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Liquid ejection head and liquid ejection apparatus

Abstract

A liquid ejection head and liquid ejection apparatus are capable of reducing or preventing a decrease in image quality without increasing the chip size. To achieve this, a configuration is employed in which a bonding layer is not provided between a liquid supply substrate and channel partitions between common supply channels and common collection channels, and a minute communication portion is provided there.

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Background/Summary

BACKGROUND OF THE INVENTION
Field of the Invention
(1) The present invention relates to a liquid ejection head for ejecting a circulated liquid, and a liquid ejection apparatus on which a liquid ejection head is mountable.
Description of the Related Art
(2) A problem with liquid ejection heads that eject liquids is so-called crosstalk in which a pressure fluctuation occurring in response to ejection of a droplet from an ejection port through a pressure chamber propagates to other pressure chambers through a liquid channel and changes ejection characteristics.
(3) Also, in recent years, there have been demands for liquid ejection heads to eject liquids in pressure chambers while circulating these liquids, in addition to demands to achieve higher image quality and resolution.

(4) Japanese Patent Laid-Open No. 2019-155909 discloses a configuration in which common supply channels and common collection channels are alternately disposed, and dampers are provided on part of walls forming the common supply channels and the common collection channels to suppress crosstalk. In the configuration of Japanese Patent Laid-Open No. 2019-155909, a damper member, which serves as the dampers, is joined to upper portions of channel partitions between the common supply channels and the common collection channels.
(5) Configurations such as the one in Japanese Patent Laid-Open No. 2019-155909 need sufficient joining areas on the upper portions of the channel partitions. In this case, however, the damper areas and the fluid areas may be small. The decrease in the size of the damper areas may increase the crosstalk, and the decrease in the size of the fluid areas may increase the pressure drop. This may consequently decrease the image quality. On the other hand, in a case where the joining areas are made small, the bonding layer may stick out of the joining portions, which leads to a concern about closure of the channels or the like. This may consequently decrease the image quality. Moreover, it is not preferable to increase the chip size in order to provide sufficient damper areas, fluid areas, and joining areas.
SUMMARY OF THE INVENTION
(6) In view of the above, the present invention provides a liquid ejection head and liquid ejection apparatus capable of reducing or preventing a decrease in image quality without increasing the chip size.
(7) A liquid ejection head of the present invention includes: an ejection port from which to eject a liquid; a pressure chamber communicating with the ejection port; a pressure generating element provided in the pressure chamber and being capable of ejecting the liquid from the ejection port by applying a pressure; an individual supply channel communicating with the pressure chamber and being capable of supplying the liquid to the pressure chamber; an individual collection channel communicating with the pressure chamber and being capable of collecting the liquid from the pressure chamber; a common supply channel communicating with the individual supply channel; a common collection channel communicating with the individual collection channel; and a channel partition provided between the common supply channel and the common collection channel, in which a plurality of the ejection ports and a plurality of the pressure chambers are provided, the common supply channel and the common collection channel communicate with a plurality of the individual supply channels and a plurality of the individual collection channels, respectively, and a communication portion communicating with the common supply channel and the common collection channel is provided at an area which is present between a first substrate where the channel partition is formed and a second substrate laminated on the first substrate, and corresponds to the channel partition.
(8) According to the present invention, it is possible to provide a liquid ejection head and liquid ejection apparatus capable of reducing or preventing a decrease in image quality without increasing the chip size.
(9) Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is a schematic perspective view illustrating a liquid ejection apparatus on which liquid ejection heads are mountable;
(2) FIG. **2** is an external perspective view illustrating a liquid ejection head;
(3) FIG. **3**A is a view illustrating a liquid ejection substrate;
(4) FIG. **3**B is a view illustrating the liquid ejection substrate;

