(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 205 502 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
27.03.2019 Bulletin 2019/13

(51) Int Cl.:
B41J 2/165 *(2006.01)*

(21) Application number: **17155979.2**

(22) Date of filing: **14.02.2017**

(54) **LIQUID EJECTING DEVICE AND HEAD MAINTENANCE METHOD**

FLÜSSIGKEITSAUSSTOSSVORRICHTUNG UND KOPFWARTUNGSVERFAHREN

DISPOSITIF D'ÉJECTION DE LIQUIDE ET PROCÉDÉ DE MAINTENANCE DE TÊTE

(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

(30) Priority: **15.02.2016 JP 2016025677**

(43) Date of publication of application:
16.08.2017 Bulletin 2017/33

(73) Proprietor: **Fujifilm Corporation**
Minato-ku
Tokyo 106-8620 (JP)

(72) Inventor: **YAMANOBE, Jun**
Kanagawa, 258-8538 (JP)

(74) Representative: **Klunker IP**
Patentanwälte PartG mbB
Destouchesstraße 68
80796 München (DE)

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EP 3 205 502 B1

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a liquid ejecting device and a head maintenance method, and particularly, to a maintenance technique of a liquid ejecting head having a plurality of nozzles.

Description of the Related Art

[0002] In an inkjet recording device as one embodiment of a liquid ejecting device equipped with a liquid ejecting head of an inkjet system, there is known a maintenance method of wiping a nozzle surface of the liquid ejecting head using a wiping member such as a web. According to Paragraph 0044 to Paragraph 0047 in Japanese Patent Application Laid-Open No. 2015-171821, there is described the configuration that a control unit determines a section requiring cleaning on a nozzle formation surface of a record head, and after moving a carriage of a cleaning device to the vicinity of a position facing the required section, a cleaning tape is caused to make contact with the nozzle formation surface of the record head and the carriage moves in the contact state to perform the cleaning of the nozzle formation surface.

[0003] "Record head" in Japanese Patent Application Laid-Open No. 2015-171821 is a term corresponding to "liquid ejecting head" in the present specification. "Nozzle formation surface" in Japanese Patent Application Laid-Open No. 2015-171821 is a term corresponding to "nozzle surface" in the present specification. "Cleaning" in Japanese Patent Application Laid-Open No. 2015-171821 is a term corresponding to "maintenance" or "wipe" in the present specification. "Cleaning tape" in Japanese Patent Application Laid-Open No. 2015-171821 is a term corresponding to "web" in the present specification.

[0004] According to the invention described in Japanese Patent Application Laid-Open No. 2015-171821, it is possible to selectively perform the maintenance of only the required section on the nozzle surface in the liquid ejecting head. By thus performing the maintenance of only the required section, there are advantages of shortening maintenance hours and suppressing use of the wasteful web.

[0005] US 2007/222815 A1 discloses a liquid ejecting device in which a suction cap which can wipe the nozzle surface is adapted to carry out the contact operation in which the suction cap is broad into contact with the nozzle surface. After a suction operation, the suction cap is again moved so as to separate it from the nozzle surface.

SUMMARY OF THE INVENTION

[0006] However, the invention described in Japanese Patent Application Laid-Open No. 2015-171821 has the following problem. In a case of the invention described in Japanese Patent Application Laid-Open No. 2015-171821, the web is caused to make contact with the nozzle surface in a specific place on the nozzle surface of the liquid ejecting head to start the wiping of the nozzle surface. The wiping in a required range is completed, and the web is separated from the nozzle surface in some place within the nozzle surface.

[0007] Since openings of a plurality of nozzles that are ejection ports of liquids are arrayed on the nozzle surface of the liquid ejecting head, the opening of the nozzle is present in a contact starting position where the web starts to contact with the nozzle surface and in a separation starting position where the web in a state of contacting with the nozzle surface is separated from the nozzle surface to be in a non-contact state on the nozzle surface.

[0008] In each position of the contact starting position and the separation starting position of the web on the nozzle surface, at the time the web makes contact with the nozzle surface and at the time the web separates from the nozzle surface, more inks are absorbed by the web to generate engulfment of air bubbles into the nozzle or the like, deteriorating ejection performance of the nozzle in the contact starting position and the separation starting position.

[0009] Such a problem is a problem common to not only the inkjet recording device but also the configuration of wiping a nozzle surface of a liquid ejecting head having a plurality of nozzles by a wiping member.

[0010] The present invention is made in view of such a circumference, and an object of the present invention solves the problem to provide a liquid ejecting device and a head maintenance method that can suppress deterioration in ejection performance of nozzles present in a contact starting position and in a separation starting position of a wiping member on a nozzle surface of a liquid ejecting head.

[0011] The following aspects of the invention will be provided as devices for solving the problem.

[0012] According to a first aspect, a liquid ejecting device includes the features of claim 1.

[0013] According to the first aspect, the wiping control device can perform at least one control of the contact control of causing the wiping member and the nozzle surface to be brought into contact in the front part of the wiping target section in the wiping start side on the nozzle surface and the separation control of separating the wiping member from the nozzle surface in the rear part of the wiping target section in the wiping end side on the nozzle surface. When the contact control is performed by the wiping control device, the wiping member and the nozzle surface in the separated state are brought into contact while performing the relative movement of the liquid ejecting head and the wiping unit in the first direction in the front part of the wiping target section in the wiping start side on the nozzle surface. When the separation control is performed by the wiping control device

and when the separation control of separating the wiping member from the nozzle surface in the rear part of the wiping target section in the wiping end side on the nozzle surface is performed by the wiping control device, the wiping member and the nozzle surface in the contacting state are separated while performing the relative movement of the liquid ejecting head and the wiping unit in the first direction.

[0014] According to the first aspect, it is possible to reduce damage of the meniscus by the nozzle present in the vicinity of the contact position where the wiping member starts to contact with the nozzle surface and by the nozzle in the vicinity of the separation position where the wiping member is separated from the nozzle surface on the nozzle surface to suppress the deterioration of the ejection performance.

[0015] A case of performing only any one of the contact control and the separation control may occur depending upon a location of the wiping target section on the nozzle surface.

[0016] As a second aspect, the liquid ejecting device in the first aspect may be configured such that the wiping member is a band-shaped web, a web conveying device for causing the wiping member to travel in a third direction that is the opposite direction to the first direction is provided, and the wiping control device controls a feeding operation of the web by the web conveying device.

[0017] As a third aspect, the liquid ejecting device in the second aspect may be configured to, in a case where a conveying velocity of the web at the contact starting of the wiping member and the nozzle surface by the contact control is designated at Vw1 and a conveying velocity of the web at the time of wiping the wiping target section by the wiping member is designated at Vw2, satisfy Vw1 < Vw2.

[0018] According to the third aspect, the conveying velocity of the web at the contact starting when the nozzle surface and the wiping member in the separated state start to be brought into contact is slower than the conveying velocity of the web at the wiping and an area of the web contacting with the nozzle at the contacting is made small. Therefore, suction of the liquid by the web is made weak, making it possible to further reduce the damage of the meniscus.

[0019] As a fourth aspect, the liquid ejecting device in the second aspect or the third aspect may be configured to, in a case where a conveying velocity of the web at the separation starting of the wiping member and the nozzle surface by the separation control is designated at Vw3 and a conveying velocity of the web at the time of wiping the wiping target section by the wiping member is designated at Vw2, satisfy Vw3 < Vw2.

[0020] According to the fourth aspect, the conveying velocity of the web at the separation starting when the nozzle surface and the wiping member in the contacting state start to be separated is slower than the conveying velocity of the web at the wiping and an area of the web contacting with the nozzle at the separation starting is made small. Therefore, suction of the liquid by the web is made weak, making it possible to further reduce the damage of the meniscus.

[0021] As a fifth aspect, the liquid ejecting device according to any aspect of the second aspect to the fourth aspect may be configured such that the wiping unit includes a wash liquid applying device configured to apply a wash liquid to the wiping member.

[0022] As a sixth aspect, the liquid ejecting device in the fifth aspect may be configured to, in a case where a wash liquid applying amount per a unit area of wash liquids to be applied in a contact part position of the web contacting with the nozzle surface at the contact starting of the wiping member and the nozzle surface by the contact control is designated at Q1 and a wash liquid applying amount per a unit area of wash liquids to be applied in a contact part position of the web contacting with the nozzle surface in the middle of wiping the wiping target section is designated at Q2, satisfy Q1 > Q2.

[0023] According to the sixth aspect, the wash liquid amount in the contact part position of the web at the contact starting of the nozzle surface and the wiping member is larger than the wash liquid amount in the contact part position of the web at the wiping. Therefore, an air gap in the web in the contact part position of the web at the contact starting is filled with the wash liquid to substantially reduce an absorption volume of the web. As a result, the suction of the liquid from the nozzle by the web is made weak, making it possible to further reduce the damage of the meniscus.

[0024] As a seventh aspect, the liquid ejecting device in the fifth aspect or the sixth aspect may be configured to, in a case where a wash liquid applying amount per a unit area of wash liquids to be applied in a contact part position of the web contacting with the nozzle surface at the separation starting of the wiping member and the nozzle surface by the separation control is designated at Q3 and a wash liquid applying amount per a unit area of wash liquids to be applied in a contact part position of the web contacting with the nozzle surface in the middle of wiping the wiping target section is designated at Q2, satisfy Q3 > Q2.

[0025] According to the seventh aspect, the wash liquid amount in the position of the contact part of the web at the separation starting of the nozzle surface and the wiping member is larger than the wash liquid amount in the contact part position of the web at the wiping. Therefore, an air gap in the web in the contact part position of the web at the separation starting is filled with the wash liquid to substantially reduce an absorption volume of the web. As a result, the suction of the liquid from the nozzle by the web is made weak, making it possible to further reduce the damage of the meniscus.

[0026] As an eighth aspect, the liquid ejecting device in any aspect of the first aspect to the seventh aspect may be configured to include a wiping target section setting device configured to set a location that is a wiping target section on the nozzle surface.

[0027] The wiping target section setting device may be configured to set a wiping target section based upon an input operation by a user or automatically set a wiping target section based upon a program.

[0028] As a ninth aspect, the liquid ejecting device in any aspect of the first aspect to the eighth aspect may be configured such that a position where the wiping member and the nozzle surface start to be brought into contact by the contact control includes a position outside of the wiping target section.

[0029] As a tenth aspect, the liquid ejecting device in any aspect of the first aspect to the ninth aspect may be configured such that a position where the wiping member starts to separate from the nozzle surface by the separation control includes a position outside of the wiping target section.

[0030] As an eleventh aspect, the liquid ejecting device in any aspect of the first aspect to the tenth aspect may be configured such that the liquid ejecting head includes a line head and the first direction includes a longitudinal direction of the line head.

[0031] A head maintenance method according to a twelfth aspect including wiping, by a wiping member, a part of a nozzle surface of a liquid ejecting head, wherein openings of a plurality of nozzles that eject liquids are arrayed on the nozzle surface, includes the features of claim 12.

[0032] In the twelfth aspect, the items similar to the items specified in the second aspect to the eleventh aspect can be combined as needed. In this case, the devices for carrying out the processes and functions specified in the liquid ejecting device can be recognized as elements of "steps" for the associated processes and operations.

[0033] According to the present invention, it is possible to suppress deterioration in ejection performance of the nozzles present in the contact starting position and in the separation starting position of the wiping member on the nozzle surface in the liquid ejecting head.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034]

Fig. 1 is an entire configuration diagram of an inkjet recording device according to an embodiment;
Fig. 2 is a front view schematically illustrating a configuration of a maintenance unit provided side by side with a drawing unit;
Fig. 3 is a plane development explanatory diagram schematically illustrating a configuration of each of a drawing unit and a maintenance unit;
Fig. 4 is a schematic diagram illustrating a configuration example of a wiping unit;
Fig. 5 is an explanatory diagram schematically illustrating a positional relationship between a web and a liquid ejecting head, and a wiping target section on the nozzle surface;
Fig. 6 is a timing chart illustrating one example of a profile of a head maintenance operation according to the present embodiment;
Fig. 7A is an explanatory diagram illustrating a state at time t = t2a in Fig. 6;
Fig. 7B is an explanatory diagram illustrating a state at time t = t2c in Fig. 6;
Fig. 7C is an explanatory diagram illustrating a state at time t = t3 in Fig. 6;
Fig. 8A is a schematic diagram in the vicinity of a nozzle according to a comparative example;
Fig. 8B is a schematic diagram in the vicinity of a nozzle used for explaining a function of the present embodiment;
Fig. 9 is a timing chart illustrating a profile of a head maintenance operation according to the other control example;
Fig. 10 is a block diagram illustrating a schematic configuration of a control system in the inkjet recording device;
Fig. 11 is an essential part block diagram in regard to control of the maintenance unit in the present embodiment;
Fig. 12 is a perspective view illustrating a configuration example of a liquid ejecting head;
Fig. 13 is a plane schematic diagram of a liquid ejecting head;
Fig. 14 is a perspective view of a head module and is a diagram including a partial cross section;
Fig. 15 is a transparent plan view of an ejection surface in the head module; and
Fig. 16 is a cross section illustrating an internal structure of the head module.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0035] Hereinafter, preferred embodiments of the present invention will be described with reference to the accompanying drawings.

[Entire Configuration of Inkjet Recording Device]

[0036] The present disclosure exemplifies an inkjet recording device as one form of a liquid ejecting device. Fig. 1 is an entire configuration diagram of an inkjet recording device according to an embodiment. An inkjet recording device 10 is an image forming device that draws an image on a form S of a sheet using ink. The form S is one form of a medium used in image forming.

[0037] The inkjet recording device 10 includes a sheet feeding unit 12, a treatment liquid applying unit 14, a treatment liquid drying processing unit 16, a drawing unit 18, an ink drying processing unit 20, and a sheet discharging unit 24.

<Sheet Feeding Unit>

[0038] The sheet feeding unit 12 includes a sheet feed-

ing platform 30, a sheet feeding device 32, a pair of sheet feeding rollers 34, a feeder board 36, a front guide 38, and a sheet feeding barrel 40. The forms S stacked on the sheet feeding platform 30 are lifted up one by one by a suction fit of the sheet feeding device 32 to be fed to the pair of sheet feeding rollers 34. The form S fed to the pair of sheet feeding rollers 34 is sent out forward in a form conveying direction by the pair of sheet feeding rollers 34, and is placed on the feeder board 36. The form S placed on the feeder board 36 is pressed on a conveying surface of the feeder board 36 by a retainer 36A and a guide roller 36B in the conveying process by the feeder board 36 to correct concavity/convexity thereof.

[0039] The form S conveyed by the feeder board 36 is corrected in inclination with abutment of a tip end against the front guide 38. Thereafter, the form S is delivered to the sheet feeding barrel 40.

[0040] The sheet feeding barrel 40 is formed in a cylindrical shape having a direction in parallel to a rotational shaft 40B as a longitudinal direction. The sheet feeding barrel 40 has a length exceeding an entire length of the form S in the longitudinal direction. A direction of the rotational shaft 40B in the sheet feeding barrel 40 is a direction penetrating through a sheet surface in Fig. 1.

[0041] The sheet feeding barrel 40 is provided with a gripper 40A. The gripper 40A is a gripping device that grips a tip end of the form S. The gripper 40A includes a plurality of nails, a nail platform, and a gripper shaft. Illustration of the plurality of nails, the nail platform, and the gripper shaft is omitted.

[0042] The plurality of nails in the gripper 40A are arranged along a direction in parallel to the rotational shaft 40B in the sheet feeding barrel 40. Base end parts of the plurality of nails are supported by the gripper shaft to be capable of swinging. Arrangement intervals of the plurality of nails and a length of a region where the plurality of nails are arranged are determined in accordance with a size of the form S. The nail platform is a member having the direction in parallel to the rotational shaft 40B in the sheet feeding barrel 40 as a longitudinal direction. In the longitudinal direction of the sheet feeding barrel 40, the longitudinal direction of the nail platform is defined as a length equal to or more than the length of the region where the plurality of nails are arranged. The nail platform is arranged in a position facing tip ends of the plurality of nails.

[0043] The form S delivered to the sheet feeding barrel 40 from the feeder board 36 is gripped in the tip end by the gripper 40A of the sheet feeding barrel 40 and is conveyed to the treatment liquid applying unit 14.

<Treatment liquid Applying Unit>

[0044] The treatment liquid applying unit 14 is a device that applies treatment liquids on a recording surface of the form S. The treatment liquid applying unit 14 includes a treatment liquid barrel 42 and a treatment liquid applying device 44. The treatment liquid contains components that cause color materials in the ink to clump together or be thickened. Methods for causing the color materials to clump together or be thickened may specifically include a method for using treatment liquids that react to ink to perform precipitation or insolubilization of color materials in the ink, a method for using treatment liquids that generate gels as a semisolid substance containing color materials in the ink, or the like. Methods for causing reaction between the ink and the treatment liquid may include, for example, a method for causing reaction between anionic color materials in the ink and cationic chemical compounds in the treatment liquid, a method for mixing ink and a treatment liquid that differ in pH (pH: potential of hydrogen) with each other to change pH of the ink and cause dispersion breaking of pigment in the ink, causing the pigment to clump together or a method for causing dispersion breaking of pigment in the ink by reaction with multivalent metal salts in the treatment liquid to causing the pigment to clump together.

[0045] The treatment liquid barrel 42 has a diameter that is twice as large as a diameter of the sheet feeding barrel 40. The treatment liquid barrel 42 is provided with the grippers 42A arranged in two locations in the circumferential direction. The arrangement positions of the grippers 42A in the two locations are positions that deviate from each other by a semicircle on an outer peripheral surface 42C of the treatment liquid barrel 42. The structure of the gripper 42A may adopt the structure as similar to the gripper 40A of the sheet feeding barrel 40.

[0046] The treatment liquid barrel 42 is configured to fix the form S on the outer peripheral surface 42C on which the form S is supported. An example of the configuration of fixing the form S on the outer peripheral surface 42C of the treatment liquid barrel 42 may include the configuration that a plurality of absorption holes are provided on the outer peripheral surface 42C of the treatment liquid barrel 42 and a vacuum acts on the plurality of absorption holes. The configuration of the treatment liquid barrel 42 other than the above can have the configuration as similar to the sheet feeding barrel 40. A reference number 42B designates a rotational shaft of the treatment liquid barrel 42.

[0047] A roller coating method can be applied to the treatment liquid applying device 44. The treatment liquid applying device 44 of the roller coating method can adopt the configuration provided with a treatment liquid reservoir, a measuring roller, and a coating roller. Illustration of the treatment liquid reservoir, the metering roller and the coating roller is omitted.

[0048] The treatment liquid reservoir reserves therein the treatment liquid supplied from a treatment liquid tank through a treatment liquid supplying system. Illustration of the treatment liquid supplying system and the treatment liquid tank is omitted. The measuring roller measures the treatment liquid reserved in the treatment liquid reservoir. The measuring roller transfers the measured treatment liquid to the coating roller. The coating roller coats the form S with the treatment liquid.

[0049] The configuration of the treatment liquid applying device 44 herein explained is absolutely an example, and the other method may be applied to the treatment liquid applying device 44. The other configuration may be applied to the treatment liquid applying device 44. An example of the other method of the treatment liquid applying device 44 may include the coating using a blade, ejection by an inkjet method, spray by a spraying method, or the like.

[0050] When the treatment liquid barrel 42 is rotated in a state where the tip end of the form S is gripped by the gripper 42A, the form S is conveyed along the outer peripheral surface of the treatment liquid barrel 42. The treatment liquid is applied on the form S conveyed along the outer peripheral surface of the treatment liquid barrel 42 by the treatment liquid applying device 44. The form S on which the treatment liquid is applied is sent to the treatment liquid drying processing unit 16.

<Treatment liquid Drying Processing Unit>

[0051] The treatment liquid drying processing unit 16 includes a treatment liquid drying processing barrel 46, a form conveying guide 48 and a treatment liquid drying processing part 50. The treatment liquid drying processing unit 16 performs drying processing to the form S on which the treatment liquid is applied. The treatment liquid drying processing barrel 46 has a diameter equivalent to that of the treatment liquid barrel 42, and the grippers 46A are arranged in two locations in the circumferential direction as similar to the treatment liquid barrel 42. The configuration of the gripper 46A may adopt the configuration as similar to the gripper 40A of the sheet feeding barrel 40. A reference number 46B designates a rotational shaft of the treatment liquid drying processing barrel 46.

[0052] The form conveying guide 48 is arranged in a position facing the outer peripheral surface 46C of the treatment liquid drying processing barrel 46. The form conveying guide 48 is arranged on the lower side of the treatment liquid drying processing barrel 46. "Lower side" in the present specification indicates a side of a gravity direction. "Upper side" indicates a side opposing the gravity direction.

[0053] The treatment liquid drying processing part 50 is arranged inside of the treatment liquid drying processing barrel 46. The treatment liquid drying processing part 50 includes an air blowing part that blows air to an exterior of the treatment liquid drying processing barrel 46 and a heating part that heats air. For illustrative purposes, reference numbers for the air blowing part and the heating part are omitted.

