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Otana

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(54) **INKJET RECORDING APPARATUS**

(71) Applicant: **KYOCERA Document Solutions Inc.**, Osaka (JP)

(72) Inventor: **Aiichiro Otana**, Osaka (JP)

(73) Assignee: **KYOCERA Document Solutions Inc.**, Osaka (JP)

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B41J 2/17 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/16523*** (2013.01); ***B41J 2/1721*** (2013.01); *B41J 2/1742* (2024.05)

(58) **Field of Classification Search**
CPC B41J 2/16523; B41J 2/1721
See application file for complete search history.

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Primary Examiner — Sharon Polk
(74) *Attorney, Agent, or Firm* — Stein IP LLC

(57) **ABSTRACT**

An inkjet recording apparatus includes a recording head, a conveyance belt, a control portion, an ink collector, and a suction portion. The ink collector includes a plurality of ink receivers that receives ink that has passed through openings of the conveyance belt during execution of flushing and a suction path leading from each of the ink receivers to the suction portion. The suction path includes a plurality of first flow paths each connected to each of the plurality of ink receivers, a merging chamber in which the plurality of first flow paths merges together and that is linked to the suction portion, and ink separation walls that are provided in the merging chamber and are impinged on by airflows that have passed through the first flow paths so that the ink contained in the airflows is separated from the airflows.