(5) FIG. **3**C is a view illustrating the liquid ejection substrate;
(6) FIG. **3**D is a view illustrating the liquid ejection substrate;
(7) FIG. **4**A is a view illustrating a liquid ejection substrate;
(8) FIG. **4**B is a view illustrating the liquid ejection substrate;
(9) FIG. **5** is a view illustrating a liquid ejection substrate;
(10) FIG. **6** is a cross-sectional view illustrating a liquid ejection substrate as a comparative example;
(11) FIG. **7** is a graph illustrating a relation between the height of a minute communication portion and a viscous resistance ratio;
(12) FIG. **8**A is a view illustrating a liquid ejection substrate;
(13) FIG. **8**B is a view illustrating the liquid ejection substrate;
(14) FIG. **9**A is a view illustrating a liquid ejection substrate;
(15) FIG. **9**B is a view illustrating the liquid ejection substrate;
(16) FIG. **10**A is a view illustrating a modification of the liquid ejection substrate; and
(17) FIG. **10**B is a view illustrating the modification of the liquid ejection substrate.

DESCRIPTION OF THE EMBODIMENTS

First Embodiment

(18) A liquid ejection head and liquid ejection apparatus according to the present embodiment are applicable to apparatuses such as printers, copiers, facsimile machines having a communication system, and word processors having a printer unit, as well as industrial printing apparatuses combining various processing apparatuses.

(19) A first embodiment of the present invention will be described below with reference to drawings.

(20) FIG. **1** is a schematic perspective view illustrating a liquid ejection apparatus **101** on which liquid ejection heads **1** are mountable, the liquid ejection heads **1** being liquid ejection heads to which the present embodiment is applicable. The liquid ejection apparatus **101** forms an image on a print medium **111** by ejecting liquids (hereinafter also referred to as “inks”) from the liquid ejection heads **1** while moving the print medium **111** to a position opposed to the liquid ejection surfaces of the liquid ejection heads **1**. The liquid ejection heads **1** mounted on the liquid ejection apparatus **101** include liquid ejection heads **1**Ca and **1**Cb for a cyan (C) ink and liquid ejection heads **1**Ma and **1**Mb for a magenta (M) ink. The liquid ejection heads **1** further include liquid ejection heads **1**Ya and **1**Yb for a yellow ink and liquid ejection heads **1**Ka and **1**Kb for a black (K) ink.

(21) A plurality of ejection ports are provided in the liquid ejection heads **1** along an X direction along the width of the print medium **111**. The print medium **111** is conveyed in an A direction by a conveyance unit **110**, and printing is performed thereon by the liquid ejection heads **1**.

(22) FIG. **2** is an external perspective view illustrating a liquid ejection head **1**. Each liquid ejection head **1** in the present embodiment has four liquid ejection substrates **2** disposed in a head main body **4**. The liquid ejection substrates **2** are disposed such that end portions of arrays of ejection ports **3** extending in the X direction overlap one another in a Y direction. Disposing the liquid ejection substrates **2** in this manner enables printing with long ejection port arrays. The ink to be ejected by the liquid ejection head **1** is supplied to the liquid ejection substrates **2** from a liquid tank (not illustrated) through a common supply port (not illustrated) in the head main body **4**,

(23) FIG. **3**A is a view illustrating a liquid ejection substrate **2** as seen from the ejection port surface side where ejection ports **3** are formed. FIG. **3**B is a view illustrating the liquid ejection substrate **2** as seen from the side opposite to the ejection port surface. The plurality of ejection ports **3** formed in an ejection port substrate **201** are disposed along the longitudinal direction of the ejection port substrate **201**, and form a plurality of ejection port arrays. A plurality of connection channels **15** are formed in a channel formation substrate **204**. The ink is supplied from some of the connection channel **15** into the liquid ejection substrate **2**, and is ejected from the ejection ports **3** through internal channels to be applied to the print medium **111**.

