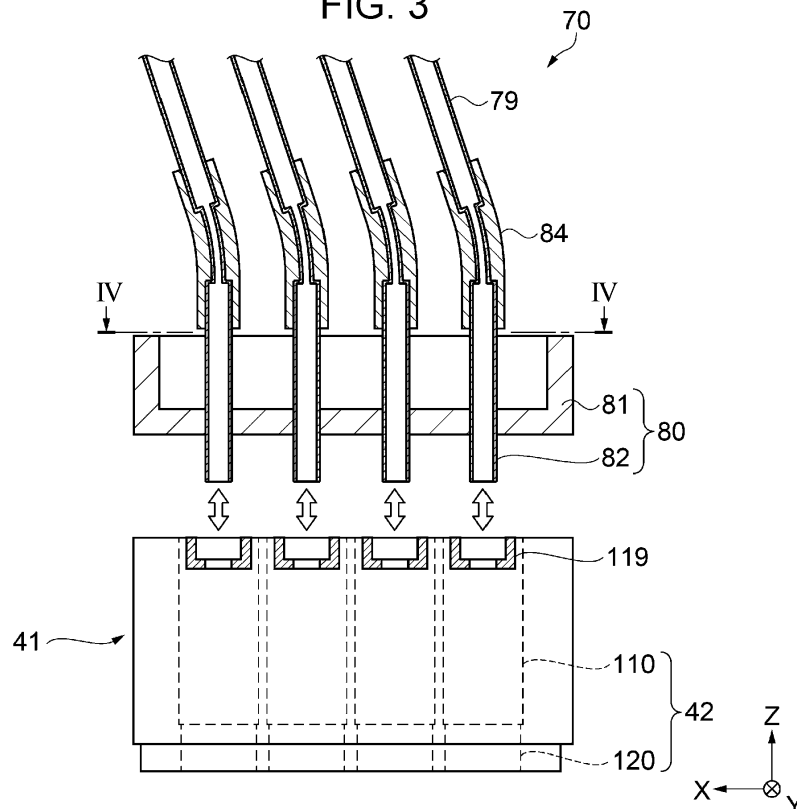
(74) Representative: **Miller Sturt Kenyon**
9 John Street
London WC1N 2ES (GB)

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(54) PRINTING APPARATUS

(57) A printing apparatus includes a head section which discharges a plurality of types of liquid, a plurality of liquid flow paths which supply the liquids to the head section, and a manifold which bundles the plurality of liquid flow paths to connect the liquid flow paths to the

head section, in which the liquid flow paths are connected to manifold pipes which are provided in an inner portion of a housing which has a bottomed lidless box shape of the manifold, and in which the manifold is attachable and detachable with respect to the head section.

FIG. 3**EP 3 403 831 A1**

Description

BACKGROUND

1. Technical Field

[0001] The present invention relates to a printing apparatus.

2. Related Art

[0002] In the related art, there is known an ink jet type printing apparatus which discharges a liquid such as an ink from a head section toward a medium to print an image or the like. In a large printing apparatus which performs printing on a medium which is transported using a transport system such as roll-to-roll, the liquid is supplied from a liquid tank which stores the liquid to a head section using a tube (a liquid flow path) which supplies the liquid. In the printing apparatus, it is necessary to prevent the head section from being damaged by liquid which leaks from the tube. For example, JP-A-2012-192717 discloses an image forming apparatus (a printing apparatus) in which a head (a head section) is covered by a head cover formed in an introduction path which introduces the liquid to a discharge portion.

[0003] The large printing apparatus is used while extending the product life by exchanging components that cause problems. However, the printing apparatus described in JP-A-2012-192717 is configured such that the head section is covered by the head cover and each of a plurality of liquid flow paths is individually attached and detached. Therefore, when it is necessary to exchange the head section, since it is necessary for the user to individually detach and attach the plurality of liquid flow paths and the head cover from the head section, the exchanging work of the head section (hereinafter referred to as head exchanging) is laborious.

SUMMARY

[0004] The invention can be realized in the following aspects or application examples.

Application Example 1

[0005] According to this application example, there is provided a printing apparatus which includes a head section which discharges a plurality of types of liquid, a plurality of liquid flow paths which supply the liquids to the head section, and a manifold which bundles the plurality of liquid flow paths to connect the liquid flow paths to the head section, in which the liquid flow paths are connected to manifold pipes which are provided in an inner portion of a housing which has a bottomed lidless box shape of the manifold, and in which the manifold is attachable and detachable with respect to the head section.

[0006] According to this application example, the liquid

flow paths of the printing apparatus are connected to the manifold pipes which are provided in the inner portion of the housing which has a bottomed lidless box shape of the manifold, and the manifold to which the plurality of liquid flow paths are connected is attachable and detachable with respect to the head section. In other words, the manifold is provided with both a function of storing the liquid which leaks from the liquid flow paths in the inner portion of the housing and a function of attaching and detaching the plurality of liquid flow paths at once with respect to the head section. Therefore, it is possible to prevent the liquid which leaks from the liquid flow paths from reaching the head section and to reduce the labor of the user when performing the head exchanging.

Application Example 2

[0007] In the printing apparatus according to the application example, it is preferable that the housing be provided with a partitioning member which is partitioned for every one of the liquid flow paths which are connected to the manifold pipes.

[0008] According to this application example, since the housing of the manifold is provided with a partitioning member which is partitioned for every one of the liquid flow paths, it becomes easier to identify the liquid flow paths from which the liquid leaks.

Application Example 3

[0009] In the printing apparatus according to the application example, it is preferable that the housing be provided with ribs, which are connected to a side wall of the housing and partition the inner portion of the housing, as the partitioning member.

[0010] According to this application example, the housing is provided with ribs which are connected to the side wall of the housing and partition the inner portion of the housing. Since the per-liquid flow path partitioning is defined by the side wall of the housing of the manifold and the ribs, the liquid that leaks from the liquid flow paths is stored inside the partitions. Accordingly, it is possible to identify the liquid flow paths from which the liquid leaks.

45 Application Example 4

[0011] In the printing apparatus according to the application example, it is preferable that a height of the ribs be lower than the height of the side wall.

[0012] According to this application example, the liquid which leaks from the liquid flow paths is stored inside the partitions which are defined by the side wall of the housing of the manifold and the ribs. Even in a case in which the amount of the liquid which leaks from the liquid flow paths increases and the liquid overflows from the partitions, since the height of the ribs in this application example is lower than the height of the side walls of the housing, the liquid does not leak to the outside of the

housing and is stored in the other partitions that are adjacent. Accordingly, even in a case in which the amount of the liquid that leaks increases, it is possible to prevent the liquid from leaking from the housing of the manifold and reaching the head section.

Application Example 5

[0013] In the printing apparatus according to the application example, it is preferable that an absorbing material which absorbs the liquid be provided in the inner portion of the housing.

[0014] According to this application example, since the absorbing material which absorbs the liquid is provided in the inner portion of the housing of the manifold, in a printing apparatus which performs the printing using a serial head system, it is possible to suppress the scattering of the liquid which is stored in the inner portion of the housing to the outside of the housing using acceleration and deceleration when the head section moves. Since the absorbing material is dyed by the liquid which leaks being absorbed by the absorbing material, it is possible to easily identify the liquid flow paths from which the liquid leaks.

Application Example 6

[0015] In the printing apparatus according to the application example, it is preferable that the housing be provided with an absorbing material which includes slits and absorbs the liquid as the partitioning member.

[0016] According to this application example, the housing is provided with an absorbing material which includes slits and absorbs the liquid. Since the per-liquid flow path partitioning is defined by the side wall of the housing of the manifold and the slits which are formed in the absorbing material, the liquid that leaks from the liquid flow paths is absorbed by the absorbing material which is partitioned by the slits and the absorbing material inside the partitions is dyed. Accordingly, it is possible to easily identify the liquid flow paths from which the liquid leaks.

Application Example 7

[0017] In the printing apparatus according to the application example, it is preferable that a height of the absorbing material of a portion which contacts the side wall be lower than a height of the side wall.

[0018] According to this application example, by setting the height of the absorbing material of the portion which contacts the side wall of the housing of the manifold lower than the height of the side wall, it is possible to prevent the liquid which is absorbed by the absorbing material from leaking to the outside of the housing.

Application Example 8

[0019] In the printing apparatus according to the appli-

cation example, it is preferable that the height of the absorbing material of a portion which does not contact the side wall be higher than the height of the side wall.

[0020] According to this application example, by setting the height of the absorbing material of the portion which does not contact the side wall of the housing of the manifold higher than the height of the side wall, it is possible to increase a volume of the liquid which can be absorbed by the absorbing material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] Embodiments of the invention will now be described by way of example only with reference to the accompanying drawings, wherein like numbers reference like elements.

Fig. 1 is a schematic diagram schematically illustrating the overall configuration of a printing apparatus according to an embodiment.

Fig. 2 is an overview diagram describing a liquid flow path which supplies a liquid to a head section.

Fig. 3 is a lateral sectional diagram illustrating a state before a manifold is connected to the head section.

Fig. 4 is a plan view of a section taken along a line IV-IV in Fig. 3.

Fig. 5 is a lateral sectional diagram illustrating a state after the manifold is connected to the head section.

Fig. 6 is a lateral sectional diagram illustrating the configuration of the manifold according to Modification Example 1.

Fig. 7 is a plan view of a section taken along a line VII-VII in Fig. 6.

Fig. 8 is a lateral sectional diagram illustrating the configuration of the manifold according to Modification Example 2.

Fig. 9 is a plan view of a section taken along a line IX-IX in Fig. 8.

Fig. 10 is a lateral sectional diagram illustrating the configuration of the manifold according to Modification Example 3.

Fig. 11 is a plan view of a section taken along a line XI-XI in Fig. 10.

Fig. 12 is a lateral sectional diagram illustrating the configuration of the manifold according to Modification Example 4.