9 Claims, 7 Drawing Sheets

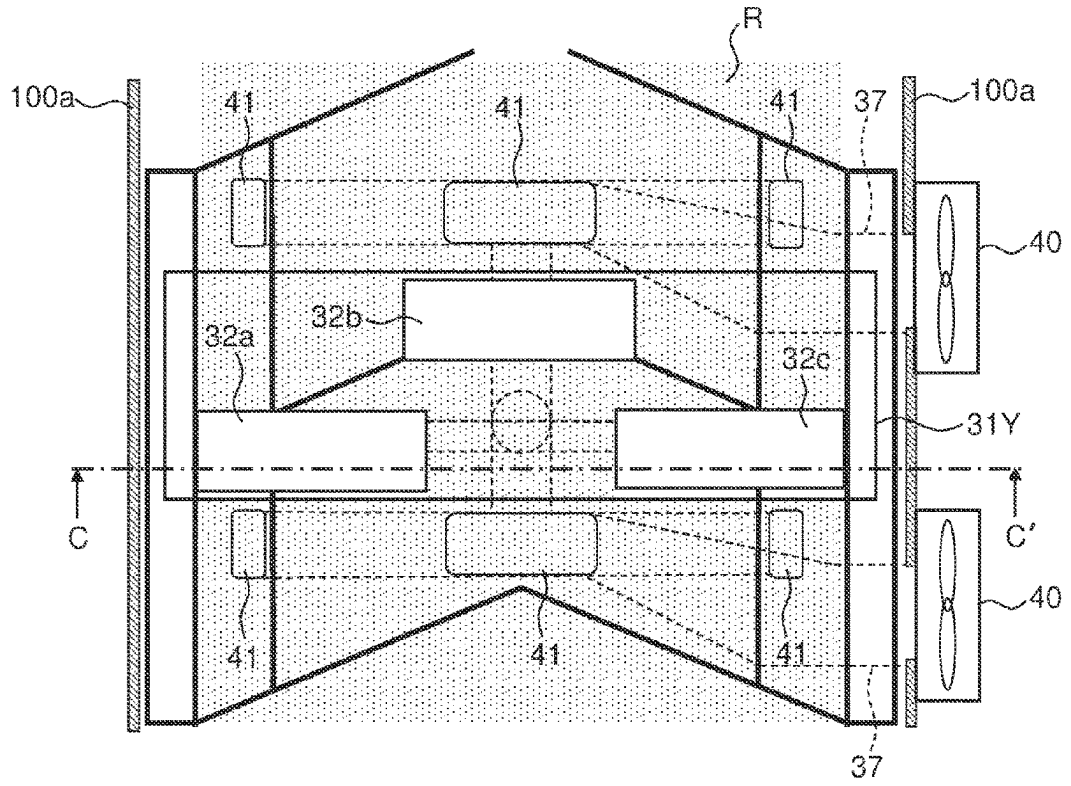


FIG.1

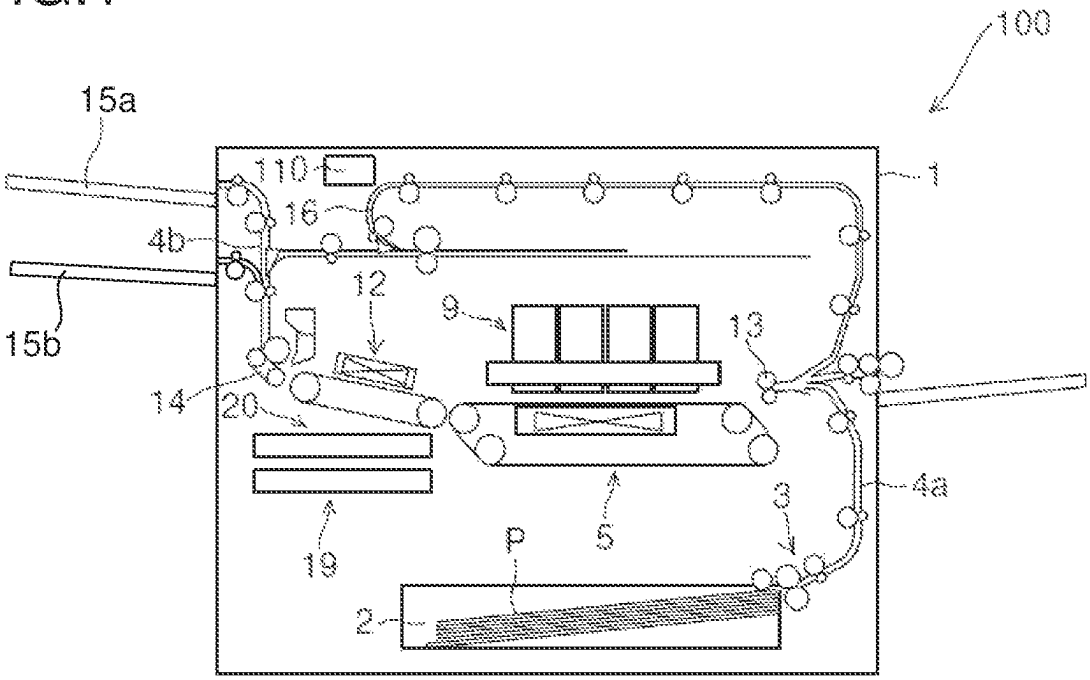
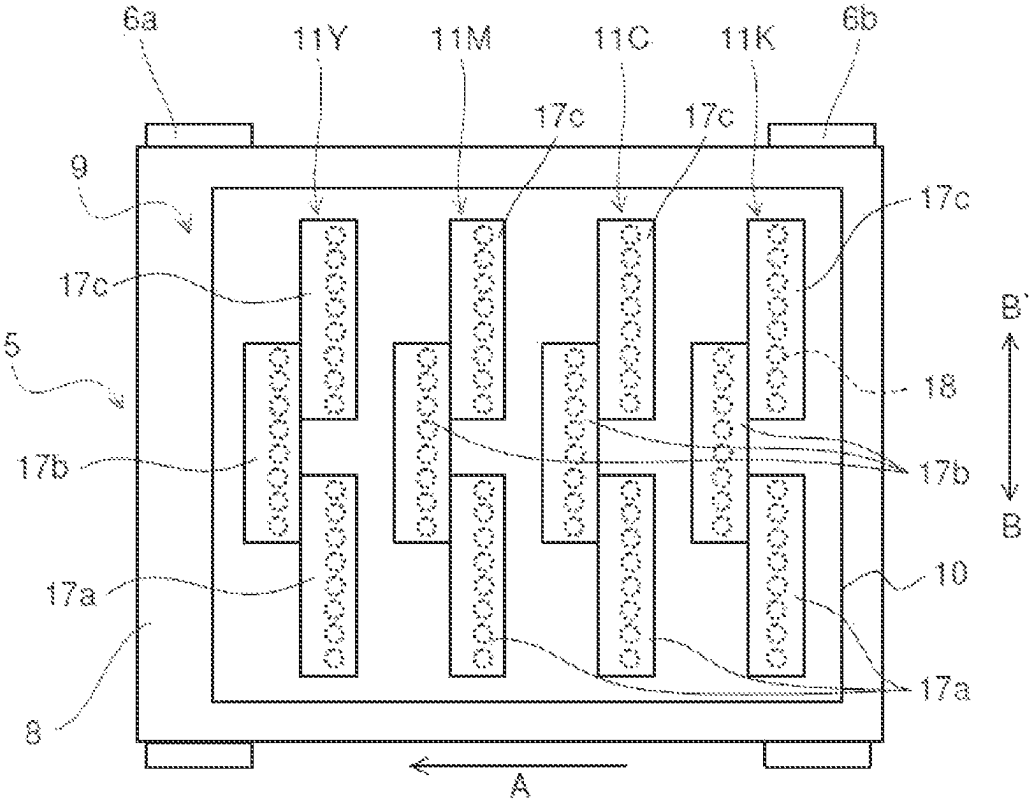