(24) In the head main body **4**, there is disposed an electric substrate (not illustrated) for supplying electric power and signals necessary for ejecting the liquid. This electric substrate is connected to terminals **10** on each liquid ejection substrate **2** by wirings (not illustrated). The liquid ejection head **1** can be configured in any forms including the example of FIG. **2**, and other forms are not limited.
(25) FIG. **3**C is a cross-sectional view of the liquid ejection substrate **2** along the IIIC-IIIC line in FIG. **3**A. The liquid ejection substrate **2** includes the ejection port substrate **201**, an actuator substrate **202**, a liquid supply substrate **203**, and the channel formation substrate **204**. The liquid ejection substrate **2** further includes a damper substrate **302** including a damper member **300** between the channel formation substrate **204** and the liquid supply substrate **203**. Thus, the liquid ejection substrate **2** includes five substrates.
(26) FIG. **3**D is an enlarged view of the circled part IIID in FIG. **3**C. A plurality of pressure chambers **11** are provided in the liquid ejection substrate **2**. Each pressure chamber **11** is formed so as to communicate with an ejection port **3**. In the actuator substrate **202**, which forms some walls of the pressure chambers **11**, piezoelectric elements **18** are provided so as to face the ejection ports **3**. The liquid can be ejected from the ejection ports **3** by actuating the piezoelectric elements **18**. By receiving a voltage, the piezoelectric elements **18** deform so as to pressurize the liquid inside the pressure chambers **11** and eject the liquid in the form of droplets from the ejection ports **3**. Also, individual supply channels **12***a* and individual collection channels **12***b* are formed so as to communicate with the pressure chambers **11**. Each individual supply channel **12***a* communicates with a common supply channel **13***a*. Each individual collection channel **12***b* communicates with a common collection channel **13***b*. The individual supply channels **12***a* are configured to be capable of supplying the liquid to the pressure chambers **11**. The individual collection channels **12***b* are configured to be capable of collecting the liquid from the pressure chambers **11**.
(27) The walls of the common supply channels **13***a* facing the individual supply channels **12***a* are formed by the damper member **300**. The walls of the common collection channels **13***b* facing the individual collection channels **12***b* are formed by the damper member **300**. The surfaces of the damper member **300** opposite to its surfaces facing the individual collection channels **12***b* form some of damper areas **301**. The common supply channels **13***a* are connected to connection channels **15***a*, and the liquid is supplied from the outside to the common supply channels **13***a* through the connection channels **15***a*, The common collection channels **13***b* are connected to connection channels **15***b*, and the liquid is collected from the common collection channels **13***b* to the outside through the connection channels **15***b*.
(28) The ejection port substrate **201**, the actuator substrate **202**, the liquid supply substrate **203**, and the channel formation substrate **204** can each be a silicon substrate or the like. They are not limited to separate substrates.
(29) The damper member **300** is made of an elastic material. For example, resin materials such as polyimides and polyamides are usable. As for the damper substrate **302**, the damper member **300** is affixed to one surface of a silicon substrate, and openings are formed in the damper member **300** according to the shapes of the channels in the channel formation substrate **204** by means such as etching. Then, the damper substrate **302** is affixed to the channel formation substrate **204**, and the surface opposite to the damper member **300** is etched. In this way, the common supply channels **13***a* and the common collection channels **13***b* can be formed. The means for forming the openings in the damper member **300** can be dry etching, or patterning using light exposure in a case where the damper member **300** is a photosensitive resin.
(30) In the present embodiment, a configuration in which the liquid is ejected from the ejection ports **3** by actuating the piezoelectric elements **18** has been exemplarily described. The configuration, however, is not limited to this one and may be such that the liquid is ejected from the ejection ports by actuating pressure generating elements, such as heating elements.
(31) FIG. **4**A is an enlarged transparent plan view illustrating a part of a liquid ejection substrate **2**.

