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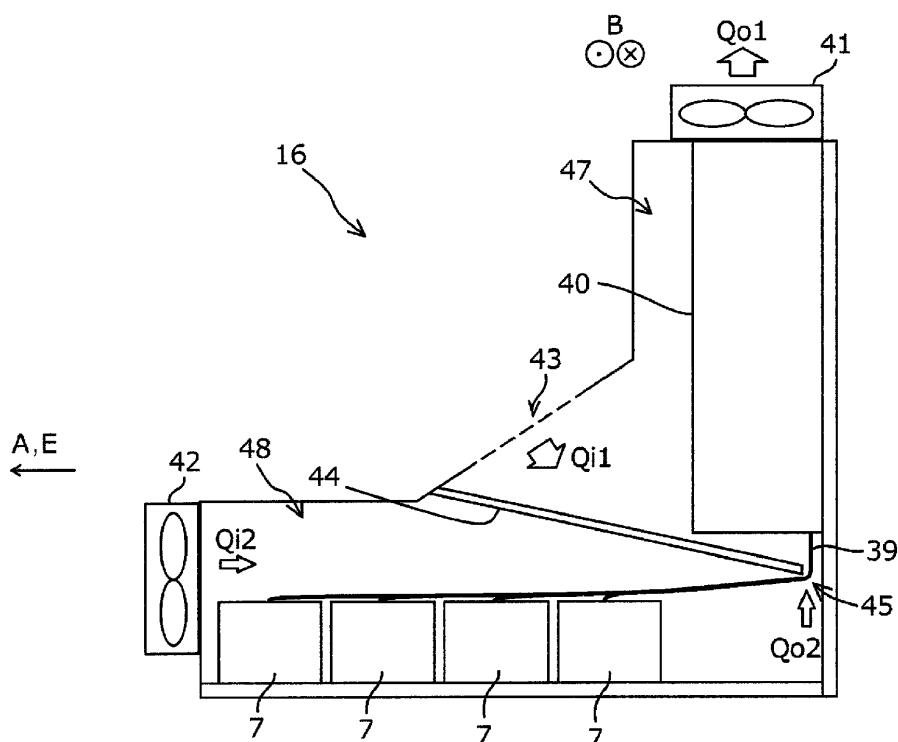
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(54) **CARRIAGE AND LIQUID EJECTING APPARATUS**

(57) A carriage which is movable in a reciprocating manner with respect to a medium and includes an ejecting section that ejects liquid onto the medium, a driving substrate for the ejecting section, an air flow generating section that blows air flow onto the driving substrate, and

a partition that reduces change in pressure in the ejecting section due to generation of air flow by the air flow generating section is provided. In the carriage configured as above, an effect by generation of air flow is reduced.

FIG. 3



Description

BACKGROUND

1. Technical Field

[0001] The present invention relates to carriages and liquid ejecting apparatuses.

2. Related Art

[0002] A variety of liquid ejecting apparatuses has been used. For example, JP-A-2014-94454 discloses a liquid ejecting apparatus that forms an image by moving a carriage having an ejecting section that ejects liquid and a driving substrate for the ejecting section in a reciprocating direction with respect to a medium.

[0003] In the carriage having the ejecting section that ejects liquid and the driving substrate for the ejecting section, the temperature of the driving substrate in the carriage rises as the ejecting section is driven. Accordingly, in order to prevent the temperature rise of the driving substrate, air flow is blown onto the driving substrate. However, when blown onto the driving substrate, the air flow may enter the ejecting section and deviate the ejection direction of liquid. In addition, when the carriage is surrounded by the housing, a pressure in the carriage may be different from a pressure outside the carriage. As a consequence, air flow may blow out from the carriage to cause an ejection direction of liquid to be deviated, or air flow may flow into the carriage to cause mist of liquid ejected from the ejecting section to flow into the carriage.

SUMMARY

[0004] An advantage of some aspects of the invention is that an effect by generation of air flow is reduced in a carriage having an ejecting section that ejects liquid, a driving substrate for the ejecting section, and an air flow generating section that blows air flow onto the driving substrate.

[0005] According to an aspect of the invention, a carriage movable in a reciprocating manner with respect to a medium includes an ejecting section that ejects liquid onto the medium, a driving substrate for the ejecting section, an air flow generating section that blows air flow onto the driving substrate, and a partition that reduces change in pressure in the ejecting section due to generation of air flow by the air flow generating section.

[0006] In this configuration, the partition that reduces change in pressure in the ejecting section due to generation of air flow by the air flow generating section is provided. Accordingly, an effect by generation of air flow can be reduced in a carriage having an ejecting section that ejects liquid, a driving substrate for the ejecting section, and an air flow generating section that blows air flow onto the driving substrate.

[0007] In the carriage according to the above aspect of the invention, the partition has an aperture that allows a member to pass through.

[0008] In this configuration, the aperture that allows a member to pass through is provided. Accordingly, members such as a cable and a liquid tube can pass through the aperture.

[0009] The carriage according to the above aspect of the invention further includes a detachable member that is removed independently from the partition to enable access to the ejecting section.

[0010] In this configuration, the detachable member that is removed independently from the partition to enable access to the ejecting section is provided. Accordingly, for example, in the case where the ejecting section provided in the carriage causes a failure, the detachable member can be removed so that replacement of the ejecting section can be easily performed without removing the partition.

[0011] In the carriage according to the above aspect of the invention, the carriage is separated by the partition into a driving substrate chamber in which the driving substrate is disposed and an ejecting section chamber in which the ejecting section is disposed, and a pressure adjustment section that adjusts a pressure in the ejecting section chamber is provided in the ejecting section chamber.

[0012] In this configuration, the carriage is separated by the partition into the driving substrate chamber in which the driving substrate is disposed and the ejecting section chamber in which the ejecting section is disposed, and the pressure adjustment section that adjusts a pressure in the ejecting section chamber is provided in the ejecting section chamber. Accordingly, a pressure in the ejecting section chamber can be adjusted, and air flow flowing from inside to outside the ejecting section chamber and air flow flowing from outside to inside the ejecting section chamber can be reduced. Therefore, air flow blowing out from the carriage that may cause an ejection direction of liquid to be deviated and air flow flowing into the carriage that may cause mist of liquid ejected from the ejecting section to flow into the carriage can be reduced.

[0013] In the carriage according to the above aspect of the invention, the pressure adjustment section is driven to reduce a pressure difference between an inside of the ejecting section chamber and an outside of the carriage.

[0014] In this configuration, the pressure adjustment section is driven to reduce a pressure difference between the inside of the ejecting section chamber and the outside of the carriage. Accordingly, a pressure in the ejecting section chamber can be particularly effectively adjusted, and air flow flowing from inside to outside the ejecting section chamber and air flow flowing from outside to inside the ejecting section chamber can be particularly effectively reduced.

[0015] According to another aspect of the invention, a liquid ejecting apparatus includes the carriage of any one

of the above configurations.

[0016] In this configuration, liquid can be ejected onto the medium while reducing an effect by generation of air flow.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Embodiment 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 side view of a recording apparatus according to an example of the invention.

Fig. 2 is a block diagram of a recording apparatus according to an example of the invention.

Fig. 3 is a schematic side view of an essential part of a recording apparatus according to an example of the invention.

Fig. 4 is a schematic perspective view of an essential part of a recording apparatus according to an example of the invention.

Fig. 5 is a schematic perspective view of an essential part of a recording apparatus according to an example of the invention.

Fig. 6 is a schematic perspective view of an essential part of a recording apparatus according to an example of the invention.

Fig. 7 is a schematic perspective view of an essential part of a recording apparatus according to an example of the invention.