100
15a
110
1
16
4b
12
9
13
15b
14
20
4a
3
19
P
5
2

FIG.2


6a
11Y
11M
11C
11K
6b
17c
17c
9
17c
17c
5
18
B'
17b
17b
B
17a
10
17a
8
A

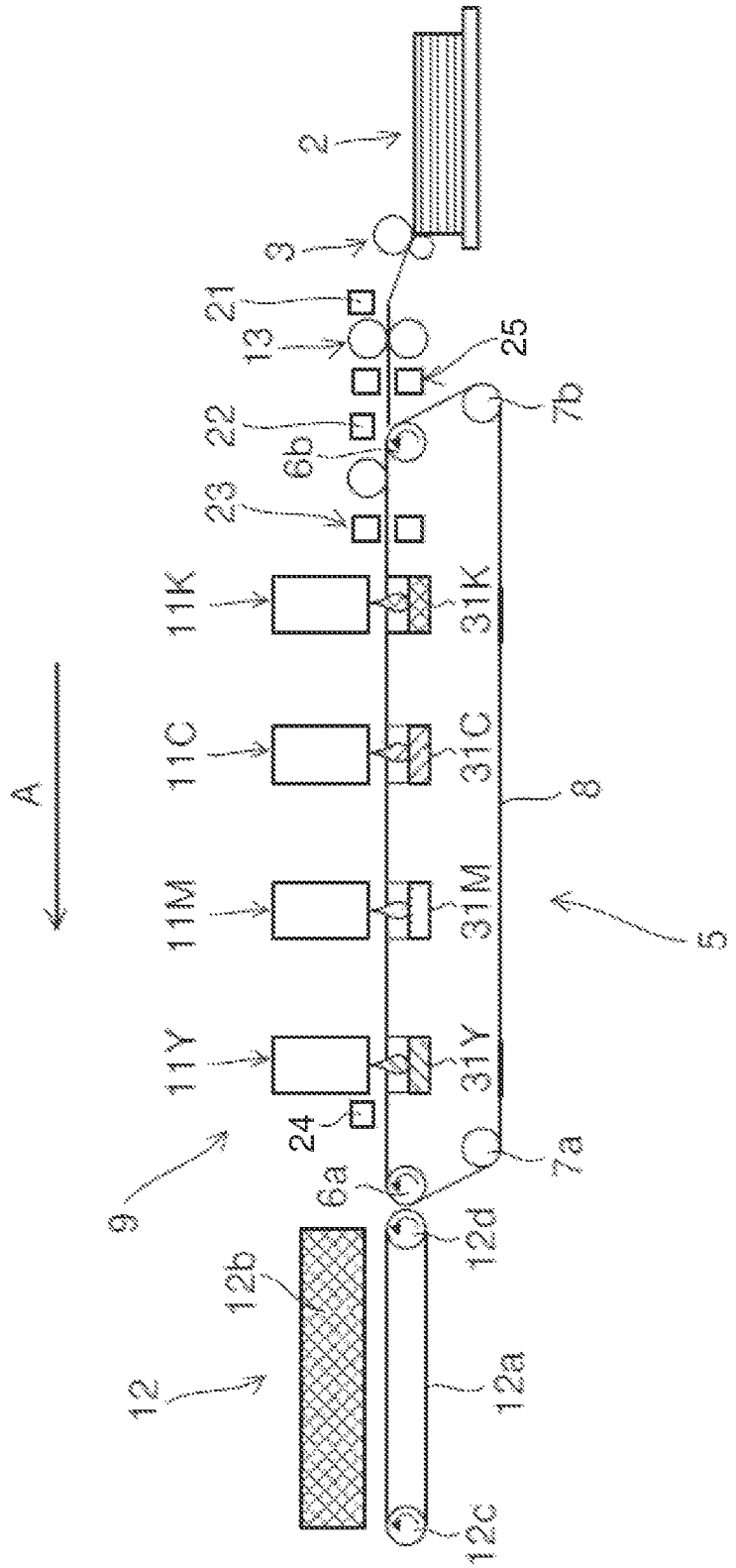

2
3
21
13
25
22
6b
7b
23
11K
31K
A
11C
31C
8
11M
31M
5
11Y
31Y
24
9
6a
7a
12d
12b
12
12a
12c