FIG. **4**B is a cross section along the IVB-IVB line in FIG. **4**A. In the liquid ejection substrate **2**, there are disposed a plurality of ejection ports **3**, and pressure chambers **11** communicating with the ejection ports **3** and provided corresponding to the ejection ports **3**. Also, in the liquid ejection substrate **2**, a plurality of ejection port arrays each formed by arraying ejection ports **3** in the X direction are formed side by side in the Y direction, and an individual supply channel **12***a* and an individual collection channel **12***b* are formed for each pressure chamber **11**. The common supply channels **13***a* and the common collection channels **13***b* are formed so as to extend in the X direction, which is the longitudinal direction of the substrate. Moreover, the damper areas **301** are disposed so as to overlap the positions of the individual supply channels **12***a* and the individual collection channels **12***b*. Furthermore, the individual supply channels **12***a* are connected to the supply connection channels **15***a* through the common supply channels **13***a*, and the individual collection channels **12***b* are connected to the collection connection channels **15***b* through the common collection channels **13***b*.

(32) The pressure chambers **11** corresponding to the ejection ports are adjacent to one another in the X direction, which is the transverse direction of the pressure chambers **11**. By being adjacent in this manner, the ejection ports communicating with the pressure chambers **11** form ejection port arrays. This enables an increase in density. For example, in the present embodiment, the length of each pressure chamber **11** in its transverse direction (X direction) is 110 μm, and the pressure chambers **11** and the ejection ports **3** are disposed at intervals of 150 dpi. The plurality of ejection port arrays are disposed so as to be offset from one another in the Y direction, Such an arrangement enables a high ejection port density of 600 dpi on a print medium. In the present embodiment, four ejection port arrays are disposed to achieve 600 dpi. Alternatively, the configuration may be such that eight ejection port arrays are disposed to achieve 1200 dpi.

(33) As mentioned earlier, by receiving a voltage, the piezoelectric elements **18** deform so as to pressurize the liquid inside the pressure chambers **11** and eject the liquid in the form of droplets from the ejection ports **3**. At this time, pressure fluctuations occur in the pressure chambers **11**. Increasing the density of the ejection ports **3** not only brings the pressure chambers **11** closer to one another but also brings the common supply channels **13***a* and the common collection channels **13***b* closer to one another. This will lead to so-called crosstalk in which the pressure fluctuation occurring in response to ejection of a droplet from an ejection port propagates through the corresponding pressure chamber **11**, common supply channel **13***a*, and common collection channel **13***b* to other pressure chambers. The pressure generated in the pressure chamber **11** at the time of ejection propagates from the pressure chamber **11** through the corresponding individual supply channel **12***a* and individual collection channel **12***b* to the corresponding common supply channel **13***a* and common collection channel **13***b*. The pressure then propagates through the common supply channel **13***a* and the common collection channel **13***b* to the other pressure chambers.

(34) The damper substrate **302** forms part of the common supply channels **13***a* and the common collection channels **13***b*, and channel partitions **16** are provided between the common supply channels **13***a* and the common collection channels **13***b*. In the present embodiment, the channel partitions **16** are made thin. This shortens the distances between the common supply channels **13***a* and the common collection channels **13***b* without narrowing the common supply channels **13***a* and the common collection channels **13***b* in the Y direction. Also, the damper areas **301** are disposed so as to extend along the longitudinal direction of the liquid ejection substrate **2**, which is the X direction. This increases the size of the damper areas **301** without increasing the size of the liquid ejection substrate **2**.

(35) The damper areas **301** are provided at positions opposed to the individual supply channels **12***a* and the individual collection channels **12***h*. The damper areas **301** are configured to enable the damper member **300** to receive pressures propagating through the individual supply channels **12***a* and the individual collection channels **12***b* and get deformed to absorb pressure fluctuations. In the channel formation substrate **204**, the damper areas **301**, which permit the deformation of the

