

(19)



(11)

EP 3 085 542 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.10.2016 Bulletin 2016/43

(51) Int Cl.:
B41J 2/21 (2006.01)

(21) Application number: **16160752.8**

(22) Date of filing: **16.03.2016**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
 GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
 PL PT RO RS SE SI SK SM TR**
 Designated Extension States:
BA ME
 Designated Validation States:
MA MD

(71) Applicant: **Seiko Epson Corporation
Shinjuku-ku
Tokyo (JP)**

(72) Inventor: **MIZUGAKI, Koichi
Suwa-shi, Nagano 392-8502 (JP)**

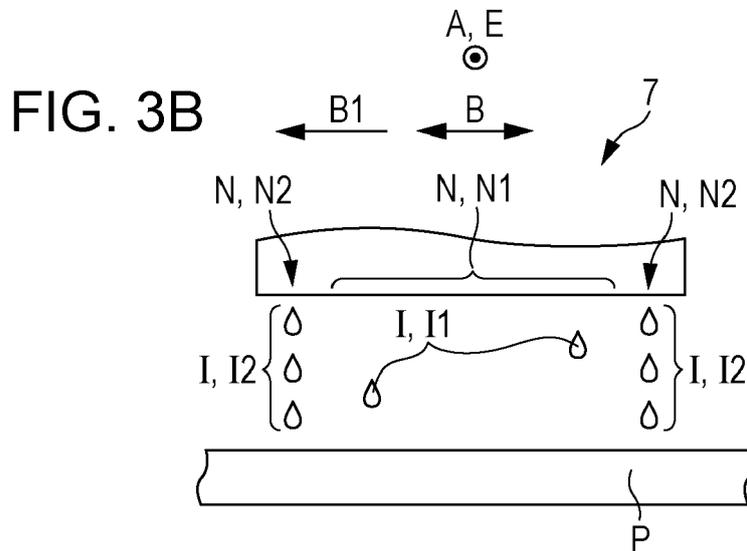
(74) Representative: **Miller Sturt Kenyon
9 John Street
London WC1N 2ES (GB)**

(30) Priority: **23.03.2015 JP 2015059171**

(54) **RECORDING APPARATUS**

(57) A recording apparatus includes an ejecting unit which can eject first ink for image forming and a colorless second ink onto a recording medium; and a control unit which can control ejecting operations of the first ink and the second ink in the ejecting unit, in which the control

unit performs ejecting operations of the first ink and the second ink so that landing positions of the second ink, the first ink, and the second ink overlap on the recording medium in this order.



EP 3 085 542 A1

Description

BACKGROUND

1. Technical Field

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

2. Related Art

[0002] In the related art, a recording apparatus which performs recording by ejecting ink onto a recording medium (medium) from nozzles has been disclosed. In such a recording apparatus, a recording apparatus which can form an image by ejecting ink so that a landing position of a first ink overlaps with a landing position of a second ink has been disclosed.

[0003] For example, in JP-A-2002-240328, a recording apparatus which can perform recording using a color which is lighter than color ink by ejecting the color ink and transparent ink on the same point, using the color ink and the transparent ink is disclosed.

[0004] In a recording apparatus in the recent years, recording of various forms has been executed with respect to recording media of various types. For example, there is a case in which recording is executed so that ink sufficiently permeates into cloth as a recording medium, not only on a recording face onto which ink is ejected, but also on a face on a side opposite to the recording face. In such a case, permeation ink (corresponding to the second ink) for causing ink for image forming to sufficiently permeate into the face on the side opposite to the recording face is ejected onto a recording medium, in addition to the ink for image forming (corresponding to the first ink). However, there has been a case in which the ink for image forming does not sufficiently permeate into the recording medium, and insufficient dispersion occurs in the thickness direction of the recording medium.

SUMMARY

[0005] An advantage of some aspects of the invention is to suppress insufficient dispersion of ink for image forming, when an image is formed by ejecting the ink for image forming and permeation ink.

[0006] According to an aspect of the invention, there is provided a recording apparatus which includes an ejecting unit which can eject first ink for image forming and a colorless second ink onto a recording medium; and a control unit which can control ejecting operations of the first ink and the second ink in the ejecting unit, in which the control unit performs ejecting operations of the first ink and the second ink so that the second ink, the first ink, and the second ink overlap on the recording medium in this order.

[0007] In the recording apparatus, the ejecting unit may be able to eject the first ink from a first ejecting unit, and

the second ink from a second ejecting unit while reciprocating in a reciprocating direction, and the second ejecting units may be provided on both sides of the first ejecting unit in the reciprocating direction.

[0008] In the recording apparatus, the ejecting unit may be able to eject the first ink from the first ejecting unit, and the second ink from the second ejecting unit while reciprocating in a reciprocating direction, and the control unit may perform an ejecting operation of the second ink at least once with respect to the same recording region in both an outward direction and a return direction in the reciprocating direction.

[0009] In the recording apparatus, the control unit may execute ejecting operations of the second ink before and after an ejecting operation of the first ink so that each ejecting amount becomes equal.

[0010] In the recording apparatus, the control unit may execute ejecting operations of the second ink before and after an ejecting operation of the first ink so that an ejecting amount in the previous ejecting operation is larger than an ejecting amount in the subsequent ejecting operation.

[0011] In the recording apparatus, the control unit may execute ejecting operations of the second ink before and after an ejecting operation of the first ink so that an ejecting amount in the previous ejecting operation is smaller than an ejecting amount in the subsequent ejecting operation.

[0012] According to the invention, it is possible to suppress insufficient dispersion of ink for image forming when an image is formed by ejecting the ink for image forming and permeation ink.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] 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 side view of a recording apparatus according to a first embodiment of the invention.

Fig. 2 is a block diagram which illustrates the recording apparatus according to the first embodiment of the invention.

Figs. 3A to 3C are schematic views which illustrate main portions of the recording apparatus according to the first embodiment of the invention.

Figs. 4A to 4C are schematic views which illustrate main portions of a recording apparatus according to a second embodiment of the invention.

Figs. 5A to 5C are schematic views which illustrate main portions of a recording apparatus according to a third embodiment of the invention.

Figs. 6A to 6C are schematic views which illustrate main portions of a recording apparatus according to a fourth embodiment of the invention.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

First Embodiment (Figs. 1 to 3C)

[0014] Hereinafter, a recording apparatus according to a first embodiment of the invention will be described in detail with reference to accompanying drawings.

[0015] First, an outline of a recording apparatus 1 according to the first embodiment of the invention will be described.

[0016] Fig. 1 is a schematic side view of the recording apparatus 1 according to the first embodiment.

[0017] The recording apparatus 1 according to the embodiment includes a feeding unit 2 which can send out a roll R1 of a recording medium (medium) P for performing recording. The recording apparatus further includes a transport mechanism 3 which transports the recording medium P in a transport direction A using an adhesive belt 10 (endless belt) which supports the recording medium P on a support face F onto which an adhesive is attached. The recording apparatus further includes a recording mechanism 4 which performs recording by causing a carriage 19 which includes a recording head 7 as an ejecting unit to perform reciprocating scanning in a reciprocating direction B which intersects the transport direction A of the recording medium P. The recording apparatus further includes a washing mechanism 15 of the adhesive belt 10. In addition, the recording apparatus further includes a winding mechanism 18 including a winding shaft 17 which winds up the recording medium P.