[0054] The form S delivered from the treatment liquid applying unit 14 to the treatment liquid drying processing unit 16 is gripped by the gripper 46A of the treatment liquid drying processing barrel 46 in a tip end thereof.

[0055] The form S has a surface coated with the treatment liquid that is retained by the gripper 46A in a state of being directed to the inside of the treatment liquid drying processing barrel 46 and a surface opposing the surface coated with the treatment liquid that is supported by the form conveying guide 48. By rotating the treatment liquid drying processing barrel 46, the form S is conveyed along the outer peripheral surface 46C of the treatment liquid drying processing barrel 46.

[0056] The form S conveyed by the treatment liquid drying processing barrel 46 is subjected to the blowing of the heated air from the treatment liquid drying processing part 50, and the drying processing is executed thereto.

[0057] When the drying processing is executed to the form S, solvent components in the treatment liquid applied to the form S are removed, and a treatment liquid layer is formed on a surface of the form S on which the treatment liquid is applied. The form S subjected to the drying processing by the treatment liquid drying processing unit 16 is delivered to the drawing unit 18.

<Drawing Unit>

[0058] The drawing unit 18 includes a drawing barrel 52, a form pressing roller 54, liquid ejecting heads 56C, 56M, 56Y and 56K, and an in-line sensor 58. Grippers 52A of the drawing barrel 52 are arranged inside of concave portions provided on an outer peripheral surface 52C of the drawing barrel 52. The configuration as similar to the gripper 40A of the sheet feeding barrel 40 may be applied to the configuration other than the arrangement of the gripper 52A.

[0059] The drawing barrel 52 is provided with the grippers 52A arranged in two locations as similar to the treatment liquid barrel 42. An absorption hole for absorption of the form S is arranged in a medium supporting region supporting the form S on the outer peripheral surface 52C of the drawing barrel 52. Illustration of the absorption hole and the medium supporting region is omitted. The configuration as similar to the treatment liquid barrel 42 may be applied to the configuration of the drawing barrel 52 other than the above. A reference number 52B designates a rotational shaft of the drawing barrel 52.

[0060] The form pressing roller 54 presses the form S to the drawing barrel 52 to make the form S close contact with the peripheral surface of the drawing barrel 52. The form pressing roller 54 is arranged downstream of the delivering position of the form S and upstream of the liquid ejecting head 56C in the conveying direction of the form S in the drawing barrel 52. In the following explanation, the conveying direction of the form S may be described as a form conveying direction. The form conveying direction corresponds to the medium conveying direction.

[0061] Each of the liquid ejecting heads 56C, 56M, 56Y and 56K is an inkjet head that ejects liquids in an inkjet method. Alphabets attached on reference numbers of the liquid ejecting heads represent colors of inks. "C" represents cyan. "M" represents magenta. "Y" represents yellow. "K" represents black. Inks are supplied to the liq-

uid ejecting heads 56C, 56M, 56Y and 56K respectively through unillustrated pipe lines from unillustrated ink tanks that are ink supplying sources of the corresponding colors.

[0062] Each of the liquid ejecting heads 56C, 56M, 56Y and 56K is a full line type inkjet head having a drawing possible width of a length corresponding to the maximum width of an image forming region in the form S. A nozzle line in which a plurality of openings of nozzles as liquid ejecting ports over an entire region of the drawing possible width is formed on an ejecting surface of each of the liquid ejecting heads 56C, 56M, 56Y and 56K. "Ejecting surface" has the same meaning with "nozzle surface". In the present disclosure, the liquid ejecting head may be called simply "head".

[0063] The liquid ejecting heads 56C, 56M, 56Y and 56K are arranged on the upper side of the drawing barrel 52 in a state where the nozzle surface of each head is inclined to a horizontal plane such that the nozzle surfaces of the respective heads are in an approximately constant distance from the peripheral surface of the drawing barrel 52. That is, the liquid ejecting heads 56C, 56M, 56Y and 56K are radially arranged by constant intervals in the circumferential direction on a concentric circle at the center of a rotational shaft 52B of the drawing barrel 52. In the present example, four heads are arranged bilaterally symmetric across a vertical line (center line) passing a rotational center of the drawing barrel 52.

[0064] In this way, the liquid ejecting heads 56C, 56M, 56Y and 56K are arranged such that the nozzle surface of each head faces the outer peripheral surface of the drawing barrel 52, and are arranged in a position where the nozzle surface of each head has a given height in a radial direction (direction vertical to the outer peripheral surface) from the outer peripheral surface of the drawing barrel 52. That is, a gap with an equal width is formed between the outer peripheral surface of the drawing barrel 52 and the nozzle surface of each head.

[0065] The liquid ejecting heads 56C, 56M, 56Y and 56K are arranged in order of the liquid ejecting head 56C, the liquid ejecting head 56M, the liquid ejecting head 56Y and the liquid ejecting head 56K from the upstream side in the form conveying direction along the circumferential direction of the drawing barrel 52.

[0066] The present example exemplifies the configuration using inks of four colors that are standard colors of CMYK, but a combination of ink colors or color numbers is not limited to the present embodiment. Any of a light ink, a dense ink and a particular ink may be added to the configuration using the inks of four colors of CMYK as needed. For example, the configuration in which liquid ejecting heads ejecting light inks of light cyan, light magenta and the like are added or the configuration in which liquid ejecting heads ejecting particular inks of a green color, an orange color and the like are added may be adopted. The arrangement order of the liquid ejecting heads of the respective colors is not limited particularly.

[0067] Not illustrated in Fig. 1, the four liquid ejecting heads 56C, 56M, 56Y and 56K are supported by a common head supporting frame. It is possible to move an entire head unit composed of the four liquid ejecting heads 56C, 56M, 56Y and 56K attached on the head supporting frame in a radial direction of the drawing barrel 52 together with the head supporting frame. In addition, it is possible to move the entire head unit composed of the four liquid ejecting heads 56C, 56M, 56Y and 56K in an axial direction of the drawing barrel 52 together with the head supporting frame.

[0068] Further, not illustrated in Fig. 1, each of the liquid ejecting heads 56C, 56M, 56Y and 56K is supported by a movable support mechanism that is movable in a normal direction of the nozzle surface. The movable support mechanism can adjust a distance (gap) between the nozzle surface of each head and the outer peripheral surface of the drawing barrel 52 and can change a height of the head in a maintenance position for each head.

[0069] The in-line sensor 58 is arranged downstream of the liquid ejecting head 56K in the form conveying direction. The in-line sensor 58 includes an imaging device, a peripheral circuit of the imaging device, and an optical source. Illustration of the imaging device, the peripheral circuit of the imaging device, and the optical source is omitted.

[0070] A solid-state imaging device such as a CCD image sensor or a CMOS image sensor may be used as the imaging device. "CCD" is an abbreviation term of Charge Couple Device. "CMOS" is an abbreviation term of Complementary Metal-Oxide Semiconductor.

[0071] The peripheral circuit of the imaging device includes a processing circuit of an output signal of the imaging device. An example of the processing circuit may include a filter circuit removing noise components from the output signal of the imaging device, an amplifier circuit, a waveform shaping circuit or the like. Illustration of the filter circuit, the amplifier circuit and the waveform shaping circuit is omitted.

[0072] The optical source is arranged in an irradiation possible position of irradiation light to a reading object of the in-line sensor 58. An LED, a lamp or the like may be applied as the optical source. "LED" is an abbreviation of Light Emitting Diode.

[0073] The form S delivered from the treatment liquid drying processing unit 16 to the drawing unit 18 is gripped by the gripper 52A of the drawing barrel 52 in a tip end thereof. The form S gripped by the gripper 52A of the drawing barrel 52 in the tip end is conveyed along the outer peripheral surface 52C of the drawing barrel 52 with rotation of the drawing barrel 52.

[0074] The form S is pressed on the outer peripheral surface 52C of the drawing barrel 52 upon passing under the form pressing roller 54. Right under the liquid ejecting heads 56C, 56M, 56Y and 56K, an image is formed on the form S passing under the form pressing roller 54 by inks ejected from the liquid ejecting heads 56C, 56M, 56Y and 56K respectively.

[0075] In a reading region of the in-line sensor 58 on

the form S on which the image is formed by the liquid ejecting heads 56C, 56M, 56Y and 56K, the image is read by the in-line sensor 58.

[0076] The form S on which the image is read by the in-line sensor 58 is delivered from the drawing unit 18 to the ink drying processing unit 20. Presence or absence of ejection abnormality may be determined from a result of the image reading by the in-line sensor 58.

<Ink Drying Processing Unit>

[0077] An ink drying processing unit 20 includes a chain gripper 64, an ink drying processing unit 68 and a guide plate 72. The chain gripper 64 includes a first sprocket 64A, a second sprocket 64B, a chain 64C and a plurality of grippers 64D.

[0078] The chain gripper 64 has the structure that a pair of the endless chains 64C is wound around a pair of the first sprockets 64A and the second sprockets 64B. In Fig. 1, the pair of the first sprockets 64A and the second sprockets 64B and only one of the pair of the chains 64C are illustrated.

[0079] The chain gripper 64 has the structure that the plurality of grippers 64D are arranged between the pair of the chains 64C. The chain gripper 64 has the structure that the plurality of grippers 64D are arranged in a plurality of positions in the form conveying direction. In Fig. 1, only one of the grippers 64D is illustrated in the plurality of grippers 64D arranged between the pair of the chains 64C.

[0080] The conveying route of the form S by the chain gripper 64 illustrated in Fig. 1 includes a horizontal conveying region for conveying the form S along the horizontal direction and inclination conveying region for conveying the form S in an oblique upper direction.

[0081] The ink drying processing unit 68 is arranged on the conveying route of the form S in the chain gripper 64. A configuration example of the ink drying processing unit 68 may include the configuration including a heat source such as a halogen heater or an infrared heater. The other configuration example of the ink drying processing unit 68 may include the configuration including a fan for blowing air heated by the heat source on the form S. The ink drying processing unit 68 may be the configuration of including the heat source and the fan.

[0082] Illustration of the details of the guide plate 72 is omitted, but a plate-shaped member may be applied to the guide plate 72. The guide plate 72 has a length exceeding an entire length of the form S in a direction perpendicular to the form conveying direction.

[0083] The guide plate 72 is arranged along the conveying route in the horizontal conveying region of the form S by the chain gripper 64. The guide plate 72 is arranged under the conveying route of the form S by the chain gripper 64. The guide plate 72 has a length corresponding to a length of a processing region of the ink drying processing unit 68 in the form conveying direction.

[0084] The length corresponding to the length of the processing region of the ink drying processing unit 68 is a length of the guide plate 72 that can support the form S by the guide plate 72 at the time of the processing of the ink drying processing unit 68.

[0085] For example, the length of the processing region of the ink drying processing unit 68 may be made equal to the length of the guide plate 72 in the form conveying direction. The guide plate 72 may be provided with a function of adsorbing/supporting the form S.

[0086] The form S delivered to the ink drying processing unit 20 from the drawing unit 18 is gripped in a tip end thereof by the gripper 64D. When at least any one of the first sprocket 64A and the second sprocket 64B is rotated in a clockwise direction in Fig. 1 to cause the chain 64C to travel, the form S is conveyed along the travel route of the chain 64C.

[0087] When the form S passes the processing region of the ink drying processing unit 68, the ink drying processing is executed to the form S by the ink drying processing unit 68.

[0088] The form S subjected to the ink drying processing by the ink drying processing unit 68 is conveyed by chain gripper 64 to be sent to the sheet discharging unit 24.

[0089] The chain gripper 64 illustrated in Fig. 1 conveys the form S in a left oblique upper direction in Fig. 1 downstream of the ink drying processing unit 68 in the form conveying direction. A guide plate 73 is arranged in the conveying route of the inclination conveying region for conveying the form S in the left oblique upper direction in Fig. 1.

[0090] A member as similar to the guide plate 72 may be applied as the guide plate 73. The explanation of the structure and function of the guide plate 73 is omitted.

<Sheet Discharging Unit>

[0091] The sheet discharging unit 24 includes a sheet discharging platform 67. The chain gripper 64 is applied for the conveyance of the form S in the sheet discharging unit 24. The sheet discharging platform 76 is arranged under the conveying route of the form S by the chain gripper 64. The sheet discharging platform 76 may be configured to include an unillustrated elevating mechanism. The sheet discharging platform 76 is caused to move up/down depending upon an increase/decrease of the forms S stacked, making it possible to keep a height of the form S positioned in the top level to be constant.

[0092] The sheet discharging unit 24 collects the form S subjected to a series of the processing for the image formation. When the form S reaches a position of the sheet discharging platform 76, the gripper 64D releases the gripping of the form S. The form S is stacked on the sheet discharging platform 76.

[0093] Fig. 1 illustrates the inkjet recording device 10 provided with the treatment liquid applying unit 14 and the treatment liquid drying processing unit 16, which may be configured to eliminate the treatment liquid applying

unit 14 and the treatment liquid drying processing unit 16.

[0094] Fig. 1 shows an example of the chain gripper 64 as the configuration for conveying the form S after the drawing, but the other configuration of belt conveyance, drum conveyance or the like may be applied as the configuration of conveying the form S after the drawing.

[0095] Omitted in illustration in Fig. 1, the inkjet recording device 10 is provided with the maintenance unit. The maintenance unit is mounted in parallel to the drawing barrel 52 in an axial direction of the rotational shaft 52B of the drawing barrel 52.

[Explanation of Maintenance Unit]

[0096] Fig. 2 is a front view schematically illustrating the configuration of a maintenance unit 80 provided together with the drawing unit 18. Fig. 2 is a diagram of the drawing unit 18 as viewed from the upstream side to the downstream side in the form conveying direction. Fig. 3 is a plane development explanatory diagram schematically illustrating the configuration of each of the drawing unit 18 and the maintenance unit 80.

[0097] Fig. 2 illustrates only the liquid ejecting head 56C of cyan in the four liquid ejecting heads 56C, 56M, 56Y and 56K explained in Fig. 1. As already explained, the plurality of the liquid ejecting heads 56C, 56M, 56Y and 56K are attached on the common head supporting frame 90.

[0098] The drawing barrel 52 is supported on a pair of bearings 92 in both ends of the rotational shaft 52B to be rotatably provided (refer to Fig. 2). The bearings 92 are provided on a body frame 94 of the inkjet recording device 10. When both the ends of the rotational shaft 52B are supported on the bearings 92, the rotational shaft 52B of the drawing barrel 52 is attached in parallel to a horizontal mount plane. A motor is jointed to the rotational shaft 52B of the drawing barrel 52 through a rotation transmitting mechanism. Illustration of the driving motor and the rotation transmitting mechanism in a form conveying system is omitted. The drawing barrel 52 is driven by the driving motor in the unillustrated form conveying system for rotation.

[0099] The head supporting frame 90 includes a pair of side plates 96L, 96R and a joint frame 98. The pair of the side plates 96L, 96R are arranged to be perpendicular to the rotational shaft 52B of the drawing barrel 52. The joint frame 98 is a member for jointing the side plates 96L, 96R at the upper end.

[0100] The side plates 96L, 96R are formed in a plate shape, and are arranged to oppose to each other at the center of the drawing barrel 52. Mounting parts 102 are provided inside of the pair of the side plates 96L, 96R to mount the liquid ejecting heads 56C, 56M, 56Y and 56K. Fig. 2 illustrates, for descriptive purposes, only the mounting parts 102 for mounting the liquid ejecting head 56C of cyan, but the head of each color is provided with the identical mounting parts.

[0101] The mounting parts 102 are radially arranged by constant intervals on the concentric circle at the center of the rotational shaft 52B of the drawing barrel 52. The liquid ejecting heads 56C, 56M, 56Y and 56K are attached on the head supporting frame 90 by fixing mounted parts 104 formed in both ends of each head to the mounting parts 102. Fig. 2 illustrates, for descriptive purposes, only the mounted parts 104 of the liquid ejecting head 56C of cyan, but the head of each color is provided with the identical mounted parts.

[0102] The head supporting frame 90 is guided by an unillustrated guide rail and is provided in parallel to an axial direction of the rotational shaft 52B of the drawing barrel 52 to be capable of sliding. That is, an unillustrated head supporting frame moving mechanism causes the head supporting frame 90 to horizontally slide in a direction perpendicular to the form conveying direction. The head supporting frame moving mechanism includes, for example, a ceiling frame horizontally mounted across the form conveying mechanism, a guide rail laid on the ceiling frame, a traveling body sliding on the guide rail, and a driving device causing the traveling body to move along the guide rail. An example of a linear driving mechanism that may be herein adopted as a driving device may include a feed screw mechanism. The head supporting frame 90 is attached on the traveling body, and horizontally slides along the guide rail.

[0103] With this configuration, the liquid ejecting heads 56C, 56M, 56Y and 56K mounted on the head supporting frame 90 can move between "image recording position" illustrated in a solid line in Fig. 2 and "maintenance position" illustrated in a broken line in Fig. 2. A device that causes the head supporting frame 90 to move between the image recording position and the maintenance position corresponds to one form of "a first relative movement device".

[0104] When the head supporting frame 90 is positioned in the image recording position, the liquid ejecting heads 56C, 56M, 56Y and 56K are arranged on the periphery of the drawing barrel 52 to be in an image recordable state.

[0105] The maintenance position is set to a position (waiting position) where the liquid ejecting heads 56C, 56M, 56Y and 56K go backward from the drawing barrel 52. A humidity retention unit 110 for humidity retention of each of the liquid ejecting heads 56C, 56M, 56Y and 56K is mounted on the maintenance position.

[0106] As illustrated in Fig. 3, the humidity retention unit 110 is provided with caps 120C, 120M, 120Y and 120K for covering the nozzle surfaces of the liquid ejecting heads 56C, 56M, 56Y and 56K respectively. Fig. 3 illustrates, for easy understanding, a diagram in which the configuration of the heads of the respective colors arranged along an arc of the peripheral surface of the drawing barrel 52 and the caps corresponding to the respective heads is plane-developed.

[0107] The liquid ejecting heads 56C, 56M, 56Y and 56K are moved to the maintenance position in a case of stopping the device for a long time or in a period of waiting

for input of a printing job, such as at power-off of the device or print waiting, that is, in a non-printing period having no schedule for performing ink ejection for image forming, and the nozzle surface of each head is covered with each of the caps 120C, 120M, 120Y and 120K.

[0108] Each of the caps 120C, 120M, 120Y and 120K is provided with an unillustrated humidity retention liquid supplying mechanism, which is configured to be capable of supplying a humidity liquid inside of the cap. By covering the periphery of the nozzle surface of each head with each of the caps 120C, 120M, 120Y and 120K by which the humidity retention liquid is retained, the nozzle unit is humidity-retained to suppress clogging by drying. Inks may be used as the humidity retention liquids or solvent components of inks may be also used. The caps 120C, 120M, 120Y and 120K can be used as ink receivers at preliminary ejection or pressurization purge. The preliminary ejection is called "dummy jet" as well.

[0109] The caps 120C, 120M, 120Y and 120K are provided with unillustrated pressurization and suction mechanisms, which can perform pressurization and suction for the nozzle. In a case of the present example, each of the liquid ejecting heads 56C, 56M, 56Y and 56K can perform the pressurization purge for forcibly pressing out inks from the nozzle of each head by back pressure control for pressurizing the ink supplying system.

[0110] Each of the liquid ejecting heads 56C, 56M, 56Y and 56K is configured to join a plurality of head modules, and the pressurization purge can be performed per head module.

[0111] A waste liquid tray 130 is arranged in a position under each of the caps 120C, 120M, 120Y and 120K. The humidity retention liquid supplied to each of the caps 120C, 120M, 120Y and 120K and the ink discharged from each of the liquid ejecting heads 56C, 56M, 56Y and 56K are discharged to the waste liquid tray 130 and are collected in a waste liquid tank 134 through a waste liquid collecting pipe 132.

[0112] A nozzle surface wiping device 160 is provided between the image recording position and the maintenance position to clean the nozzle surface of each of the liquid ejecting heads 56C, 56M, 56Y and 56K. Fig. 2 illustrates only a wiping unit 170C corresponding to the liquid ejecting head 56C of cyan and an elevating mechanism 172C thereof, but as illustrated in Fig. 3, the liquid ejecting heads 56C, 56M, 56Y and 56K are respectively provided with the wiping units 170C, 170M, 170Y and 170K.

[0113] The nozzle surface wiping device 160 includes the wiping units 170C, 170M, 170Y and 170K attached on a wiping device body frame 162 and the elevating mechanisms for individually the wiping units 170C, 170M, 170Y and 170K to the wiping device body frame 162. In Fig. 3, illustration of the individual elevation mechanism provided corresponding to each of the wiping units 170C, 170M, 170Y and 170K is omitted. The nozzle surface wiping device 160 may include an unillustrated wiping device body elevating mechanism for elevating the wiping device body frame 162.

[0114] In the process where each of the liquid ejecting heads 56C, 56M, 56Y and 56K moves from the image recording position to the maintenance position or from the maintenance position to the image recording position, the nozzle surface is wiped by each of the corresponding wiping units 170C, 170M, 170Y and 170K.