Fig. 8 is a schematic side view of an essential part of a recording apparatus of a reference example.

Fig. 9 is a schematic side view of an essential part of a recording apparatus of another reference example.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0018] With reference to the drawings, a recording apparatus according to one example of a liquid ejecting apparatus of the invention will be described in detail. First, an outline of a recording apparatus 1 according to an embodiment of the invention will be described. Fig. 1 is a schematic side view of the recording apparatus 1 of the present example.

[0019] The recording apparatus 1 of the present example includes a pay out section 2 configured to feed out a recording medium (medium) P from a roll R1 for performing recording. Further, the recording apparatus 1 includes a transport mechanism 3 that transports the recording medium P in a transport direction A by using an adhesive belt 10 (a transport belt formed of an endless belt) having a support surface F on which an adhesive is applied to support the recording medium P. The recording apparatus 1 further includes a recording mechanism 4 that performs recording onto the recording medium P by scanning a carriage 16 having a recording

head 7 as an ejecting section that ejects ink (liquid) in a reciprocating manner in a scan direction B which is perpendicular to a transport direction A of the recording medium P. The recording apparatus 1 further includes a cleaning mechanism 15 for the adhesive belt 10. Moreover, the recording apparatus 1 includes a take-up mechanism 38 having a take-up shaft 17 that takes up the recording medium P. The term "scan" as used herein means to move the carriage 16 in the scan direction B, which includes to move the carriage 16 in the scan direction B while ejecting ink from the recording head 7 during recording, for example.

[0020] The recording medium P may be a textile material. Textile materials include fabrics, cloths, and other fashion products to be printed. Fabrics include woven, knitted, and non-woven fabrics of natural fibers such as cotton, linen, silk and wool, chemical fibers such as Nylon, and composite fibers thereof. Further, cloths and other fashion products include sewn products including T-shirts, handkerchiefs, scarfs, towels, handbags, fabric bags, and furniture such as curtains, sheets, bed covers as well as cut or uncut fabrics provided as parts to be sewed.

[0021] Further, in addition to the above textile materials, paper sheets dedicated to ink jet recording such as plain paper, high quality paper, and glossy paper may be used as the recording medium P. Further, examples of the recording medium P also include plastic films that are not surface-treated for ink jet printing (that is, those on which an ink absorbing layer is not formed) and substrates such as paper on which plastic is coated or on which a plastic film is adhered. Such plastics include, but are not limited to, polyvinyl chloride, polyethylene terephthalate, polycarbonate, polystyrene, polyurethane, polyethylene, and polypropylene.

[0022] The pay out section 2 includes a rotation shaft 5 which is also a set position of the roll R1 of the recording medium P for recording. The pay out section 2 is configured to feed out the recording medium P from the roll R1 set on the rotation shaft 5 to the transport mechanism 3 via the driven rollers 6 and 37. When the recording medium P is fed out to the transport mechanism 3, the rotation shaft 5 rotates in a rotation direction C.

[0023] The transport mechanism 3 includes an adhesive belt 10 that carries the recording medium P fed out from the pay out section 2 for transport, a driving roller 8 that moves the adhesive belt 10 in a direction E, and a driven roller 9. The recording medium P is pressed against the support surface F of the adhesive belt 10 by a press roller 12 to be bonded thereto. When the recording medium P is transported, the driving roller 8 rotates in the rotation direction C. The endless belt used as the transport is not limited to the adhesive belt. For example, an electrostatic attracting endless belt may also be used. Moreover, under the adhesive belt 10 of the present example, platens 18 and 19 are provided as support sections for supporting the adhesive belt 10. The platens 18 and 19, which support the adhesive belt 10, can prevent

the adhesive belt 10 from being vibrated while moving the adhesive belt 10. The platen 18 is disposed in a region facing the recording head 7 with the adhesive belt 10 interposed therebetween, and the platen 19 is disposed in a region facing the press roller 12 with the adhesive belt 10 interposed therebetween.

[0024] The press roller 12 of the present example is configured to rotate as the recording medium P is transported in a direction opposite to the rotation direction C about the rotation shaft 20 which extends along the scan direction B. Further, the press roller 12 of the present example is configured to reciprocate (swing) in the transport direction A in order to prevent traces of contact left on the recording medium P when it is in contact with the recording head 7 at the same position for a certain period of time. It should be noted that the press roller 12 is not limited to the above configuration.

[0025] The recording mechanism 4 includes a carriage motor 30 (see Fig. 2) that reciprocates the carriage 16 having the recording head 7 in the scan direction B. In Fig. 1, the scan direction B is a direction perpendicular to the sheet of the drawing. The carriage 16 having the recording head 7 reciprocates to scan during recording, while the transport mechanism 3 stops the transport of the recording medium P during recording scanning (during movement of the carriage 16). In other words, reciprocating scanning of the carriage 16 and transport of the recording medium P are alternately performed during recording. That is, during recording, the transport mechanism 3 performs intermittent transport of the recording medium P (intermittent movement of the adhesive belt 10) corresponding to reciprocating scanning of the carriage 16. The detail of the carriage 16, which is an essential part of the recording apparatus of the present example will be described later.

[0026] The cleaning mechanism 15 for the adhesive belt 10 includes a cleaning brush 13 composed of a plurality of cleaning rollers joined in a rotation axis direction, and a tray 14 which houses a cleaning agent for cleaning the cleaning brush 13.

[0027] The take-up mechanism 38 is a mechanism for taking up the recording medium P transported from the transport mechanism 3 via the driven roller 11 after recording is performed. The take-up mechanism 38 is configured to take up the recording medium P as a roll R2 by winding the recording medium P around a paper tube or the like set on the take-up shaft 17. Further, Fig. 1 shows that the roll R1 has a surface to be recorded oriented outside and the recorded surface is oriented outside when taken up. Accordingly, both the rotation shaft 5 and the take-up shaft 17 rotate in the rotation direction C. However, in the recording apparatus 1 of the present example, the roll R1 having a surface to be recorded oriented inside can also be used, and the recorded surface can also be oriented inside when taken up. That is, both the rotation shaft 5 and the take-up shaft 17 can rotate in the direction opposite to the rotation direction C.

[0028] Next, an electric configuration of the recording

apparatus 1 of the present example will be described. Fig. 2 is a block diagram of the recording apparatus 1 of the present example. A control unit 23 includes a CPU 24 that controls the entire recording apparatus 1. The CPU 24 is connected to a ROM 26 that stores various control programs performed by the CPU 24 and a RAM 27 that can temporarily store data via a system bus 25.

[0029] Further, the CPU 24 is connected to a head drive unit 28 for driving the recording head 7 via the system bus 25. Further, the CPU 24 is connected to a motor drive unit 29 for driving the carriage motor 30, a transport motor 31, a pay out motor 32, a take-up motor 33, a swing motor 34, fan drive motors 35 and 36 via the system bus 25. The carriage motor 30 is a motor for moving the carriage 16 having the recording head 7. Further, the transport motor 31 is a motor for driving the driving roller 8. Further, the pay out motor 32 is a rotation mechanism for the rotation shaft 5, and a motor for driving the rotation shaft 5 to feed the recording medium P to the transport mechanism 3. Further, the take-up motor 33 is a driving motor for rotating the take-up shaft 17. Further, the swing motor 34 is a driving motor for swinging (reciprocating) the press roller 12 in the transport direction A. Further, the fan drive motor 35 is a motor for driving a fan 41 (see Fig. 3) as an air flow generating section, which is described later. The fan drive motor 36 is a motor for driving a fan 42 (see Fig. 3) as a pressure adjustment section, which is described later.