[0018] The feeding unit 2 includes a rotating shaft 5 as a setting position of the roll R1 of the recording medium P for performing recording, and can feed the recording medium P to the transport mechanism 3 through a driven roller 6 from the roll R1 which is set on the rotating shaft 5. In addition, when feeding the recording medium P to the transport mechanism 3, the rotating shaft 5 rotates in a rotation direction C.

[0019] The transport mechanism 3 includes the adhesive belt 10 which transports the recording medium P which is fed from the feeding unit 2 by mounting the medium thereon, and a driving roller 8 and a driven roller 9 which move the adhesive belt 10 in a direction E. The recording medium P is mounted on the support face F of the adhesive belt 10 by being pressurized and attached using a pressurizing roller 12. In addition, when transporting the recording medium P, the driving roller 8 rotates in the rotation direction C.

[0020] However, the endless belt as a transport belt is not limited to the adhesive belt. For example, an electrostatic suctioning-type endless belt may be used.

[0021] The recording apparatus 1 according to the embodiment has a configuration in which it is possible to use cloth as the recording medium P, by including the transport mechanism with such a configuration. However, it is not limited to the transport mechanism with such a configuration, and may be a transport mechanism with a configuration in which the recording medium P is trans-

ported by being supported by a movable support tray, or a configuration in which the recording medium P is transported using a pair of rollers, or the like. In addition, it may be a recording apparatus of a so-called flatbed type in which recording is performed by fixing the recording medium P to a support unit, and the recording head 7 is moved with respect to the fixed recording medium.

[0022] The recording mechanism 4 includes a carriage motor 30 (refer to Fig. 2) which causes the carriage 19 including the recording head 7 to reciprocate in the reciprocating direction B. In addition, in Fig. 1, the reciprocating direction B is a direction perpendicular to a plane on which

[0023] Fig. 1 is represented.

[0024] When performing recording, the carriage 19 including the recording head 7 is caused to perform reciprocating scanning; however, the transport mechanism 3 stops transporting of the recording medium P in the middle of scanning for recording (in the middle of moving of carriage 19). In other words, when performing recording, reciprocating scanning of the carriage 19 and transporting of the recording medium P are alternately performed. That is, when performing recording, the transport mechanism 3 causes the recording medium P to be intermittently transported (intermittent movement of adhesive belt 10) corresponding to reciprocating scanning of the carriage 19.

[0025] In addition, though it will be described in detail later, the recording apparatus 1 according to the embodiment has a configuration in which it is possible to perform recording by ejecting permeation ink as second ink 12 (refer to Figs. 3A to 3C) from the recording head 7, in addition to color ink for image forming as first ink I1 (refer to Figs. 3A to 3C). For this reason, it is a configuration in which it is possible to perform recording so that ink I sufficiently permeates onto a face on a side opposite to a recording face, not only the recording face onto which the ink I (refer to Figs. 3A to 3C) is ejected, when cloth is used as the recording medium P, for example.

[0026] The washing mechanism 15 of the adhesive belt 10 includes a washing brush 13 to which a plurality of washing rollers are connected in a rotating shaft direction, and a tray 14 in which a detergent for washing the washing brush 13 is filled.

[0027] The winding mechanism 18 is a mechanism which winds up the recording medium P on which recording is performed, and which is transported from the transport mechanism 3 through a driven roller 11, and can wind up the medium as a roll R2 of the recording medium P, by setting a paper tube for winding on the winding shaft 17, and winding the recording medium P around the paper tube.

[0028] Subsequently, an electrical configuration in the recording apparatus 1 according to the embodiment will be described.

[0029] Fig. 2 is a block diagram of the recording apparatus 1 according to the embodiment.

[0030] A CPU 24 which is in charge of a control of the

entire recording apparatus 1 is provided in the control unit 23. The CPU 24 is connected to a ROM 26 which stores various control programs, or the like, which are executed by the CPU 24, and a RAM 27 which can temporarily store data through a system bus 25.

[0031] In addition, the CPU 24 is connected to a head driving unit 28 for driving the recording head 7 through the system bus 25.

[0032] The CPU 24 is connected to a motor driving unit 29 for driving the carriage motor 30, a transport motor 31, a feeding motor 32, and a winding motor 33 through the system bus 25.

[0033] Here, the carriage motor 30 is a motor for moving the carriage 19 including the recording head 7. In addition, the transport motor 31 is a motor for driving the driving roller 8. The feeding motor 32 is a motor which is a rotation mechanism of the rotating shaft 5, and which drives the rotating shaft 5 for sending the recording medium P to the transport mechanism 3. In addition, the winding motor 33 is a driving motor for rotating the winding shaft 17.

[0034] In addition, the CPU 24 is connected to an input-output unit 21 through the system bus 25, and the input-output unit 21 is connected to a PC 22 for performing transceiving of data such as recording data, and a signal.

[0035] Subsequently, the carriage 19 which is a main portion of the recording apparatus 1 according to the embodiment will be described.

[0036] Figs. 3A to 3C are schematic views which illustrate the recording head 7 which is provided in the carriage 19 according to the embodiment. Among these, Fig. 3A is a schematic bottom view of the recording head 7, and Figs. 3B and 3C are schematic front views of the recording head 7.

[0037] As described above, the recording apparatus 1 according to the embodiment can perform recording by ejecting the first ink I1 as color ink for image forming, and the second ink 12 as permeation ink from the recording head 7. Here, the second ink 12 as the permeation ink is ink which supports permeation of the first ink I1 as the color ink for image forming with respect to the recording medium P, and is substantially colorless ink which does not contain a coloring material of an effective dose. In addition, as illustrated in Fig. 3A, the recording head 7 according to the embodiment is provided with a first nozzle column N1 as a first ejecting unit which ejects the first ink I1, and a second nozzle column N2 as a second ejecting unit which ejects the second ink 12 as nozzle columns N. In detail, the first nozzle column N1 and the second nozzle column N2 are arranged at an overlapping position when viewed in the reciprocating direction B, and the first nozzle column N1 is provided so as to interpose the second nozzle column N2 in the reciprocating direction B. In this specification, the expression "nozzle column" includes a plurality of nozzle columns. In this embodiment, the second nozzle column N2 lies on either side of the first nozzle column N1.

[0038] Here, when recording is performed on the re-

ording medium P using color ink for image forming (first ink I1) and permeation ink (second ink 12), there is a case in which a coloring material of the color ink does not disperse (color ink does not permeate) as much as an expectation of a user in the thickness direction of the recording medium P.

[0039] Therefore, the recording apparatus 1 according to the embodiment has a configuration in which it is possible to perform recording by ejecting the second ink 12 before and after an ejecting operation of the first ink I1 in a case in which recording is performed using the second ink 12 as the permeation ink along with the first ink I1 as the color ink for image forming, when the control unit 23 controls ejecting of the ink I from the first nozzle column N1 and the second nozzle column N2.