[Configuration Example of Wiping Unit]

[0115] Since the structure of each of the wiping units 170C, 170M, 170Y and 170K is identical to each other, the wiping unit will be hereinafter described as the wiping unit 170C. The explanation of common items of the liquid ejecting heads 56C, 56M, 56Y and 56K of the respective colors will be made by designating the liquid ejecting head by a reference number 56 representative of the liquid ejecting heads 56C, 56M, 56Y and 56K.

[0116] Fig. 4 is a schematic diagram illustrating a configuration example of the wiping unit 170. The wiping unit 170 includes a web conveying unit 182 for conveying a web 180 and a wash liquid applying unit 200 for supplying a wash liquid to the web 180. The web conveying unit 182 corresponds to one form of "a web conveying device".

[0117] The web 180 is configured with a sheet composed of knot or weave using microfibers of polyethylene terephthalate, polyethylene, nylon or polyamide synthetic fibers, for example, and is formed in an elongated band shape having a width corresponding to a transverse width of the nozzle surface 57 of the liquid ejecting head 56.

[0118] The web conveying unit 182 is configured with a feed side web core 184 for feeding the pre-wipe web 180, a rewinding side web core 186 for rewinding the wiped web 180, a first guide roller 188, a pressing roller 190, and a second guide roller 192. The rewinding side web core 186 is a shaft member that is rotated by an unillustrated rewinding motor to rewind the web 180. The first guide roller 188 is a guide member that abuts on the web 180 fed from the feed side web core 184 for rotation to guide the web 180 toward the pressing roller 190.

[0119] The pressing roller 190 functions as a pressing device to cause the web 180 to abut on the nozzle surface 57 of the liquid ejecting head 56 at a predetermined pressure. The pressing roller 190 is urged in a direction of the nozzle surface 57 by an unillustrated urging spring.

[0120] Silicone, ethylene-propylene-diene rubber, polyurethane or the like may be used as a material of a pressing portion of the pressing roller 190.

[0121] The web 180 is fed from the feed side web core 184, is guided by the first guide roller 188, is wound around the pressing roller 190, and is rewound by the rewinding side web core 186 through the second guide roller 192. The web 180 travels along a traveling route of the web 180 leading from the feed side web core 184 through the first guide roller 188, the pressing roller 190 and the second guide roller 192 to the rewinding side web core 186.

[0122] The traveling direction of the web 180 is a direction in reverse to a moving direction of the liquid ejecting head 56 in the contact part position with the nozzle surface 57. That is, the web 180 is conveyed in a direction opposing a relative moving direction of the liquid ejecting head 56 to the wiping unit 170. The traveling direction of the web 180 corresponds to one form of "a third direction".

[0123] The wash liquid applying unit 200 includes a wash liquid supplying nozzle 202. The wash liquid supplying nozzle 202 is mounted upstream of the pressing roller 190 in the web traveling direction. A wash liquid supplying unit 210 for supplying a wash liquid to the wash liquid supplying nozzle 202 includes a wash liquid tank 212 in which the wash liquid is reserved, a wash liquid flow passage 214 and a wash liquid pump 216. The wash liquid flow passage 214 is a flow passage for connecting the wash liquid tank 212 to the wash liquid supplying nozzle 202. The wash liquid pump 216 is provided in the wash liquid flow passage 214 and feeds a wash liquid to the wash liquid supplying nozzle 202 from the wash liquid tank 212. By driving the wash liquid pump 216, the wash liquid is supplied to the wash liquid supplying nozzle 202 through the wash liquid flow passage 214.

[0124] The wash liquid supplying nozzle 202 has a spurting port having a width corresponding to a width of the web 180 and spurts a wash liquid from the spurting port. The wash liquid supplying nozzle 202 is mounted to eject a wash liquid downward. When the web 180 passes under the wash liquid supplying nozzle 202, the wash liquid spurted from the wash liquid supplying nozzle 202 is applied thereto. Thereby the wash liquid is applied to the pre-wipe web 180, and the wash liquid is absorbed in the web 180. The wash liquid applying unit 200 corresponds to one form of "a wash liquid applying device".

[0125] The web 180 wound around the pressing roller 190 is conveyed by a drive of an unillustrated rewinding motor. By wiping the nozzle surface 57 of the liquid ejecting head 56 while causing the web 180 to travel, it is possible to regularly wipe the nozzle surface 57 using a new surface (region not yet used) of the web 180 by wiping the nozzle surface 57 of the liquid ejecting head 56. It is possible to efficiently wipe the nozzle surface 57 by moving the liquid ejecting head 56 in a direction in reverse to the traveling direction of the web 180.

[0126] As already described, the wiping unit 170 can move in an upper-lower direction by the unillustrated elevating mechanism. In a case where the wiping of the nozzle surface 57 is unnecessary, it is possible to retreat the wiping unit 170 in a position where the web 180 does not make contact with the nozzle surface 57.

[Explanation of Head Maintenance Method in the Present Embodiment]

[0127] The inkjet recording device 10 according to the present embodiment can selectively perform a maintenance operation of only a partial region of the nozzle surface 57 of the liquid ejecting head 56. Here, an explanation will be made of an example of wiping the nozzle surface 57 using the web 180 as one form of the maintenance. A section in a region of the nozzle surface 57 that is a target of performing the maintenance is called "a wiping target section". The wiping target section is set as a partial region of the nozzle surface 57.

[0128] In a case of performing the head maintenance, first, a place of a part of the nozzle surface 57 for performing the maintenance is determined. Specifically it is possible to determine the place for maintenance by "a method 1" or "a method 2" hereinafter shown, for example.

[0129] [Method 1] A printed matter printed by the inkjet recording device 10 is inspected visually by a user to confirm a spot of ejection disturbance in the printed matter and a place corresponding to an image position of the ejection disturbance is input from a user interface. The ejection disturbance appears as a streak on the image of the printed matter. Since the corresponding relationship between the image position of the printed matter and the position of the nozzle in the liquid ejecting head 56 is retained in a control device in the inkjet recording device 10, for example, by designating a position of the streak in the image of the printed matter from a graphical user interface, it is possible to specify a section requiring the maintenance in the liquid ejecting head 56.

[0130] [Method 2] A printed matter printed by the inkjet recording device 10 is read by the in-line sensor 58 or an off-line scanner and the obtained read image is analyzed, making it possible to specify a place where the ejection disturbance occurs. By using the in-line sensor 58, it is possible to automatically set the section requiring the maintenance.

[0131] The printed matter for confirmation of the ejection disturbance may be a test pattern printed matter having a test pattern for examining an ejection state of each of the nozzles in the liquid ejecting head 56 or a printed matter of a target image that is output by a printing job.

[0132] A maintenance required section determined as described above is set as a wipe target section. The user interface for setting the wiping target section or the function realized by the automatic program corresponds to one form of "a wiping target section setting device".

[0133] Next, the maintenance of the wiping target section determined as described above will be performed.

[0134] Fig. 5 is an explanatory diagram schematically illustrating a positional relationship between the web 180 and the liquid ejecting head 56, and a wiping target section 230 on the nozzle surface 57 of the liquid ejecting head 56.

[0135] In the following explanation, the liquid ejecting head 56 moves in an X direction to the wiping unit 170, and the wiping unit 170 including the web 180 moves in a Z direction to the liquid ejecting head 56. However, a relation in movement between the liquid ejecting head 56 and the wiping unit 170 is relative in any direction of the X direction and the Z direction, and any one or both of the liquid ejecting head 56 and the wiping unit 170 may

move.

[0136] The X direction is in parallel to a longitudinal direction of the liquid ejecting head 56, and is in parallel to the rotational shaft 52B of the drawing barrel 52 explained in Fig. 1. The Z direction is in parallel to a gravity direction. The X direction is perpendicular to the Z direction. The X direction corresponds to one form of "a first direction", and the Z direction corresponds to one form of "a second direction".

[0137] Here, reference numbers used in the explanation will be defined as follows.

[0138] A relative moving velocity between the liquid ejecting head 56 and the wiping unit 170 is designated at Vb. A relative distance in the Z direction between the nozzle surface 57 of the liquid ejecting head 56 and the web 180 is designated at ΔZ. Here, a relative distance in the Z direction between the top level position of the web 180 a portion of which is wound around the pressing roller 190 and the nozzle surface 57 is designated at ΔZ. A conveying velocity of the web 180 in the wiping unit 170 is designated at Vw. The conveying velocity of the web 180 can be translated as a traveling velocity of the web 180 or a feeding velocity of the web 180.

[0139] A wash liquid amount in the contact part position of the web 180 in each time is designated at Q. The wash liquid amount Q is represented by an amount of a wash liquid per unit area of the web 180. The wash liquid amount Q corresponds to "a wash liquid applying amount per unit area of the wash liquid applied to the contact part position of the web making contact with the nozzle surface". The contact part position of the web 180 means a position of the web 180 a portion of which abuts on the nozzle surface 57 through the pressing roller 190. The wash liquid amount Q in the contact part position of the web 180 at some time differs from a supplying amount of a wash liquid from the wash liquid supplying nozzle 202 at the same time. This is because there is a time difference for the web 180 to travel from a position where the wash liquid is applied by the wash liquid supplying nozzle 202 to the contact part position. The wash liquid amount Q is represented by an amount of the wash liquid per unit area of the web 180.

[0140] Figs. 6A to 6D are timing charts illustrating one example of a profile of the head maintenance operation according to the present embodiment. Fig. 6A is a graph illustrating a change in relative moving velocity Vb between the liquid ejecting head 56 and the wiping unit 170. A horizontal axis in Fig. 6A represents time, and a vertical axis in Fig. 6A represents a relative moving velocity Vb. A unit of time can be represented by "second", for example. A unit of velocity can be represented by "meter/second", for example. "Velocity" is represented by vector, but is understood as a magnitude of vector, that is, as an absolute value of velocity (speed) at the time of describing a magnitude of velocity in the present specification.

[0141] Fig. 6B is a graph illustrating a change in a relative distance ΔZ in the Z direction between the nozzle surface 57 of the liquid ejecting head 56 and the web 180. A horizontal axis in Fig. 6B represents time, and a vertical axis in Fig. 6B represents a relative distance ΔZ. A unit of distance can be represented by "millimeter", for example.

[0142] Fig. 6C is a graph illustrating a change in a conveying velocity Vw of the web 180. A horizontal axis in Fig. 6C represents time, and a vertical axis in Fig. 6C represents a conveying velocity Vw.

[0143] Fig. 6D is a graph illustrating a change in a wash liquid amount Q in the wiping part position of the web 180. A horizontal axis in Fig. 6D represents time, and a vertical axis in Fig. 6D represents a wash liquid amount Q. A unit of a liquid amount per unit area can be represented by a volume of a wash liquid applied per unit area.

[0144] Hereinafter, operational contents illustrated in Figs. 6A to 6D will be explained according to time.

[1] At time t = 0, as illustrated in Fig. 6A, the liquid ejecting head 56 starts to move in the X direction, and moves in a first relative moving velocity VH that is a predetermined moving velocity. The movement of the liquid ejecting head 56 in a velocity of Vb = VH is a movement of causing the wiping target section 230 to be closer to the wiping unit 170. The first relative moving velocity VH is a higher velocity as compared to a second relative moving velocity VL to be described later.

[2] At time t = t1, as illustrated in Fig. 6C, the web 180 starts to move. The conveying velocity Vw of the web 180 is a first conveying velocity VwL that is a predetermined conveying velocity. In the present example, the conveying of the web 180 starts at timing of time t = t1 to prevent a state where the wash liquid is not applied to the web 180 from occurring at the contacting between the nozzle surface 57 of the liquid ejecting head 56 and the web 180. However, when it is possible to realize a state of the purpose that the wash liquid is being applied to the web 180 at the time the nozzle surface 57 of the liquid ejecting head 56 makes contact with the web 180, the conveying start of the web 180 may not be necessarily the timing of t = t1.

The conveying velocity VwL of the web 180 is preferably a velocity lower than the conveying velocity VwL at the time of actually wiping the wiping target section 230.

[3] At time t = t2a, as illustrated in Fig. 6A, the liquid ejecting head 56 starts to decelerate, and at time t = t2b, the moving velocity of the liquid ejecting head 56 is a second relative moving velocity VL lower than the first relative moving velocity VH. As illustrated in Fig. 6B, at timing of time t = t2b, the liquid ejecting head 56 does not yet make contact with the web 180, and the nozzle surface 57 and the web 180 are in a separated state.

[4] The liquid ejecting head 56 is caused to be reduced in velocity to Vb = VL, and thereafter, the wiping unit 170 is raised to the Z direction. As illustrated

in Fig. 6B, after time t = t2b, the web 180 moves closer to the nozzle surface 57 of the liquid ejecting head 56. At timing of time t = t2c when a relative distance ΔZ between the web 180 and the nozzle surface 57 is "0", the web 180 and the nozzle surface 57 start to contact with each other.

Thereafter, the wiping unit 170 is further uplifted, and both of the web 180 and the nozzle surface 57 have a predetermined pressing amount (ΔZ = ΔZ1) at time t = t3. A value of "ΔZ1" illustrated in Fig. 6B is a negative value (ΔZ1 < 0), but this shows that the web 180 is pressed in on some degree. That is, the wiping unit 170 is provided with an elastic member such as a spring, and when the wiping unit 170 is pressed to the liquid ejecting head 56, the elastic member such as the spring is contracted. As a result, pressures are firmly applied on the nozzle surface 57. When the pressing amount of ΔZ = ΔZ1 is realized, the movement of the wiping unit 170 in the Z direction is stopped.

Figs. 7A to 7C are diagrams schematically illustrating a series of operations from time t = t2a to time t = t3. Fig. 7A is a diagram illustrating a state at time t = t2a. Fig. 7B is a diagram illustrating a state at time t = t2c. Fig. 7C is a diagram illustrating a state at time t = t3.

According to the present embodiment, the nozzle surface 57 makes gradual contact with the web 180 while the liquid ejecting head 56 and the wiping unit 170 move relatively in the X direction. Therefore the phenomenon that the web 180 sucks out the ink of a specific nozzle in the vicinity of the contact starting position is difficult to occur, and the involvement of air bubbles or the like in the specific nozzle is also difficult to occur. As a result, deterioration in ejection performance of the nozzle present in the vicinity of the contact starting position is suppressed.

A function of the present embodiment as described above will be explained in contrast to a comparative example. Fig. 8A is a schematic diagram in the vicinity of a nozzle by the comparative example, and Fig. 8B is a schematic diagram in the vicinity of a nozzle by the present embodiment. The comparative example illustrated in Fig. 8A shows a state where a relative moving velocity Vb = 0 in the X direction. Fig. 8A schematically illustrates a state where the nozzle surface 57 starts to make contact with the web 180 in a state where Vb = 0. Since the liquid ejecting head is stopped in a state in Fig. 8A in the comparative example, absorption of the ink by the web 180 is generated to reversely suck air bubbles 242 within the web 180 into the nozzle 250.

On the other hand, in the present embodiment, the liquid ejecting head 56 moves in the X direction in a relative moving velocity Vb = VL, and the contact between the nozzle surface 57 and the web 180 starts. That is, focusing on one nozzle 250, the nozzle 250 moves in the X direction in Vb = VL, and moves in the X direction immediately from the position of the web 180. Therefore, the state illustrated in Fig. 8B lasts for an extremely short time, and the absorption of the ink by the web 180 is not nearly generated, and the sucking-in of the air bubble is difficult to be generated.

From a principle of the function explained in Fig. 8B, the conveying velocity of the web 180 at time t = t2c is preferably a low velocity of VwL. As illustrated in Fig. 6C, the conveying velocity of the web 180 is VwL at time t = t2c. When the conveying velocity of the web 180 at the contact starting is made lower than the conveying velocity during wiping, an area of the web 180 contacting with the nozzle present in the contact position is made smaller, making it difficult to suck in extra inks. This means that in Fig. 8B, the air bubble designated at a reference number 244 does not reach a nozzle surface portion by the travel of the web 180, and means that it is difficult to suck the air bubble 244 into the nozzle 250.

As illustrated in Fig. 6D, a wash liquid amount Q in the contact part position of the web 180 at timing from time t = t2c to time t = t3 is made to Q = QH, which is preferably greater than Q = QL that is a regular wash liquid amount at the time of wiping the wiping) target section 230. By satisfying a relation of QH > QL, an absorption allowance amount of the ink of the web 180 at the contact starting is lower than an absorption allowance amount of the ink of the web 180 at a regular wiping operation. Therefore it is possible to prevent the extra inks in the vicinity of the contact position at the contact starting from being further sucked out. This means that in Fig. 5B, the air bubbles 242, 244 and the like present within the web 180 are reduced.

[5] At time t = t3, on the nozzle surface 57 of the liquid ejecting head 56, the front part of the wiping target section 230 in the wiping start side reaches a position of contacting with the web 180. "Front part" herein is the vicinity of the end of the wiping target section 230 in the wiping start side, preferably slightly outside of a front end position of the wiping target section 230 in the wiping start side. In Fig. 5, the front end position of the wiping target section 230 in the wiping start side is designated at a reference number 232. In Fig. 5, a rear end position of the wiping target section 230 in the wiping end side is designated at a reference number 234.

After time t = t3, the wiping of the nozzle surface 57 of the wiping target section 230 starts.

Here, in a case where the conveying velocity of the web 180 at the contact starting is a low velocity of VwL, it is preferable to change the conveying velocity of the web 180 to an appropriate velocity. The appropriateness of the conveying velocity of the web 180 means, for example, to change the conveying velocity Vw of the web 180 to a relatively higher velocity VwH than VwL. Thereby, the wiping of the wip-

ing target section 230 that is a section requiring the maintenance is made appropriate. That is, it is possible to wipe off work-up of the nozzle surface 57 using a new surface of the web 180.

As illustrated in Fig. 6D, a wash liquid amount Q at timing of time t = t3 is preferably made to Q = QL that is an appropriate amount for the wiping of the wiping target section 230. Thereby, the wiping of the wiping target section 230 is made to be appropriate. If the wash liquid amount remains to be Q = QH, the wash liquid may be largely consumed wastefully, possibly leading to an increase in costs.

[6] After time t = t3, the maintenance on the condition of a constant relative moving velocity Vb = VL, a constant abutting pressure (that is, a constant relative distance $\Delta Z = \Delta Z1$), a constant web conveying velocity (Vw = VwL) and a constant wash liquid amount Q = QL lasts to time t = t4.

On the nozzle surface 57 of the liquid ejecting head 56 at a point of time t = t4, a rear part of the wiping target section 230 in the wiping end side reaches a position of contacting with the web 180. "Rear part" herein is the vicinity of the end of the wiping target section 230 in the wiping end side, preferably slightly outside of a rear end position of the wiping target section 230 in the wiping end side. At time t = t4, the web 180 makes contact with a slight outside of the wiping target section 230, and thereby, an entire region of the wiping target section 230 that is a section requiring the maintenance is wiped out.

[7] After time t = t4, the wiping unit 170 is farther from the nozzle surface 57 of the liquid ejecting head 56, and as illustrated in Fig. 6B, reaches a position of an initial relative distance $\Delta Z = \Delta Z0$ at timing of time t = t5a. When the web 180 is separated from the nozzle surface 57, the wiping of the nozzle surface 57 ends. At timing of time t = t5c between time t = t4 and time t = t5a, the nozzle surface 57 is separated from the web 180. Also at timing of time t = t5c, as similar to the contact start time of time t = t2c, the liquid ejecting head 56 moves in the relative moving velocity Vb = VL, and an abutting pressure of the web 180 on the nozzle surface 57 is gradually weakened. Therefore, it is difficult for the web 180 to suck out the ink in the specific nozzle, thus suppressing the breaking of the meniscus of the specific nozzle. The timing at time t = t5c corresponds to a timing at the separation starting.

The conveying velocity of the web 180 at the separation starting when the nozzle surface 57 and the web 180 in the contacting state start to be separated with each other, as illustrated in Fig. 6C, is preferably a velocity VwL lower than the conveying velocity VwH at a regular wiping operation. As a result, it is possible to suppress extra inks from being sucked out from the nozzle in a separation part position of the nozzle surface 57.

As illustrated in Fig. 6D, a wash liquid amount Q in the contact part position of the web 180 at timing of time t = t5c is made to Q = QH, which is preferably greater than Q = QL that is a regular wash liquid amount during the wiping. Therefore it is possible to suppress the further sucking-out of the extra inks from the nozzle in the separation part position of the nozzle surface 57.

[8] Thereafter, at timing of time t = t5a when the relative distance ΔZ becomes an initial relative distance $\Delta Z0$, the downward movement of the wiping unit 170 is stopped and the moving velocity of the liquid ejecting head 56 is back to an original velocity (VH). As illustrated in Fig. 6A, after time t = t5b, the liquid ejecting head 56 starts to move in a velocity of VH, and moves to a predetermined position to stop. On the other hand, the web 180, as illustrated in Fig. 6B, stops at timing of time t = t6.