[0030] Further, the CPU 24 is connected to an input/output section 21 via the system bus 25. The input/output section 21 is connected to a PC 22 for transmitting and receiving data and signals such as recording data. The control unit 23 thus configured can control the entire recording apparatus 1.

[0031] Next, the carriage 16, which is an essential part of the present example, will be described in detail. Fig. 3 is a schematic side view of the carriage 16 of the present example. Further, Figs. 8 and 9 are schematic side views of the carriage 16 of reference examples.

[0032] As shown in Figs. 3, 8 and 9, in the configuration in which the carriage 16 includes the driving substrate 40 that drives ejection of liquid droplets from the recording head 7, data loss and noise can be reduced since the recording head 7 and the driving substrate 40 can be connected by a short cable 39. However, when driving the recording head 7, the driving substrate 40 generates heat and raises temperature. Accordingly, in the configuration in which the carriage 16 has the driving substrate 40, an air flow generating section that blows air flow onto the driving substrate 40 can be provided in order to prevent temperature rise of the driving substrate 40.

[0033] Fig. 8 shows a reference example of the carriage 16 which includes the driving substrate 40. The carriage 16 is provided with the fan 41 and a through hole 43 as the air flow generating section that blows air flow onto the driving substrate 40. The carriage 16 shown in Fig. 8 drives the fan 41 to exhaust air flow at a flow rate Q₀ via the fan 41 from inside to outside the carriage 16.

Accordingly, as the inside of the carriage 16 becomes a negative pressure, air flow at a flow rate Q_i enters the carriage 16 through the through hole 43. However, in general, since a gap is formed in a mounting section for the recording head 7 in the carriage 16, air flow enters the carriage 16 through the gap. If air flow enters the carriage 16 through the gap, ink mist generated while ink is ejected from the recording head 7 enters the carriage 16, which may contaminate inside the carriage 16.

[0034] Further, Fig. 9 shows a reference example of the carriage 16 which includes the driving substrate 40. The carriage 16 is provided with a fan 46 as the air flow generating section that blows air flow onto the driving substrate 40. Further, while the fan 41 is the air flow generating section that exhausts air flow from inside to outside the carriage 16, the fan 46 is the air flow generating section that introduces air flow from outside to inside the carriage 16. The carriage 16 shown in Fig. 9 drives the fan 46 to introduce air flow at a flow rate Q_i via the fan 46 from outside to inside the carriage 16. Accordingly, as the inside of the carriage 16 becomes a positive pressure, air flow at a flow rate Q_o exits the carriage 16 through a through hole, which is not shown, provided on the top of the carriage 16. However, in general, since a gap is formed in a mounting section for the recording head 7 in the carriage 16, air flow exits the carriage 16 through the gap. If air flow exits the carriage 16 through the gap, ink droplets ejected from the recording head 7 may be deposited at misaligned positions on the recording medium P.

[0035] On the other hand, the carriage 16 of the present example shown in Fig. 3 includes the fan 41 and the through hole 43 as with the carriage 16 of a reference example shown in Fig. 8. Moreover, the carriage 16 includes a partition 44 that separates the inside of the carriage 16 into a driving substrate chamber 47 and an ejecting section chamber 48. That is, the carriage 16 of the present example can be described as being movable in a reciprocating manner with respect to the recording medium P, and including the recording head 7 that ejects ink onto the recording medium P; the driving substrate 40 for the recording head 7; the fan 41 that blows air flow onto the driving substrate 40; and the partition 44 that reduces air flow blown onto the driving substrate 40 (that is, reduces change in pressure due to generation of air flow by the fan 41). The term "air flow" as used herein refers to both the air flow caused by an outward fan (e.g., fan 41) and the air flow caused by an inward fan (e.g., fan 42). The carriage 16 of the present example is configured with the partition 44 and includes the recording head 7 that ejects ink, the driving substrate 40 for the recording head 7, and the fan 41 that blows air flow onto the driving substrate 40. Accordingly, air flow can be prevented from flowing in and out through a gap formed in a mounting section for the recording head 7 and thus an effect by generation of air flow can be prevented. That is, while there are problems that air flow may blow out from the carriage 16 (Fig. 9) and air flow may blow into

the carriage 16 (Fig. 8), the partition 44 is configured to solve both the problems by reducing change in pressure in the recording head 7 (change in pressure in the ejecting section chamber 48 in which the recording head 7 is disposed).

[0036] In other words, the recording apparatus 1 of the present example includes the carriage 16 configured as above. Accordingly, ink can be ejected onto the recording medium P while reducing an effect by generation of air flow.

[0037] Further, as shown in Fig. 3, the partition 44 of the present example has an aperture 45 that allows a cable 39 as an exemplary member to pass through. As the partition 44 of the present example, when the aperture 45 that allows a member to pass through is formed in the partition 44, members such as the cable 39 and an ink tube can pass through the aperture 45.

[0038] Further, as shown in Fig. 3, the carriage 16 of the present example is separated by the partition 44 into the driving substrate chamber 47 in which the driving substrate 40 is disposed and the ejecting section chamber 48 in which the recording head 7 is disposed. In the ejecting section chamber 48, the fan 42 is provided as a pressure adjustment section that adjusts a pressure in the ejecting section chamber 48. Accordingly, in this configuration, a pressure in the ejecting section chamber 48 can be adjusted, and air flow flowing from inside to outside the ejecting section chamber 48 and air flow flowing from outside to inside the ejecting section chamber 48 can be reduced. Therefore, in this configuration, air flow blowing out from the carriage 16 that may cause an ink ejection direction to be deviated and air flow flowing into the carriage 16 that may cause mist of ink ejected from the recording head to flow into the carriage 16 can be reduced.

[0039] More specifically, the fan 42 of the present example is driven by control of the control unit 23 to reduce a pressure difference between the inside of the ejecting section chamber 48 and the outside of the carriage 16. Accordingly, a pressure in the ejecting section chamber 48 is particularly effectively adjusted, and air flow flowing from inside to outside the ejecting section chamber 48 and air flow flowing from outside to inside the ejecting section chamber 48 are particularly effectively reduced. Specifically, a flow rate Q_{o1} of air flow exhausted from the driving substrate chamber 47 via the fan 41 is equal to a sum of a flow rate Q_{i1} of air flow flowing into the driving substrate chamber 47 through the through hole 43 and a flow rate Q_{o2} of air flow flowing (exhausted) from the ejecting section chamber 48 into the driving substrate chamber 47 through the aperture 45. Accordingly, the fan 42 is driven so that the flow rate Q_{o2} of air flow exhausted from the ejecting section chamber 48 into the driving substrate chamber 47 and a flow rate Q_{i2} of air flow flowing into the ejecting section chamber 48 via the fan 42 become equal to each other. Since the flow rate Q_{o1} is equal to a sum of the flow rate Q_{i1} and Q_{o2} , it is obvious that the flow rate Q_{o1} is larger than the flow rate

Qi2.

[0040] Next, with reference to Figs. 4 to 7, the carriage 16, which is an essential part of the present example, will be further described in detail. Figs. 4 to 7 are schematic perspective views of the carriage 16 of the present example. Among these drawings, Fig. 4 is a schematic perspective view of the carriage 16 as viewed from the side of the fan 41 with a cover 49 that covers the entire carriage 16 being mounted. Further, Fig. 5 is a schematic perspective view of the carriage 16 as viewed from the side of the fan 41 with a side cover 49a of the cover 49 of the carriage 16 in the scan direction B being removed. Further, Fig. 6 is a schematic perspective view of the carriage 16 as viewed from the side of the fan 41 with a cover 49 that covers the entire carriage 16 being completely removed. Further, Fig. 7 is a schematic perspective view of the carriage 16 as viewed from the side of the recording head 7 with the cover 49 that covers the entire carriage 16 being mounted.