Fig. 13 is a plan view of a section taken along a line XIII-XIII in Fig. 12.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0022] Hereinafter, the embodiments of the invention will be described with reference to the drawings. In the drawings used in the following description, the scale of each layer and each member is depicted differently from actuality to render each layer and each member a visually recognizable size.

[0023] In Figs. 1, 3, and 5, to facilitate explanation,

three axes, an X-axis, a Y-axis, and a Z-axis that orthogonally intersect each other are depicted, and the tip sides of the arrows depicting the axial directions are denoted as "+ sides", and the base sides are denoted as "- sides". Hereinafter, a direction parallel to the X-axis will be referred to as "an X-axis direction", a direction parallel to the Y-axis will be referred to as "a Y-axis direction", and a direction parallel to the Z-axis will be referred to as "a Z-axis direction".

Embodiment

Configuration of Printing Apparatus

[0024] Fig. 1 is a schematic diagram schematically illustrating the overall configuration of a printing apparatus according to the embodiment. First, a description will be given of the overall configuration of a printing apparatus 100 according to the embodiment with reference to Fig. 1. In the embodiment, a description will be given exemplifying the printing apparatus 100 of an ink jet type in which textile printing is performed on a medium 95 by forming an image or the like on the medium 95.

[0025] As illustrated in Fig. 1, the printing apparatus 100 is provided with a medium transport section 20, a medium adhering section 60, a printing section 40, a drying unit 27, a cleaning unit 50, and the like. The printing apparatus 100 also includes a control section 1 which controls these parts. The parts of the printing apparatus 100 are attached to a frame portion 92.

[0026] The medium transport section 20 transports the medium 95 in a transport direction (the +Y-axis direction in the printing section 40). The medium transport section 20 is provided with a medium supply section 10, transport rollers 21 and 22, a transport belt 23, a belt rotating roller 24, a belt drive roller 25, transport rollers 26 and 28, and a medium collection portion 30. First, a description will be given of the transport path of the medium 95 from the medium supply section 10 to the medium collection portion 30. In the embodiment, a direction going along gravity is the Z-axis, a direction in which the medium 95 is transported in the printing section 40 is the Y-axis, and the width direction of the medium 95 which intersects both the Z-axis and the Y-axis is the X-axis.

[0027] The medium supply section 10 supplies the medium 95 on which to form the image to the printing section 40 side. It is possible to use a woven or non-woven textile formed from natural fibers, cotton, silk, hemp, mohair, wool, cashmere, recycled fibers, synthetic fibers, nylon, polyurethane, polyester, a mixed spin of these, or the like as the medium 95, for example. A preprocessing agent for promoting color exhibition properties and fixing properties may be applied to the woven or non-woven textile. The medium supply section 10 includes a supply shaft portion 11 and a bearing portion 12. The supply shaft portion 11 is formed in a cylindrical shape or a columnar shape and is provided to be capable of rotating in a circumferential direction. The band-shaped medium 95 is

wound on the supply shaft portion 11 in a roll shape. The supply shaft portion 11 is attached to the bearing portion 12 to be attachable and detachable. Accordingly, the medium 95 which is in a state of being wound onto the supply shaft portion 11 in advance is configured to be attachable to the bearing portion 12 together with the supply shaft portion 11. The winding direction of the medium 95 which is held on the supply shaft portion 11 is an example and the configuration is not limited thereto. A configuration may be adopted in which the medium 95 is supplied from a roll in which the recording surface is wound on the inside.

[0028] The bearing portion 12 supports both ends of the supply shaft portion 11 in the axial direction such that the supply shaft portion 11 is capable of rotating. The medium supply section 10 includes a rotation drive section (not illustrated) which rotationally drives the supply shaft portion 11. The rotation drive section causes the supply shaft portion 11 to rotate in a direction in which the medium 95 is fed out. The operation of the rotation drive section is controlled by the control section 1. The transport rollers 21 and 22 relay the medium 95 from the medium supply section 10 to the transport belt 23.

[0029] The transport belt 23 transports the medium 95 in the transport direction (the +Y-axis direction). The transport belt 23 is formed in an endless shape in which both end portions of a band-shaped belt are connected and is attached to the belt rotating roller 24 and the belt drive roller 25. The transport belt 23 is held in a state in which a predetermined tensile force acts on the transport belt 23 such that the portion between the belt rotating roller 24 and the belt drive roller 25 is parallel to a floor surface 99. An adhesive layer 29 which adheres to the medium 95 is provided on a surface 23a (a support surface) of the transport belt 23. The transport belt 23 supports (holds) the medium 95 which is transported from the transport roller 22 and is adhered to the adhesive layer 29 by the medium adhering section 60 (described later). Accordingly, it is possible to treat a cloth or the like with elasticity as the medium 95.

[0030] The belt rotating roller 24 and the belt drive roller 25 support an inner circumferential surface 23b of the transport belt 23. A support portion which supports the transport belt 23 is provided between the belt rotating roller 24 and the belt drive roller 25.

[0031] The belt drive roller 25 includes a motor (not illustrated) which rotationally drives the belt drive roller 25. When the belt drive roller 25 is rotationally driven, the transport belt 23 rotates together with the rotation of the belt drive roller 25 and the belt rotating roller 24 rotates according to the rotation of the transport belt 23. The medium 95 which is supported on the transport belt 23 is transported in a predetermined transport direction (the +Y-axis direction) according to the rotation of the transport belt 23 and an image is formed on the medium 95 by the printing section 40 (described later).

[0032] In the embodiment, the medium 95 is supported on the side (the +Z-axis side) at which the surface 23a

of the transport belt 23 faces the printing section 40 and the medium 95 is transported from the belt rotating roller 24 side to the belt drive roller 25 side (the +Y-axis direction) together with the transport belt 23. On the side (the -Z-axis side) at which the surface 23a of the transport belt 23 faces the cleaning unit 50, only the transport belt 23 is transported from the belt drive roller 25 side to the belt rotating roller 24 side (the -Y-axis direction). Although the transport belt 23 is described as being provided with the adhesive layer 29 which adheres to the medium 95, the configuration is not limited thereto. For example, the transport belt may be an electrostatic attracting transport belt which attracts the medium to the belt using electrostatic attraction.

[0033] The transport roller 26 separates the medium 95 on which the image is formed from the adhesive layer 29 of the transport belt 23. The transport rollers 26 and 28 relay the medium 95 from the transport belt 23 to the medium collection portion 30.

[0034] The medium collection portion 30 collects the medium 95 which is transported by the medium transport section 20. The medium collection portion 30 includes a winding shaft portion 31 and a bearing portion 32. The winding shaft portion 31 is formed in a cylindrical shape or a columnar shape and is provided to be capable of rotating in a circumferential direction. The band-shaped medium 95 is wound on the winding shaft portion 31 in a roll shape. The winding shaft portion 31 is attached to the bearing portion 32 to be attachable and detachable. Accordingly, the medium 95 which is in a state of being wound onto the winding shaft portion 31 is configured to be removable together with the winding shaft portion 31.

[0035] The bearing portion 32 supports both ends of the winding shaft portion 31 in the axial direction such that the winding shaft portion 31 is capable of rotating. The medium collection portion 30 includes a rotation drive section (not illustrated) which rotationally drives the winding shaft portion 31. The rotation drive section causes the winding shaft portion 31 to rotate in a direction in which the medium 95 is wound up. The operation of the rotation drive section is controlled by the control section 1. The winding direction of the medium 95 which is held on the medium collection portion 30 (refer to Fig. 1) is an example and the configuration is not limited thereto. A configuration may be adopted in which the recording surface of the medium 95 is wound on the inside.

[0036] Next, a description will be given of the parts which are provided along the medium transport section 20.

[0037] The medium adhering section 60 adheres the medium 95 to the transport belt 23. The medium adhering section 60 is provided closer to the upstream side (the -Y-axis side) than the printing section 40. The medium adhering section 60 includes a pressing roller 61, a pressing roller drive section 62, and a roller support portion 63. The pressing roller 61 is formed in a cylindrical shape or a columnar shape and is provided to be capable of rotating in a circumferential direction. The pressing roller

61 is disposed such that the axial line direction intersects the transport direction so as to rotate in a direction along the transport direction. The roller support portion 63 is provided on the inner circumferential surface 23b side of the transport belt 23 facing the pressing roller 61 to interpose the transport belt 23.

[0038] The pressing roller drive section 62 causes the pressing roller 61 to move in the transport direction (the +Y-axis direction) and the reverse direction from the transport direction (the -Y-axis direction) while pressing the pressing roller 61 to the bottom side (the -Z-axis side) in the vertical direction. The medium 95 which is overlaid on the transport belt 23 is pressed against the transport belt 23 between the pressing roller 61 and the roller support portion 63. Accordingly, it is possible to reliably adhere the medium 95 to the adhesive layer 29 which is provided on the surface 23a of the transport belt 23 and it is possible to prevent the occurrence of lifting of the medium 95 on the transport belt 23.

[0039] The printing section 40 is disposed above (on the +Z-axis side of) the disposition position of the transport belt 23 and performs printing on the medium 95 which is mounted on the surface 23a of the transport belt 23. The printing section 40 is provided with a head section 41, a carriage 43, a carriage transport section 93, and the like. The head section 41 discharges a plurality of liquids toward the medium 95, the head section 41 is mounted on the carriage 43, and the carriage transport section 93 moves the carriage 43 in the width direction (the X-axis direction) of the medium 95 intersecting the transport direction. The head section 41 of the embodiment is configured by a plurality of discharge heads 42 which discharge liquids such as inks of the colors yellow, cyan, magenta, black, and the like, for example, and the various liquids are supplied to the discharge heads 42 from a liquid tank 71 (described later, refer to Fig. 2) via liquid flow paths 70 and a manifold 80.