[0145] In the above-mentioned explanation, the control of the operation at the time of causing the web 180 to make contact with the nozzle surface 57 corresponds to one form of "contact control". Based upon this contact control, an operation in which the web 180 makes contact with the nozzle surface 57 in the front part of the wiping target section 230 while the web 180 and the nozzle surface 57 in the separated state move relative to each other in the X direction corresponds to one form of "contact operation". The control of the operation at the time of causing the web 180 in the contacting state to separate from the nozzle surface 57 corresponds to one form of "separation control". Based upon this separation control, an operation in which the web 180 separates from the nozzle surface 57 in the rear part of the wiping target section 230 while the web 180 and the nozzle surface 57 in the contacting state move relative to each other in the X direction corresponds to one form of "separation operation".

<Other Control Example>

[0146] In Fig. 6A, the explanation is made of an example in which the relative moving velocity Vb between the liquid ejecting head 56 and the wiping unit 170 is switched to two steps of VH and VL, but the relative moving velocity Vb may further change across the contact starting timing or separation starting timing between the web 180 and the nozzle surface 57.

[0147] Fig. 9A is a graph illustrating the other control example regarding the relative moving velocity Vb between the liquid ejecting head 56 and the wiping unit 170. In place of the control of the relative moving velocity Vb explained in Fig. 6A, a control method illustrated in Fig. 9A may be adopted. Fig. 9B is the same as Fig. 6B, and is illustrated for reference.

[0148] In Fig. 9A, the relative moving velocity Vb is controlled to VM across time t = t2c that is the contact starting timing and across time t = t5c that is the separation starting timing. VM is a velocity satisfying a relation

of VL < VM < VH. Since it is necessary that the relative moving velocity Vb is a prescribed relative moving velocity VL upon wiping the wiping target section 230, it is preferable that the relative moving velocity Vb is made to VL by time t = t3 at the latest. It is preferable to switch the relative moving velocity Vb to VM after the wiping end of the wiping target section 230.

[Explanation of Control System in Inkjet Recording Device 10]

[0149] Fig. 10 is a block diagram illustrating a schematic configuration of a control system in the inkjet recording device 10. The inkjet recording device 10 includes a system controller 300. The system controller 300 includes a CPU 300A, a ROM 300B, and a RAM 300C. CPU is an abbreviation term of Central Processing Unit. ROM is an abbreviation term of Read Only Memory. RAM is an abbreviation term of Random Access Memory. The memories of the ROM 300B, the RAM 300C and the like may be provided outside of the system controller 300.

[0150] The system controller 300 functions as an entire control unit for comprehensively controlling the respective units in the inkjet recording device 10. The system controller 300 also functions as a computing unit for various computing tasks. Further, the system controller 300 functions as a memory controller that controls read-out of data and writing-in of data in the memories of the ROM 300B, the RAM 300C and the like.

[0151] The inkjet recording device 10 includes a communication unit 302, an image memory 304, a conveyance control unit 310, a sheet feed control unit 312, a treatment liquid applying control unit 314, a treatment liquid drying control unit 316, a drawing control unit 318, an ink drying control unit 320 and a sheet discharging control unit 324.

[0152] The communication unit 302 includes an unillustrated communication interface, and can perform transmission/reception of data between the communication unit 302 and a host computer 400 connected to the communication interface.

[0153] The image memory 304 functions as a temporal memory unit of various data including image data. The image data incorporated from the host computer 400 through communication unit 302 is once stored in the image memory 304.

[0154] The conveyance control unit 310 controls operations in a conveying system 11 of the form S in the inkjet recording device 10. The conveying system 11 includes therein the treatment liquid barrel 42, the treatment liquid drying processing barrel 46, the drawing barrel 52 and the chain gripper 64 illustrated in Fig. 1.

[0155] The sheet feed control unit 312 illustrated in Fig. 10 operates the sheet feeding unit 12 according to a command from the system controller 300. The sheet feed control unit 312 controls a supply start operation of the form S, a supply stop operation of the form S, and the like.

[0156] The treatment liquid applying control unit 314 operates the treatment liquid applying unit 14 according to a command from the system controller 300. The treatment liquid applying control unit 314 controls an applying amount and an applying timing of treatment liquids, and the like.

[0157] The treatment liquid drying control unit 316 operates the treatment liquid drying processing unit 16 according to a command from the system controller 300. The treatment liquid drying control unit 316 controls a drying temperature, a flow amount of dried gases and an injection timing of dried gases, and the like.

[0158] The drawing control unit 318 controls an operation of the drawing unit 18 according to a command from the system controller 300.

[0159] The drawing control unit 318 includes an image processing unit, a waveform generating unit, a waveform memory unit and a drive circuit. Illustration of the image processing unit, the waveform generating unit, the waveform memory unit and the drive circuit is omitted. The image processing unit forms dot data from input image data. The waveform generating unit generates a waveform of a drive voltage. The waveform memory unit stores therein a waveform of the drive voltage. The drive circuit generates a drive voltage having a drive waveform corresponding to the dot data. The drive circuit supplies a drive voltage to the liquid ejecting head.

[0160] In the image processing unit, the input image data is subjected to color separation processing for separating into each of colors of RGB, color conversion processing for converting RGB into CMYK, correction processing of a gamma correction, a non-uniformity correction and the like, and halftone processing for converting a gradation value for each pixel of each color into a gradation value less than an original gradation value.

[0161] An example of the input image data may include a raster data represented by digital values from 0 to 255. The dot data obtained as a result of the halftone processing may be binary data, or multiple values equal to or higher than ternary values and less than a gradation value before the halftone processing.

[0162] An ejection timing and an ink ejection amount in each pixel position are determined based upon the dot data generated through the processing by the image processing unit, and a drive voltage in response to the ejection timing and the ink ejection amount of each pixel position and a control signal for determining the ejection timing of each pixel are generated. This drive voltage is supplied to the liquid ejecting head, and dots are recorded by the inks ejected from the liquid ejecting head.

[0163] The drawing control unit 318 may include an unillustrated correction processing unit. The correction processing unit executes the correction processing to an abnormal nozzle. When the correction processing is executed, a reduction in image quality due to generation of the abnormal nozzle is suppressed.

[0164] The ink drying control unit 320 operates the ink drying processing unit 20 in response to a command from the system controller 300. The ink drying control unit 320

controls a drying gas temperature, a flow amount of a drying gas, an injection timing of a drying gas or the like.

[0165] The sheet discharging control unit 324 operates the sheet discharging unit 24 in response to a command from the system controller 300. The sheet discharging control unit 324, in a case where the sheet discharging platform 76 illustrated in Fig. 1 includes an elevating mechanism, controls an operation of the elevating mechanism according to an increase/decrease of the forms S.

[0166] The inkjet recording device 10 illustrated in Fig. 10 includes an operating unit 330, a display unit 332, a parameter memory unit 334 and a program storage unit 336.

[0167] The operating unit 330 includes operating members of operating buttons, a key board, a touch panel and the like. The operating unit 330 may include a plurality of kinds of operating members. Illustration of the operating members is omitted.

[0168] The information input through the operating unit 330 is sent to the system controller 300. The system controller 300 executes various types of processing according to the information sent from the operating unit 330.

[0169] The display unit 332 includes a display device of a crystal panel and the like, and a display driver. Illustration of the display device and the display driver is omitted. The display unit 332 displays various pieces of setting information of the device and various pieces of information such as abnormal information on the display device in response to a command from the system controller 300. The user interface is configured with the operating unit 330 and the display unit 332.

[0170] The parameter memory unit 334 stores therein various types of parameters used in the inkjet recording device 10. The various types of parameters stored in the parameter memory unit 334 are read out through the system controller 300 and are set to the respective units of the device.

[0171] The program storage unit 336 stores programs therein used in the respective units in the inkjet recording device 10. The various types of programs stored in the program storage unit 336 are read out through the system controller 300 and are executed in the respective units of the device.

[0172] The inkjet recording device 10 illustrated in Fig. 10 includes the maintenance control unit 338. The maintenance control unit 338 controls operations of the maintenance unit 80 in response to a command from the system controller 300.

[0173] The operations of the maintenance unit 80 described in the present embodiment include the wiping operation explained in Figs. 6A to 6D. The operations of the maintenance unit 80 may include purge processing, preliminary ejection and the like in the liquid ejecting head 56.

[0174] In Fig. 10, each unit for each function in the inkjet recording device 10 is listed. The respective units illustrated in Fig. 10 may be integrated, separated, combined, or omitted as needed. The respective units illustrated in Fig. 10 may be configured to combine hardware and software optionally.

[0175] Fig. 11 is an essential block diagram regarding the control of the maintenance unit 80 in the inkjet recording device 10 according to the present embodiment.

[0176] The inkjet recording device 10 includes a head conveyance driving unit 352 and a head conveying mechanism 354. The head conveying mechanism 354 is a mechanism for moving the liquid ejecting head 56 between the image recording position and the maintenance position explained in Fig. 2. The head conveyance driving unit 352 includes a motor that is a drive source for moving the liquid ejecting head 56 by the head conveying mechanism 354. The maintenance control unit 338 sends a control signal to the head conveyance driving unit 352 to control the movement of the liquid ejecting head 56 in the X direction.

[0177] The inkjet recording device 10 may include a first sensor 356 for detecting a position of the liquid ejecting head 56 in the X direction. A detection signal of the first sensor 356 is sent to the maintenance control unit 338. The maintenance control unit 338 can recognize a relative position relationship between the liquid ejecting head 56 and the wiping) unit 170 based upon a detection signal from the first sensor 356.

[0178] The wiping unit 170 includes the web 180, the web conveying unit 182, a web conveyance driving unit 362, and the wash liquid applying unit 200. The web conveyance driving unit 362 includes a motor that is a drive source for conveying the web 180 according to a web conveying route formed by the web conveying unit 182. The rewinding side web core 186 explained in Fig. 4 is rotated by driving the web conveyance driving unit 362 to rewind the web 180. The web conveyance driving unit 362 may be mounted outside of the wiping unit 170. The maintenance control unit 338 sends a control signal to the web conveyance driving unit 362 to control the travel of the web 180.

[0179] The inkjet recording device 10 includes the elevating mechanism 172 for moving the wiping unit 170 in the Z direction, and the elevation driving unit 364. The elevation driving unit 364 includes a motor that is a power source for moving up/down the elevating mechanism 172. The maintenance control unit 338 controls a drive of the elevation driving unit 364 and controls the movement of the wiping unit 170 in the Z direction.

[0180] The inkjet recording device 10 may include a second sensor 366 for detecting a position of the wiping unit 170 in the Z direction. A detection signal of the second sensor 366 is sent to the maintenance control unit 338. The maintenance control unit 338 can recognize a relative distance ΔZ between the nozzle surface 57 of the liquid ejecting head 56 and the web 180 of the wiping unit 170 based upon a detection signal from the second sensor 366.

[0181] The head maintenance operation in the present embodiment explained in Fig. 6A to Fig. 6D, Fig. 9A and the like is realized by the control of the maintenance con-

trol unit 338.

[0182] The head conveyance driving unit 352 and the head conveying mechanism 354 correspond to one form of "a first relative movement device". The elevation driving unit 364 and the elevating mechanism 172 correspond to one form of "a second relative movement device". The maintenance control unit 338 corresponds to one form of "a wiping control device". Alternatively, it may be understood that a combination of the system controller 300 and the maintenance control unit 338 corresponds to one form of "a wiping control device".

[Configuration Example of Liquid Ejecting Head]

[0183] Next, a configuration example of the liquid ejecting head 56 will be explained.

[0184] Fig. 12 is a perspective view of the liquid ejecting head 56. Fig. 12 illustrates a state where an ejection surface is viewed upward from an oblique lower side of the liquid ejecting head 56. The liquid ejecting head 56 is an elongated inkjet head bar composed of a plurality of head modules 412 lining up in the form width direction.

[0185] Fig. 12 illustrates an example where seventeen head modules 412 are jointed together, but the structure of the head module 412 and the number and arrangement form of the head module 412 are not limited to the illustrated example. A reference number 414 in the figure designates a base frame that is a frame body for connecting/fixing the plurality of head modules 412 in a bar shape. A reference number 416 designates a flexible substrate connected to each of the head module 412. The plurality of head modules 412 are mounted to the base frame 414 to be integrated, which configures a single liquid ejecting head 56.

[0186] Fig. 13 is a plan view of the nozzle surface 57 of the liquid ejecting head 56. The liquid ejecting head 56 has the structure that a plurality of nozzles parts are arranged over a length exceeding an entire width L_{max} of the form S in a direction perpendicular to the form conveying direction. In Fig. 3, illustration of the nozzle parts is omitted. The nozzle part is illustrated using a reference number 481 in Fig. 16.

[0187] A direction illustrated using a reference number X in Fig. 13 is a direction perpendicular to the form conveying direction. A direction illustrated using a reference number Y is the form conveying direction. A direction perpendicular to the form conveying direction is the X direction. The form conveying direction may be described as the Y direction.

[0188] The plurality of head modules 412 may be formed of the same configuration. The head module 412 alone may have the structure of being capable of functioning as the liquid ejecting head.

[0189] Fig. 13 illustrates the liquid ejecting head 56 in which the plurality of head modules 412 are arranged in one line along the form width direction, but the plurality of head modules 412 may be arranged in two lines by shifting their position in the form conveying direction.

<Structure Example of Head Module>

[0190] Next, the head module 412 will be explained in detail. Fig. 14 is a perspective view of the head module 412 and a diagram including a partial cross section thereof. Fig. 15 is a plan view of an ejection surface in the head module 412. As illustrated in Fig. 14, the head module 412 includes an ink supplying chamber 432 and an ink circulation chamber 436.

[0191] The ink supplying chamber 432 and the ink circulation chamber 436 are arranged on a nozzle plate 475 at the opposite side to an ejection surface 477. The ink supplying chamber 432 is connected to an unillustrated ink tank through a supplying tube 452. The ink circulation chamber 436 is connected to an unillustrated collection tank through a circulation tube 456.

[0192] In Fig. 15, the number of nozzle openings 480 is omitted. The plurality of nozzle openings 480 are arranged in a two-dimensional arrangement on a face of the ejection surface 477 of the nozzle plate 475 in the one head module 412.

[0193] That is, the head module 412 is formed in a planar shape of parallelogram having an end face on the long side along a V direction having an inclination of an angle β to the X direction and an end face on a short side along a W direction having an inclination of an angle α to the Y direction, and the plurality of nozzle openings 480 are provided in a matrix arrangement in a row direction along the V direction and in a column direction along the W direction.

[0194] The arrangement of the nozzle openings 480 is not limited to the aspect illustrated in Fig. 15, and the plurality of nozzle openings 480 may be arranged in the row direction along the X direction and in the column direction intersecting obliquely with the X direction.

[0195] In a case of the liquid ejecting head having the two-dimensional nozzle arrangement, a projection nozzle line in which the respective nozzle openings in the two-dimensional nozzle arrangement are projected (orthographically-projected) to line up in the X direction can be assumed as an equivalent to one nozzle line in which the respective nozzles line up in an approximately equal interval in a nozzle density of achieving the maximum recording resolution in the X direction. "Approximately equal interval" means a substantially equal interval as deposits recordable in the inkjet recording device. For example, a case where intervals differ slightly between the nozzles in consideration of errors on the manufacture or the movement of liquid droplets on the form by ejected droplet interference is also included in the concept of "equal interval". In consideration of the projection nozzle line (called a substantial nozzle line as well), the nozzle number representing the nozzle position can be associated in lining-up order of projection nozzles lining up along the X direction.

[0196] The liquid ejecting head 56 described in the present embodiment is configured such that the nozzle openings 480 belonging to one head module 412 and

the nozzle openings 480 belonging to the other head module 412 are mixed in a connecting part of the adjacent head modules 412 each other in the projection nozzle line in the X direction.

<Internal Structure of Head Module>

[0197] Fig. 16 is a cross section illustrating an internal structure of the head module 412. The head module 412 includes ink supplying passages 514, individual supplying passages 516, pressure chambers 518, nozzle communication passages 520, circulation individual flow passages 526, circulation common flow passages 528, piezoelectric elements 530 and a vibration plate 566.

[0198] The ink supplying passage 514, the individual supplying passage 516, the pressure chamber 518, the nozzle communication passage 520, the circulation individual flow passage 526, and the circulation common flow passage 528 are formed on a flow passage structure 510. The nozzle part 481 may include the nozzle opening 480 and the nozzle communication passage 520. The nozzle part 481 may be called simply "a nozzle". The nozzle 250 illustrated in Fig. 8B corresponds to the vicinity of the nozzle opening 480 in the nozzle part 481. "Nozzle opening" means an opening of the nozzle, and corresponds to an ejection port for ejecting liquid droplets.

[0199] The individual supplying passage 516 is a flow passage for communicating the pressure chamber 518 with the ink supplying passage 514. The nozzle communication passage 520 is a flow passage for communicating the pressure chamber 518 with the nozzle opening 480. The circulation individual flow passage 526 is a flow passage for communicating the nozzle communication passage 520 with the circulation common flow passage 528.

[0200] The vibration plate 566 is provided on the flow passage structure 510. The piezoelectric element 530 is arranged on the vibration plate 566 through an adhesion layer 567. The piezoelectric element 530 has a lamination structure composed of a lower electrode 565, a piezoelectric body layer 531 and an upper electrode 564. The lower electrode 565 may be called a common electrode, and the upper electrode 564 may be called an individual electrode.

[0201] The upper electrode 564 is the individual electrode patterned corresponding to a shape of each of the pressure chambers 518, and each of the pressure chambers 518 is provided with the piezoelectric element 530.

[0202] The ink supplying passage 514 is communicated with the ink supplying chamber 432 explained in Fig. 14. Ink is supplied to the pressure chamber 518 through the individual supplying passage 516 from the ink supplying passage 514. When a drive voltage is applied to the upper electrode 564 in the piezoelectric element 530 of an operation target according to the image data, the piezoelectric element 530 and the vibration plate 566 are deformed to change a volume of the pressure chamber 518.

[0203] The head module 412 can eject ink liquid droplets from the nozzle openings 480 through the nozzle communication passage 520 by a change in pressure due to a change in volume of the pressure chamber 518.

[0204] The head module 412 controls a drive of the piezoelectric element 530 corresponding to each nozzle opening 480 according to dot data generated from the image data.

[0205] While conveying the form S illustrated in Fig. 13 in the form conveying direction in a constant velocity, ejection timing of ink liquid droplets from each nozzle opening 480 is controlled according to a conveying velocity of the form S to form a desired image on the form S.

[0206] An unillustrated circulation outlet is formed in the nozzle part 481 including the nozzle opening 480 and the nozzle communication passage 520. The nozzle part 481 is communicated with the circulation individual flow passage 526 through the circulation outlet. Among the inks of the nozzle part 481, inks not used for ejection are collected into the circulation common flow passage 528 through the circulation individual flow passage 526.

[0207] The circulation common flow passage 528 is communicated to the ink circulation chamber 436 explained in Fig. 14. When the ink is regularly collected through the circulation individual flow passage 526 into the circulation common flow passage 528, the thickening of the ink in the nozzle part 481 for a non-ejection period is prevented.

[Ejection Method]

[0208] Regarding an ejection method of the liquid ejecting head 56, a device for generating ejection energy may use not only the piezoelectric element but also various ejection energy generating elements such as a heater element and an electrostatic actuator. For example, it is possible to adopt a method for ejecting liquid droplets utilizing a pressure of film boiling by the heating of liquids by the heater element. An appropriate ejection energy generating element is provided in the flow passage structure according to the ejection method of the liquid ejecting head.

[Advantages of Embodiment]

[0209] According to the present embodiment, it is possible to suppress deterioration in ejection performance of the nozzle present in the contact start position or the separation start position of the web 180 on the nozzle surface 57 in the liquid ejecting head 56.

[0210] According to the present embodiment, it is possible to selectively wipe only the wiping target section 230 that is a part of the nozzle surface 57 in the liquid ejecting head 56 by the web 180. For example, the wiping can be performed for each head module 412 constituting the liquid ejecting head 56.

[0211] The wiping target sections 230 may be set in the nozzle surface 57 at a plurality of locations. In a case

of setting the plurality of wiping target sections, the control of the contact operation and the control of the separation operation as described above are performed across each of the wiping target sections.

[Modification 1]

[0212] In the embodiment, the case of performing the control of both of the contact operation in the front part of the wiping target section 230 in the wiping start side and the separation operation in the rear part thereof in the wiping end side is explained, but a case of performing only any one of the contact operation and the separation operation may be adopted.

[Modification 2]

[0213] In the embodiment, the example of controlling both the conveying velocity of the web 180 at the contact operation and the conveying velocity of the web 180 at the separation operation to VwL is explained, but upon carrying out the invention, a conveying velocity Vw1 of the web at the contact operation and a conveying velocity Vw3 of the web at the separation operation may be controlled to different velocities.

[0214] That is, in a case of setting a conveying velocity of the web in the middle of wiping the wiping target section to Vw2, it is only required to satisfy Vw1 < Vw2 regarding the contact operation. In addition, it is only required to satisfy Vw3 < Vw2 regarding the separation operation. The example explained in Fig. 6 is a case of Vw1 = Vw3 = VwL, and Vw2 = VwH.