[0041] As shown in Figs. 4 and 7, the carriage 16 of the present example includes the cover 49 that covers the entire carriage 16. As shown in Fig. 5, the side cover 49a (shown in Fig. 4) of the cover 49 can be removed by itself. Further, as shown in Fig. 5, the partition 44 is integrally formed with the portion of the cover 49 except for the side cover 49a such that the partition 44 is removed from the carriage 16 when the cover 49 is removed from the carriage 16. As shown in Fig. 5, an operator can access the recording head 7 by removing only the side cover 49a without removing the entire cover 49. Accordingly, replacement of the recording head 7 can be performed, for example, by removing only the side cover 49a.

[0042] That is, the carriage 16 of the present example includes the side cover 49a as a detachable member that can be removed independently from the partition 44 to enable access to the recording head 7. Therefore, for example, in the case where the recording head 7 provided in the carriage 16 causes a failure, the side cover 49a can be removed so that replacement of the recording head 7 can be easily performed without removing the partition 44.

[0043] It should be noted that the present invention is not limited to the above embodiments. Needless to say, various modifications are contemplated within the scope of the invention as defined in the appended claims, and these should be included in the scope of the present invention.

Claims

1. A carriage (16) movable in a reciprocating manner with respect to a medium (P), the carriage comprising:

an ejecting section (7) configured to eject liquid onto the medium;
a driving substrate (40) for the ejecting section;

an air flow generating section (41) configured to blow air flow onto the driving substrate; and
a partition (44) configured to reduce a change in pressure in the ejecting section due to generation of air flow by the air flow generating section.

2. The carriage according to Claim 1, wherein the partition has an aperture (45) that allows a member to pass through.
3. The carriage according to Claim 2, further comprising a detachable member (49a) that is removed independently from the partition to enable access to the ejecting section.
4. The carriage according to any one of the preceding claims, wherein the carriage is separated by the partition into a driving substrate chamber (47) in which the driving substrate is disposed and an ejecting section chamber (48) in which the ejecting section is disposed, and a pressure adjustment section (42) configured to adjust a pressure in the ejecting section chamber is provided in the ejecting section chamber.
5. The carriage according to Claim 4, wherein the pressure adjustment section is driven to reduce a pressure difference between an inside of the ejecting section chamber and an outside of the carriage.
6. A liquid ejecting apparatus comprising the carriage according to any one of the preceding claims.