[0040] The carriage transport section 93 causes the head section 41 to move reciprocally along the X-axis direction together with the carriage 43. The carriage transport section 93 is provided above (on the +Z-axis direction side of) the transport belt 23 and includes a pair of guide rails 93a, 93b, and the like which extends along the X-axis direction. The guide rails 93a and 93b support the carriage 43. The carriage 43 is guided along the X-axis direction by the guide rails 93a and 93b and is supported by the guide rails 93a and 93b in a state of being capable of reciprocal movement in the X-axis direction.

[0041] The carriage transport section 93 is provided with a movement mechanism and a motive force source which are not illustrated. It is possible to adopt a mechanism which combines a ball screw and a ball nut, a linear guide mechanism, or the like as the movement mechanism, for example. A motor (not illustrated) is provided in the carriage transport section 93 as a motive force source for moving the carriage 43 along the X-axis direction. It is possible to adopt various motors such as a stepping motor, a servo motor, and a linear motor as the mo-

tor. When the motor is driven by the control of the control section 1, the head section 41 moves reciprocally along the X-axis direction together with the carriage 43.

[0042] An image or the like is formed on the medium 95 by alternately repeating a main scan in which the control section 1 controls the carriage transport section 93 and the head section 41 to move the head section 41 (the carriage 43) while causing the liquids to be discharged from the discharge heads 42 and a sub-scan in which the control section 1 controls the medium transport section 20 to transport the medium 95 in the transport direction. In the embodiment, although a serial head system which is mounted on the carriage 43 which moves reciprocally and which discharges the liquids while moving in the width direction (the X-axis direction) of the medium 95 is exemplified as the head section 41, a line head system which extends in the width direction of the medium 95 and is fixed to be lined up may be used.

[0043] The drying unit 27 is provided between the transport roller 26 and the transport roller 28. The drying unit 27 dries the liquid which is discharged onto the medium 95. The drying unit 27 includes an IR heater, and it is possible to dry the liquid which is discharged onto the medium 95 in a short time by driving the IR heater. Accordingly, it is possible to wind the band-shaped medium 95 on which the image or the like is formed onto the winding shaft portion 31.

[0044] The cleaning unit 50 cleans the transport belt 23. The cleaning unit 50 is configured by a cleaning section 51, a pressing section 52, and a moving section 53. The moving section 53 is capable of integrally moving the cleaning unit 50 along the floor surface 99 and fixing the cleaning unit 50 at a predetermined position. The cleaning unit 50 is disposed between the belt rotating roller 24 and the belt drive roller 25 in the Y-axis direction.

[0045] The pressing section 52 is a lifting and lowering device which is configured by an air cylinder 56 and a ball bush 57, for example, and is capable of moving the cleaning section 51 which is provided on the top portion of the pressing section 52 between a cleaning position and a withdrawn position. The cleaning position is a position at which a cleaning roller 58 and a blade 55 abut against the transport belt 23. The withdrawn position is a position at which the cleaning roller 58 and the blade 55 are distanced from the transport belt 23. The cleaning section 51 cleans the surface (the support surface) 23a of the transport belt 23 from below (the -Z-axis direction) at the cleaning position. Fig. 1 illustrates a case in which the cleaning section 51 is lifted and is disposed at the cleaning position.

[0046] The cleaning section 51 includes a cleaning tank 54, the cleaning roller 58, and the blade 55. The cleaning tank 54 is a tank which stores the liquid which is adhered to the surface 23a of the transport belt 23 and the cleaning liquid which is used in the cleaning of foreign matter, and the cleaning roller 58 and the blade 55 are provided on the inside of the cleaning tank 54. It is possible to use water or a water soluble solvent (an alcohol

aqueous solution or the like), for example, as the cleaning liquid, and a surfactant and an antifoaming agent may be added as necessary.

[0047] The bottom side (the -Z-axis side) of the cleaning roller 58 is immersed in the cleaning liquid which is stored in the cleaning tank 54. When the cleaning roller 58 rotates at the cleaning position, the cleaning liquid is supplied to the surface 23a of the transport belt 23 and the cleaning roller 58 and the transport belt 23 slide on each other. Accordingly, the liquid which is adhered to the transport belt 23 and the fibers of the cloth which serves as the medium 95 and the like are removed by the cleaning roller 58.

[0048] It is possible to form the blade 55 using a flexible material such as silicon rubber. The blade 55 is provided closer to the downstream side than the cleaning roller 58 in the movement direction of the transport belt 23. The cleaning liquid which remains on the surface 23a of the transport belt 23 is removed by the sliding of the transport belt 23 and the blade 55 on each other.

Configuration of Liquid Flow Path

[0049] Fig. 2 is an overview diagram describing a liquid flow path which supplies a liquid to a head section. Next, a description of the configuration of the liquid flow path will be given with reference to Fig. 2.

[0050] The liquid flow path 70 supplies the liquid to the head section 41. A number of lines of the liquid flow paths 70 corresponding to the types of the liquid to be discharged from the head section 41 is provided in the printing apparatus 100. Since the lines of the liquid flow paths 70 have the same configuration, a single line of the liquid flow paths 70 is illustrated in Fig. 2.

[0051] The liquid flow path 70 is connected between the liquid tank 71 which stores the liquid and the manifold 80 which bundles a plurality of lines of the liquid flow paths 70 to connect the liquid flow paths 70 to the head section 41. The liquid flow path 70 supplies the liquid from the liquid tank 71 to the discharge head 42 via the manifold 80. The liquid tank 71 may be configured to be capable of being filled with the liquid via a filling hole (not illustrated) in a state of being installed in the printing apparatus 100, and may be configured such that the cartridge-shaped liquid tank 71 is installed in the printing apparatus 100 to be attachable and detachable.

[0052] A pump 72, a filter 73, a degassing section 74, an opening-closing valve 75, a sub-tank 76, a pump 77, and an opening-closing valve 78 are provided in the liquid flow path 70 from the liquid tank 71 side toward the manifold 80 side. The spaces between the liquid tank 71, the manifold 80, and these parts are connected by tube-shaped liquid pipes 79.

[0053] The pumps 72 and 77 have a role of causing the liquid to flow and the opening-closing valves 75 and 78 have a role of restricting the flow of the liquid. The liquid flow path 70 is configured such that the flowing of the liquid from the liquid tank 71 side toward the discharge

head 42 side is made possible by opening the opening-closing valves 75 and 78 and driving the pumps 72 and 77.

[0054] The filter 73 is for capturing foreign matter and the like in the liquid and is exchangeable. Accordingly, even in a case in which the flow of the liquid in the liquid flow path 70 is degraded by a large amount of the foreign matter and the like being captured in the filter 73, it is possible to improve the flow by exchanging the filter 73.

[0055] The degassing section 74 is provided with a cylindrical hollow fiber membrane 74a which forms a portion of the liquid flow path 70, a pressure reducing mechanism which reduces the pressure of the liquid of the liquid flow path 70 to assist in the degassing, and the like. The pressure reducing mechanism is provided with a pressure reducing chamber 74b which stores the hollow fiber membrane 74a, a pump (not illustrated) capable of reducing the pressure of the pressure reducing chamber 74b, and the like. When the pump reduces the pressure of the pressure reducing chamber 74b, the space on the outside of the hollow fiber membrane 74a is reduced in pressure and the gas which is dissolved in the liquid inside the hollow fiber membrane 74a is sucked to the outside of the hollow fiber membrane 74a, and so the liquid inside of the hollow fiber membrane 74a is degassed.

[0056] The sub-tank 76 includes a holding bag 76a in a holding chamber 76b and has a role as a liquid holding portion which receives a supply of the liquid from the liquid tank 71, is capable of holding the liquid, and is capable of supplying the liquid to the discharge head 42. The sub-tank 76 includes a pressurizing section (not illustrated) which compresses the holding bag 76a and the liquid which is stored inside the holding bag 76a is pressurized by the pressurizing section and the pump 77 and is supplied to the discharge head 42 under pressure. It is possible to execute work such as replenishing the liquid of the liquid tank 71 or exchanging the liquid tank 71 while supplying the liquid from the sub-tank 76 to the discharge head 42 by closing the opening-closing valve 75.

[0057] The discharge head 42 includes a valve unit 110 and a liquid discharge section 120. The valve unit 110 is connected to the liquid flow path 70 via the manifold 80 and the liquid discharge section 120 discharges the liquid.

[0058] The valve unit 110 adjusts the flow pressure of the liquid which is supplied to the liquid discharge section 120 such that the liquid is stably discharged from nozzles 124 of the liquid discharge section 120.

[0059] The valve unit 110 includes a liquid inlet path 111, a liquid supply chamber 112, a filter 113 which is provided inside the liquid supply chamber 112, a valve body 114, a pressure chamber 115, and a liquid outlet path 116. The liquid which is supplied under pressure from the liquid flow path 70 is supplied to the liquid discharge section 120 via the liquid inlet path 111, the liquid supply chamber 112, the valve body 114, the pressure chamber 115, and the liquid outlet path 116.

[0060] The liquid is supplied from the liquid inlet path 111 to the liquid supply chamber 112 in a pressurized state. The valve body 114 is disposed between the liquid supply chamber 112 and the pressure chamber 115 and opens and closes the flow path between the liquid supply chamber 112 and the pressure chamber 115.

[0061] During the printing operation, due to the pressure of the pressure chamber 115 dropping according to the consumption of the liquid, the liquid is sequentially replenished from the liquid supply chamber 112 to the pressure chamber 115 while the valve body 114 is slightly opened. The pressure fluctuation of the liquid inside the liquid supply chamber 112 is restricted by the opening and closing of the valve body 114 to stay within a fixed range and is divorced from the pressure changing of the liquid inside the pressure chamber 115. Therefore, even if a pressure change occurs on the upstream side of the valve body 114, there is no influence of the pressure change on the downstream side of the valve body 114. Therefore, the pressure which acts on the liquid inside the pressure chamber 115 in the valve unit 110 is controlled to be within a fixed range and the flow pressure of the liquid which is supplied to the liquid discharge section 120 is adjusted.