FIG.3

FIG.4

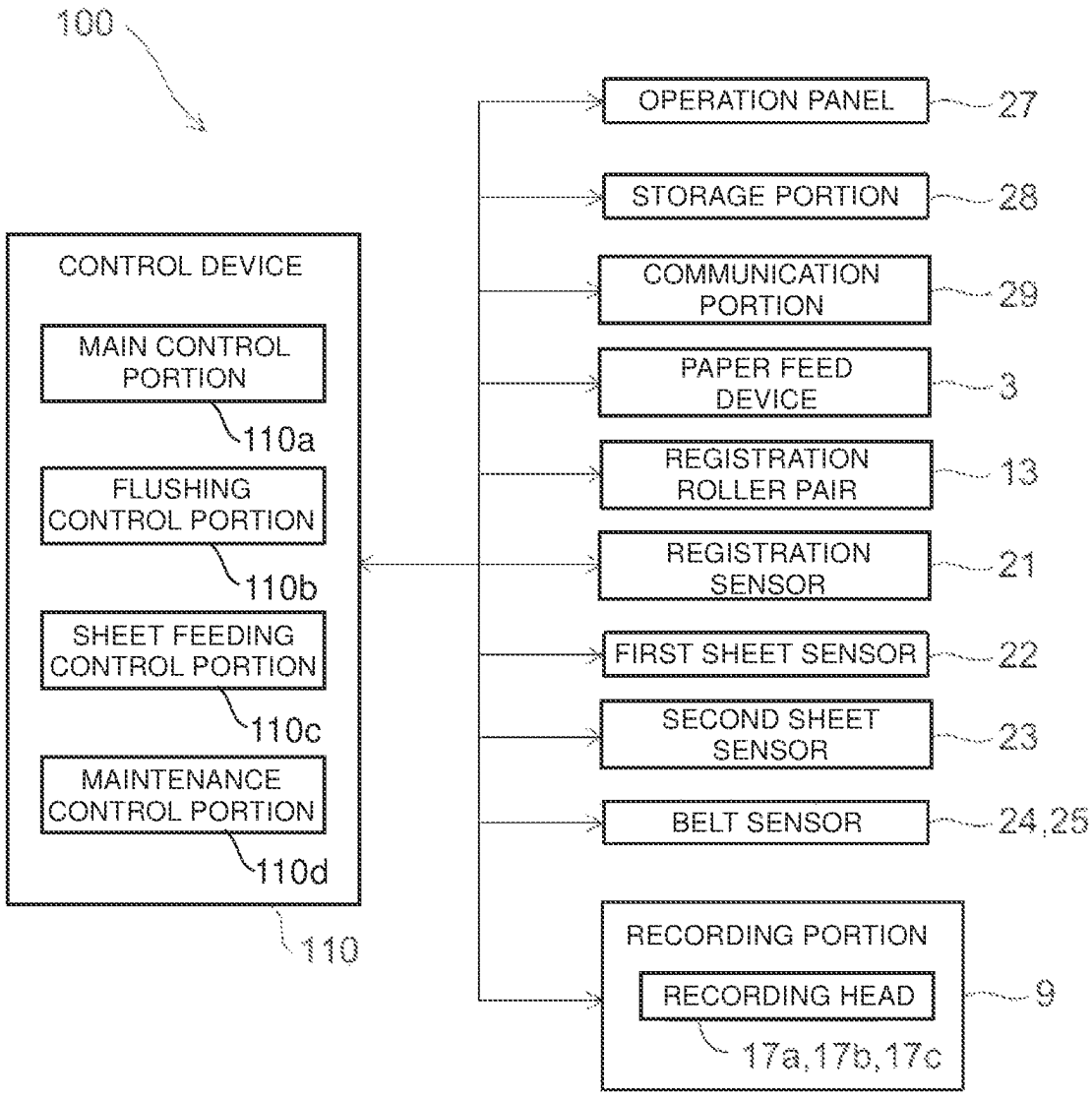

100
CONTROL DEVICE
MAIN CONTROL PORTION
110a
FLUSHING CONTROL PORTION
110b
SHEET FEEDING CONTROL PORTION
110c
MAINTENANCE CONTROL PORTION
110d
110
OPERATION PANEL
27
STORAGE PORTION
28
COMMUNICATION PORTION
29
PAPER FEED DEVICE
3
REGISTRATION ROLLER PAIR
13
REGISTRATION SENSOR
21
FIRST SHEET SENSOR
22
SECOND SHEET SENSOR
23
BELT SENSOR
24,25
RECORDING PORTION
RECORDING HEAD
9
17a,17b,17c