FIG. 1

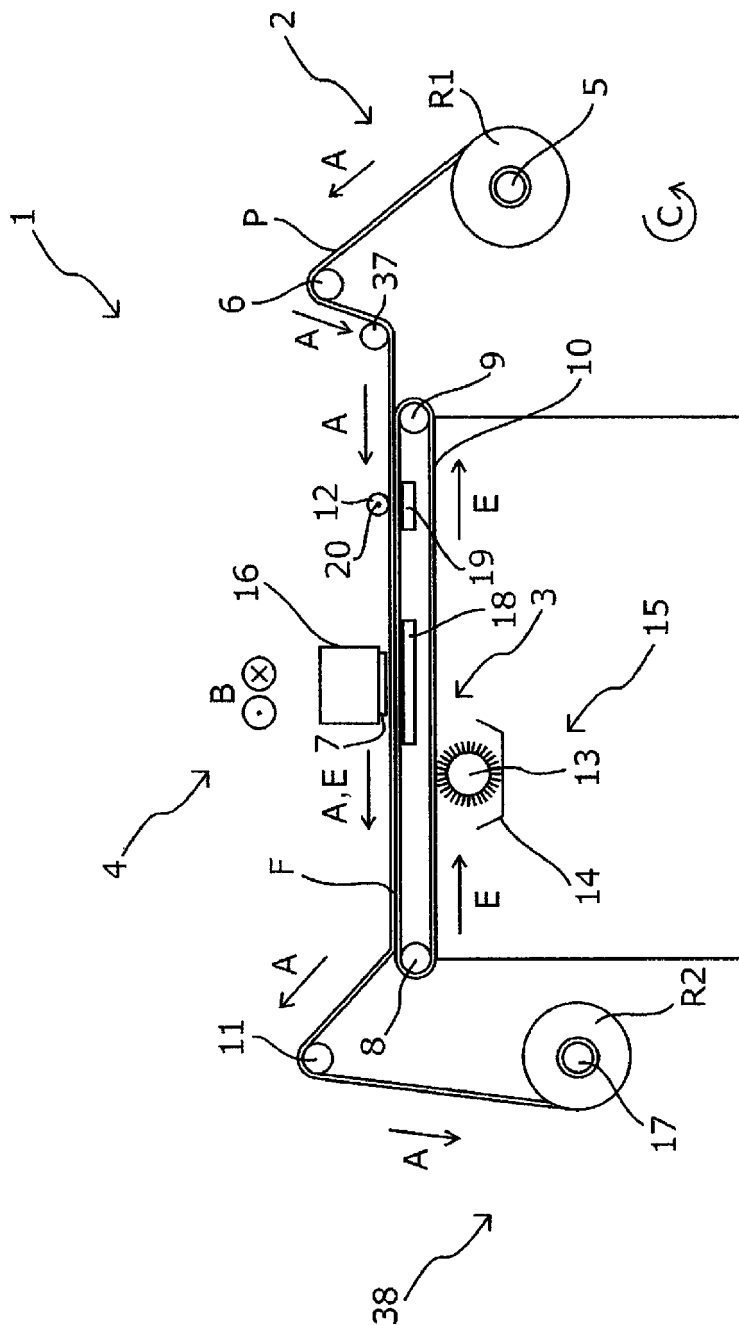


FIG. 2

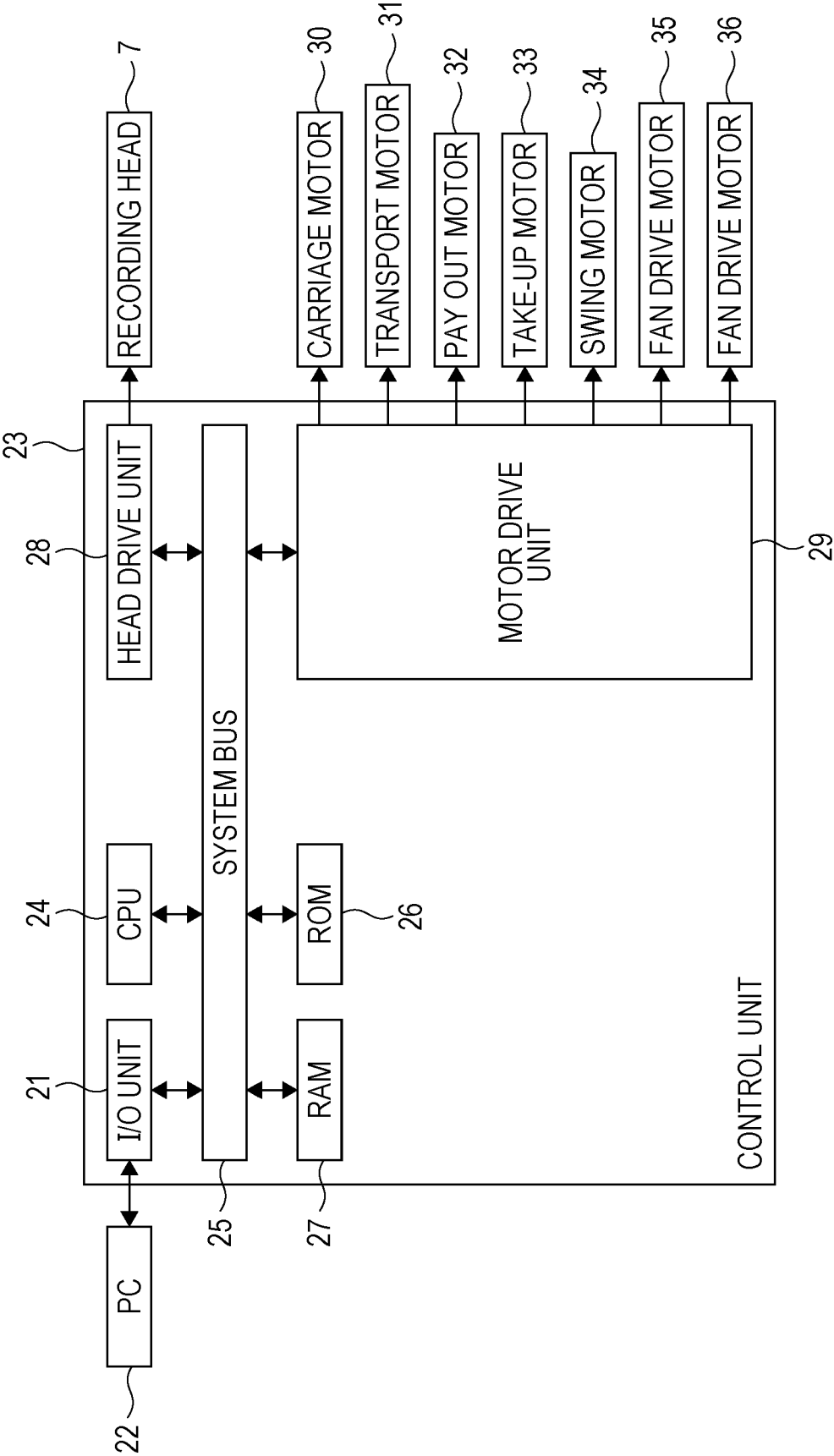


FIG. 3

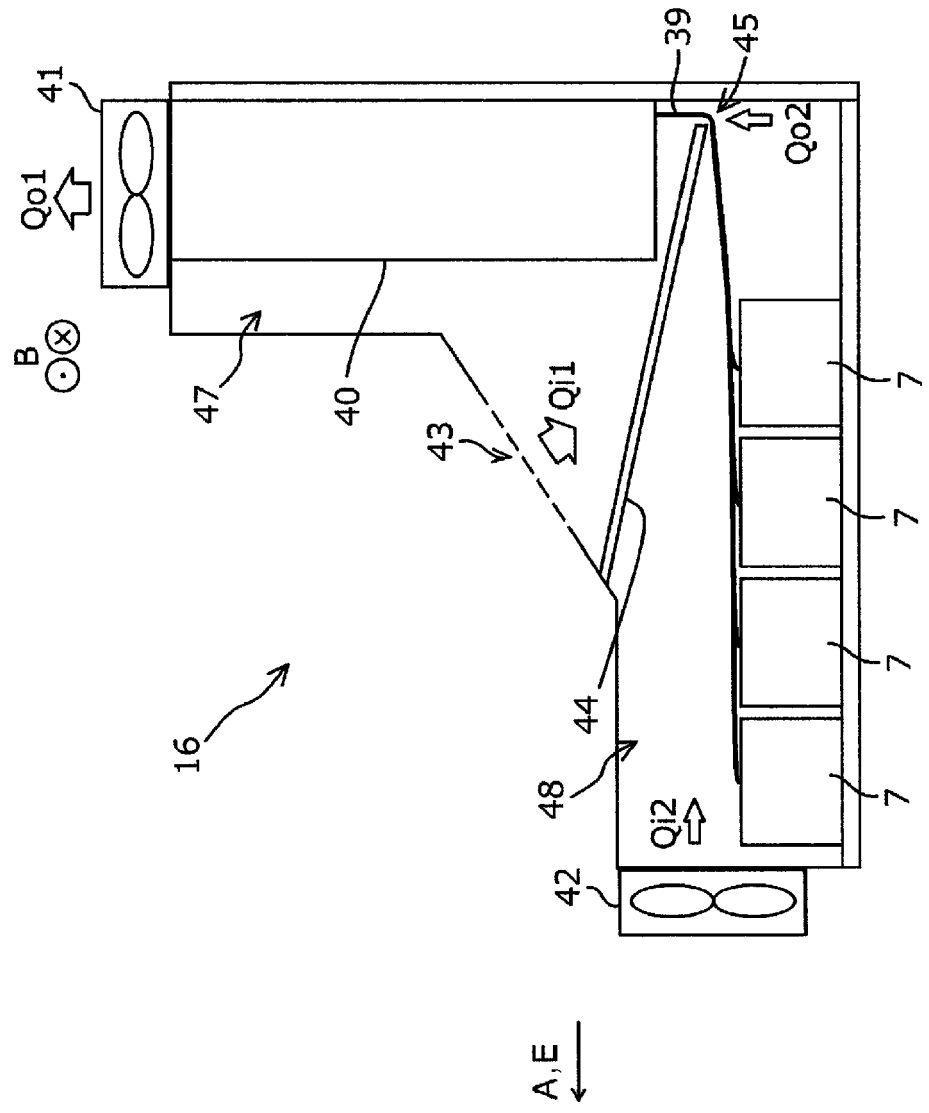