[0062] In other words, the valve unit 110 adjusts the pressure of the liquid which is supplied to the liquid discharge section 120 such that a negative pressure acts on the liquid which is supplied to the nozzles 124 such that the liquid does not leak from the nozzles 124 of the liquid discharge section 120 when not printing, and the liquid is appropriately ejected from the nozzles 124 when printing.

[0063] The liquid discharge section 120 includes a liquid inlet path 121, a common liquid chamber 122, pressure generating chambers 123, the nozzles 124, and the like.

[0064] The liquid is supplied to the common liquid chamber 122 from the valve unit 110 via the liquid inlet path 121. A plurality of the pressure generating chambers 123 are provided for the common liquid chamber 122 corresponding one-to-one with the plurality of nozzles 124. The common liquid chamber 122 is a liquid chamber that is common to the plurality of pressure generating chambers 123 and the nozzles 124 communicate with the common liquid chamber 122 via the pressure generating chambers 123. The plurality of nozzles 124 form a nozzle row 125 which lines up along the transport direction (the Y-axis direction) of the medium 95.

[0065] The pressure generating chamber 123 is provided with an actuator (not illustrated) which expands and contracts the volume of the pressure generating chamber 123. When the pressure generating chamber 123 expands, the pressure generating chamber 123 is filled with the liquid from the common liquid chamber 122. When the pressure generating chamber 123 contracts, the liquid inside the pressure generating chamber 123 is discharged from the nozzle 124 which communicates with the pressure generating chamber 123. It is possible

to adopt a piezoelectric actuator which uses an inverse piezoelectric effect of the piezoelectric body, an electrostatic actuator which uses an electrostatic force, or the like as the actuator, for example. A mechanism which uses a heat generating body to generate bubbles and discharge the liquid may be adopted.

[0066] Next, a description will be given of the configuration of the manifold.

[0067] Fig. 3 is a lateral sectional diagram illustrating a state before a manifold is connected to the head section. Fig. 4 is a plan view of a section taken along a line IV-IV in Fig. 3. Fig. 5 is a lateral sectional diagram illustrating a state after the manifold is connected to the head section. A description will be given of the configuration of the manifold 80 with reference to Figs. 3 to 5.

[0068] The manifold 80 includes a housing 81 and a manifold pipe 82. The housing 81 has a bottomed lidless box shape and the manifold pipe 82 penetrates the bottom wall of the housing and protrudes from the bottom wall in both directions ($\pm Z$ -axis directions). The manifold 80 of the embodiment is provided with eight of the manifold pipes 82 which are lined up in two columns and four rows. In other words, the printing apparatus 100 is provided with eight lines of the liquid flow paths 70 corresponding to eight types of the liquid, and the head section 41 which is configured by eight of the valve units 110 corresponding to the eight types of the liquid and eight of the liquid discharge sections 120 corresponding to eight of the nozzle rows 125 which discharge the eight types of the liquid. The head section 41 may be configured integrally and may be a head unit which combines the plurality of discharge heads 42.

[0069] The liquid flow path 70 is connected to the inner portion of the housing 81 of the manifold 80. Specifically, the liquid pipe 79 of each of the liquid flow paths 70 is connected to the distal end of the corresponding manifold pipe 82 which protrudes from the upper side of the bottom wall of the housing 81 in the $+Z$ -axis direction using a joint portion 84 which connects one pipe to another. In other words, the eight lines of the liquid flow paths 70 are connected to be bundled on the inner portion of the housing 81 by the eight manifold pipes 82. Even in a case in which the liquid leaks from the liquid pipe 79 or the joint portion 84 of the liquid flow path 70 due to degradation with the passage of time or the like of the printing apparatus 100 over a long period, as illustrated in Fig. 5, the liquid which is leaked is stored in the inner portion of the housing 81 of the manifold 80. Accordingly, it is possible to prevent the liquid which leaks from reaching the head section 41 and damaging the head section 41.

[0070] The distal end of each of the manifold pipes 82 which protrudes in the $-Z$ -axis direction from the bottom wall is connected to the liquid inlet path 111 of the corresponding valve unit 110 which is provided with a bush 119 which receives the manifold pipe 82 such that it is possible to remove and to insert the manifold pipe 82. Accordingly, in the manifold 80, it is possible to attach and detach the eight lines of the liquid flow paths 70 with

respect to the head section 41. In other words, since the plurality of liquid flow paths 70 are connected to the manifold pipes 82 which are provided in the manifold 80, it is possible to remove and to insert the plurality of liquid flow paths 70 with respect to the head section 41 all at once by attaching and detaching the manifold 80 with respect to the head section 41. Accordingly, since it is not necessary to individually attach and detach the plurality of liquid flow paths 70 when there is a problem with the head section 41 (the discharge heads 42), it is possible to reduce the labor of the head exchanging which is performed by the user. A configuration may be adopted in which it is possible to perform the attachment and the detachment in one operation by adjusting the shapes or the contact state of the manifold pipes 82 and the bush(es) 119. The one operation referred to here indicates that it is possible to attach and detach the manifold 80 with respect to the head section 41 with a single operation.

[0071] In the embodiment, a description is given of an example in which the invention is applied to the printing apparatus 100 of an ink jet type which performs textile printing on the medium 95. However, it is possible to apply the invention to any printing apparatus of an ink jet type which supplies the liquid to the head section 41 (the discharge heads 42) which discharges the liquid using the liquid flow paths 70 (tubes).

[0072] In the embodiment, a configuration in which the valve unit 110 is included in the discharge head 42 is exemplified. However, a configuration may be adopted in which the valve unit 110 is included on the manifold 80 side.

[0073] The number of lines of the liquid flow paths 70 and the number and disposition of the manifold pipes 82 are examples and the configuration is not limited thereto.

[0074] As described above, according to the printing apparatus 100 according to the embodiment, it is possible to obtain the following effects.

[0075] The printing apparatus 100 includes the manifold 80 which bundles the plurality of liquid flow paths 70 and connects the plurality of liquid flow paths 70 to the head section 41. The plurality of liquid flow paths 70 are connected to the inner portion of the housing 81 which has a bottomed lidless box shape. Even in a case in which the liquid leaks from the liquid pipe 79 or the joint portion 84 of the liquid flow path 70, the liquid which is leaked is stored in the inner portion of the housing 81 of the manifold 80. Accordingly, it is possible to prevent the liquid which leaks from reaching the head section 41 and damaging the head section 41.

[0076] The manifold 80 is configured such that it is possible to attach and detach the plurality of liquid flow paths 70 with respect to the head section 41. Accordingly, since it is not necessary to individually attach and detach the plurality of liquid flow paths 70 when there is a problem with the head section 41 (the discharge heads 42), it is possible to reduce the labor of the head exchanging which is performed by the user.

[0077] The invention is not limited to the embodiments

and it is possible to add various modifications and improvements to the embodiments. Modification examples will be described hereinafter.

Modification Example 1

[0078] Fig. 6 is a lateral sectional diagram illustrating the configuration of the manifold according to Modification Example 1. Fig. 7 is a plan view of a section taken along a line VII-VII in Fig. 6. Next, a description will be given of the configuration of a manifold 180 with reference to Figs. 6 and 7. Components which are the same as those in the embodiment will be given the same numbers, and duplicate description will be omitted.

[0079] An absorbing material 185 which absorbs the liquid is provided in the inner portion of the housing 81 of the manifold 180. The liquid which leaks from the liquid flow path 70 is absorbed by the absorbing material 185. It is possible to use a porous material which is formed by old paper, polyurethane, or the like as the absorbing material 185, for example. Accordingly, it is possible to suppress the scattering of the liquid which is stored in the inner portion of the housing 81 of the manifold 180 to the outside of the housing 81 using acceleration and deceleration when the head section 41 is moved by a main scan. Since the absorbing material 185 is dyed by the liquid which leaks, it is possible to identify the liquid flow path 70 from which the liquid leaks. It is possible to exchange the absorbing material 185 with respect to the housing 81 using a slit (not illustrated) or the like.

[0080] As illustrated in Fig. 6, the height of an absorbing material 185b of a portion which contacts a side wall 81a of the housing 81 in the absorbing material 185 is preferably lower than the height of the side wall 81a. Accordingly, it is possible to prevent the liquid which is absorbed by the absorbing material 185 from traveling along the side wall 81a of the manifold 180 and leaking to the outside of the housing 81.

[0081] In the absorbing material 185, the height of the absorbing material 185a of a portion which does not contact the side wall 81a of the housing 81 is preferably higher than the height of the side wall 81a. Accordingly, it is possible to increase the volume of the liquid which can be absorbed by the absorbing material 185.

Modification Example 2

[0082] Fig. 8 is a lateral sectional diagram illustrating the configuration of the manifold according to Modification Example 2. Fig. 9 is a plan view of a section taken along a line IX-IX in Fig. 8. Next, a description will be given of the configuration of a manifold 280 with reference to Figs. 8 and 9. Components which are the same as those in the embodiment will be given the same numbers, and duplicate description will be omitted.

[0083] The inner portion of the housing 81 of the manifold 280 is partitioned for every liquid flow path 70 which is connected to the manifold 280. In this modification ex-

ample, a partition 287 is defined by the side wall 81a of the housing 81 of the manifold 280 and ribs 286 which partition the inner portion of the housing 81 in a lattice shape. As illustrated in Fig. 9, the periphery of each of the eight manifold pipes 82 which is connected to the liquid pipe 79 is partitioned and defined by the side wall 81a and the ribs 286. Accordingly, since the liquid which leaks from the liquid flow paths 70 is stored inside the partitions 287, even in a case in which the liquid leaks from the plurality of liquid flow paths 70, it is possible to identify the liquid flow paths 70 from which the liquid leaks.