[0040] Specifically, recording is performed using the first nozzle column N1, and the second nozzle columns N2 on both sides of the first nozzle column N1 in the reciprocating direction B, in both cases of a case in which recording is performed (ejecting ink I) while causing the carriage 19 to move in the outward direction B1 in the reciprocating direction B which is illustrated in Fig. 3B, and a case in which recording is performed while causing the carriage 19 to move in the return direction B2 in the reciprocating direction B which is illustrated in Fig. 3C. That is, the ejecting operations of the second ink 12 of two times in total are performed before and after an ejecting operation of the first ink I1, respectively, with respect to one ejecting operation of the first ink I1. In addition, a correlation between the outward direction B1 and the return direction B2 may be reverse in the direction in the figure.

[0041] By performing recording in this manner, it is also possible to prevent the coloring material of the color ink from not dispersing as much as an expectation of a user, also in a case in which recording is performed on the recording medium P using the color ink for image forming as the first ink I1, and the permeation ink as the second ink 12. The reason for this is that, by performing recording in this manner, the first ink I1 easily disperses in the thickness direction of the recording medium P compared to a case in which the second ink 12 is caused to be landed only either before or after landing of the first ink I1.

[0042] In conclusion, the recording apparatus 1 according to the embodiment includes the recording head 7 which can eject the first ink I1 for image forming and the colorless second ink 12 onto the recording medium P, and a control unit 23 which can control ejecting operations of the first ink I1 and the second ink 12 in the recording head 7.

[0043] In addition, the control unit 23 performs ejecting operations of the first ink I1 and the second ink 12 so that landing positions of the second ink 12, the first ink I1, and the second ink 12 overlap in this order on the recording medium P.

[0044] That is, the recording apparatus 1 according to the embodiment causes the second ink 12 to land on the recording medium P before and after landing of the first

ink I1. By performing such an ejecting operation, the first ink I1 easily disperses in the thickness direction of the recording medium P compared to a case in which the second ink 12 is caused to land on the recording medium P before or after landing of the first ink I1. For this reason, the recording apparatus 1 according to the embodiment can suppress insufficient dispersion of the first ink I1.

[0045] In other words, the recording apparatus 1 according to the embodiment can perform recording using a color which is lighter than the color ink, using the first ink I1 as the color ink, and the second ink 12 as the colorless permeation ink. In addition, since insufficient dispersion of the color ink can be suppressed, it is possible to adjust density of the color ink in a wide range.

[0046] In addition, as described above, the recording apparatus 1 according to the embodiment can cause the first ink I1 to be ejected from the first nozzle column N1, and cause the second ink 12 to be ejected from the second nozzle column N2 while causing the recording head 7 to reciprocate in the reciprocating direction B under a control of the control unit 23. In addition, as illustrated in Figs. 3A to 3C, the second nozzle columns N2 are provided on both sides of the first nozzle column N1 in the reciprocating direction B.

[0047] The recording apparatus 1 according to the embodiment can cause the ejecting operation of causing the second ink 12 to be landed before and after landing of the first ink I1 to be executed along with a movement of the recording head in each direction of the outward direction B1 and the return direction B2 in the reciprocating direction B.

[0048] Here, the control unit 23 according to the embodiment can cause the plurality of ejecting operations of the second ink 12 (each ejecting operation of second nozzle column N2 on both sides of first nozzle column N1) which are executed along with a movement in one direction of the outward direction B1 and the return direction B2 to be executed so that each ejecting amount of the second nozzle column N2 on both sides becomes equal. By setting each ejecting amount of the ejecting operations of the second ink 12 before and after the ejecting operation of the first ink I1 to be equal in this manner, it is possible to simply perform an ejecting control using the control unit 23.

[0049] In addition, the control unit 23 according to the embodiment can execute each ejecting operation of the second nozzle column N2 on both sides of the first nozzle column N1 so that an ejecting amount of the second nozzle column N2 on the front side in the movement direction of the recording head 7 during the movement in the reciprocating direction B is larger than an ejecting amount of the second nozzle column N2 on the rear side. In other words, it is possible to execute the ejecting operation of the second ink 12 before and after the ejecting operation of the first ink I1 which is executed along with a movement in one direction of the outward direction B1 and the return direction B2 so that an ejecting amount in the previous ejecting operation is larger than an ejecting amount in

the subsequent ejecting operation.

[0050] For this reason, in a case in which it is not desirable to wet the recording medium P using the second ink 12 after ejecting of the first ink I1, or the like, it is possible to suppress insufficient dispersion of the first ink I1.

[0051] In addition, the control unit 23 according to the embodiment can cause each ejecting operation of the second nozzle column N2 on both sides of the first nozzle column N1 to be ejected so that an ejecting amount of the second nozzle column N2 on the front side in the movement direction of the recording head 7 during the movement in the reciprocating direction B is smaller than an ejecting amount of the second nozzle column N2 on the rear side. In other words, it is possible to cause the ejecting operation of the second ink 12 before and after the ejecting operation of the first ink I1 which is executed along with a movement in one direction of the outward direction B1 and the return direction B2 to be executed so that an ejecting amount in the previous ejecting operation is smaller than an ejecting amount in the subsequent ejecting operation.

[0052] For this reason, in a case in which it is not desirable to wet the recording medium P using the second ink 12 before ejecting of the first ink I1, or the like, it is possible to suppress insufficient dispersion of the first ink I1.

[0053] As illustrated in Fig. 3A, the carriage 19 according to the embodiment includes the recording head 7 which is provided with both the first nozzle column N1 and the second nozzle column N2. In this manner, the recording apparatus 1 according to the embodiment suppresses insufficient dispersion of the first ink I1 in a configuration of including the recording heads 7 which is provided with both the first nozzle column N1 and the second nozzle column N2 in the carriage 19. However, it is not limited to such a configuration.

Second Embodiment (Figs. 4A to 4C)

[0054] Subsequently, a recording apparatus according to a second embodiment of the invention will be described.

[0055] Figs. 4A to 4C are schematic views which illustrate a recording head 7 which is provided in a carriage 19 as a main portion of a recording apparatus 1 according to the second embodiment of the invention. Among these, Fig. 4A is a schematic bottom view of the recording head 7, and corresponds to Fig. 3A which illustrates the recording apparatus 1 according to the first embodiment. In addition, Figs. 4B and 4C are schematic front views of the recording head 7, and correspond to Figs. 3B and 3C which illustrate the recording apparatus 1 according to the first embodiment.

[0056] In addition, constituent elements which are common to those in the first embodiment will be given the same reference numerals, and detailed descriptions will be omitted.

[0057] The recording apparatus 1 according to the embodiment is different from the recording apparatus 1 according to the first embodiment only in a configuration of the recording head 7 which is provided in the carriage 19.

[0058] The carriage 19 according to the first embodiment is provided with the recording head 7 in which both the first nozzle column N1 and the second nozzle column N2 are provided.