[0215] Further, upon carrying out the invention, it is possible to keep the conveying velocity of the web to be constant without changing it.

[Modification 3]

[0216] In the embodiment, there is explained the example of controlling both of the wash liquid amount in the web portion contacting with the nozzle surface at the contact operation and the wash liquid amount in the web portion contacting with the nozzle surface at the separation operation to QH, as the example of controlling the wash liquid amount Q of the web, but upon carrying out the invention, the wash liquid amount Q1 in the web portion contacting with the nozzle surface at the contact operation and the wash liquid amount Q3 in the web portion contacting with the nozzle surface at the separation operation may be controlled to be different liquid amounts.

[0217] That is, in a case of setting the wash liquid amount in the web portion contacting with the nozzle surface at the time of wiping the wiping target section to Q2, it is only required to satisfy Q1 > Q2 regarding the contact operation. In addition, it is only required to satisfy Q3 > Q2 regarding the separation operation. The example explained in Fig. 6 is a case of Q1 = Q3 = QH, and Q2 = QL.

[0218] Further, upon carrying out the invention, it is possible to keep the wash liquid amount Q to be constant without changing it. Upon carrying out the invention, it is possible to omit a device of applying wash liquids to the web.

[Modification 4]

[0219] In the embodiment, there is exemplified the configuration of conveying the form to the stopped liquid ejecting head to perform the drawing by relatively moving the liquid ejecting head and the form, but upon carrying out the invention, it is possible to move the liquid ejecting head relative to the stopped form. Single pass type line heads are regularly arranged along a direction perpendicular to the form conveying direction, but it is possible to arrange line heads along an oblique direction at an angle to the direction perpendicular to the form conveying direction.

[0220] Further, in the embodiment, there is exemplified the full line type inkjet recording device 10, but upon carrying out the invention, it is possible to apply an inkjet recording device using serial heads in which a short liquid ejecting head less than a width of the form is caused to scan in the form width direction to print in the same direction, the form is moved by a constant amount, the next region is printed in the width direction of the form, and this operation is repeated to perform printing on the form.

[Combination of Control Example and the like]

[0221] The configurations explained in the embodiment and the items explained in the modification can be combined as needed, and a part of the items can be replaced.

[Conveying Device of Form]

[0222] The conveying device for conveying the form S is not limited to the drum conveying system exemplified in Fig. 1, but may adopt various types such as a belt conveying system, a nip conveying system, a chain conveying system, and a pallet conveying system, and these systems may be combined optionally.

[Wiping Member]

[0223] In the embodiment, there is explained the form in which the web 180 is used as an example of the wiping member, but the wiping member is not limited to the web but may be a blade or a wiper. For example, the blade itself configured of a material such as rubber does not have a function of absorbing ink, but when the blade is being stopped in a state of making contact with the nozzle opening, the ink may be pulled out from the nozzle running through the surface of the blade. Therefore, by applying the present invention, it is possible to suppress the pulling-out of the ink by the blade.

[Terms]

[0224] The term of "wipe" in the present specification is the same meaning as "clean off" or "wiping". "Wipe" is one form of sweep or cleaning.

[0225] The term of "perpendicular or "vertical" in the present specification may include the form of generating an operational effect as similar to a case of intersecting substantially at an angle of 90° among the forms of intersecting at an angle less than 90° or more than 90°.

[0226] The term of "parallel" in the present specification may include a substantial parallel achieving an operational effect equivalent to the parallel although two directions intersect with each other. That is, "parallel" may include an allowance range which is exactly non-parallel, but may be treated as assumed to be substantially parallel.

[0227] The term of "barrel" in the present specification is used in the same meaning as "drum". The drum is a conveying member that is formed in a cylindrical shape, and holds at least a part of a medium to be rotated about a center axis of the cylindrical shape, thereby conveying the medium along the outer peripheral surface of the cylindrical shape.

[0228] The term of "form" in the present specification is used in the same meaning as "medium" on which liquids ejected from the liquid ejecting head are attached. "Form" has the same meaning as the term such as a record medium, a print sheet, a record form, a print medium, a printed medium, a recorded medium, an image forming medium, an image formed medium, an image receiving medium, or an ejected medium. A material, a shape and the like of the medium are not particularly limited, but may be a paper material, besides, a resin sheet, a film, a cloth, a non-woven cloth, or the other material, and various types such as a continuous form, a cut paper of a sheet (sheet paper), a seal form or the like.

[0229] "Image" should be broadly interpreted, and may include a color image, a black-and-white image, a single color image, a gradation image, a uniform density (solid) image, and the like. "Image" is not limited to a photo image, but is used as a comprehensive term including a design, a character, a code, a line drawing, a mosaic pattern, a coat separated pattern of color, other various patterns, or an optional combination of these. "Printing" may include the concept of the term such as printing characters, recording of an image, formation of an image, a drawing, or a print.

[0230] "Recording device" has the same meaning as the term of a printing device, a printing machine, a printer, an image recording device, a drawing device, an image forming device or the like.

[Application Example to Other Devices]

[0231] In the embodiment, an application to the inkjet recording device for graphic printing is explained as an example, but an application range of the present invention is not limited to this example. The present invention can be applied widely to liquid ejecting devices that can obtain various shapes or patterns using a liquid functional material, such as a wiring drawing device that draws a wiring pattern of an electronic circuit, a manufacturing device for various types of devices, a resist printing device using resin liquids as a functional liquid body for ejection, a color filter manufacturing device, a microstructural object forming device that forms a microstructural object using a material for material deposition or the like.

[0232] The embodiment of the present invention as described above can perform, alternation, addition and elimination of the constitutional elements as needed without departing from the subject of the appended claims.

Claims

1. A liquid ejecting device (10) comprising:

a liquid ejecting head (56, 56C, 56M, 56Y, 56K) having a nozzle surface (57) on which openings of a plurality of nozzles (250) that eject liquids are arrayed;
a wiping unit (170, 170C, 170M, 170Y, 170K) that wipes the nozzle surface using a wiping member (180);
a first relative movement device (352, 354) that performs a relative movement of the liquid ejecting head and the wiping unit in a first direction in parallel to the nozzle surface;
a second relative movement device (364, 172) that performs a relative movement of the liquid ejecting head and the wiping member in a second direction that is a direction causing the wiping member to make contact with or to be separated from the nozzle surface; and
a wiping control device (300, 338) that controls the first relative movement device and the second relative movement device to selectively wipe a wiping target section that is a part of the nozzle surface by the wiping member, wherein the wiping control device performs a contact control of causing the wiping member and the nozzle surface in a separated state to be brought into contact by the second relative movement device to start a wipe of the wiping target section while performing the relative movement of the wiping unit and the liquid ejecting head by the first relative movement device in a first direction in a front part of the wiping target section in the wiping start side on the nozzle surface and **characterised in that** the wiping control device further performs a separation control of separating the wiping member from the nozzle surface in a contacting state by the second relative movement device to end the wipe of the wiping target

section while performing the relative movement of the wiping unit and the liquid ejecting head by the first relative movement device in the first direction in a rear part of the wiping target section in the wiping end side on the nozzle surface.

2. The liquid ejecting device (10) according to claim 1, wherein the wiping member includes a band-shaped web, further comprising:
a web conveying device (182) that causes the wiping member to travel in a third direction that is the opposite direction to the first direction, wherein the wiping control device controls a feeding operation of the web by the web conveying device.

3. The liquid ejecting device (10) according to claim 2, wherein in a case where a conveying velocity of the web at the contact starting of the wiping member and the nozzle surface by the contact control is designated at Vw1 and a conveying velocity of the web at the time of wiping the wiping target section by the wiping member is designated at Vw2, Vw1 < Vw2 is satisfied.

4. The liquid ejecting device (10) according to claim 2 or 3, wherein in a case where a conveying velocity of the web at the separation starting of the wiping member and the nozzle surface by the separation control is designated at Vw3 and a conveying velocity of the web at the time of wiping the wiping target section by the wiping member is designated at Vw2, Vw3 < Vw2 is satisfied.

5. The liquid ejecting device (10) according to any one of claims 2 to 4, wherein the wiping unit includes a wash liquid applying device (200) that applies a wash liquid to the wiping member.

6. The liquid ejecting device (10) according to claim 5, wherein in a case where a wash liquid applying amount per a unit area of the wash liquid to be applied in a contact part position of the web contacting with the nozzle surface at the contact starting of the wiping member and the nozzle surface by the contact control is designated at Q1 and a wash liquid applying amount per a unit area of the wash liquid to be applied in a contact part position of the web contacting with the nozzle surface in the middle of wiping the wiping target section is designated at Q2, Q1 > Q2 is satisfied.

7. The liquid ejecting device (10) according to claim 5 or 6, wherein in a case where a wash liquid applying amount per a unit area of the wash liquid to be applied in a contact part position of the web contacting with the nozzle surface at the separation starting of the wiping member and the nozzle surface by the separation control is designated at Q3 and a wash liquid applying amount per a unit area of the wash liquid to be applied in a contact part position of the web contacting with the nozzle surface in the middle of wiping the wiping target section is designated at Q2, Q3 > G2 is satisfied.

8. The liquid ejecting device (10) according to any one of claims 1 to 7, further comprising:
a wiping target section setting device that sets a location that is a wiping target section on the nozzle surface.

9. The liquid ejecting device (10) according to any one of claims 1 to 8, wherein a position where the wiping member and the nozzle surface start to contact by the contact control includes a position outside of the wiping target section.

10. The liquid ejecting device (10) according to any one of claims 1 to 9, wherein a position where the wiping member and the nozzle surface start to separate by the separation control includes a position outside of the wiping target section.

11. The liquid ejecting device (10) according to any one of claims 1 to 10, wherein the liquid ejecting head includes a line head, and the first direction includes a longitudinal direction of the line head.

12. A head maintenance method including wiping, by a wiping member (180) of a wiping unit, a part of a nozzle surface (57) of a liquid ejecting head (56, 56C, 56M, 56Y, 56K),wherein openings of a plurality of nozzles (250) that eject liquids are arrayed on the nozzle surface, the head maintenance method comprising:

performing a relative movement of the liquid ejection head and the wiping unit in a first direction in parallel to the nozzle surface;
a contact operation by performing a relative movement of the liquid ejecting head and the wiping member in a second direction that is a direction causing the wiping member and the nozzle surface in a separated state to be brought into contact to start a wipe of a wiping target section while performing a relative movement of a wiping unit provided with the wiping member and the liquid ejecting head in the first direction in parallel to the nozzle surface upon causing the wiping member to make contact with the nozzle surface in a front part of a wiping target section in the wiping start side that is the part of the nozzle surface; and
characterised in that the head maintenance method further comprises: a separation operation by performing a relative movement of the liquid ejecting head and the wiping member in

said second direction that is a direction separating the wiping member from the nozzle surface in a contacting state to end the wipe of the wiping target section while performing a relative movement of the wiping unit and the liquid ejecting head in the first direction upon separating the wiping member from the nozzle surface in a rear part of the wiping target section in the wiping end side.

Patentansprüche

1. Flüssigkeitsausstoßvorrichtung (10), umfassend:

einen Flüssigkeitsausstoßkopf (56, 56C, 56M, 56Y, 56K) mit einer Düsenfläche (57), auf der Öffnungen mit mehreren Düsen (250), die Flüssigkeiten ausstoßen, angeordnet sind;
eine Wischeinheit (170, 170C, 170M, 170Y, 170K), welche die Düsenfläche unter Einsatz eines Wischelements (180) wischt;
eine erste Relativbewegungseinrichtung (352, 354), die eine Relativbewegung des Flüssigkeitsausstoßkopfs und der Wischeinheit in einer ersten Richtung parallel zu der Düsenfläche ausführt;
eine zweite Relativbewegungseinrichtung (364, 172), die eine Relativbewegung des Flüssigkeitsausstoßkopfs und des Wischelements in einer zweiten Richtung ausführt, das ist eine Richtung, die das Wischelement dazu bringt, mit der Düsenfläche in Berührung zu treten oder von dieser abzurücken; und
eine Wischsteuereinrichtung (300, 338), die die erste Relativbewegungseinrichtung und die zweite Relativbewegungseinrichtung steuert, um einen Wischzielbereich, das ist ein Teil der Düsenfläche, selektiv mit dem Wischelement zu wischen, wobei die Wischsteuereinrichtung eine Berührsteuerung zum Veranlassen des Wischelements und der Düsenfläche in einem abgerückten Zustand, durch die zweite Relativbewegungseinrichtung in Berührung zu treten, um ein Wischen des Wischzielbereichs zu starten, während die Relativbewegung der Wischeinheit und des Flüssigkeitsausstoßkopfs durch die erste Relativbewegungseinrichtung in einer ersten Richtung in einem vorderen Teil des Wischzielbereichs auf der Wisch-Startseite der Düsenfläche ausgeführt wird, **dadurch gekennzeichnet, dass** die Wischsteuereinrichtung weiterhin eine Abrücksteuerung zum Abrücken des Wischelements von der Düsenfläche im Kontaktzustand durch die zweite Relativbewegungseinrichtung zum Beendigen des Wischens des Wischzielbereichs ausführt, während die Relativbewegung der Wischeinheit und des Flüssigkeitsausstoßkopfs durch die erste Relativbewegungseinrichtung in der ersten Richtung in einem hinteren Teil des Wischzielbereichs auf der Wischendseite der Düsenfläche vollzogen wird.

2. Vorrichtung (10) nach Anspruch 1, bei der das Wischelement eine bandförmige Bahn enthält, weiterhin umfassen:
eine Bahntransporteinrichtung (182), die das Wischelement dazu bringt, in einer dritten Richtung, das ist die Gegenrichtung zu der ersten Richtung, zu fahren, wobei die Wischsteuereinrichtung ein Transportvorgang der Bahn durch die Bahntransporteinrichtung steuert.

3. Vorrichtung (10) nach Anspruch 2, bei der für den Fall, dass eine Transportgeschwindigkeit der Bahn beim Kontaktbeginn des Wischelements von der Düsenfläche durch die Berührsteuerung mit Vw1 bezeichnet wird und eine Transportgeschwindigkeit der Bahn zur Zeit des Wischens des Wischzielbereichs durch das Wischelement mit Vw2 bezeichnet wird, die Bedingung Vw1 < Vw2 erfüllt ist.

4. Vorrichtung (10) nach Anspruch 2 oder 3, bei der für den Fall, dass eine Transportgeschwindigkeit der Bahn beim Abrückbeginn des Wischelements von der Düsenfläche durch die Abrücksteuerung mit Vw3 bezeichnet wird und eine Transportgeschwindigkeit der Bahn zur Zeit des Wischens des Wischzielbereichs durch das Wischelement mit Vw2 bezeichnet wird, die Bedingung Vw3 < Vw2 erfüllt ist.

5. Vorrichtung (10) nach einem der Ansprüche 2 bis 4, bei der die Wischeinheit eine Waschflüssigkeit-Aufbringeinrichtung (200) aufweist, die eine Waschflüssigkeit auf das Wischelement aufbringt.

6. Vorrichtung (10) nach Anspruch 5, bei der für den Fall, dass eine Waschflüssigkeit-Aufbringmenge pro Flächeneinheit der Waschflüssigkeit, die an eine Berührstelle der Bahn mit der Düsenfläche beim Berührungsbeginn des Wischelements und der Düsenfläche durch die Berührsteuerung mit Q1 bezeichnet wird und eine Waschflüssigkeits-Aufbringmenge pro Flächeneinheit der Waschflüssigkeit für die Aufbringung an einer Berührstartposition der mit der Düsenfläche in Berührung tretenden Bahn in der Mitte des Wischens des Wischzielbereichs mit Q2 bezeichnet wird, die Bedingung Q1 > Q2 erfüllt ist.

7. Vorrichtung (10) nach Anspruch 5 oder 6, bei der für den Fall, dass die Waschflüssigkeit-Aufbringmenge pro Flächeneinheit der Waschflüssigkeit zum Aufbringen an einer Kontaktteilstelle der mit der Düsenfläche beim Abrückbeginn des Wischelements von der Düsenfläche durch die Abrücksteuerung in Be-

rührung stehenden Bahn mit Q3 bezeichnet wird und eine Waschflüssigkeits-Aufbringmenge pro Flächeneinheit der Waschflüssigkeit zum Aufbringen an einer Kontaktteilstelle des mit der Düsenfläche in der Mitte des Wischens des Wischzielberreichs berührenden Bahn mit Q2 bezeichnet wird, die Bedingung Q3 > Q2 erfüllt ist.

8. Vorrichtung (10) nach einem der Ansprüche 1 bis 7, weiterhin umfassend:
eine Wischzielbereichs-Einstelleinrichtung, die einen Ort einrichtet, bei dem es sich um einen Wischzielbereich auf der Düsenfläche handelt.

9. Vorrichtung (10) nach einem der Ansprüche 1 bis 8, bei der eine Stelle, an der das Wischelement und die Düsenfläche die Berührung durch die Berührsteuerung beginnen, eine Stelle außerhalb des Wischzielbereichs enthält.

10. Vorrichtung (10) nach einem der Ansprüche 1 bis 9, bei der eine Stelle, an der das Wischelement und die Düsenfläche voneinander abzurücken beginnen mit Hilfe der Abrücksteuerung, eine Stelle beinhaltet, die außerhalb des Wischzielbereichs liegt.

11. Vorrichtung (10) nach einem der Ansprüche 1 bis 10, bei der der Flüssigkeitsausstoßkopf einen Zeilenkopf enthält, wobei die erste Richtung eine Längsrichtung des Zeilenkopfs enthält.

12. Kopfwartungsverfahren, enthaltend das mit einem Wischelement (180) einer Wischeinheit durchgeführte Wischen eines Teils einer Düsenfläche (57) eines Flüssigkeitsausstoßkopfs (56, 56C, 56M, 56Y, 56K), wobei Öffnungen mehrerer Düsen (250), die Flüssigkeiten ausstoßen, in der Düsenfläche angeordnet sind, umfassend:

Ausführen einer Relativbewegung des Flüssigkeitsausstoßkopfs und der Wischeinheit in einer ersten Richtung parallel zu der Düsenfläche;
einen Berührvorgang durch Ausführen einer Relativbewegung des Flüssigkeitsausstoßkopfs und des Wischelements in einer zweiten Richtung als Richtung, welche das Wischelement und die Düsenfläche im abgerückten Zustand veranlasst, in Berührung zu treten, um ein Wischen eines Wischzielbereichs zu beginnen, während eine Relativbewegung einer mit dem Wischelement versehenen Wischeinheit und des Flüssigkeitsausstoßkopfs in der ersten Richtung parallel zu der Düsenfläche ausgeführt wird, die das Wischelement dazu bringt, mit der Düsenfläche in einem vorderen Teil des Wischzielbereichs auf der Wischstartseite als Teil der Düsenfläche in Berührung zu treten; und
dadurch gekennzeichnet, dass das Kopfwartungsverfahren weiterhin umfasst:
einen Abrückvorgang durch Ausführen einer Relativbewegung des Flüssigkeitsausstoßkopfs und des Wischelements in der zweiten Richtung, das heißt in einer Richtung des Abrückens des Wischelements von der Düsenfläche, wenn diese im Berührzustand sind, um den Wischvorgang des Wischzielbereichs zu beenden, während eine Relativbewegung der Wischeinheit und des Flüssigkeitsausstoßkopfs in der ersten Richtung nach Abrücken des Wischelements von der Düsenfläche in einem hinteren Teil des Wischzielbereichs auf der Wischendseite ausgeführt wird.

Revendications

1. Dispositif d'éjection de liquide (10), comprenant :

une tête d'éjection de liquide (56, 56C, 56M, 56Y, 56K) présentant une surface de buse (57) sur laquelle sont disposées des ouvertures d'une pluralité de buses (250), lesquelles éjectent des liquides ;
une unité d'essuyage (170, 170C, 170M, 170Y, 170K), laquelle essuie la surface de buse à l'aide d'un élément d'essuyage (180) ;
un premier dispositif de déplacement relatif (352, 354), lequel effectue un déplacement relatif de la tête d'éjection de liquide et de l'unité d'essuyage dans une première direction parallèlement à la surface de buse ;
un second dispositif de déplacement relatif (364, 172), lequel effectue un déplacement relatif de la tête d'éjection de liquide et de l'unité d'essuyage dans une deuxième direction, laquelle est une direction faisant en sorte que l'élément d'essuyage vienne en contact avec la surface de buse, ou soit séparé de celle-ci, et
un dispositif de commande d'essuyage (300, 338), lequel commande le premier dispositif de déplacement relatif et le second dispositif de déplacement relatif afin d'essuyer de manière sélective une section cible d'essuyage, laquelle est une partie de la surface de buse, par l'élément d'essuyage, dans lequel le dispositif de commande d'essuyage effectue une commande de contact faisant en sorte que l'élément d'essuyage et la surface de buse se trouvant dans un état séparé soient amenés en contact par le second dispositif de déplacement relatif, afin de débuter un essuyage de la section cible d'essuyage tout en effectuant le déplacement relatif de l'unité d'essuyage et de la tête d'éjection de liquide par le premier dispositif de déplacement relatif dans une première direction dans une partie avant de la section cible d'essuyage

dans le côté de début d'essuyage sur la surface de buse, et

caractérisé en ce que le dispositif de commande d'essuyage effectue en outre une commande de séparation pour séparer l'élément d'essuyage de la surface de buse se trouvant dans un état de contact par le second dispositif de déplacement relatif, afin de terminer l'essuyage de la section cible d'essuyage tout en effectuant le déplacement relatif de l'unité d'essuyage et de la tête d'éjection de liquide par le premier dispositif de déplacement relatif dans la première direction dans une partie arrière de la section cible d'essuyage dans le côté de fin d'essuyage sur la surface de buse.