[0084] As illustrated in Fig. 8, the height of the ribs 286 is lower than the height of the side wall 81a of the housing 81. Even in a case in which the amount of the liquid which leaks from the liquid flow path 70 increases and the liquid overflows from the partitions 287 which are defined by the side wall 81a and the ribs 286, since the height of the ribs 286 in this modification example is lower than the height of the side wall 81a, the liquid does not leak to the outside of the housing 81 and is stored in the other partitions 287 that are adjacent. Accordingly, even in a case in which the amount of the liquid that leaks increases, it is possible to prevent the liquid from leaking from the housing 81 of the manifold 280 and reaching the head section 41.

[0085] The absorbing material which is described in Modification Example 1 may be provided inside each of the partitions 287 which are partitioned by the side wall 81a and the ribs 286.

Modification Example 3

[0086] Fig. 10 is a lateral sectional diagram illustrating the configuration of the manifold according to Modification Example 3. Fig. 11 is a plan view of a section taken along a line XI-XI in Fig. 10. Next, a description will be given of the configuration of a manifold 380 with reference to Figs. 10 and 11. Components which are the same as those in the embodiment will be given the same numbers, and duplicate description will be omitted.

[0087] The inner portion of the housing 81 of the manifold 380 is partitioned for every liquid flow path 70 which is connected to the manifold 380. In this modification example, a partition 388 is defined by the side wall 81a of the housing 81 and slits 387 which are formed in an absorbing material 385. Specifically, as illustrated in Fig. 11, the inner portion of the housing 81 is provided with the absorbing material 385 in the shape of a wall which partitions the space of each of the eight manifold pipes 82 which are connected to the liquid pipes 79. In the wall-shaped absorbing material 385, the slits 387 which are intervals that divide the thickness direction of the wall into two are provided, and the periphery of each of the manifold pipes 82 is partitioned and defined by the slits 387 and the side wall 81a.

[0088] In other words, the periphery of each of the eight manifold pipes 82 which is connected to the liquid pipe

79 is surrounded by the side wall 81a and the absorbing material 385 which is provided along the slit 387 which defined the partition 388. Accordingly, since the liquid which leaks from the liquid flow path 70 is absorbed by the absorbing material 385 inside the partition 388 and the absorbing material 385 is dyed, even in a case in which the liquid leaks from the plurality of liquid flow paths 70, it is possible to easily identify the liquid flow paths 70 from which the liquid leaks.

[0089] The absorbing material 385 of this modification example is preferably formed by a porous material such that, in the same manner as the absorbing material which is described in Modification Example 1, the height of the portion which contacts the side wall 81a is lower than the height of the side wall 81a and the height of the portion which does not contact the side wall 81a is higher than the height of the side wall 81a.

Modification Example 4

[0090] Fig. 12 is a lateral sectional diagram illustrating the configuration of the manifold according to Modification Example 4. Fig. 13 is a plan view of a section taken along a line XIII-XIII in Fig. 12. Next, a description will be given of the configuration of a manifold 480 with reference to Figs. 12 and 13. Components which are the same as those in the embodiment will be given the same numbers, and duplicate description will be omitted.

[0091] An absorbing material 485 which absorbs the liquid is provided in the inner portion of the housing 81 of the manifold 480. Slits 487 which partition the spaces of the eight manifold pipes 82 which are connected to the liquid pipes 79 are provided in the absorbing material 485. The periphery of each of the manifold pipes 82 is partitioned and defined by the slits 487 and the side wall 81a of the housing 81. Accordingly, since the liquid which leaks from the liquid flow path 70 is absorbed by the absorbing material 485 inside the partition 488 and the absorbing material 485 is dyed, even in a case in which the liquid leaks from the plurality of liquid flow paths 70, it is possible to easily identify the liquid flow paths 70 from which the liquid leaks.

[0092] The absorbing material 485 of this modification example is preferably formed by a porous material such that, in the same manner as the absorbing material which is described in Modification Example 1, the height of the portion which contacts the side wall 81a is lower than the height of the side wall 81a and the height of the portion which does not contact the side wall 81a is higher than the height of the side wall 81a.

a plurality of liquid flow paths (70) configured to supply the liquids to the head section; and a manifold (80) which bundles the plurality of liquid flow paths to connect the liquid flow paths to the head section, wherein the liquid flow paths are connected to manifold pipes (82) which are provided in an inner portion of a housing (81) which has a bottomed lidless box shape, and wherein the manifold is attachable and detachable with respect to the head section.

2. The printing apparatus according to Claim 1, wherein the housing is provided with a partitioning member (286) which is partitioned for every one of the liquid flow paths which are connected to the manifold pipes.
3. The printing apparatus according to Claim 2, wherein the housing is provided with ribs (286), which are connected to a side wall (81a) of the housing and partition the inner portion of the housing, as the partitioning member.
4. The printing apparatus according to Claim 3, wherein a height of the ribs is lower than the height of the side wall.
5. The printing apparatus according to any one of the preceding claims, wherein an absorbing material (185) which absorbs the liquid is provided in an inner portion of the housing.
6. The printing apparatus according to Claim 2, wherein the housing is provided with an absorbing material (385) which includes slits (387) and absorbs the liquid as the partitioning member.
7. The printing apparatus according to Claim 5 or Claim 6, wherein a height of the absorbing material of a portion (185b) which contacts the side wall (81a) is lower than a height of the side wall.
8. The printing apparatus according to Claim 7, wherein the height of the absorbing material of a portion (185a) which does not contact the side wall (81a) is higher than the height of the side wall.