[0059] On the other hand, as illustrated in Figs. 4A to 4C, the carriage 19 according to the embodiment has a configuration of including a recording head 7a in which the first nozzle column N1 is provided, and two recording heads 7b in which the second nozzle column N2 is provided as the recording head 7. That is, according to the embodiment, in the recording head 7a and the recording head 7b as the ejecting unit, the recording head 7a can be expressed as a first ejecting unit, and the recording head 7b can be expressed as a second ejecting unit.

[0060] As illustrated in Figs. 4A to 4C, the recording apparatus 1 according to the embodiment includes the carriage 19 which has the recording head 7a in which the first nozzle column N1 is provided, and the recording head 7b in which the second nozzle column N2 is provided. In addition, a positional relationship between the first nozzle column N1 and the second nozzle column N2, and a control method thereof are the same as those in the carriage 19 according to the first embodiment.

[0061] That is, the recording apparatus 1 according to the embodiment has a configuration of suppressing insufficient dispersion of the first ink I1, similarly to the recording apparatus according to the first embodiment, in a configuration in which the carriage 19 includes the recording head 7a in which the first nozzle column N1 is provided, and the recording head 7b in which the second nozzle column N2 is provided.

Third Embodiment (Figs. 5A to 5C)

[0062] Subsequently, a recording apparatus according to a third embodiment of the invention will be described.

[0063] Figs. 5A to 5C are schematic views which illustrate a recording head 7 which is provided in a carriage 19 as a main portion of a recording apparatus 1 according to the third embodiment of the invention. Among these, Fig. 5A is a schematic bottom view of the recording head 7, and corresponds to Fig. 3A which illustrates the recording apparatus 1 according to the first embodiment. In addition, Figs. 5B and 5C are schematic front views of the recording head 7, and correspond to Figs. 3B and 3C which illustrate the recording apparatus 1 according to the first embodiment.

[0064] In addition, constituent elements which are common to those in the first and the second embodiments will be given the same reference numerals, and detailed descriptions will be omitted.

[0065] The recording apparatus 1 according to the embodiment is different from the recording apparatus 1 according to the first and second embodiments only in a

configuration of the recording head 7 which is provided in a carriage 19, and a control method thereof.

[0066] The carriage 19 according to the first and second embodiments has a configuration of providing the second nozzle columns N2 on both sides of the first nozzle column N1 in the scanning direction B.

[0067] On the other hand, the carriage 19 according to the embodiment has a configuration of providing the second nozzle column N2 only on one side of the first nozzle column N1 in the reciprocating direction B, as illustrated in Figs. 5A to 5C.

[0068] As illustrated in Figs. 5A to 5C, in the recording apparatus 1 according to the embodiment, the second nozzle column N2 is provided only on one side of the first nozzle column N1 in the reciprocating direction B. In addition, similarly to the recording apparatus in the first and second embodiments, the recording head 7 can eject the first ink I1 from the first nozzle column N1, and can eject the second ink 12 from the second nozzle column N2 while reciprocating in the reciprocating direction B.

[0069] Here, the control unit 23 according to the embodiment can perform a control in which the recording head 7 is caused to execute an ejecting operation of at least once of the second ink 12 with respect to the same recording region in both the outward direction B1 and the return direction B2 in the reciprocating direction B. Specifically, as illustrated in Fig. 5B, the recording head 7 is caused to eject the second ink 12 from the second nozzle column N2 on the front side, and the first ink I1 from the first nozzle column N1 on the rear side while being moved in the outward direction B1. In addition, as illustrated in Fig. 5C, the recording head 7 is caused to eject the second ink 12 from the second nozzle column N2 while being moved in the return direction B2 without transporting the recording medium P, that is, in the same recording region as that in the movement in the outward direction B1.

[0070] When the control unit 23 performs a control in this manner using the recording head 7 with such a configuration, it is possible to execute an ejecting operation of causing the second ink 12 to land before and after landing of the first ink I1 without increasing the number of ejecting units (second nozzle column N2).

Fourth Embodiment (Figs. 6A to 6C)

[0071] Subsequently, a recording apparatus according to a fourth embodiment of the invention will be described.

[0072] Figs. 6A to 6C are schematic views which illustrate a recording head 7 which is provided in a carriage 19 as a main portion of a recording apparatus 1 according to the fourth embodiment of the invention. Among these, Fig. 6A is a schematic bottom view of the recording head 7, and corresponds to Fig. 3A which illustrates the recording apparatus 1 according to the first embodiment. In addition, Figs. 6B and 6C are schematic front views of the recording head 7, and correspond to Figs. 3B and 3C which illustrate the recording apparatus 1 according to the first embodiment.

[0073] In addition, constituent elements which are common to those in the first to third embodiments will be given the same reference numerals, and detailed descriptions will be omitted.

[0074] The recording apparatus 1 according to the embodiment is different from the recording apparatus 1 according to the third embodiment only in a configuration of the recording head 7 which is provided in the carriage 19.

[0075] The carriage 19 according to the third embodiment has a configuration of including the recording head 7 in which both the first nozzle column N1 and the second nozzle column N2 are provided.

[0076] On the other hand, as illustrated in Figs. 6A to 6C, the carriage 19 according to the embodiment includes a recording head 7a in which the first nozzle column N1 is provided, and a recording head 7b in which the second nozzle column N2 is provided as the recording head 7.

[0077] In addition, a positional relationship between the first nozzle column N1 and the second nozzle column N2, and a control method thereof are the same as those in the carriage 19 according to the fifth embodiment.

[0078] That is, the recording apparatus 1 according to the embodiment has a configuration in which it is possible to execute an ejecting operation of landing the second ink 12 before and after landing of the first ink I1 without increasing the number of ejecting units, similarly to the recording apparatus in the third embodiment.

[0079] In addition, the invention is not limited to above described embodiments, and can be variously modified in the scope of the invention which is described in the claims, and it is needless to say that those are also included in the scope of the invention.

[0080] Hitherto, the invention has been described in detail based on specific embodiments. Here, the invention will be collectively described once again.

[0081] A recording apparatus 1 according to a first aspect of the invention includes an ejecting unit 7 which can eject first ink I1 for image forming and a colorless second ink 12 onto a recording medium, and a control unit 23 which can control ejecting operations of the first ink I1 and the second ink 12 in the ejecting unit 7, in which the control unit 23 performs ejecting operations of the first ink I1 and the second ink 12 so that the second ink 12, the first ink I1, and the second ink 12 overlap on the recording medium P in this order.

[0082] According to the aspect, the control unit 23 can perform a control in which the ejecting unit 7 is caused to execute ejecting operations of the first ink I1 and the second ink 12 so that landing positions of the second ink 12, the first ink I1, and the second ink 12 overlap in this order. That is, the second ink 12 is caused to land before and after landing of the first ink I1 on the recording medium P. By causing such ejecting operations to be executed, dispersion of the first ink I1 in the thickness direction of the medium P becomes easy, and it is possible to suppress insufficient dispersion of the first ink I1 com-

pared to a case in which the second ink 12 is caused to land before or after landing of the first ink I1.