2. Dispositif d'éjection de liquide (10) selon la revendication 1, dans lequel l'élément d'essuyage inclut une toile en forme de bande, comprenant en outre :
un dispositif de transport de toile (182) lequel fait en sorte que l'élément d'essuyage avance dans une troisième direction, laquelle est la direction opposée à la première direction, dans lequel le dispositif de commande d'essuyage commande une direction d'alimentation de la toile par le dispositif de transport de toile.

3. Dispositif d'éjection de liquide (10) selon la revendication 2, dans lequel dans un cas où une vitesse de transport de la toile au début de contact entre l'élément d'essuyage et la surface de buse par la commande de contact est désignée en Vw1, et une vitesse de transport de la toile au temps d'essuyage pour l'essuyage de la section cible d'essuyage par l'élément d'essuyage est désignée en Vw2, Vw1 < Vw2 est satisfaite.

4. Dispositif d'éjection de liquide (10) selon la revendication 2 ou 3, dans lequel dans un cas où une vitesse de transport de la toile au début de séparation entre l'élément d'essuyage et la surface de buse par la commande de séparation est désignée en Vw3, et une vitesse de transport de la toile au temps d'essuyage pour l'essuyage de la section cible d'essuyage par l'élément d'essuyage est désignée en Vw2, Vw3 < Vw2 est satisfaite.

5. Dispositif d'éjection de liquide (10) selon l'une quelconque des revendications 2 à 4, dans lequel l'unité d'essuyage inclut un dispositif d'application de liquide de lavage (200), lequel applique un liquide de lavage à l'élément d'essuyage.

6. Dispositif d'éjection de liquide (10) selon la revendication 5, dans lequel dans un cas où une quantité d'application de liquide de lavage par unité de surface du liquide de lavage à appliquer sur une position de partie de contact de la toile en contact avec la surface de buse au début de contact entre l'élément d'essuyage et la surface de buse par la commande de contact est désignée en Q1, et une quantité d'application de liquide de lavage par unité de surface du liquide de lavage à appliquer sur une position de partie de contact de la toile en contact avec la surface de buse au milieu de l'essuyage de la section cible d'essuyage est désignée en Q2, Q1 >Q2 est satisfaite.

7. Dispositif d'éjection de liquide (10) selon la revendication 5 ou 6, dans lequel dans un cas où une quantité d'application de liquide de lavage par unité de surface du liquide de lavage à appliquer sur une position de partie de contact de la toile en contact avec la surface de buse au début de séparation entre l'élément d'essuyage et la surface de buse par la commande de séparation est désignée en Q3, et une quantité d'application de liquide de lavage par unité de surface du liquide de lavage à appliquer sur une position de partie de contact de la toile en contact avec la surface de buse au milieu de l'essuyage de la section cible d'essuyage est désignée en Q2, Q3 >Q2 est satisfaite.

8. Dispositif d'éjection de liquide (10) selon l'une quelconque des revendications 1 à 7, comprenant en outre :
un dispositif de réglage de section cible d'essuyage, lequel règle un endroit qui est une section cible d'essuyage sur la surface de buse.

9. Dispositif d'éjection de liquide (10) selon l'une quelconque des revendications 1 à 8, dans lequel une position, où débute le contact entre l'élément d'essuyage et la surface de buse par la commande de contact, inclut une position hors de la section cible d'essuyage.

10. Dispositif d'éjection de liquide (10) selon l'une quelconque des revendications 1 à 9, dans lequel une position, où débute la séparation entre l'élément d'essuyage et la surface de buse par la commande de séparation, inclut une position hors de la section cible d'essuyage.

11. Dispositif d'éjection de liquide (10) selon l'une quelconque des revendications 1 à 10, dans lequel la tête d'éjection de liquide inclut une tête de type ligne, et la première direction inclut une direction longitudinale de la tête de type ligne.

12. Procédé de maintenance de tête incluant l'étape pour essuyer, par un élément d'essuyage (180) d'une unité d'essuyage, une partie d'une surface de buse (57) d'une tête d'éjection de liquide (56, 56C, 56M, 56Y, 56K), dans lequel sont disposées des ouvertures d'une pluralité de buses (250), lesquelles

éjectent des liquides sur la surface de buse, le procédé de maintenance de tête comprenant les étapes consistant à :

effectuer un déplacement relatif de la tête d'éjection de liquide et de l'unité d'essuyage dans une première direction parallèlement à la surface de buse ;

une opération de contact en effectuant un déplacement relatif de la tête d'éjection de liquide et de l'unité d'essuyage dans une deuxième direction, laquelle est une direction faisant en sorte d'amener en contact l'élément d'essuyage et la surface de buse se trouvant dans un état séparé afin de débuter un essuyage d'une section cible d'essuyage tout en effectuant un déplacement relatif d'une unité d'essuyage dotée de l'élément d'essuyage et de la tête d'éjection de liquide dans la première direction parallèlement à la surface de buse suite au contact entre l'élément d'essuyage et la surface de buse dans une partie avant d'une section cible d'essuyage dans le côté de début d'essuyage, laquelle est la partie de la surface de buse,

caractérisé en ce que le procédé de maintenance de tête comprend en outre les étapes suivantes :

une opération de séparation, en effectuant un déplacement relatif de la tête d'éjection de liquide et de l'élément d'essuyage dans ladite deuxième direction, laquelle est une direction séparant l'élément d'essuyage de la surface de buse se trouvant dans un état de contact afin de terminer l'essuyage de la section cible d'essuyage tout en effectuant un déplacement relatif de l'unité d'essuyage et de la tête d'éjection de liquide dans la première direction suite à une séparation de l'élément d'essuyage et de la surface de buse dans une partie arrière de la section cible d'essuyage dans le côté de fin d'essuyage.

FIG.1

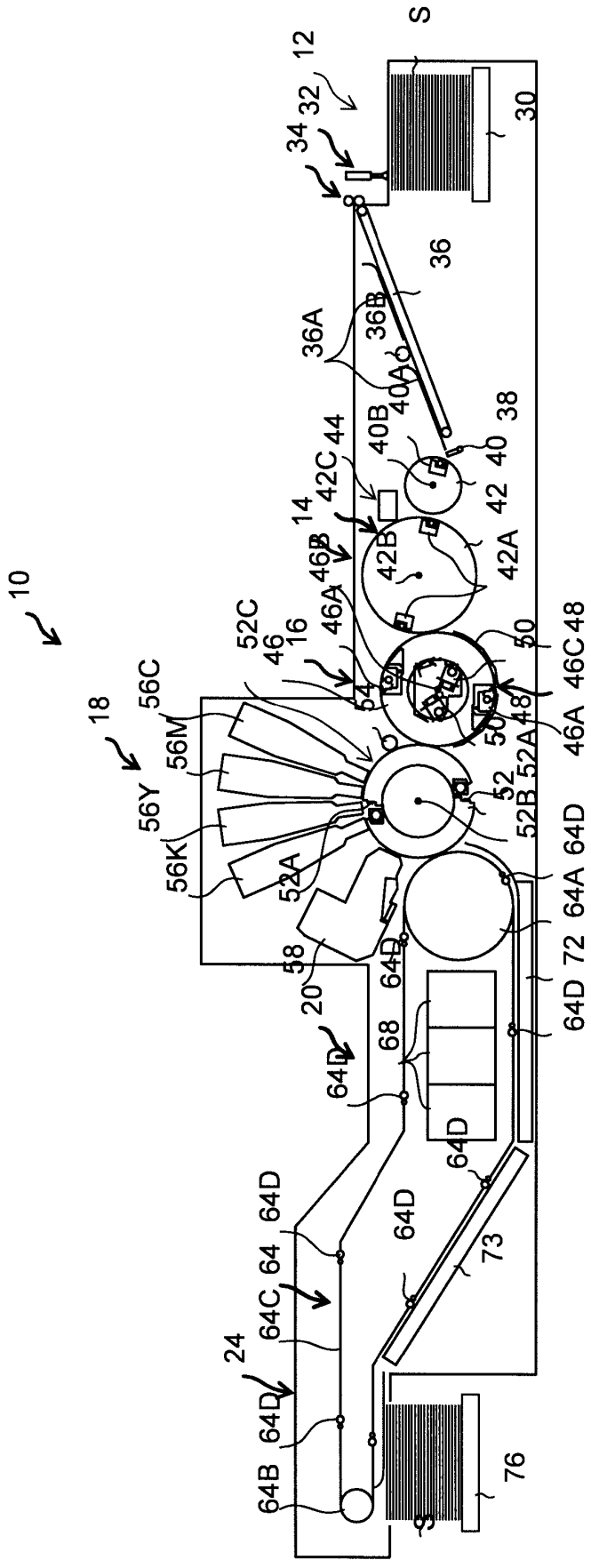

10
12
S
32
34
30
36
36A
36B
40A
40B
38
40
42
42C
44
14
42B
42A
46B
46A
52C
46
16
50
48
46C
54
56C
56M
56Y
56K
18
52
52A
52B
64D
64A
72
58
64B
20
68
64
64C
24
73
76

FIG.2

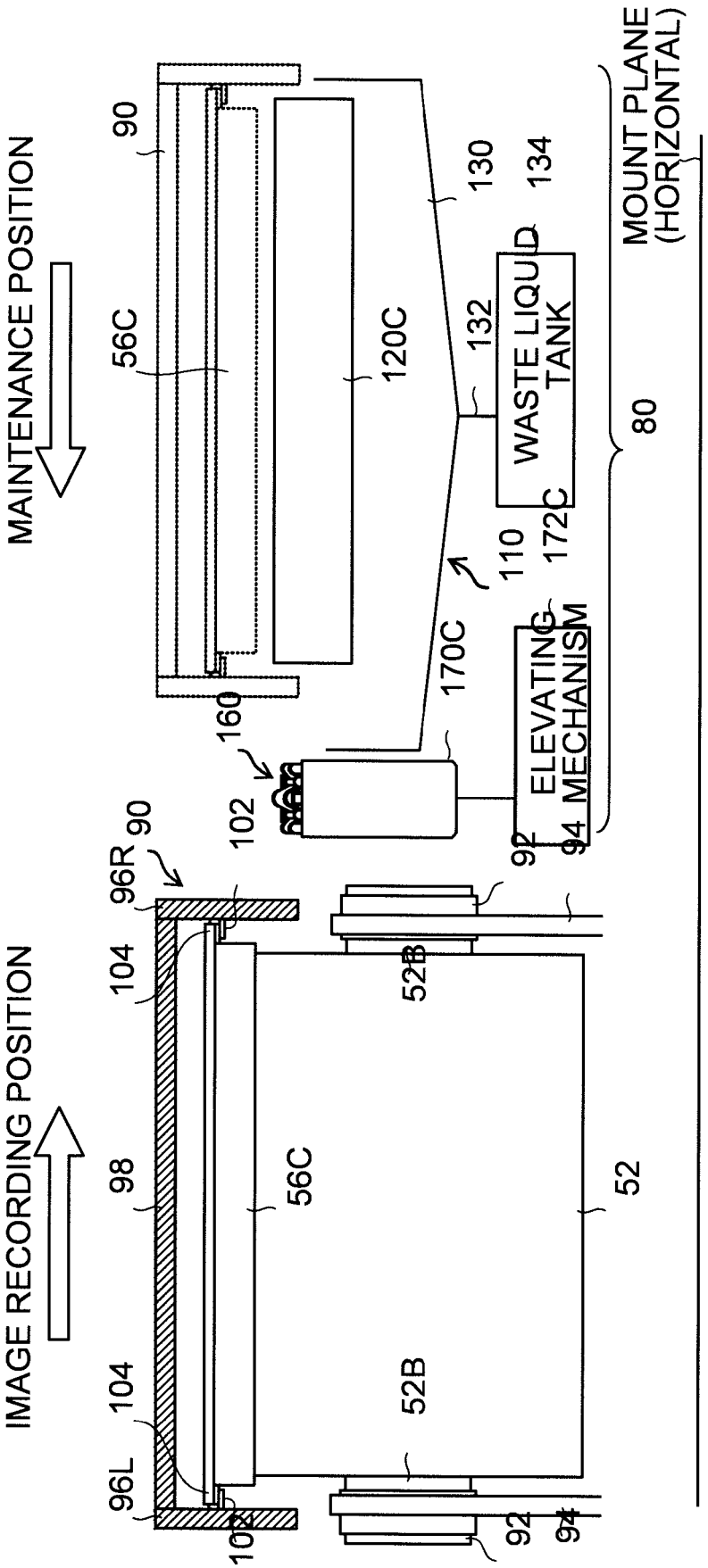

MAINTENANCE POSITION
IMAGE RECORDING POSITION
MOUNT PLANE (HORIZONTAL)
WASTE LIQUID TANK
ELEVATING MECHANISM
90
56C
120C
130
134
132
80
110
172C
170C
160
102
96R
104
52B
98
52
96L
92
94