Claims

1. A printing apparatus (100) comprising:
 - a head section (41) configured to discharge a plurality of types of liquid;

FIG. 1

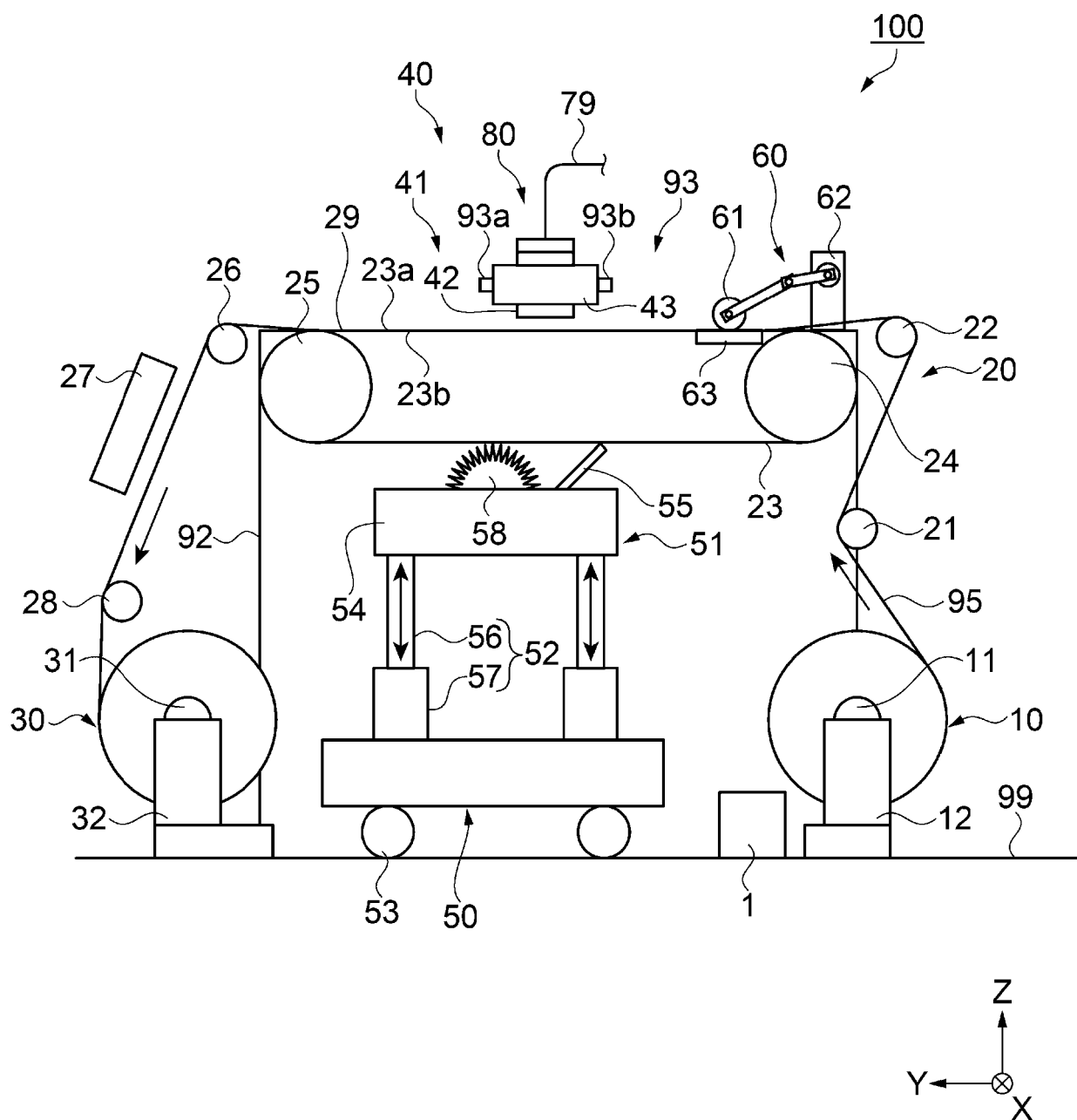


FIG. 2

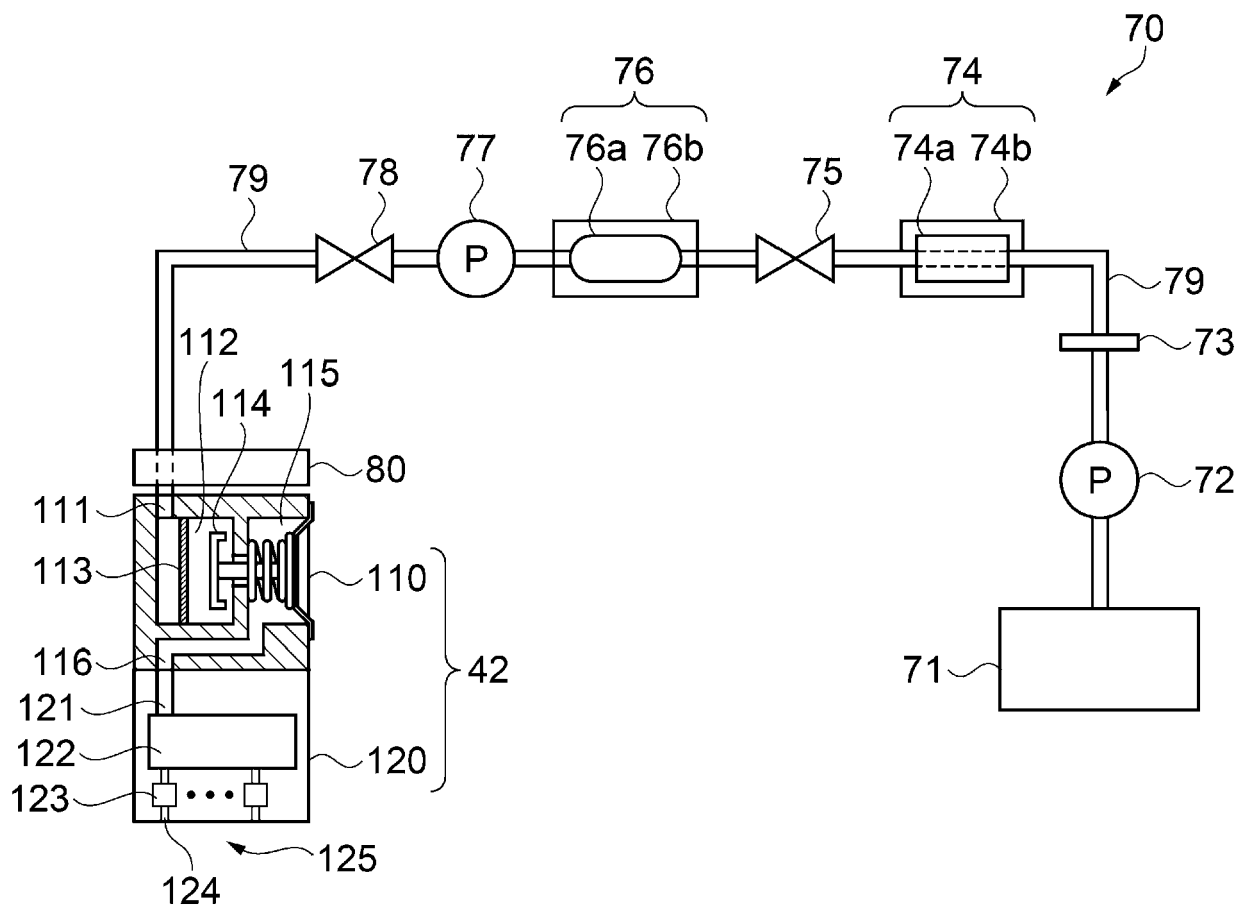


FIG. 3

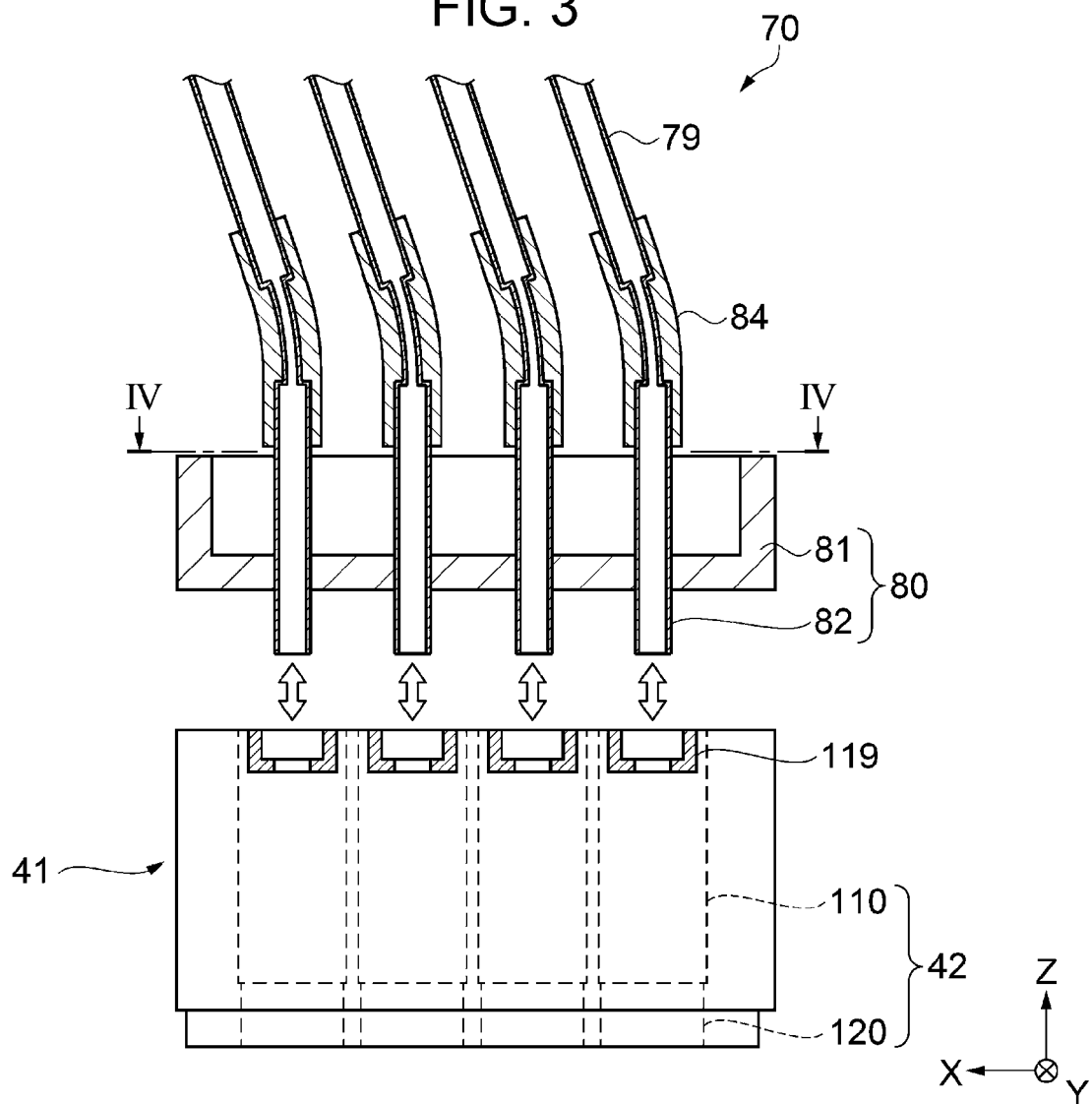


FIG. 4

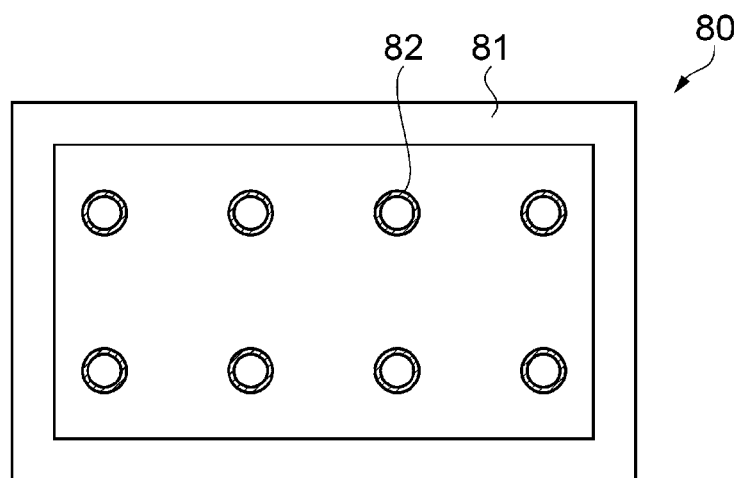


FIG. 5

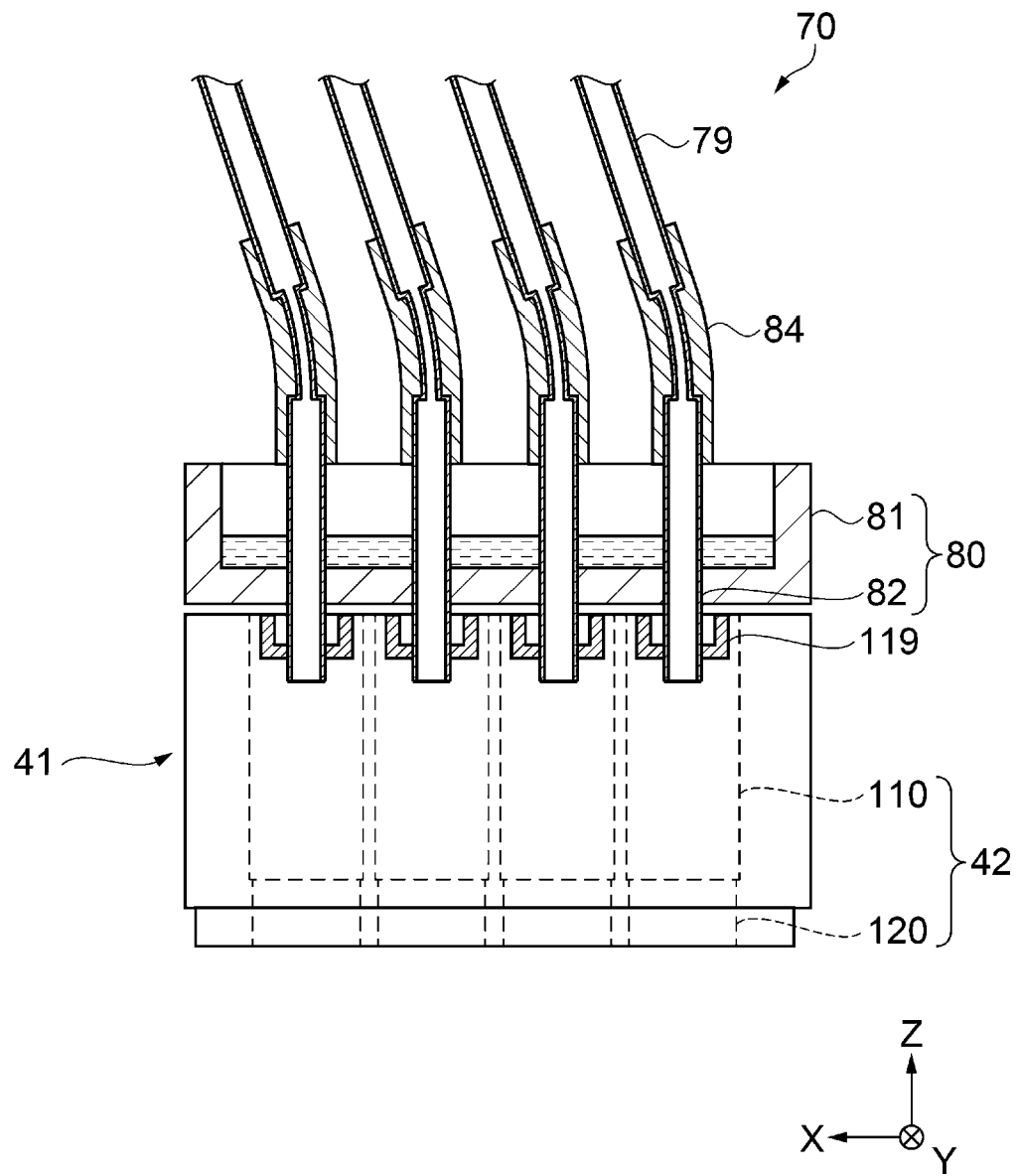


FIG. 6