FIG.5

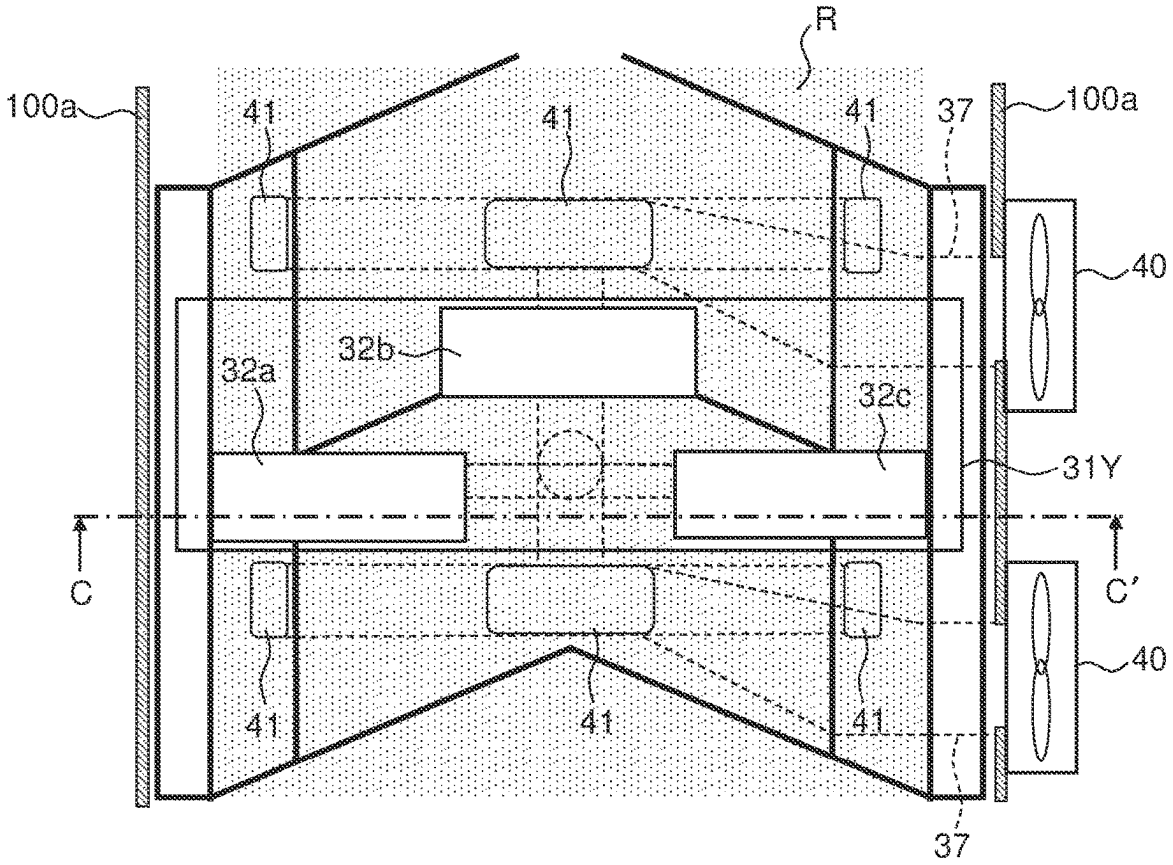

R
100a
41
41
41
37
100a
40
32b
32a
32c
31Y
C
C'
41
41
41
40
37

FIG.6

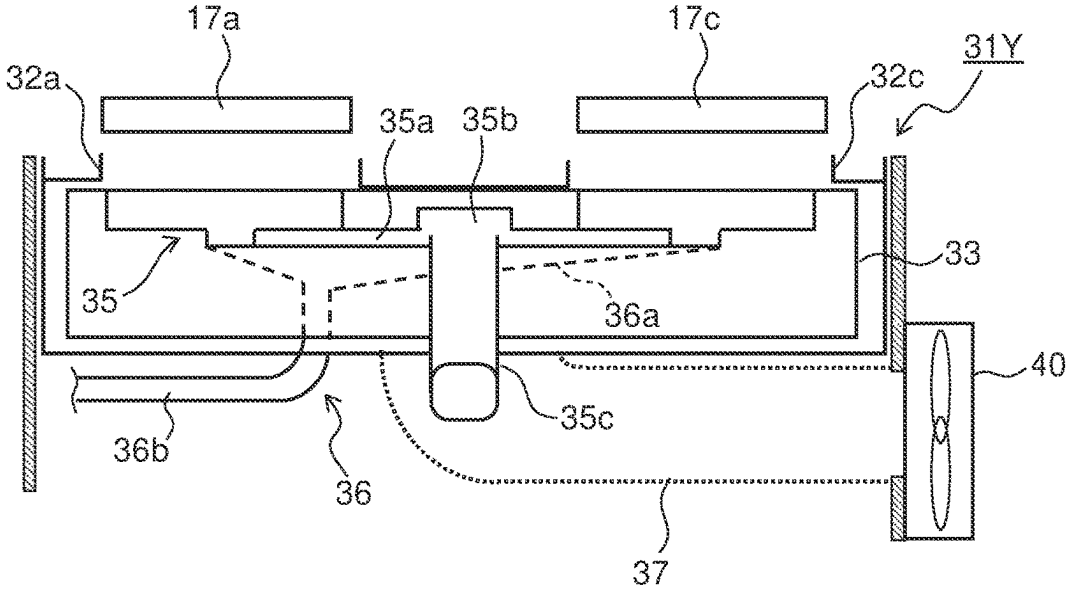

17a
17c
31Y
32a
32c
35a
35b
33
35
36a
40
35c
36b
36
37

FIG.7

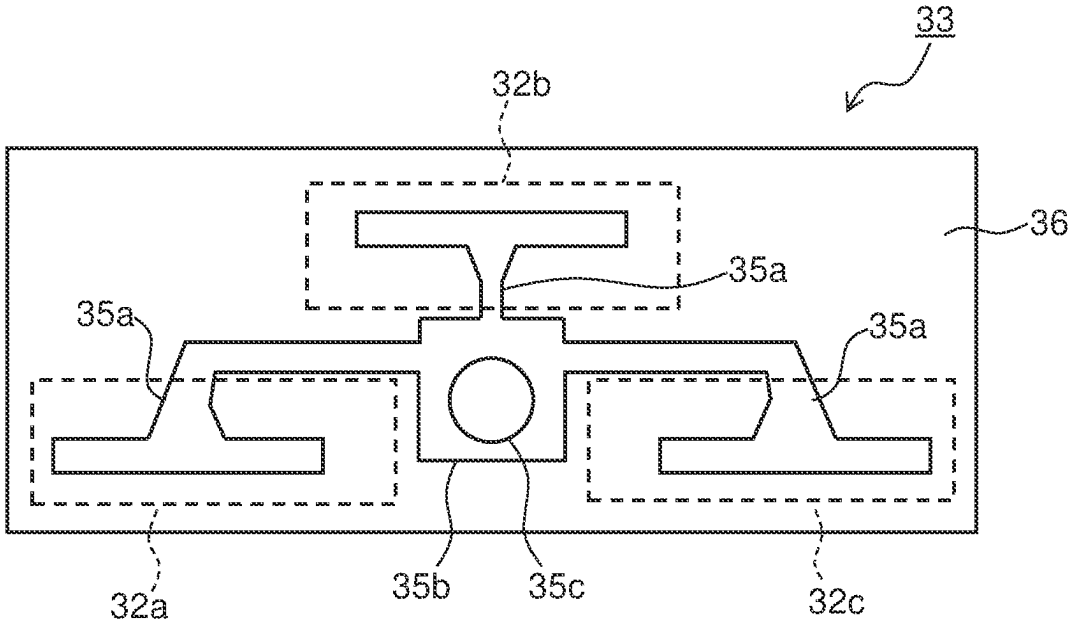


FIG.8

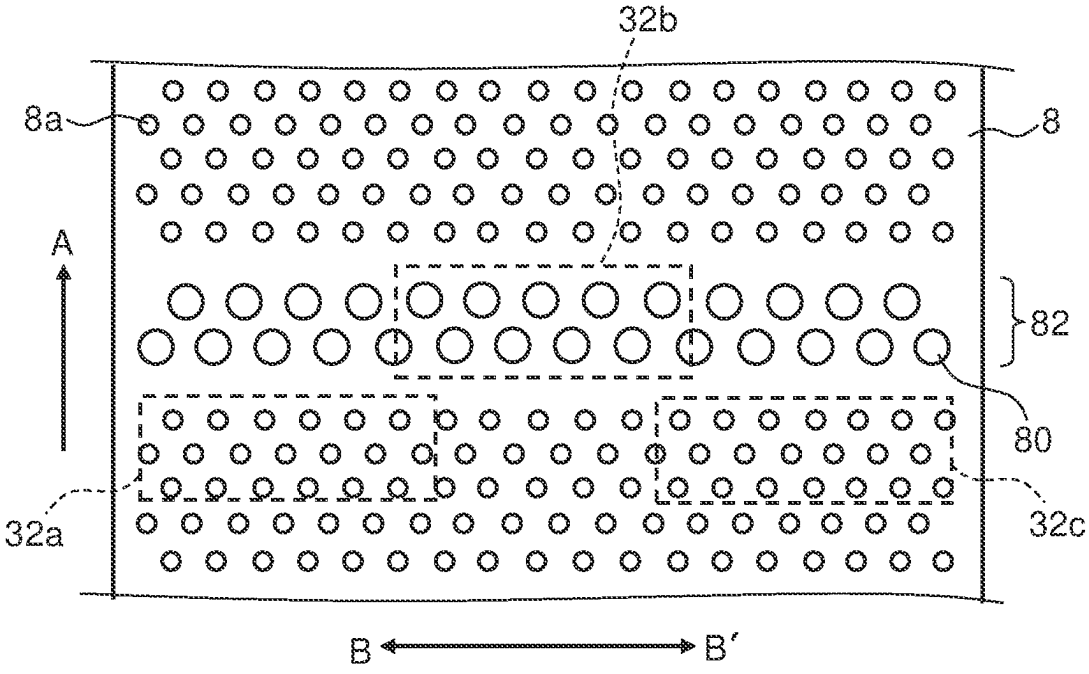


FIG.9

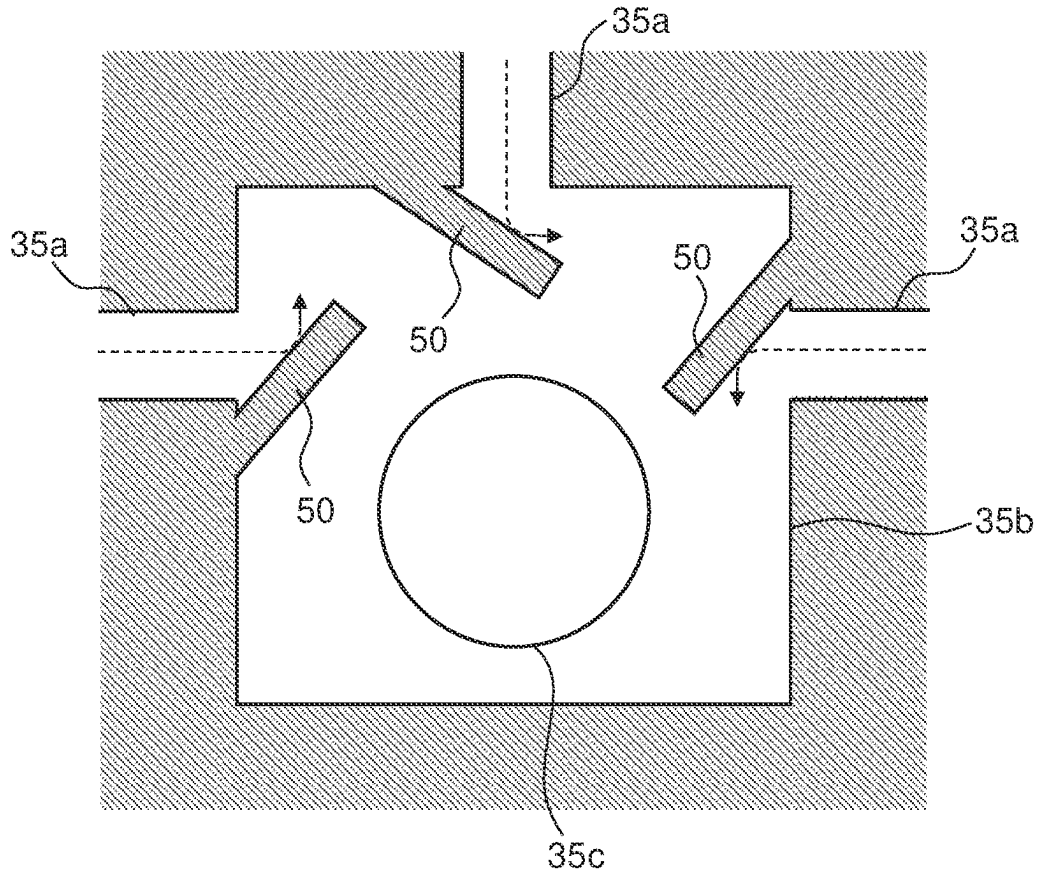


FIG.10

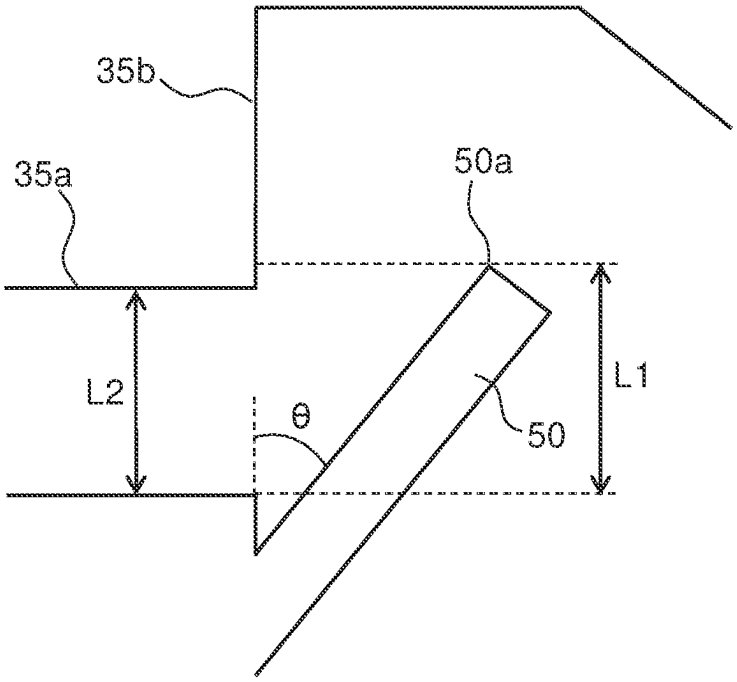


FIG.11

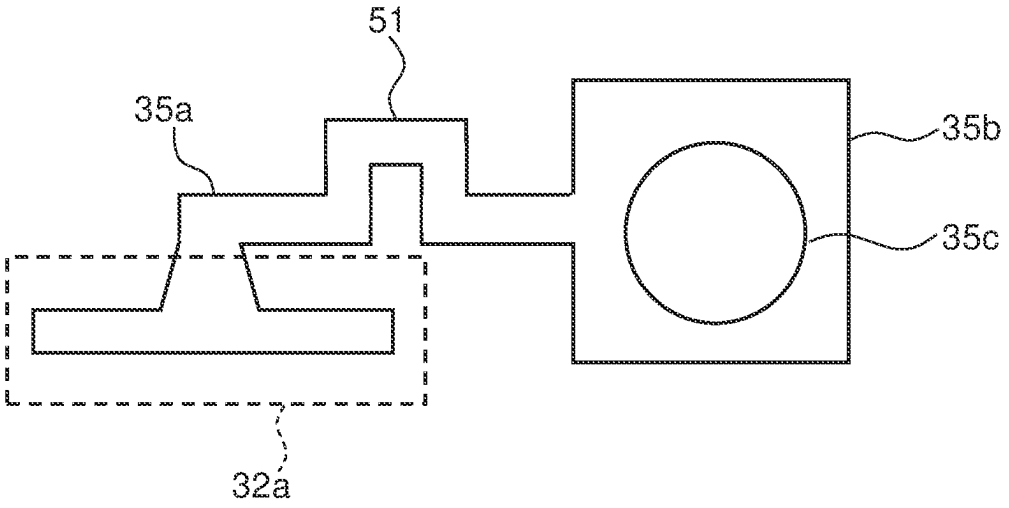
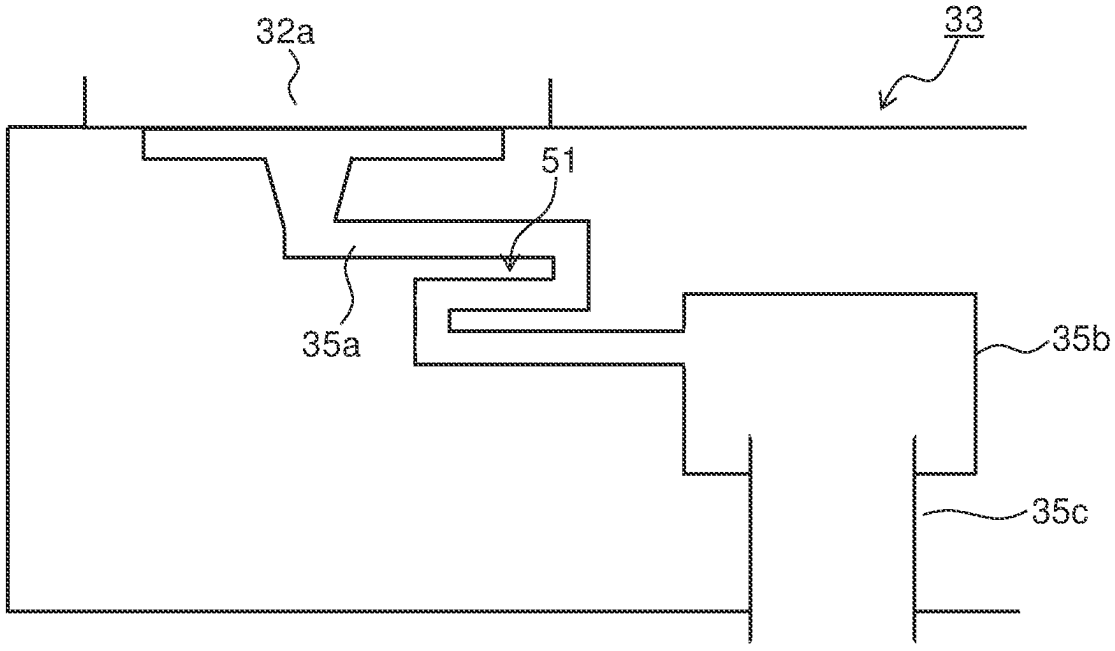


FIG.12



INKJET RECORDING APPARATUS

INCORPORATION BY REFERENCE

This application is based upon and claims the benefit of priority from the corresponding Japanese Patent Application No. 2022-167438 (filed on Oct. 19, 2022), the entire contents of which are incorporated herein by reference.