FIG.3

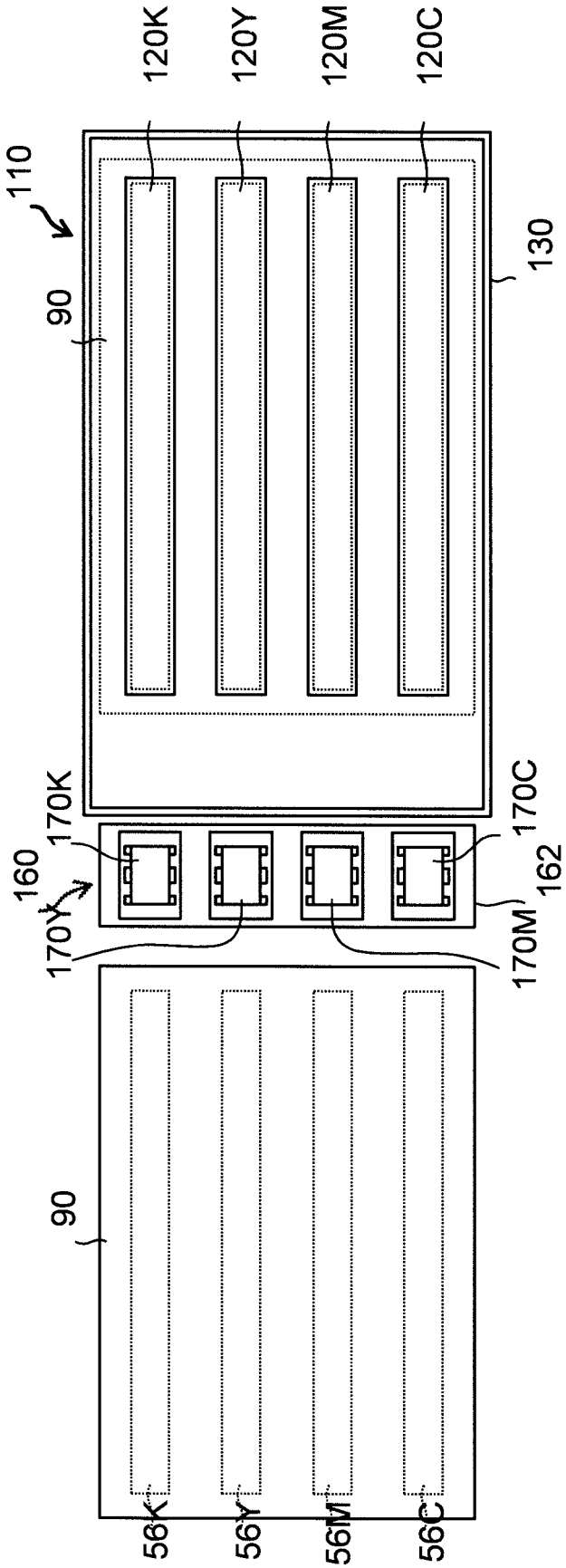

120K
120Y
120M
120C
110
90
130
170K
160
170C
162
170Y
170M
90
56K
56Y
56M
56C

FIG.4

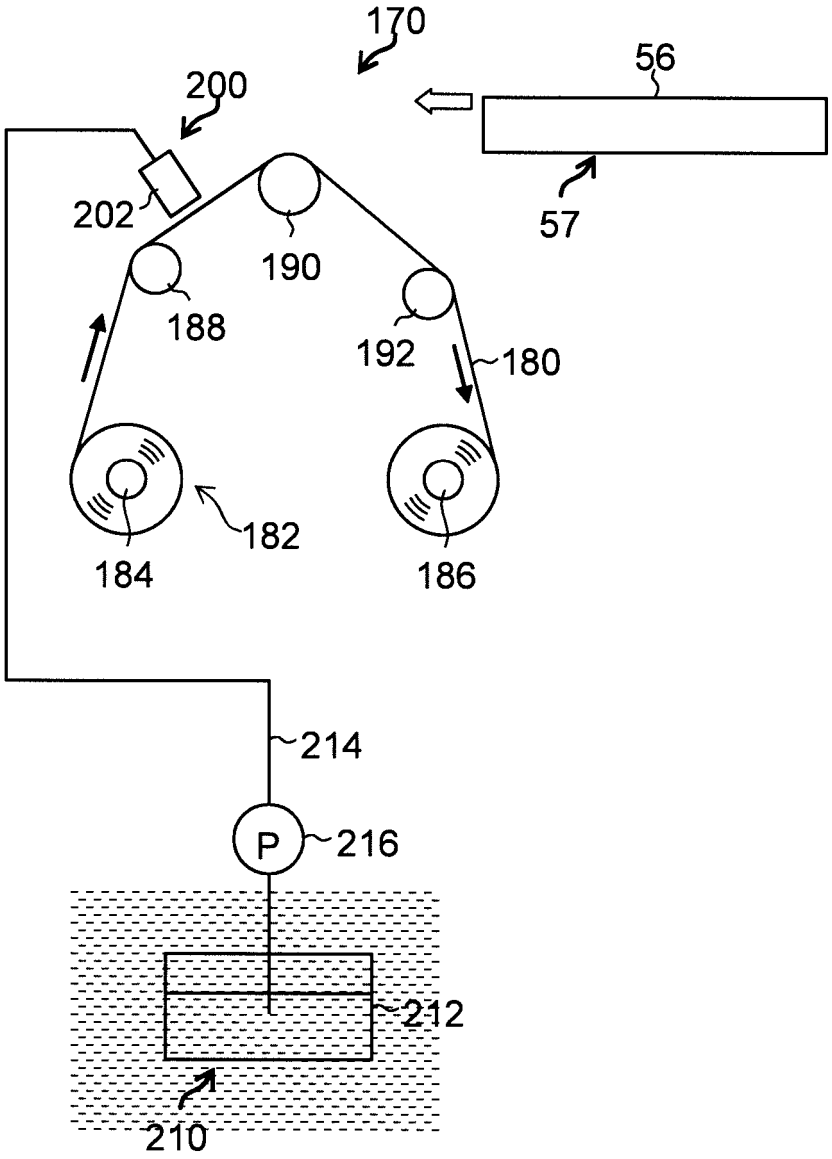


FIG.5

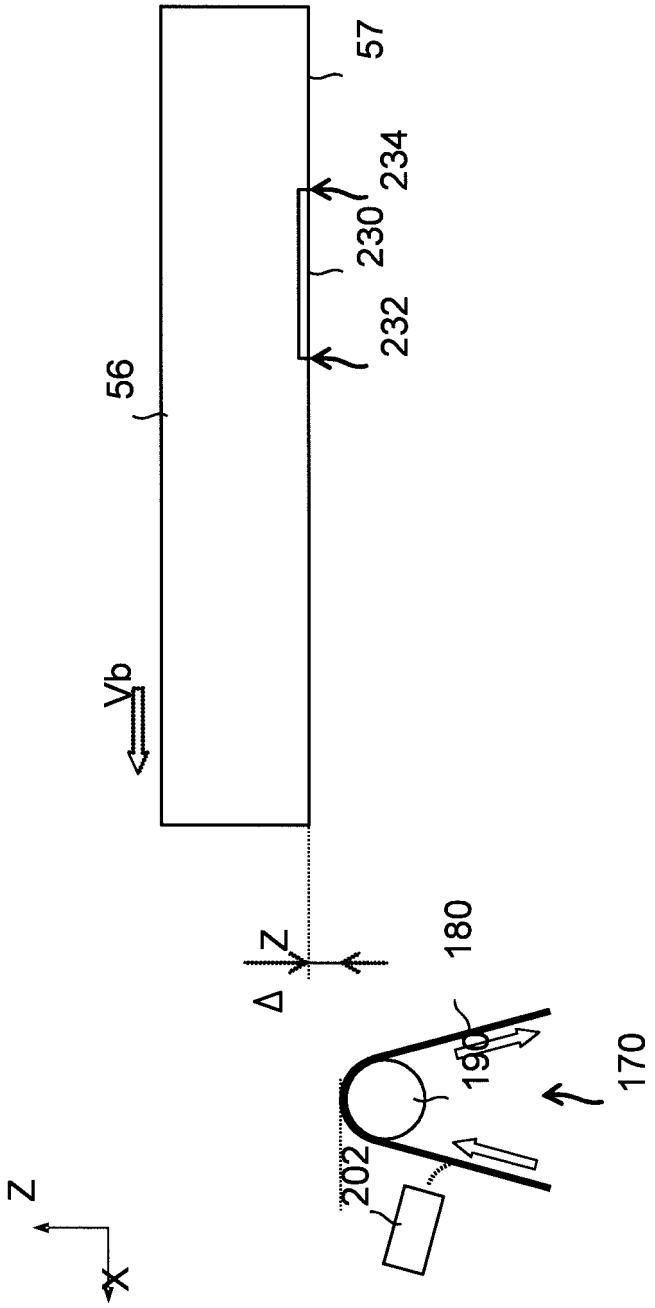


FIG.6

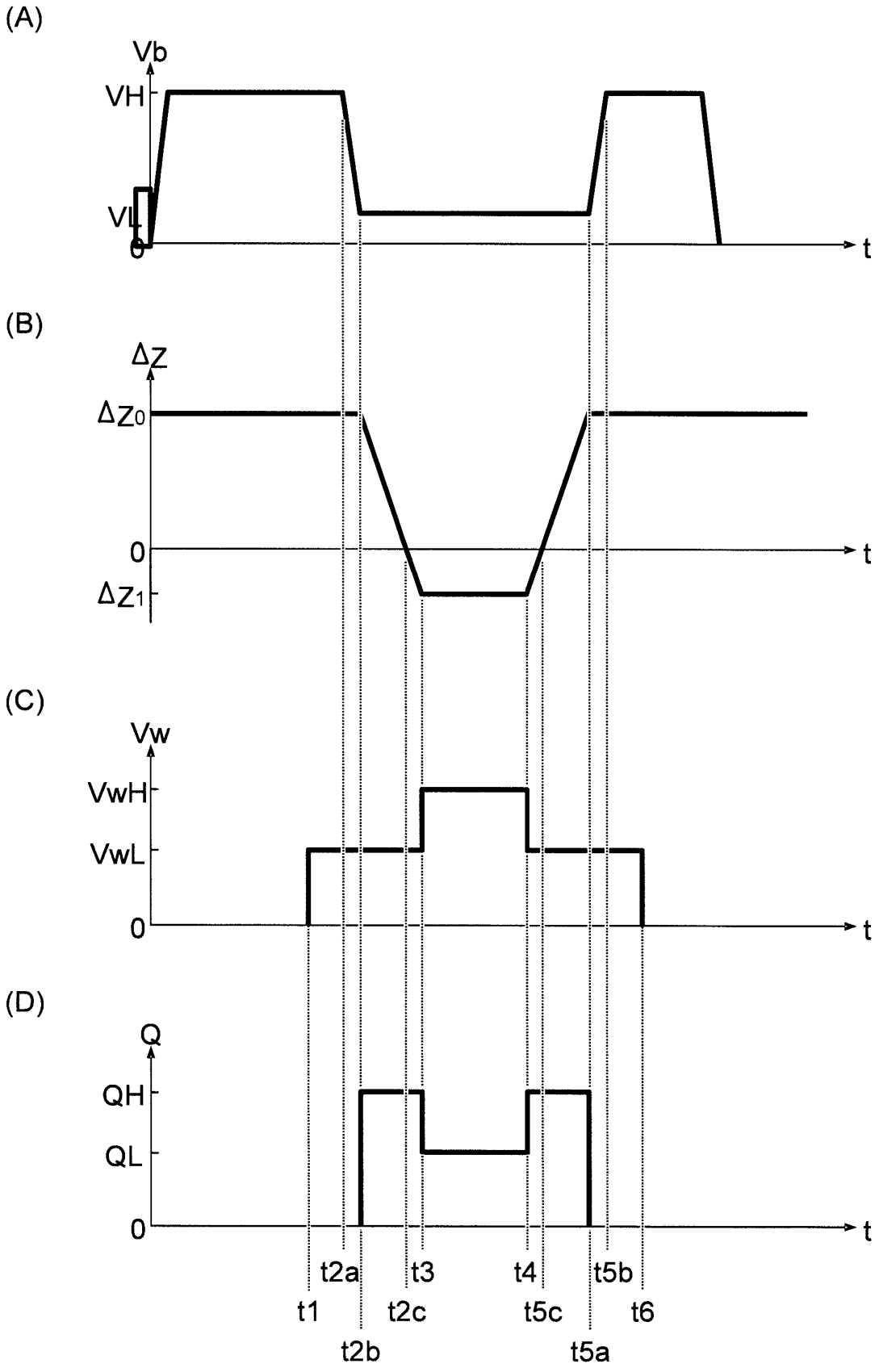

(A)
Vb
VH
VL
0
t
(B)
ΔZ
ΔZ0
0
ΔZ1
t
(C)
Vw
VwH
VwL
0
t
(D)
Q
QH
QL
0
t
t1
t2a
t2b
t2c
t3
t4
t5a
t5b
t5c
t6

FIG.7A

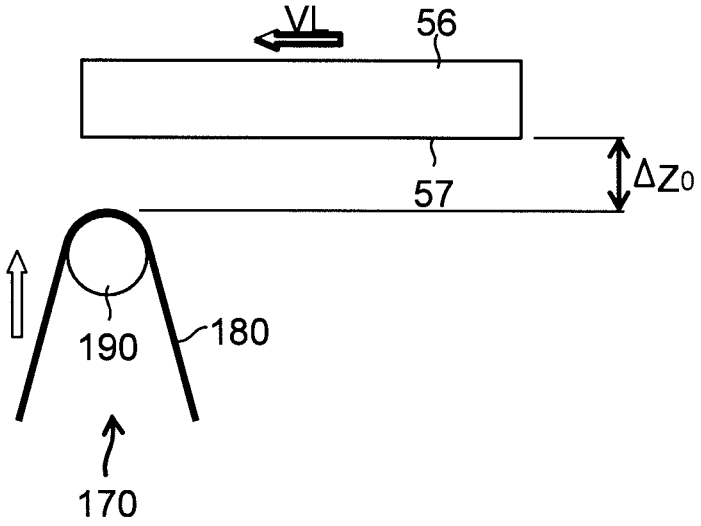


FIG.7B

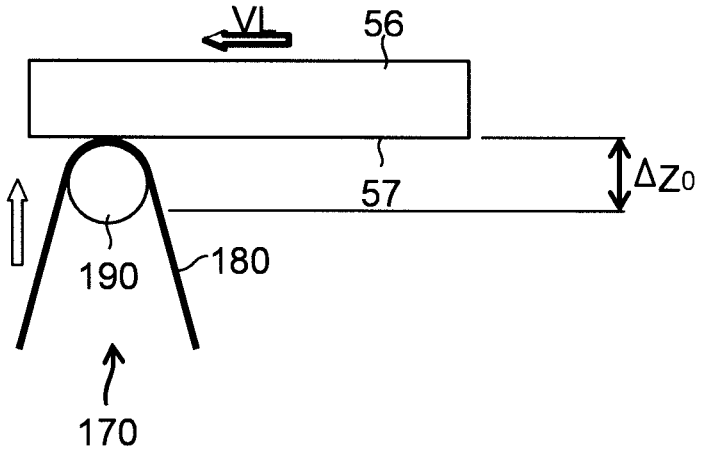


FIG.7C

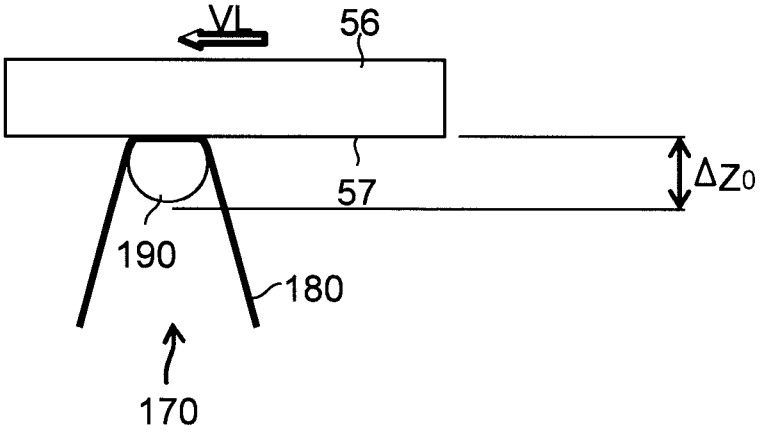


FIG.8A

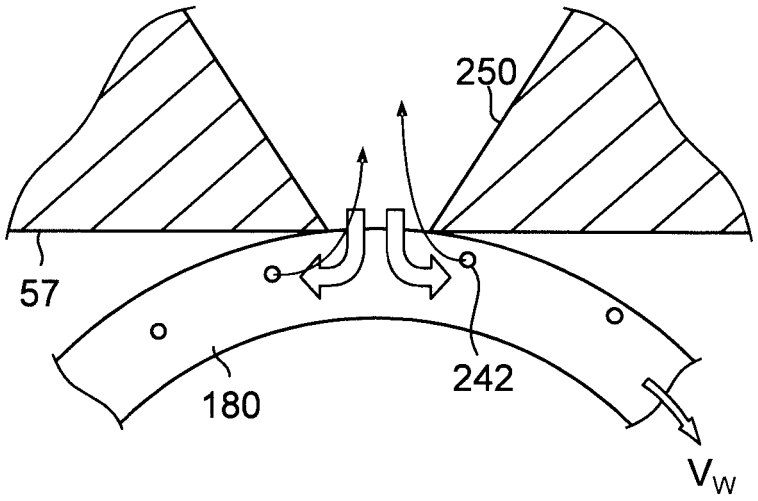


FIG.8B

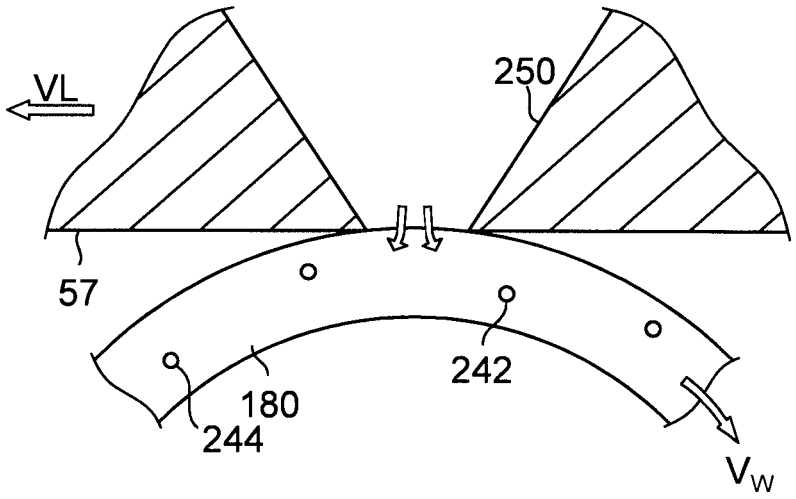


FIG.9

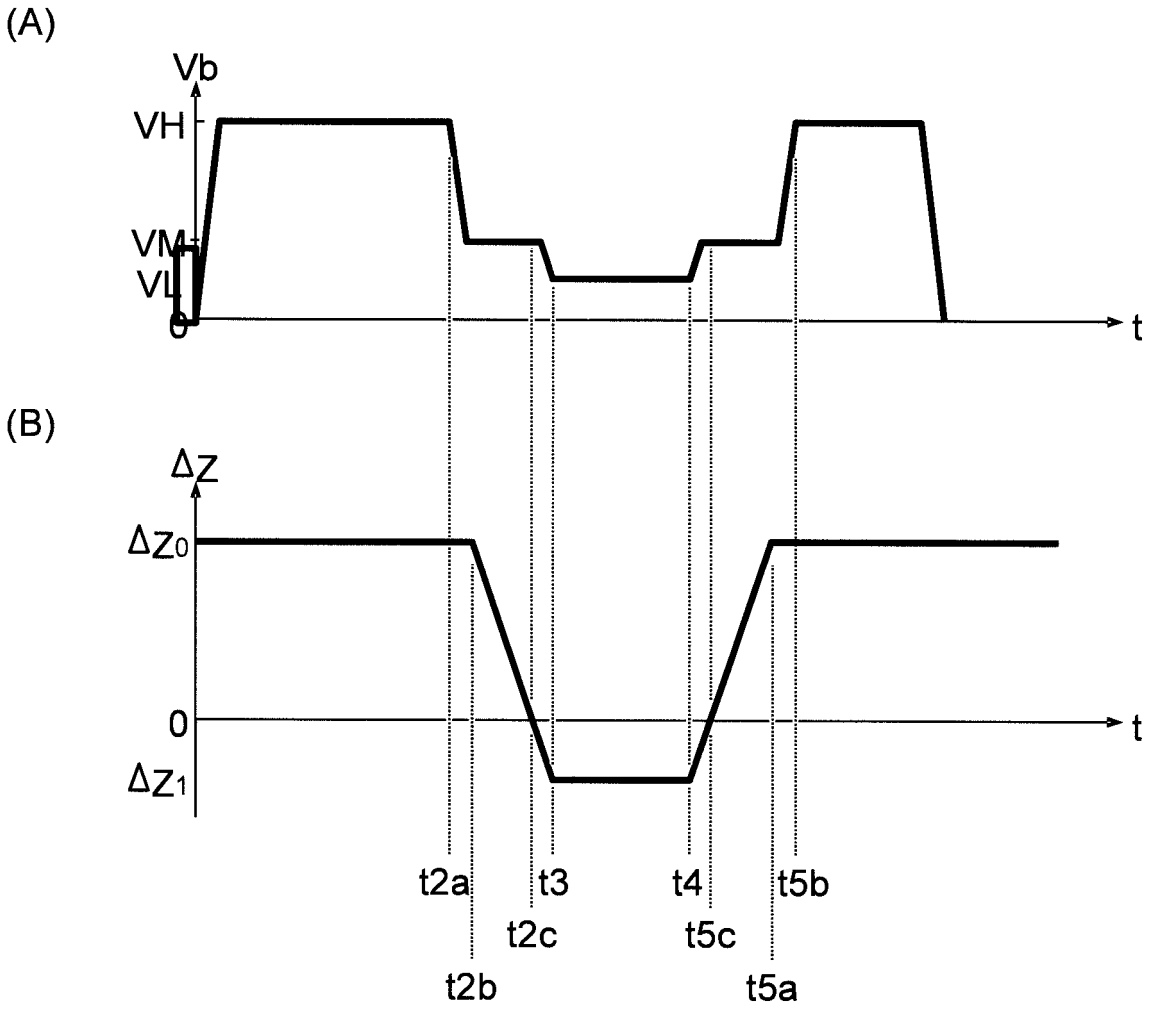
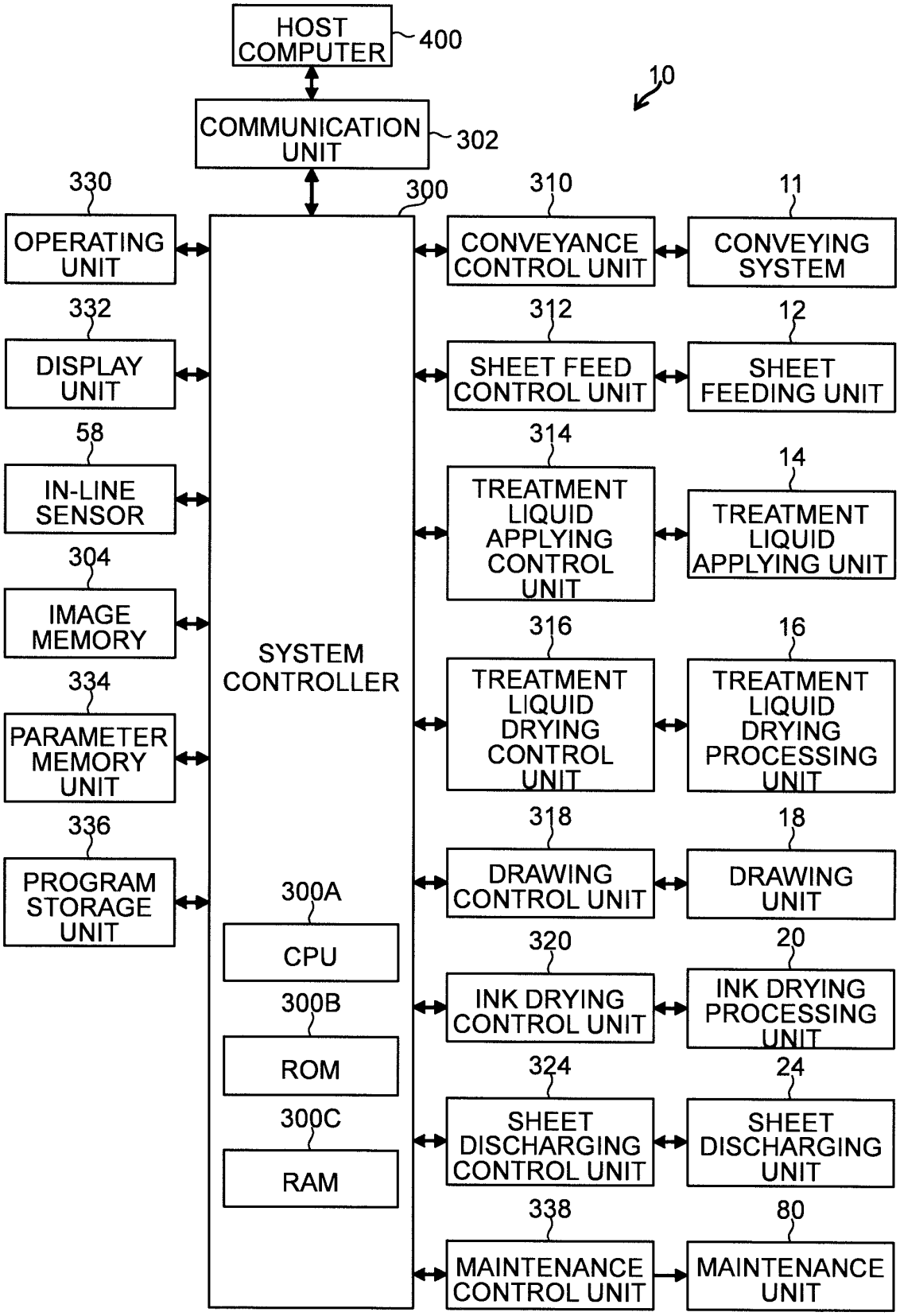