damper member **300**, and the supply connection channels **15***a* or the collection connection channels **15***b* are formed alternately.
(36) FIG. **5** is a cross-sectional view along the IVB-IVB line in FIG. **4**A but illustrates a cross section as seen from the direction opposite to FIG. **4**B. FIG. **6** is a cross-sectional view illustrating a liquid ejection substrate as a comparative example.
(37) In each liquid ejection substrate **2** in the present embodiment, the common supply channels **13***a* and the common collection channels **13***b* are formed by affixing and laminating the liquid supply substrate **203** and the damper substrate **302**, which includes the damper member **300**, with a bonding layer **19**. The bonding layer **19** is provided with a bonding area including an adhesive material and a non-bonding area including no adhesive material. When the liquid supply substrate **203** and the damper substrate **302** are affixed to each other, the area between the liquid supply substrate **203** and the channel partitions **16** between the common supply channels **13***a* and the common collection channels **13***b* is the non-bonding area, and the bonding layer **19** is not provided there. The bonding layer **19** is not provided between the liquid supply substrate **203** and the channel partitions **16**, and a minute communication portion **20** is provided there. The portion of the damper substrate **302** where the common supply channels **13***a*, the common collection channels **13***b*, or the channel partitions **16** are not provided is the bonding area, and the bonding layer **19** is provided there.
(38) In a case of affixing the substrates in a usual manner with a bonding layer, the configuration is such that the bonding layer **19** is provided also on the channel partitions **16**, as illustrated in FIG. **6**. Note that, in a case where the channel partitions are made thin as in the present embodiment, the channel partitions do not have enough area on which to provide the bonding layer. Consequently, the bonding layer may stick out into the common supply channels and the common collection channels. In the case where the bonding layer sticks out into the common supply channels and the common collection channels, there will be a possibility of closure of the common supply channels and the common collection channels or a decrease in the size of the channel areas, which may lead to an increased pressure loss.
(39) By employing a configuration in which the bonding layer **19** is not provided on the channel partitions **16** between the common supply channels **13***a* and the common collection channels **13***b* as in the present embodiment, sufficient areas are provided for the common supply channels **13***a* and the common collection channels **13***b*, thereby reducing the pressure loss. Moreover, providing the minute communication portion **20** allows generation of flows in stagnating regions at upper portions of the common supply channels **13***a* and the common collection channels **13***b* (lower portions in the direction of gravity during use) and thus reduces stagnation. This facilitates the flow of bubbles and so on in the common supply channels **13***a* and the common collection channels **13***b* by circulatory flows.
(40) Incidentally, in a case where the dimension of the minute communication portion **20** is large, the amount of the circulatory flows flowing through the individual supply channels **12***a*, the pressure chambers **11**, and the individual collection channels **12***b* in this order will be small. For this reason, the dimension of the minute communication portion **20** is preferably small, and the channel resistance of the minute communication portion **20** is preferably large.
(41) FIG. **7** is a graph in which the horizontal axis represents the height of the minute communication portion **20**, and the vertical axis represents the ratio between the viscous resistance of the minute communication portion **20** and the viscous resistance of ejection channels (channels from the individual supply channels **12***a* through the pressure chambers **11** to the individual collection channels **12***b*). The viscous resistance of the channel at the minute communication portion **20** is 100 times the viscous resistance of the ejection channels or more and desirably 1000 times or more. The height of the minute communication portion **20** is 7 μm or less and desirably 3 μm or less.
(42) As described above, the configuration is such that the bonding layer **19** is not provided

between the liquid supply substrate **203** and the channel partitions **16** between the common supply channels **13***a* and the common collection channels **13***b*, and the minute communication portion **20** is provided there. This makes it possible to provide a liquid ejection head and liquid ejection apparatus capable of reducing or preventing a decrease in image quality without increasing the chip size.

Second Embodiment

(43) A second embodiment of the present invention will be described below with reference to drawings. Note that the basic configuration in the present embodiment is similar to that in the first embodiment, and the characteristic configuration will therefore be described below.

(44) FIG. **8**A is a partial cross-sectional view of a liquid ejection substrate **2** in the present embodiment. **8**B is a cross-sectional view of the liquid ejection substrate **2**. In the liquid ejection substrate **2** in the present embodiment, the individual supply channels **12***a*, the individual collection channels **12***b*, the common supply channels **13***a*, and the common collection channels **13***b* are disposed in the liquid supply substrate **203**. Such a configuration eliminates the need for the damper substrate **302** in the first embodiment and reduces the number of substrates, thereby allowing a cost reduction.