FIG. 4

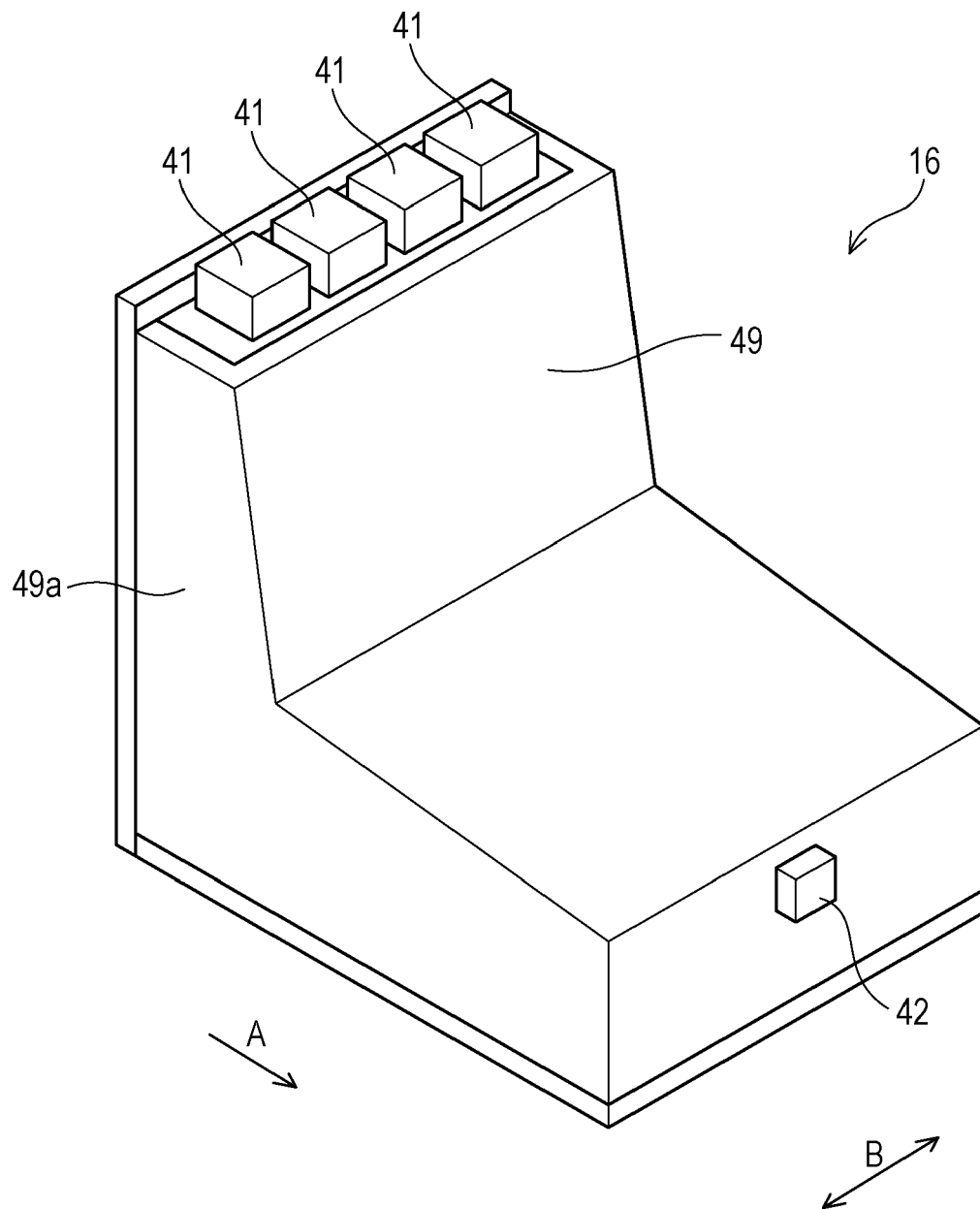


FIG. 5

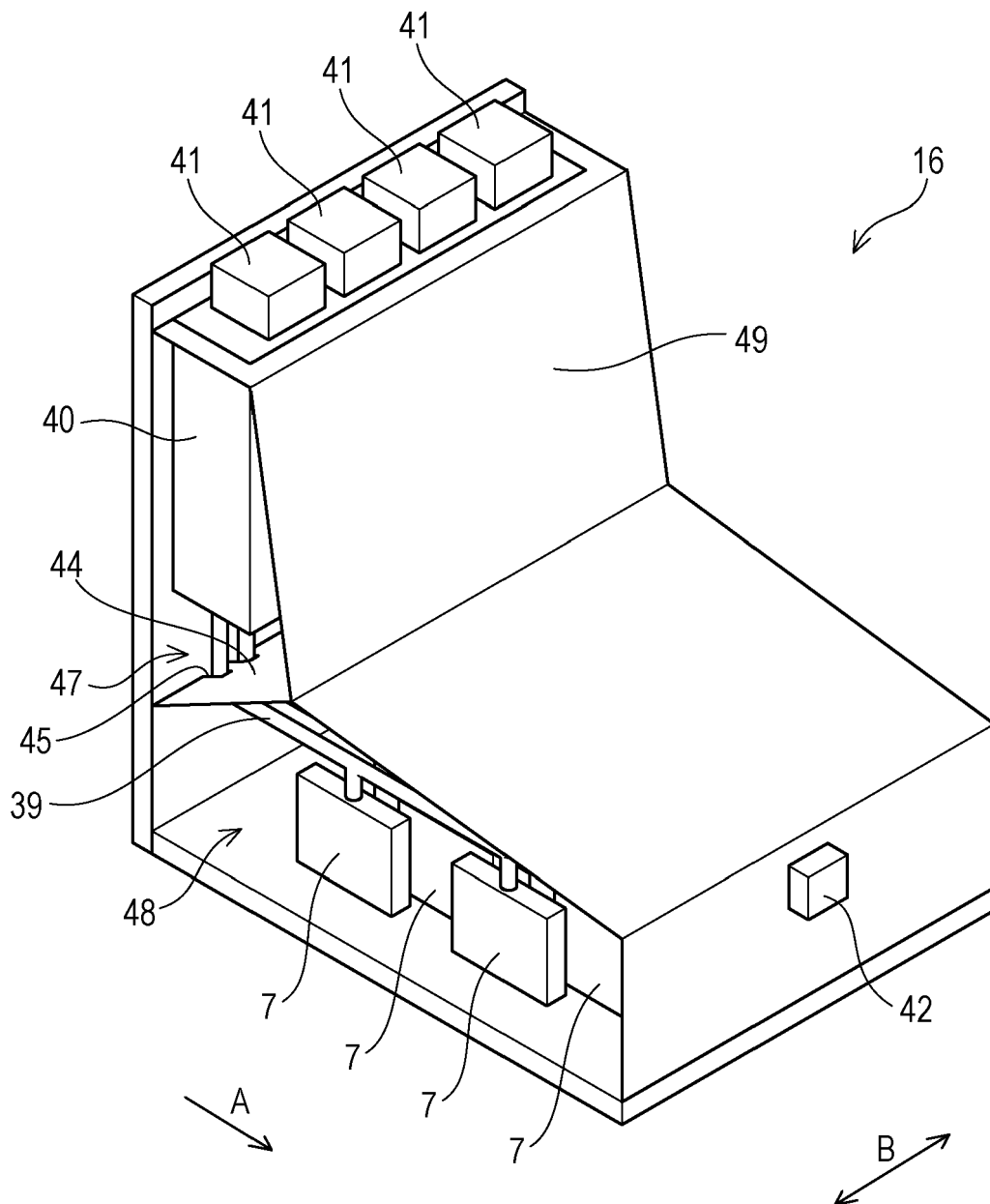


FIG. 6

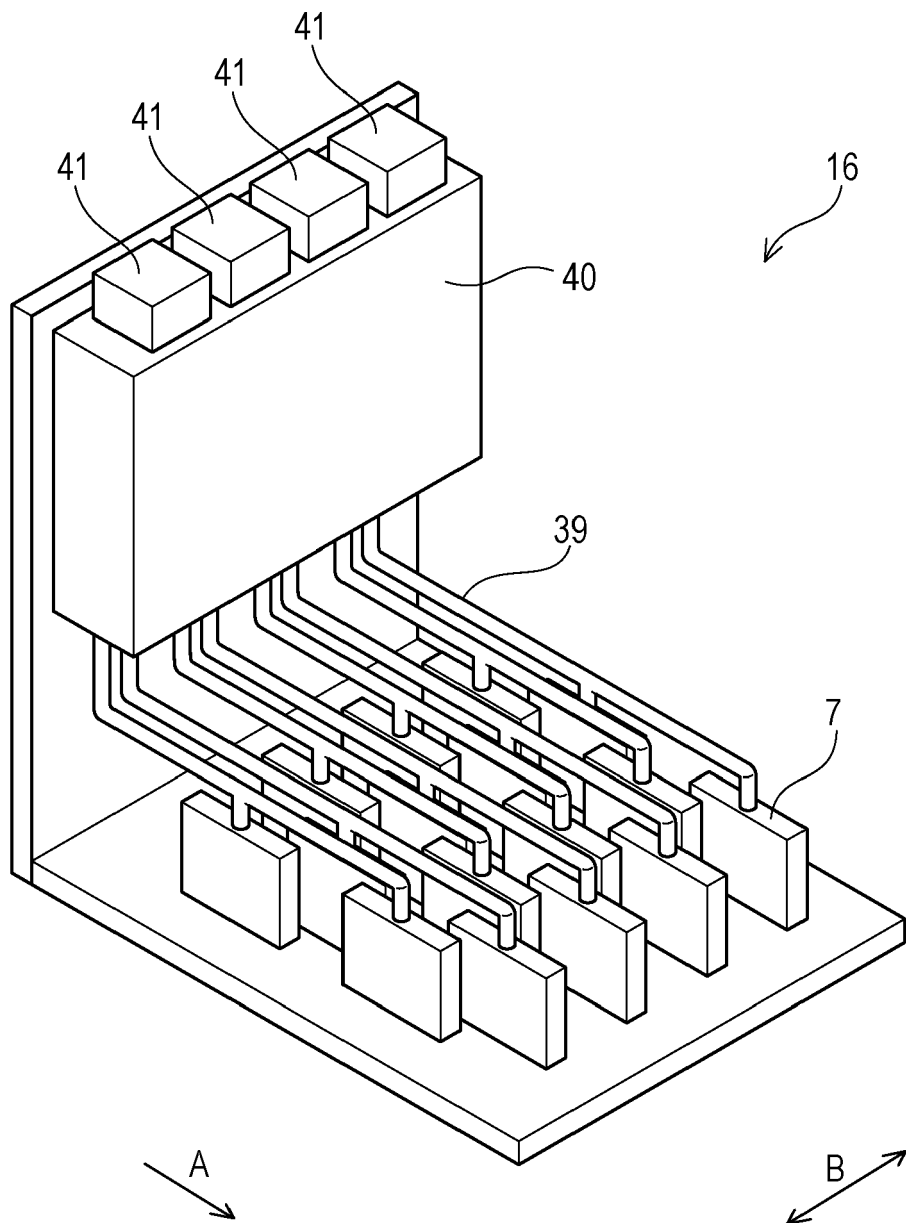