FIG.10


HOST COMPUTER
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COMMUNICATION UNIT
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OPERATING UNIT
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DISPLAY UNIT
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IN-LINE SENSOR
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IMAGE MEMORY
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PARAMETER MEMORY UNIT
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PROGRAM STORAGE UNIT
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SYSTEM CONTROLLER
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CPU
300B
ROM
300C
RAM
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CONVEYANCE CONTROL UNIT
11
CONVEYING SYSTEM
312
SHEET FEED CONTROL UNIT
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SHEET FEEDING UNIT
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TREATMENT LIQUID APPLYING CONTROL UNIT
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TREATMENT LIQUID APPLYING UNIT
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TREATMENT LIQUID DRYING CONTROL UNIT
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TREATMENT LIQUID DRYING PROCESSING UNIT
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DRAWING CONTROL UNIT
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DRAWING UNIT
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INK DRYING CONTROL UNIT
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MAINTENANCE CONTROL UNIT
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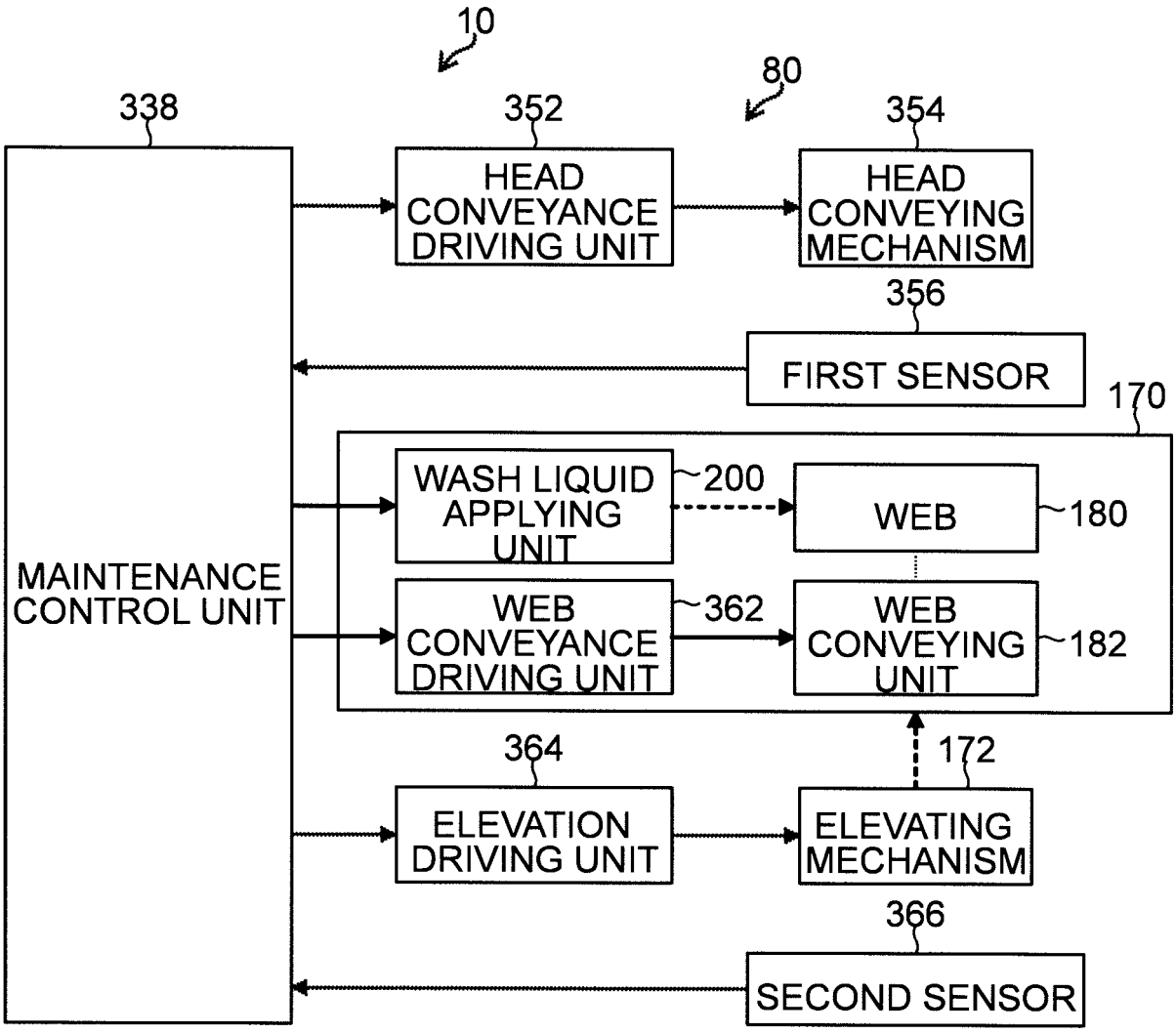
MAINTENANCE UNIT

FIG.11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FIRST SENSOR
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WEB CONVEYANCE DRIVING UNIT
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172
ELEVATION DRIVING UNIT
ELEVATING MECHANISM
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SECOND SENSOR

FIG.12

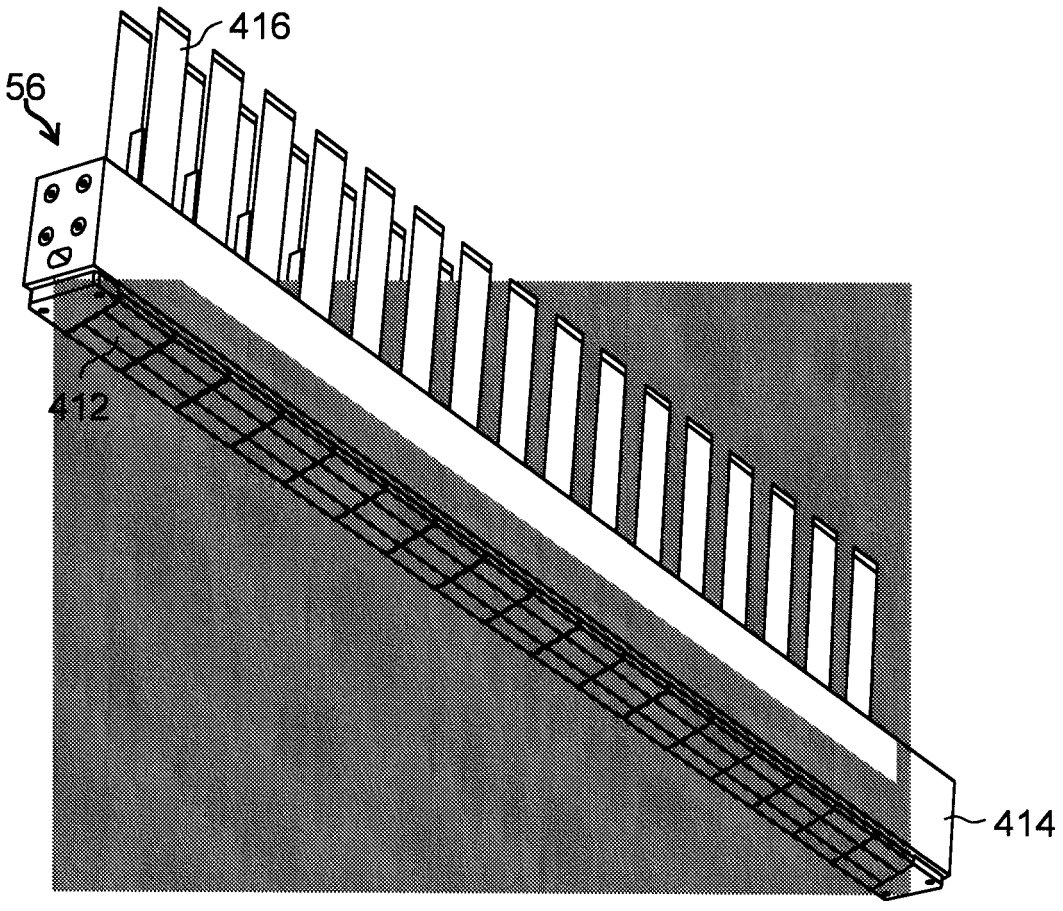


FIG.13

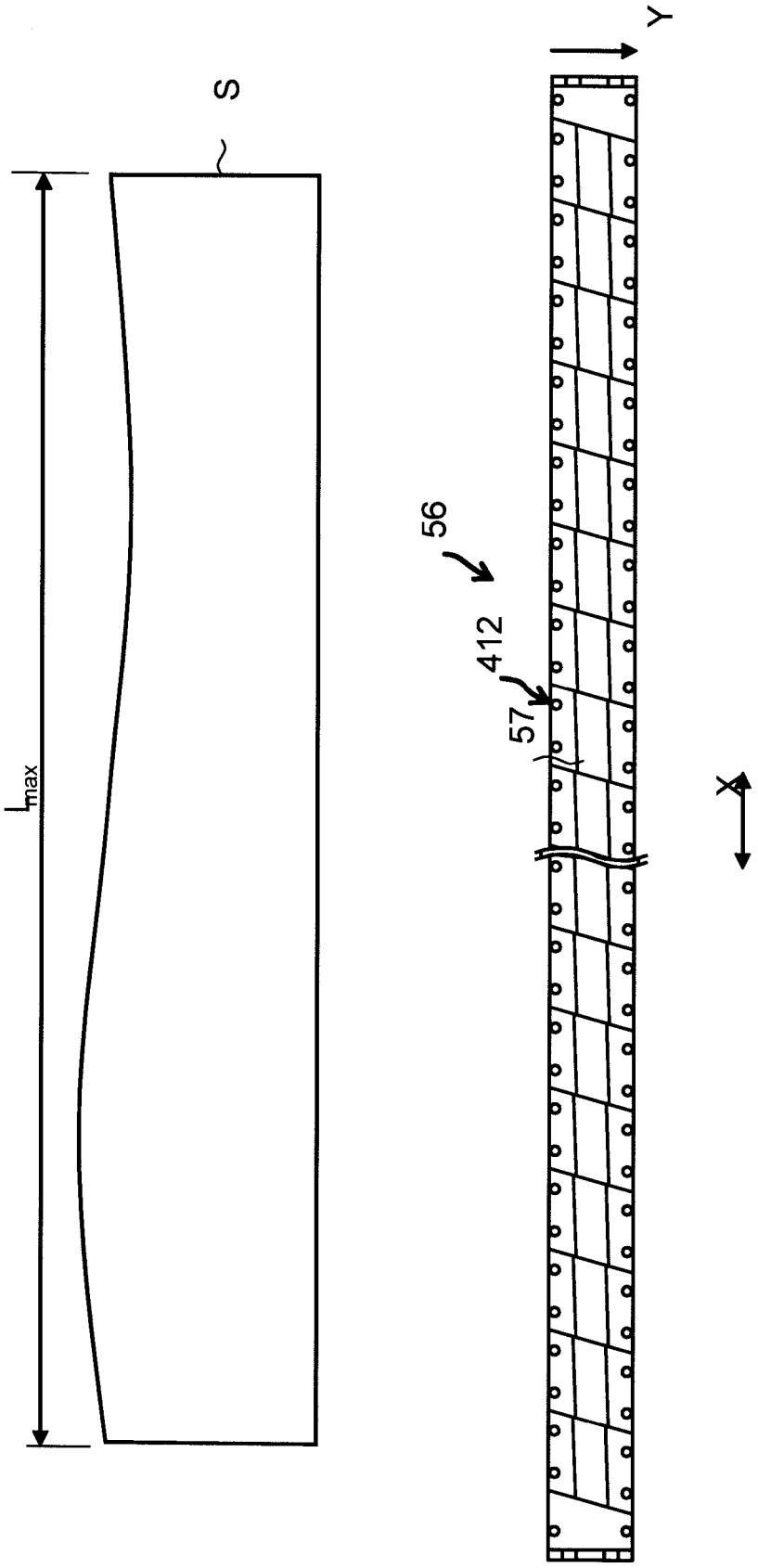


FIG.14

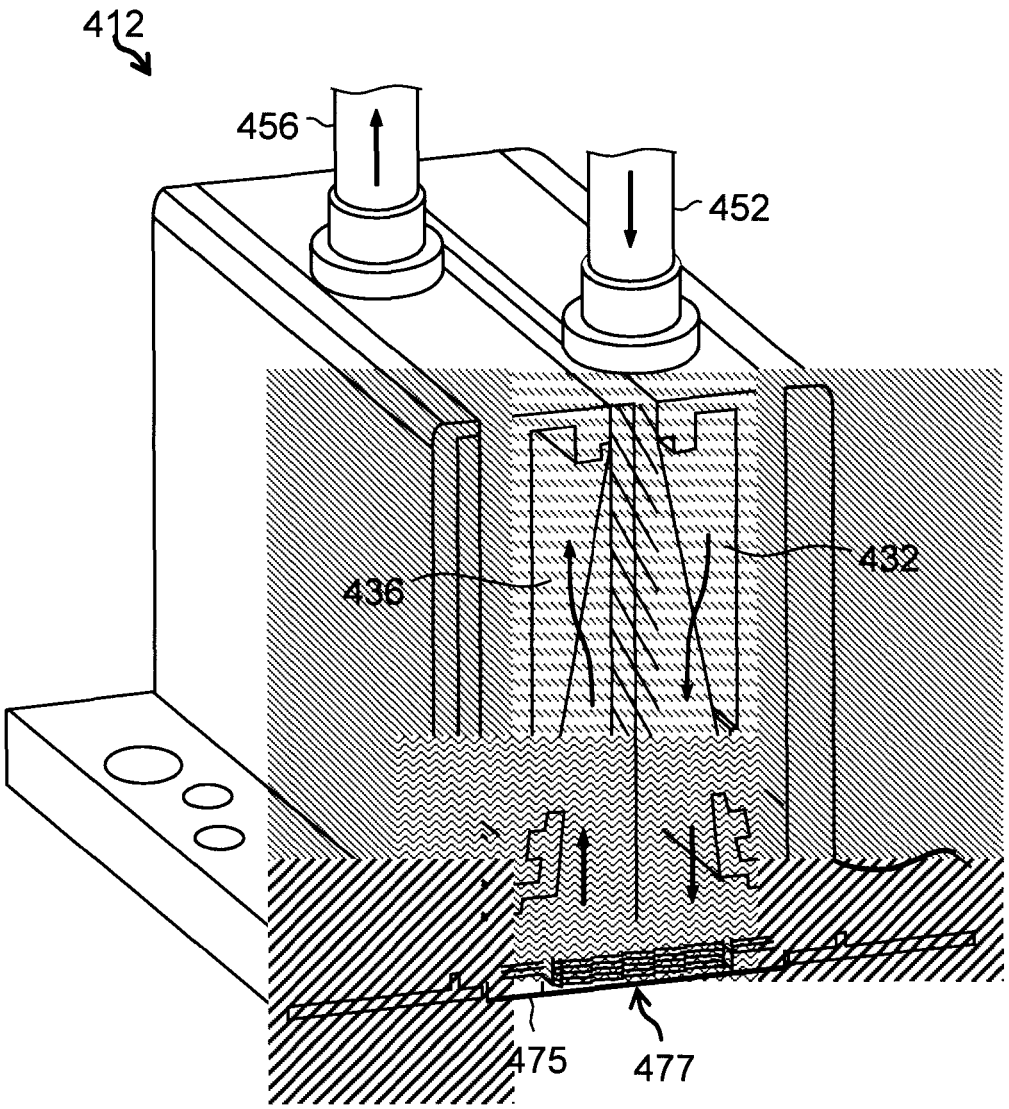


FIG.15

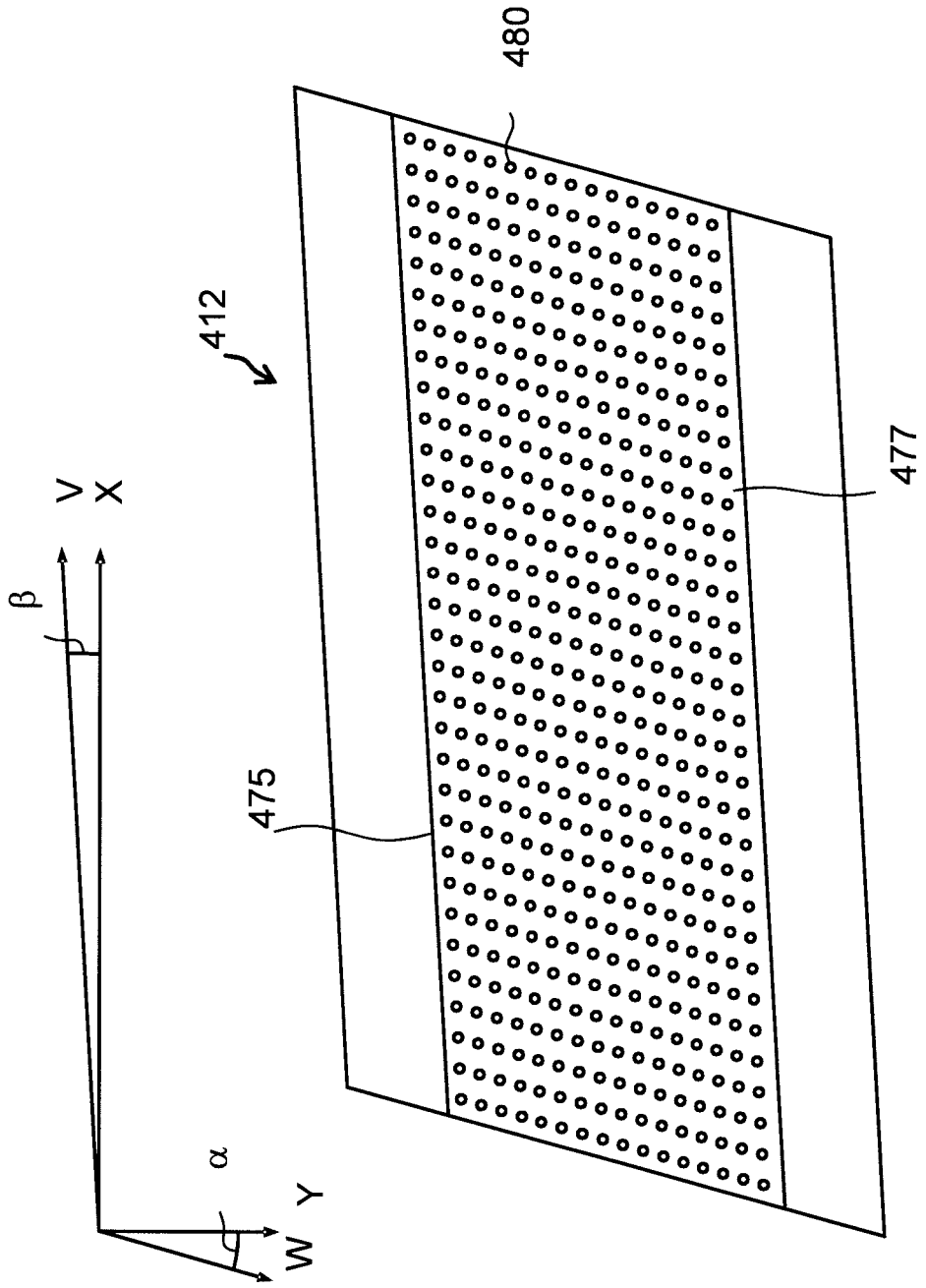
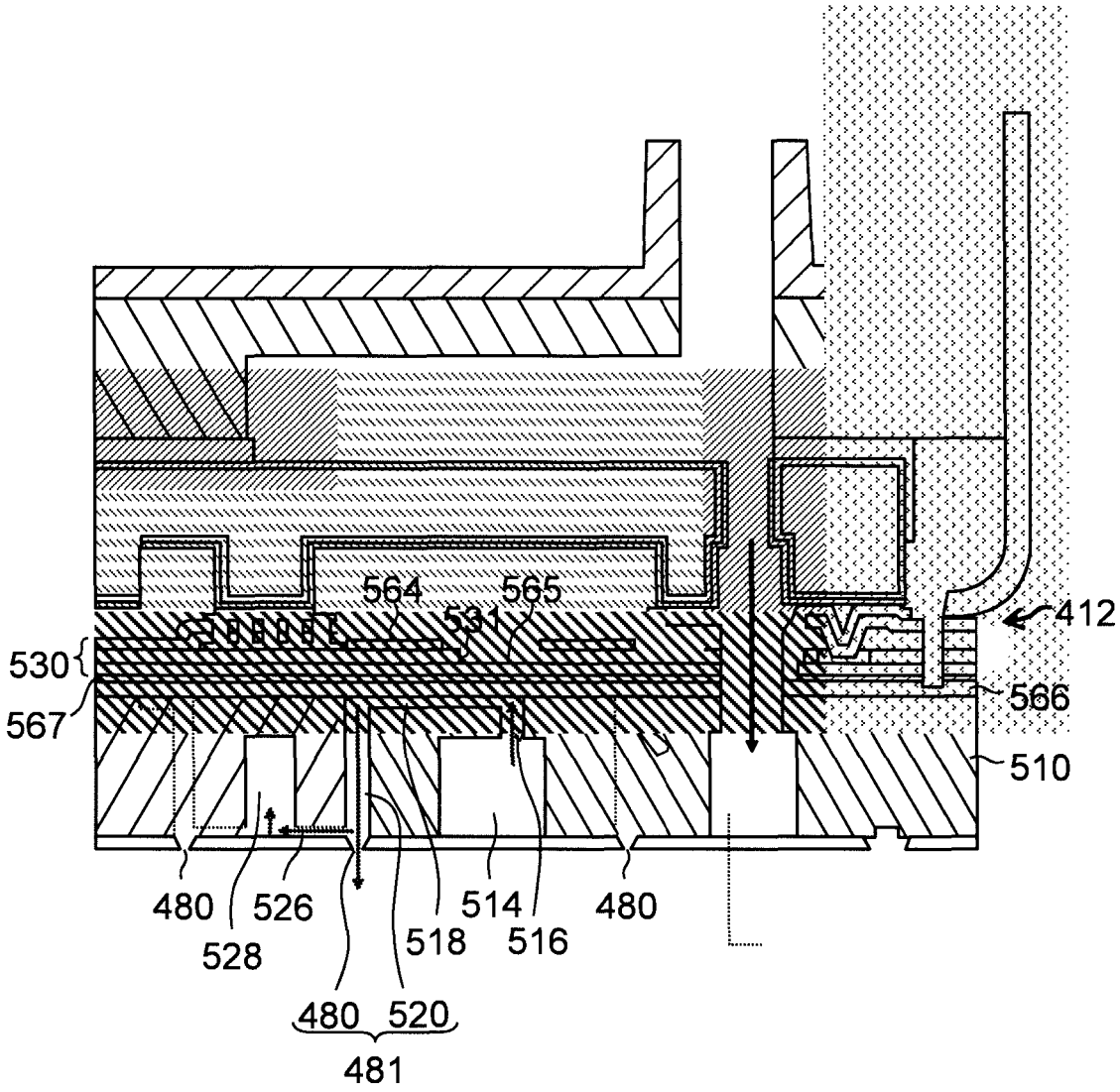


FIG.16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REFERENCES CITED IN THE DESCRIPTION

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