(45) In the present embodiment, the damper member **300** is provided between the liquid supply substrate **203** and the channel formation substrate **204**, and the bonding layer **19** is provided between the damper member **300** and the liquid supply substrate **203**. Moreover, the channel partitions **16** are provided on the liquid supply substrate **203**, the bonding layer **19** is not provided between the channel partition **16** and the damper member **300**, and the minute communication portion **20** is provided there.

(46) By, employing a configuration in which the bonding layer **19** is not provided on the channel partitions **16** between the common supply channels **13***a* and the common collection channels **13***b* as described above, sufficient areas are provided for the common supply channels **13***a* and the common collection channels **13***b*, thereby reducing the pressure loss. Moreover, providing the minute communication portion **20** allows generation of circulatory flows on the damper areas **301** and reduces stagnation. This facilitates the flow of bubbles and so on in the common supply channels **13***a* and the common collection channels **13***b* by the circulatory flows.

Third Embodiment

(47) A third embodiment of the present invention will be described below with reference to drawings. Note that the basic configuration in the present embodiment is similar to that in the first embodiment, and the characteristic configuration will therefore be described below.

(48) FIG. **9**A is a partial cross-sectional view of a liquid ejection substrate **2** in the present embodiment. FIG. **9**B is a cross-sectional view of the liquid ejection substrate **2**. In the liquid ejection substrate **2** in the present embodiment, the damper areas **301** are disposed at positions opposed to the individual collection channels **12***b* and are not provided at positions opposed to the individual supply channels **12***a*. In a configuration in which the liquid is circulated through the pressure chambers **11**, the pressure in the individual collection channels **12***b* is set lower than the pressure in the individual supply channels **12***a*, in order to generate circulatory flows. Accordingly, pressure fluctuations occurring in the pressure chambers **11** in response to ejection propagate to the individual collection channels **12***b* to a greater extent. Thus, an advantageous effect can be achieved by providing the damper areas **301** at the positions opposed to the individual collection channels **12***b* and not providing the damper areas **301** at the positions opposed to the individual supply channels **12***a*.

(49) Furthermore, the absence of the damper areas **301** at the positions opposed to the individual supply channels **12***a* makes it possible to enlarge the damper areas **301** at the positions opposed to the individual collection channels **12***b*.

(50) Generally, the damping performance is dependent on the thickness, surface area, and Young's modulus of the damper member **300**. The smaller the thickness and Young's modulus of the damper

member **300** are, the greater the crosstalk suppression effect will be. In this case, however, the mechanical strength of the damper member **300** is a concern. Hence, increasing the surface area of the damper member **300** is effective from the viewpoint of the reliability in mechanical strength.
(51) FIG. **10**A is a partial cross-sectional view illustrating a modification of the liquid ejection substrate **2** in the present embodiment. FIG. **10**B is a cross-sectional view of the liquid ejection substrate **2**. As illustrated in FIGS. **10**A and **10**B, the configuration in the present embodiment may be applied to a configuration in which the liquid supply substrate **203** and the damper substrate **302** are formed integrally with each other as in the second embodiment.
(52) In the present embodiment, an example has been described in which the damper areas **301** are disposed at the positions opposed to the individual collection channels **12***b* and not provided at the positions opposed to the individual supply channels **12***a*. However, the present embodiment is not limited to this example. Specifically, the configuration may be such that the damper areas **301** are provided at either the positions opposed to the individual collection channels **12***b* or the positions opposed to the individual supply channels **12***a*.
(53) While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.
(54) This application claims the benefit of Japanese Patent Application No. 2022-056385, filed Mar. 30, 2022, which is hereby incorporated by reference herein in its entirety.