[0083] In the recording apparatus 1 according to a second aspect of the invention, in the first aspect, the ejecting unit 7 can eject the first ink I1 from a first ejecting unit N1, and the second ink 12 from a second ejecting unit N2 while reciprocating in a reciprocating direction B, and the second ejecting units N2 are provided on both sides of the first ejecting unit N1 in the reciprocating direction B.

[0084] According to the aspect, the second ejecting units N2 are provided on both sides of the first ejecting unit N1 in the reciprocating direction B. For this reason, it is possible to execute an ejecting operation in which the second ink 12 is caused to land before and after landing of the first ink I1 along with a movement in one direction of the outward direction B1 and the return direction B2 in the reciprocating direction B.

[0085] In the recording apparatus 1 according to a third aspect of the invention, in the first aspect, the ejecting unit 7 can eject the first ink I1 from the first ejecting unit N1, and can eject the second ink 12 from the second ejecting unit N2 while reciprocating in the reciprocating direction B, and the control unit 23 performs an ejecting operation of the second ink 12 of at least once with respect to the same recording region in both the outward direction B1 and the return direction B2 in the reciprocating direction B.

[0086] According to the aspect, the control unit 23 can perform a control in which the ejecting unit 7 is caused to execute an ejecting operation of the second ink 12 of at least once with respect to the same recording region in both the outward direction B1 and the return direction B2 in the reciprocating direction B. For this reason, it is possible to execute the ejecting operation of causing the second ink 12 to land before and after landing of the first ink I1 without increasing the number of ejecting units 7.

[0087] In the recording apparatus 1 according to a fourth aspect of the invention, in any one of the first to third aspects, the control unit 23 executes ejecting operations of the second ink 12 before and after an ejecting operation of the first ink I1 so that each ejecting amount becomes equal.

[0088] According to the aspect, the control unit 23 executes the ejecting operations of the second ink 12 before and after the ejecting operation of the first ink I1 so that each ejecting amount becomes equal. It is possible to simply perform an ejecting control by setting each ejecting amount of the ejecting operations of the second ink 12 before and after the ejecting operation of the first ink I1 to be equal.

[0089] In the recording apparatus 1 according to a fifth aspect of the invention, in any one of the first to third aspects, the control unit 23 executes the ejecting operations of the second ink 12 before and after the ejecting operation of the first ink I1 so that an ejecting amount in the previous ejecting operation is larger than an ejecting amount in the subsequent ejecting operation.

[0090] According to the aspect, the control unit 23 ex-

ecutes the ejecting operations of the second ink 12 before and after the ejecting operation of the first ink I1 so that an ejecting amount in the previous ejecting operation is larger than an ejecting amount in the subsequent ejecting operation. By setting an ejecting amount in the previous ejecting operation to be larger than an ejecting amount in the subsequent ejecting operation, it is possible to suppress insufficient dispersion of the first ink I1, when it is not desirable to wet the recording medium P using the second ink 12 after ejecting of the first ink I1, or the like.

[0091] In the recording apparatus 1 according to a sixth aspect of the invention, in any one of the first to third aspects, the control unit 23 executes the ejecting operations of the second ink 12 before and after the ejecting operation of the first ink I1 so that an ejecting amount in the previous ejecting operation is smaller than an ejecting amount in the subsequent ejecting operation.

[0092] According to the aspect, the control unit 23 executes the ejecting operations of the second ink 12 before and after the ejecting operation of the first ink I1 so that an ejecting amount in the previous ejecting operation is smaller than an ejecting amount in the subsequent ejecting operation. By setting an ejecting amount in the previous ejecting operation to be smaller than an ejecting amount in the subsequent ejecting operation, it is possible to suppress insufficient dispersion of the first ink I1, when it is not desirable to wet the recording medium P using the second ink 12 before ejecting of the first ink I1, or the like.

Claims

1. A recording apparatus (1) comprising:

an ejecting unit (7) which can eject first ink (I1) for image forming and a colorless second ink (12) onto a recording medium (P); and a control unit (23) which can control ejecting operations of the first ink and the second ink in the ejecting unit, wherein the control unit is arranged to perform ejecting operations of the first ink and the second ink so that the second ink, the first ink, and the second ink overlap on the recording medium in this order.

2. The recording apparatus according to claim 1, wherein the ejecting unit can eject the first ink from a first ejecting unit (7a), and the second ink from a second ejecting unit (7b) while reciprocating in a reciprocating direction (B), and wherein the second ejecting unit is provided on both sides of the first ejecting unit in the reciprocating direction.

3. The recording apparatus according to claim 1 or claim 2,

wherein the ejecting unit can eject the first ink from a first ejecting unit (7a), and the second ink from a second ejecting unit (7b) while reciprocating in a reciprocating direction (B), and wherein the control unit is arranged to perform an ejecting operation of the second ink at least once with respect to the same recording region in both an outward direction (B1) and a return direction in the reciprocating direction (B2).

4. The recording apparatus according to any one of claims 1 to 3, wherein the control unit is arranged to execute ejecting operations of the second ink before and after an ejecting operation of the first ink so that each ejecting amount becomes equal.

5. The recording apparatus according to any one of claims 1 to 3, wherein the control unit is arranged to execute ejecting operations of the second ink before and after an ejecting operation of the first ink so that an ejecting amount in the previous ejecting operation is larger than an ejecting amount in the subsequent ejecting operation.

6. The recording apparatus according to any one of claims 1 to 3, wherein the control unit is arranged to execute ejecting operations of the second ink before and after an ejecting operation of the first ink so that an ejecting amount in the previous ejecting operation is smaller than an ejecting amount in the subsequent ejecting operation.