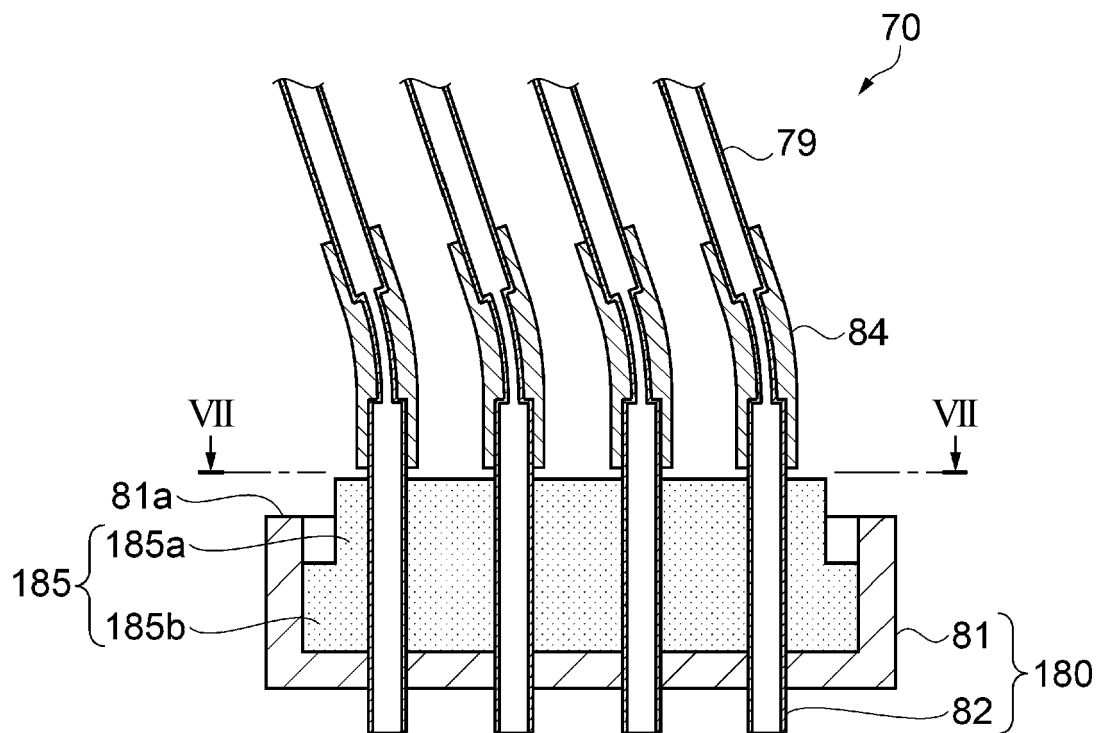


FIG. 7

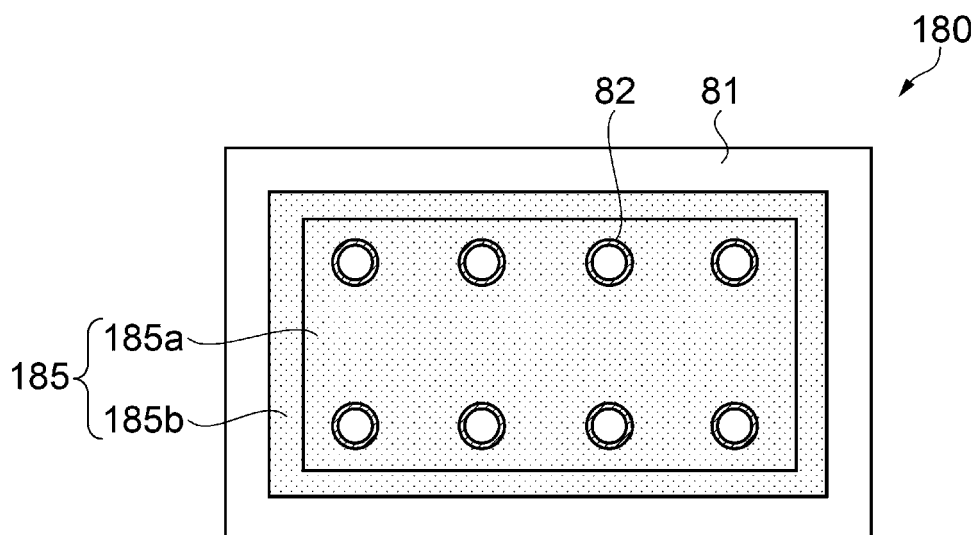


FIG. 8

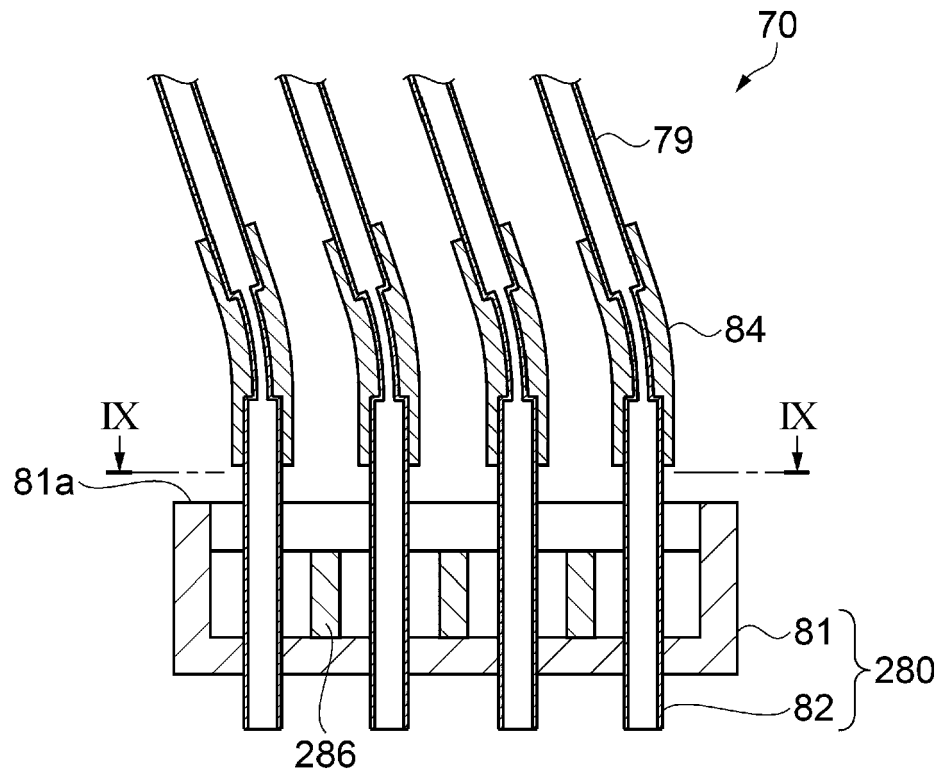


FIG. 9

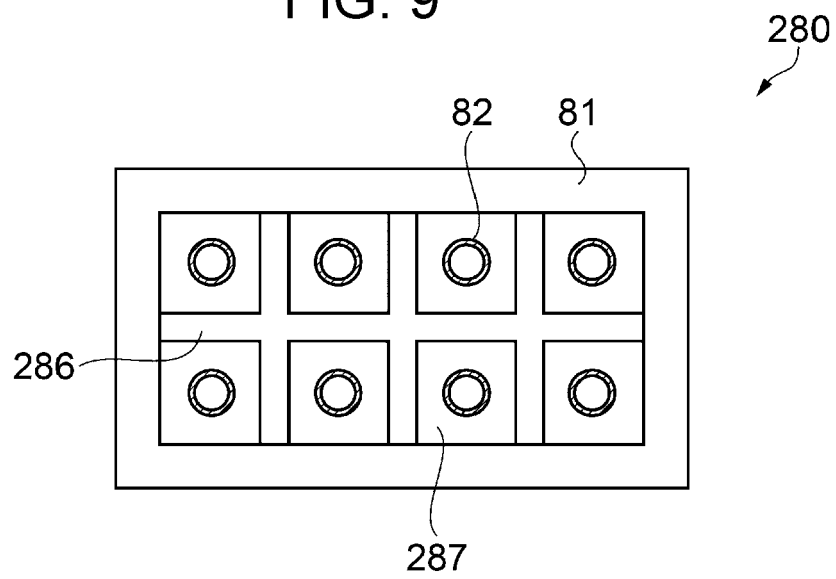


FIG. 10

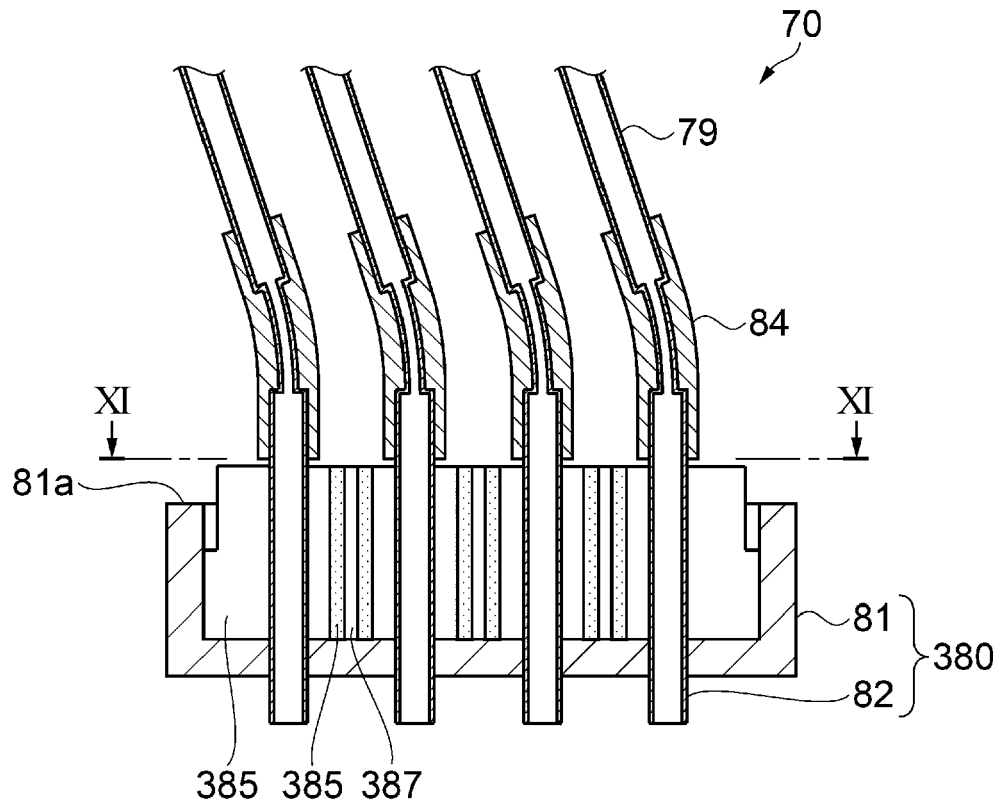


FIG. 11

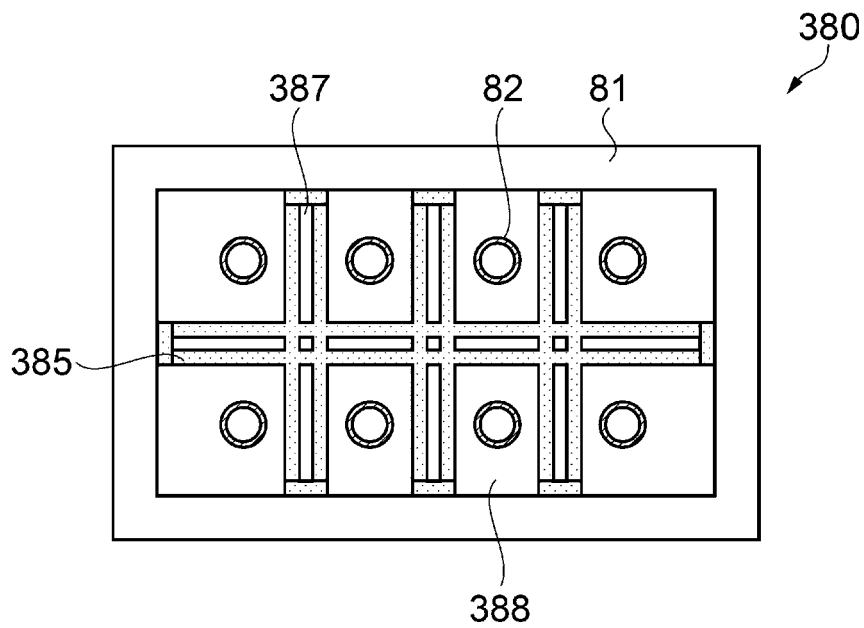


FIG. 12

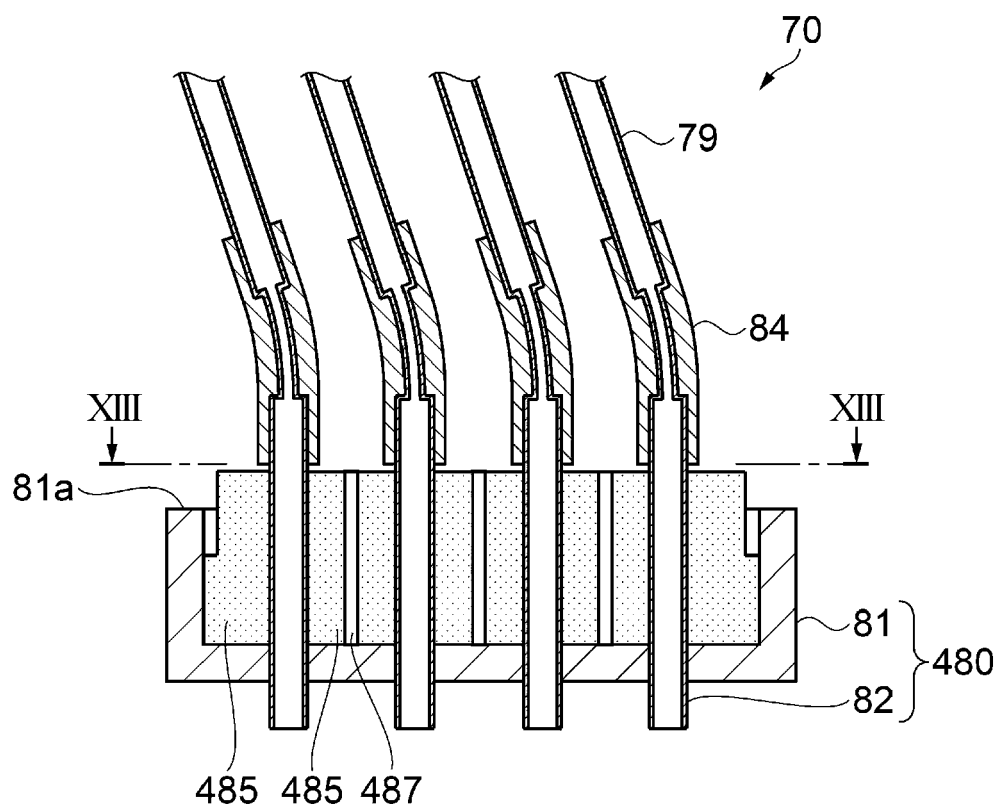
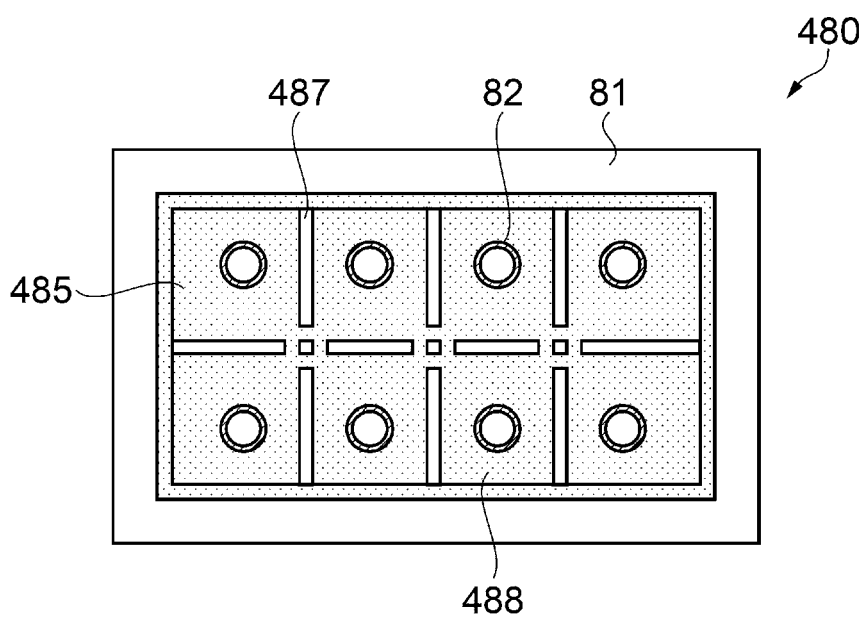


FIG. 13





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A	[0086], [0087]; figure 8 *	6-8	

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A	* paragraphs [0014], [0015]; figure 9 *	1-6,8	

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			B41J
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 September 2018	Examiner Bitane, Rehab
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