Claims

1. A liquid ejection head comprising: a plurality of ejection ports from which to eject a liquid; a plurality of pressure chambers communicating with the ejection ports; a plurality of pressure generating elements provided in the pressure chambers and being capable of ejecting the liquid from the corresponding ejection port by applying pressure; individual supply channels communicating with the pressure chambers and being capable of supplying the liquid to the pressure chambers; individual collection channels communicating with the pressure chambers and being capable of collecting the liquid from the pressure chambers; a common supply channel communicating with the individual supply channels; a common collection channel communicating with the individual collection channels; a channel partition provided between the common supply channel and the common collection channel; a first substrate where the channel partition is formed; a second substrate laminated on the first substrate; a communication portion communicating with the common supply channel and the common collection channel; and a bonding layer provided between the first substrate and the second substrate, wherein the communication portion communicating with the common supply channel and the common collection channel is provided at an area which is present between the first substrate where the channel partition is formed and the second substrate laminated on the first substrate, and corresponds to the channel partition, the bonding layer includes a bonding area provided with an adhesive material and a non-bonding area provided with no adhesive material, and the channel partition is provided at a position corresponding to the non-bonding area of the bonding layer.
2. The liquid ejection head according to claim 1, wherein circulatory flows flow through the common supply channel, the individual supply channels, the pressure chambers, the individual collection channels, and the common collection channel in the listed order.
3. The liquid ejection head according to claim 1, wherein viscous resistance of the communication portion is at least 100 times the viscous resistance of channels from the individual supply channels through the pressure chambers to the individual collection channels.
4. The liquid ejection head according to claim 1, wherein viscous resistance of the communication portion is at least 1000 times the viscous resistance of channels from the individual supply channels

through the pressure chambers to the individual collection channels.
5. The liquid ejection head according to claim 1, wherein a height of the communication portion is 7 μm or less.
6. The liquid ejection head according to claim 1, wherein a height of the communication portion is 3 μm or less.
7. The liquid ejection head according to claim 1, wherein each of the pressure generating elements comprises a piezoelectric element.
8. The liquid ejection head according to claim 1, further comprising a damper member at least at one of the common supply channel or the common collection channel, the damper member being capable of absorbing pressure fluctuations occurring in the pressure chambers.
9. The liquid ejection head according to claim 1, further comprising a damper member at the common collection channel, the damper member being capable of absorbing pressure fluctuations occurring in the pressure chambers.
10. The liquid ejection head according to claim 8, wherein the plurality of ejection ports are provided so as to form an array, and the damper member is provided so as to extend along the array of the ejection ports.
11. The liquid ejection head according to claim 1, wherein the individual supply channels, the individual collection channels, the common supply channel, and the common collection channel are formed in the first substrate.
12. A liquid ejection apparatus comprising: a liquid ejection head; and a member that mounts the liquid ejection head, wherein the liquid ejection head comprises: a plurality of ejection ports from which to eject a liquid; a plurality of pressure chambers communicating with the ejection ports; a plurality of pressure generating elements provided in the pressure chambers and being capable of ejecting the liquid from the corresponding ejection port by applying pressure; individual supply channels communicating with the pressure chambers and being capable of supplying the liquid to the pressure chambers; individual collection channels communicating with the pressure chambers and being capable of collecting the liquid from the pressure chambers; a common supply channel communicating with the individual supply channels; a common collection channel communicating with the individual collection channels; a channel partition provided between the common supply channel and the common collection channel; a first substrate where the channel partition is formed; a second substrate laminated on the first substrate; a communication portion communicating with the common supply channel and the common collection channel; and a bonding layer provided between the first substrate and the second substrate, wherein the communication portion communicating with the common supply channel and the common collection channel is provided at an area which is present between the first substrate where the channel partition is formed and the second substrate laminated on the first substrate, and corresponds to the channel partition, the bonding layer includes a bonding area provided with an adhesive material and a non-bonding area provided with no adhesive material, and the channel partition is provided at a position corresponding to the non-bonding area of the bonding layer.