5

10

15

20

25

30

35

40

45

50

55

FIG. 1

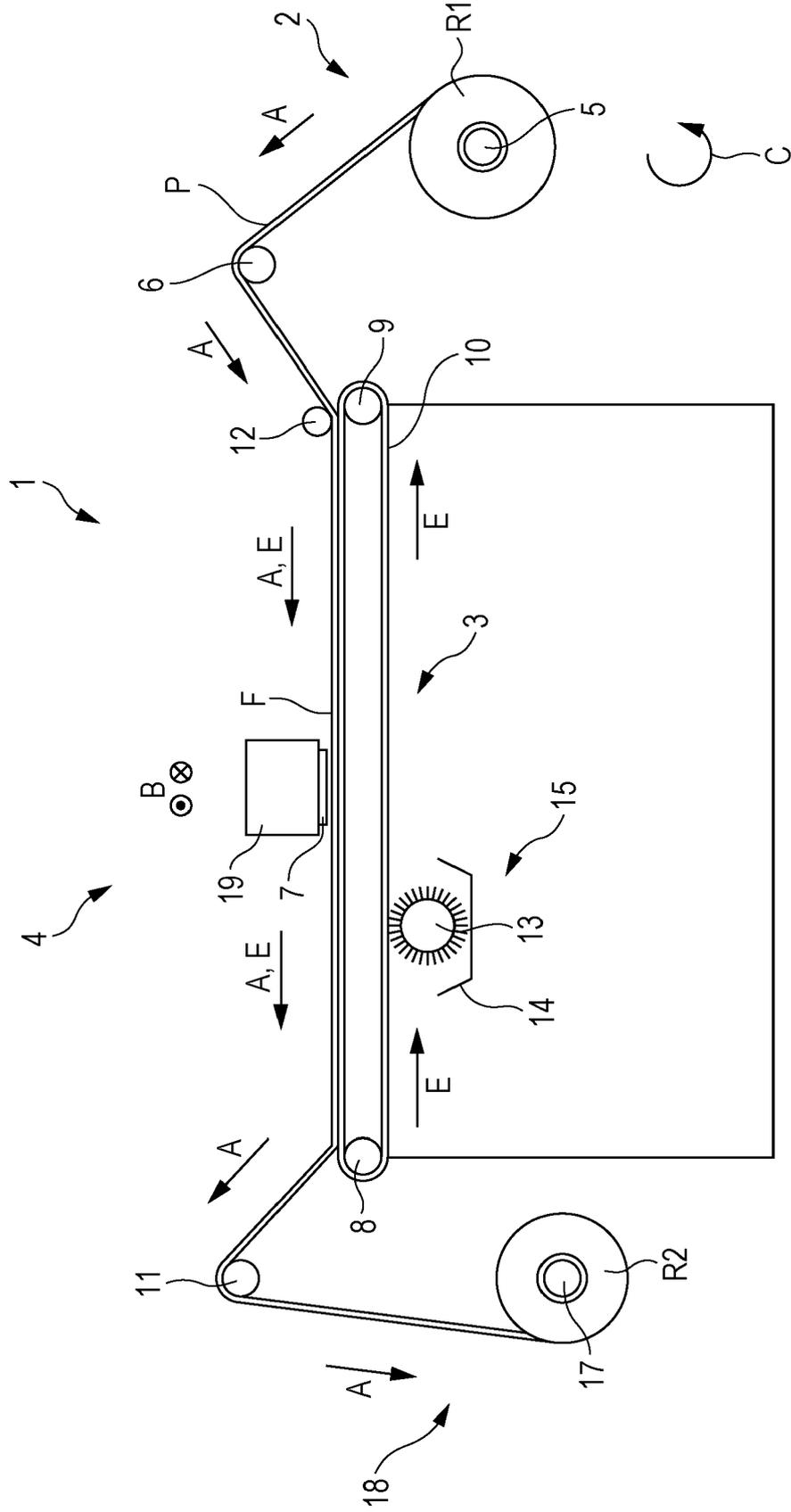


FIG. 2

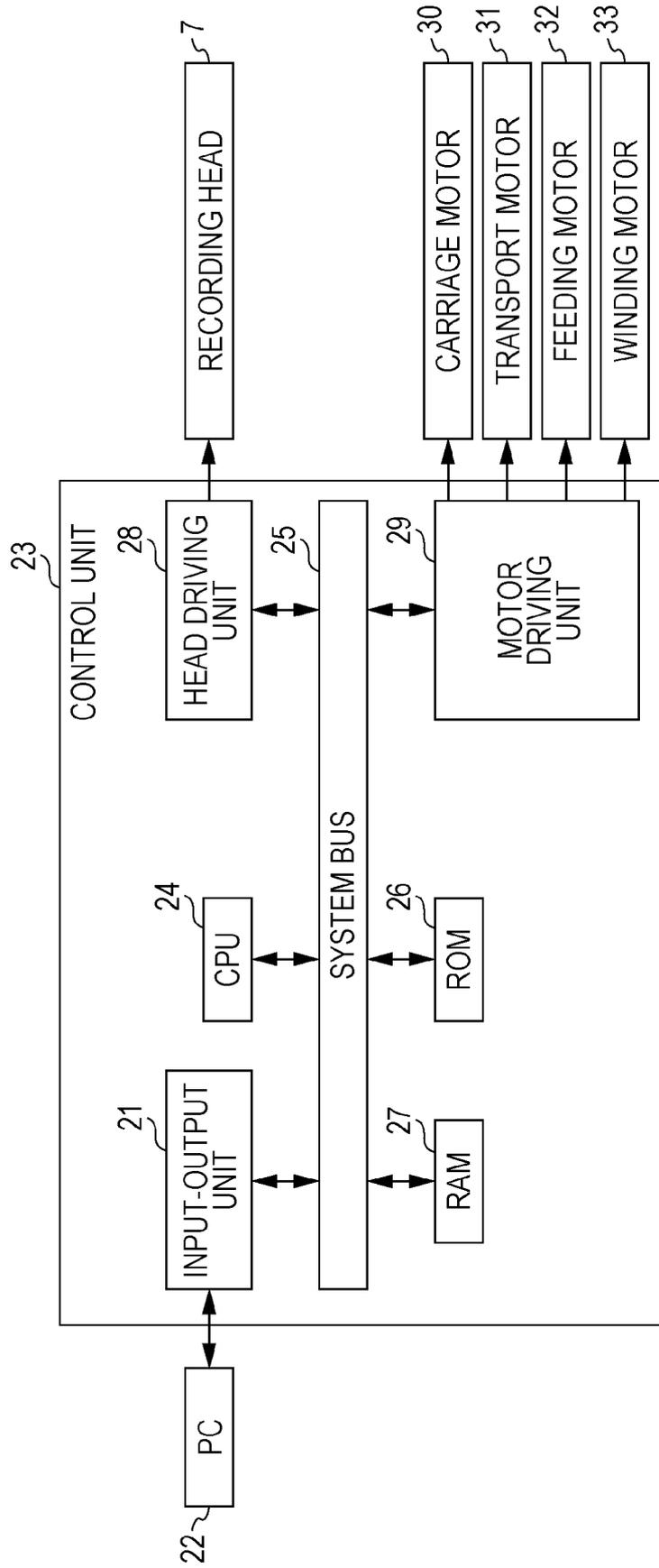


FIG. 3A

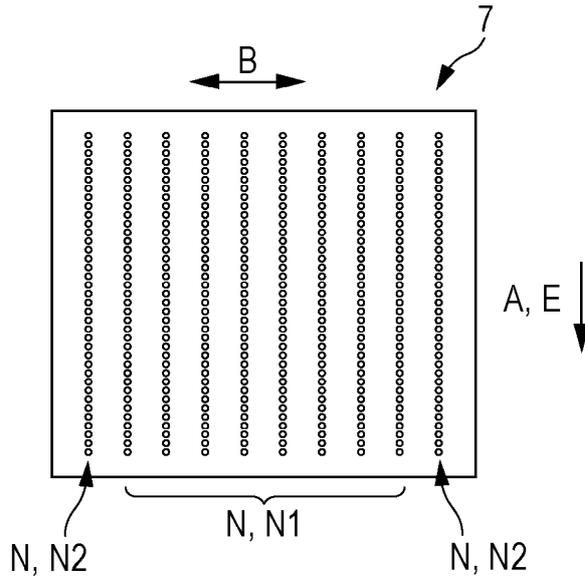


FIG. 3B

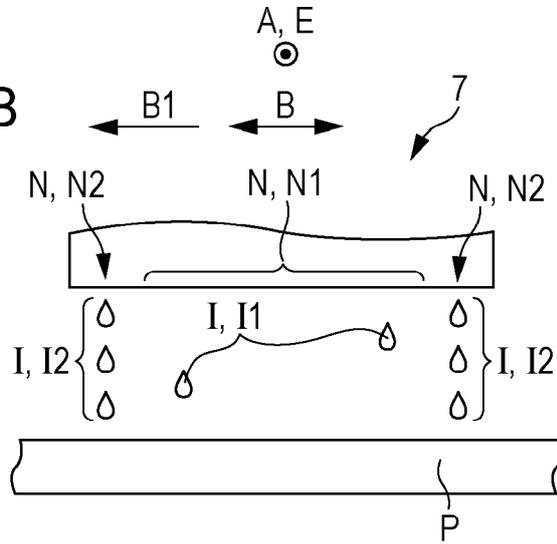


FIG. 3C

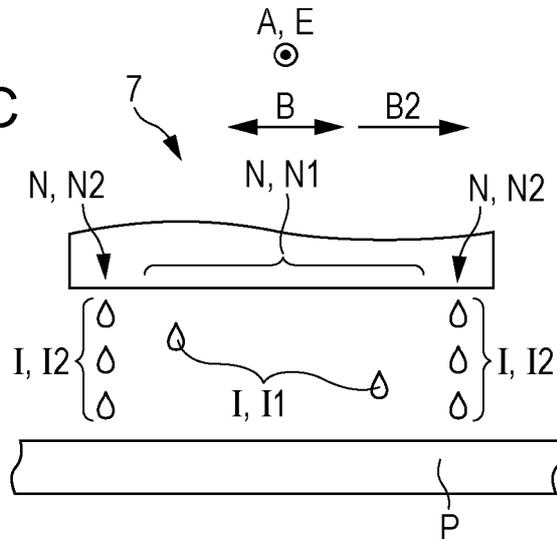


FIG. 4A

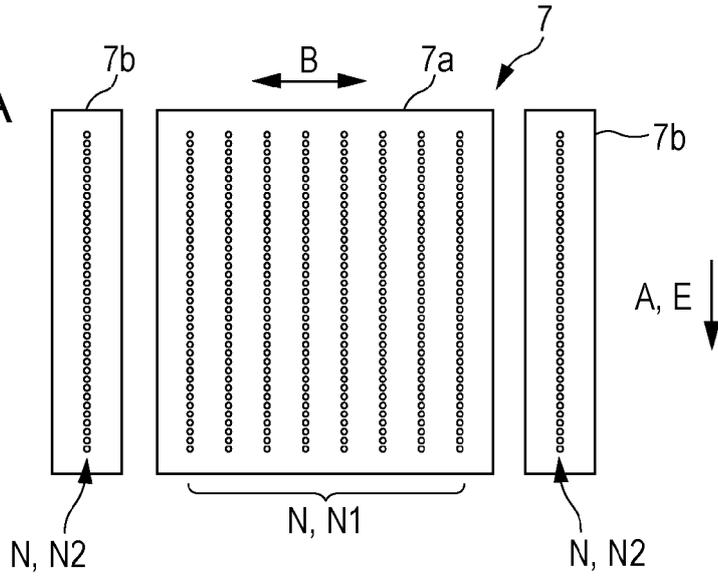


FIG. 4B

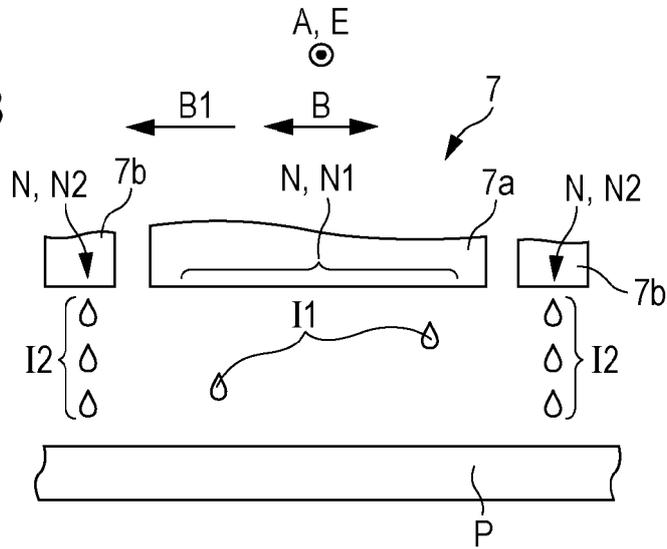


FIG. 4C

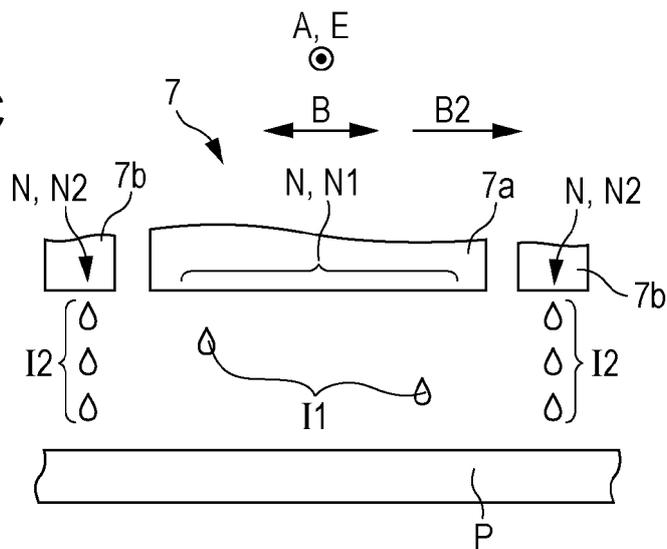


FIG. 5A

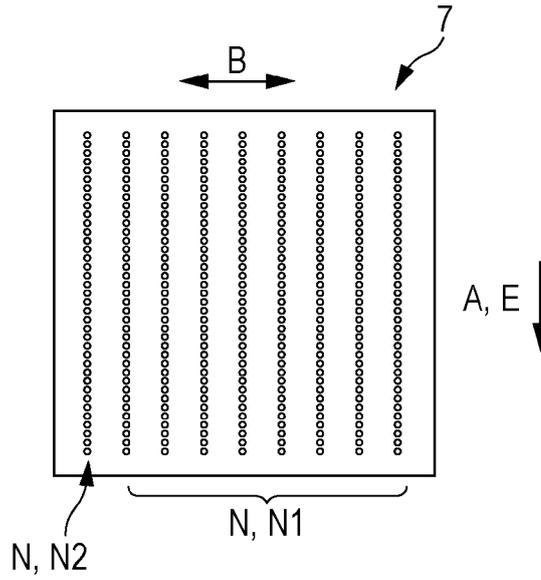


FIG. 5B

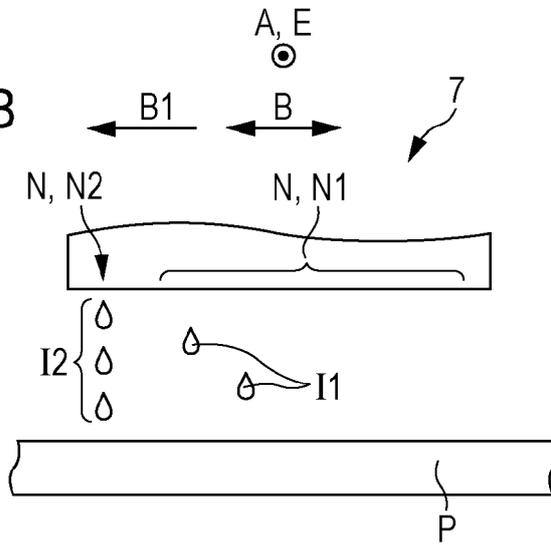