FIG. 7

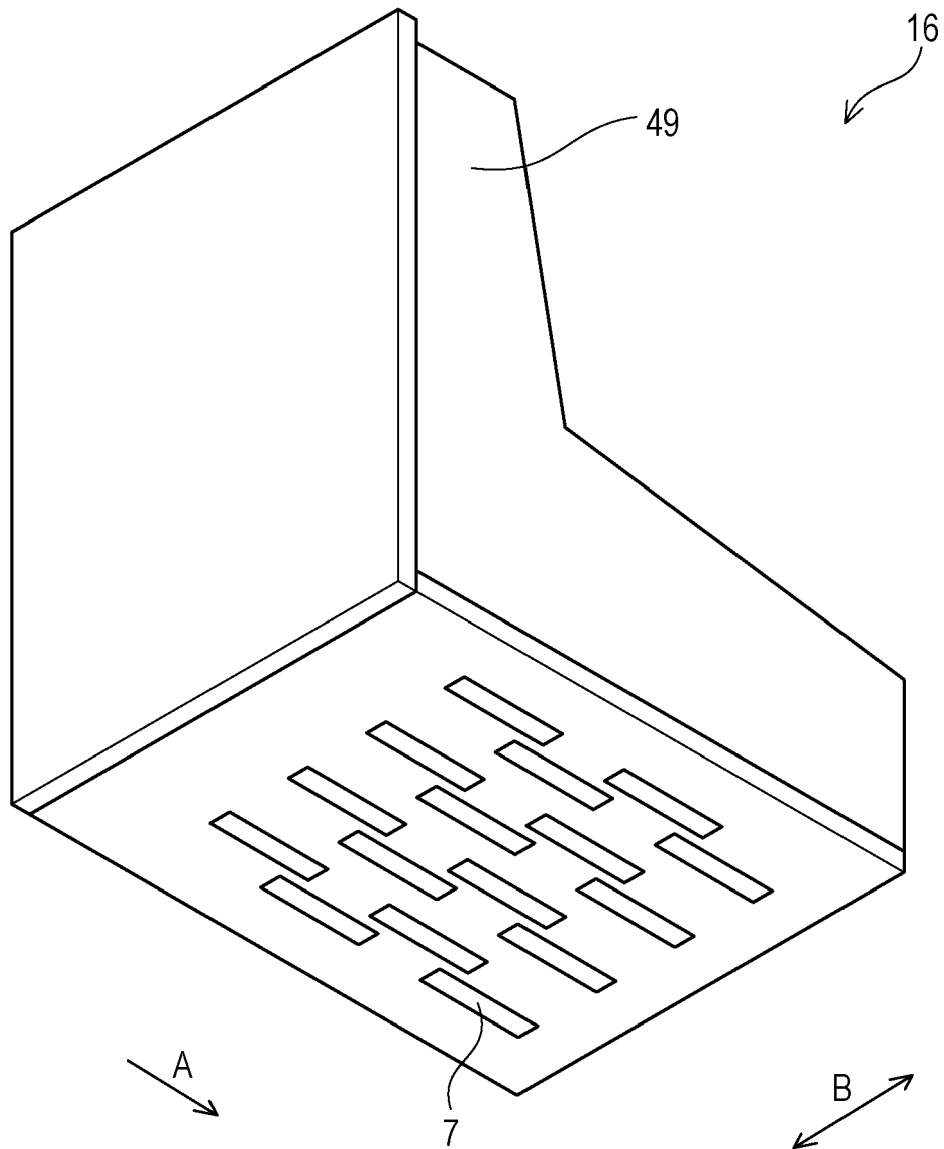
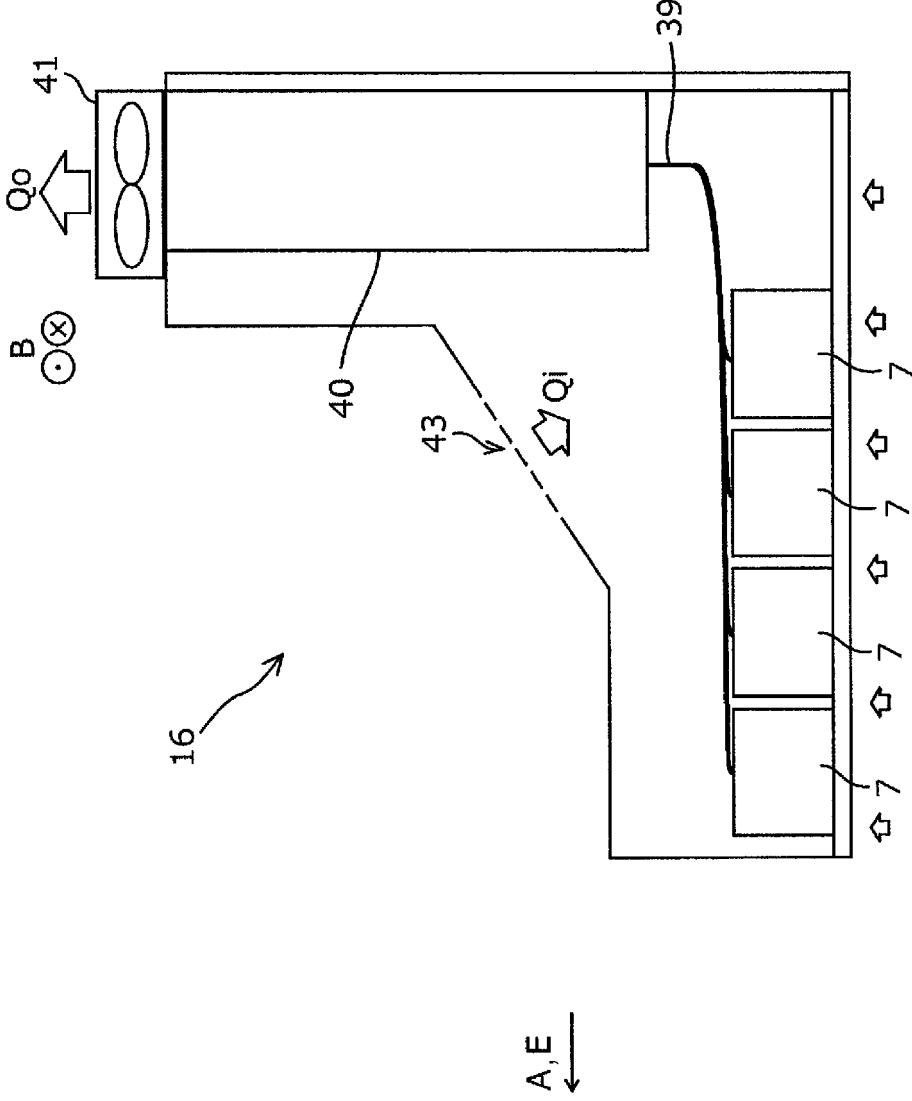
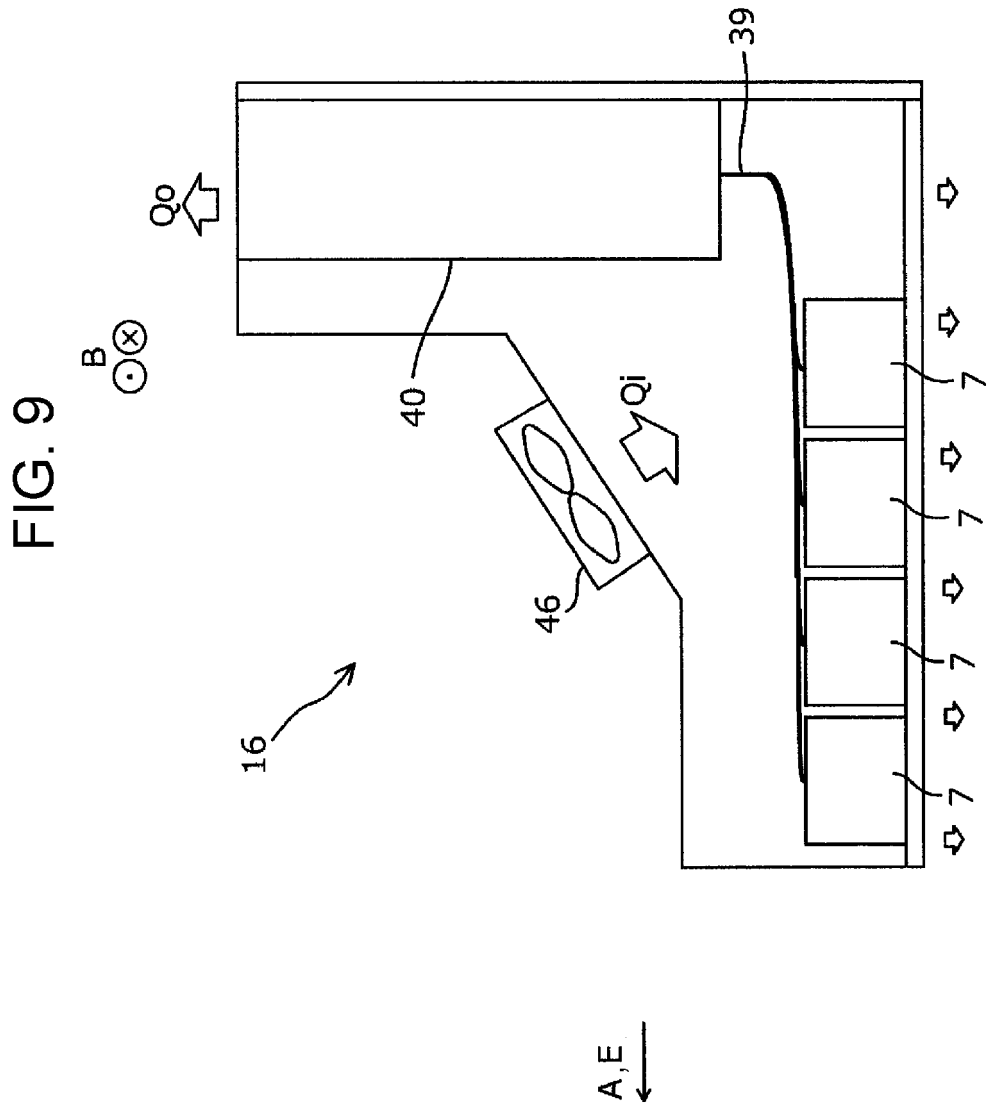