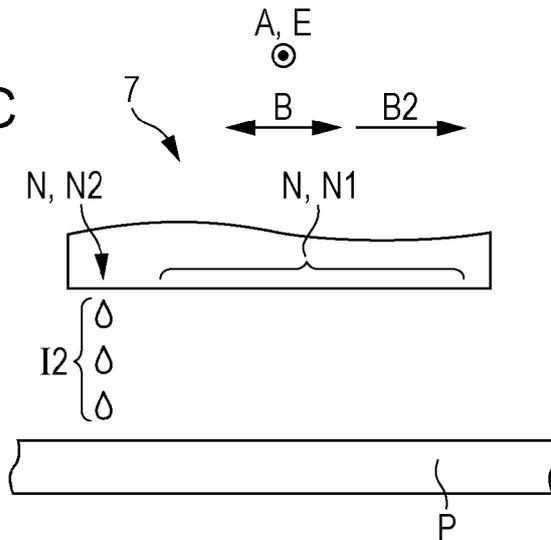
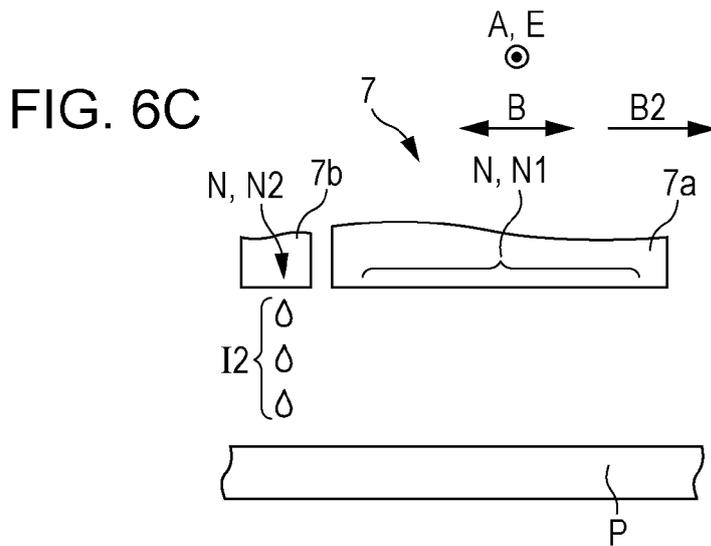
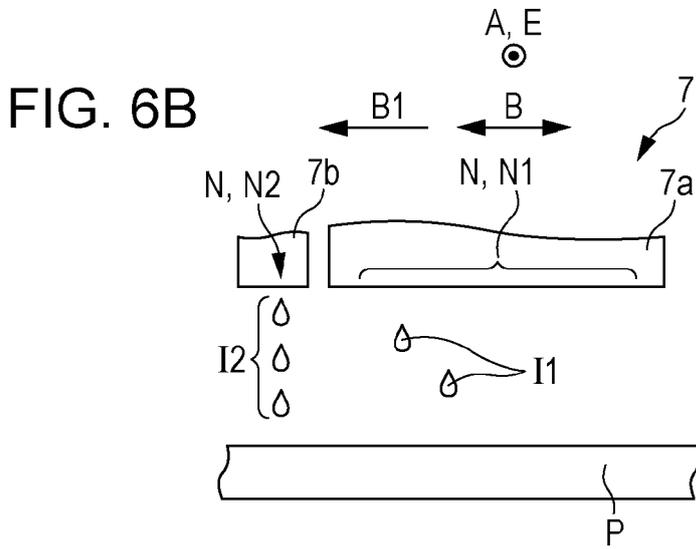
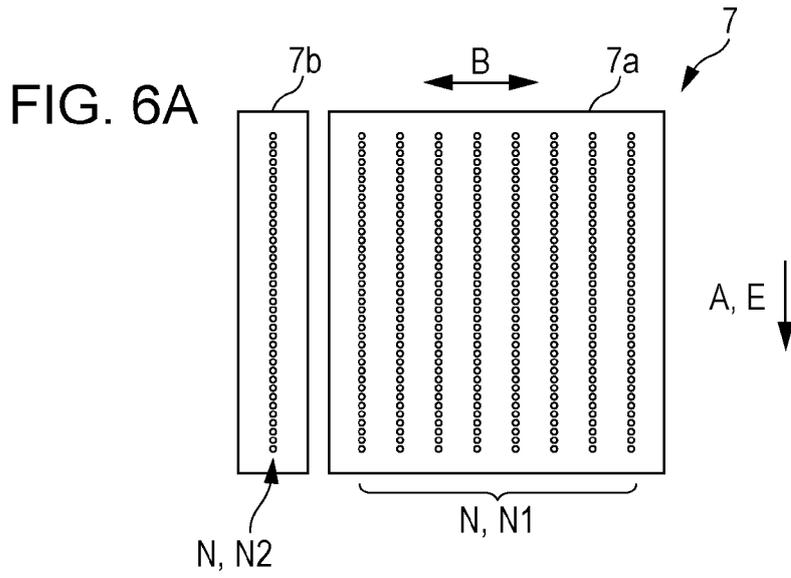


FIG. 5C







EUROPEAN SEARCH REPORT

Application Number
EP 16 16 0752

5

10

15

20

25

30

35

40

45

50

55

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	US 2014/292855 A1 (CHANG YUAN [US]) 2 October 2014 (2014-10-02)	1, 3	INV. B41J2/21
Y	* paragraph [0046] * -----	2, 4-6	
Y	US 2005/179725 A1 (MATSUSHIMA KOJI [JP]) 18 August 2005 (2005-08-18) * paragraph [0067] * -----	2, 4-6	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B41J
Place of search		Date of completion of the search	Examiner
The Hague		8 September 2016	Gavaza, Bogdan
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 16 0752

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-09-2016

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
15	US 2014292855 A1	02-10-2014	CN 103946027 A US 2014292855 A1 WO 2013123649 A1	23-07-2014 02-10-2014 29-08-2013
20	US 2005179725 A1	18-08-2005	NONE	
25				
30				
35				
40				
45				
50				
55				

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2002240328 A [0003]