FIG. 8







EUROPEAN SEARCH REPORT

 Application Number
 EP 18 17 3204

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2008 302577 A (SEIKO I INFOTECH INC) 18 December 2008 (2008-12-18) * paragraphs [0005], [0099] - [0101]; figure 10 *	1-6	INV. B41J29/377
X	EP 2 505 360 A1 (SEIKO EPSON CORP [JP]) 3 October 2012 (2012-10-03) * paragraphs [0050], [0051]; figure 6 *	1-6	
X	JP H10 151731 A (CANON KK) 9 June 1998 (1998-06-09) * paragraphs [0043], [0057]; figures 1-5 *	1,2,6	
X	JP H11 138780 A (CANON KK) 25 May 1999 (1999-05-25) * paragraphs [0034], [0035], [0046]; figures 1-5 *	1-6	
X	US 9 586 412 B2 (RISO KAGAKU CORP [JP]) 7 March 2017 (2017-03-07) * column 5, line 31 - column 6, line 24; figures 4, 9a *	1-6	TECHNICAL FIELDS SEARCHED (IPC) B41J
X	US 5 774 141 A (COOPER BRENTLY L [US] ET AL) 30 June 1998 (1998-06-30) * column 8, lines 9-38; figure 5 *	1,6	
X	US 2016/101634 A1 (SUZUKI KAZUO [JP]) 14 April 2016 (2016-04-14) * paragraph [0020]; figures 1, 2 *	1,6	
X	EP 3 075 556 A2 (SEIKO EPSON CORP [JP]) 5 October 2016 (2016-10-05) * paragraph [0035]; figures 5, 8 *	1,6	
X,P	EP 3 216 613 A1 (SEIKO EPSON CORP [JP]) 13 September 2017 (2017-09-13) * abstract; figure 3 *	1,6	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 September 2018	Examiner Adam, Emmanuel
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20-09-2018

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35

40

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50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2008302577 A	18-12-2008	JP 5026155 B2	12-09-2012
		JP 2008302577 A	18-12-2008
		WO 2008149759 A1	11-12-2008
EP 2505360 A1	03-10-2012	CN 102717609 A	10-10-2012
		EP 2505360 A1	03-10-2012
		JP 5810578 B2	11-11-2015
		JP 2012201061 A	22-10-2012
		US 2012249665 A1	04-10-2012
JP H10151731 A	09-06-1998	NONE	
JP H11138780 A	25-05-1999	NONE	
US 9586412 B2	07-03-2017	JP 2016155316 A	01-09-2016
		US 2016243857 A1	25-08-2016
US 5774141 A	30-06-1998	NONE	
US 2016101634 A1	14-04-2016	EP 2979869 A1	03-02-2016
		JP 6033246 B2	30-11-2016
		JP 2015024647 A	05-02-2015
		US 2016101634 A1	14-04-2016
		WO 2014203627 A1	24-12-2014
EP 3075556 A2	05-10-2016	CN 106004042 A	12-10-2016
		EP 3075556 A2	05-10-2016
		JP 2016182760 A	20-10-2016
		US 2016279984 A1	29-09-2016
		US 2017157958 A1	08-06-2017
EP 3216613 A1	13-09-2017	CN 107053842 A	18-08-2017
		EP 3216613 A1	13-09-2017
		JP 2017140762 A	17-08-2017
		US 2017225470 A1	10-08-2017

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2014094454 A [0002]