BACKGROUND

The present disclosure relates to an inkjet recording apparatus.

Conventionally, in an inkjet recording apparatus such as an inkjet printer, in order to reduce or prevent clogging of nozzles due to drying of ink, flushing (idle ejection) is performed in which the ink is periodically ejected through the nozzles. For example, a conveyance belt that conveys a recording medium has openings provided therein, and ink is ejected through nozzles of a recording head to pass through the openings of the conveyance belt.

In the inkjet recording apparatus described above, ink droplets that have passed through the openings of the conveyance belt as a result of the flushing normally arrive on an ink receiver that receives the ink and are collected to be discharged as a waste liquid from the ink receiver. Here, if the ink receiver can be disposed in a neighborhood of an ink ejection surface of the recording head, substantially all the ink droplets can be collected by the ink receiver. However, since the conveyance belt is disposed between the recording head and the ink receiver, the ink receiver can hardly be disposed in the neighborhood of the ink ejection surface. As a result, the ink droplets turn into a mist before reaching the ink receiver, causing contamination inside the apparatus.

SUMMARY

An inkjet recording apparatus according to an aspect of the present disclosure includes a recording head, a conveyance belt, a control portion, an ink collector, and a suction portion. The recording head includes a plurality of nozzles for ejecting ink. The conveyance belt has a plurality of openings for the ink ejected from the recording head to pass through and conveys a recording medium. The control portion controls driving of the recording head and the conveyance belt so as to execute flushing in which, at a timing different from a timing contributing to image recording, the ink is ejected through the nozzles of the recording head to pass through any of the plurality of openings. The ink collector is disposed to be opposed to the recording head via the conveyance belt and collects the ink that has passed through the openings during execution of the flushing. The suction portion sucks air in the ink collector. The ink collector includes a plurality of ink receivers that receives the ink that has passed through the openings and a suction path leading from each of the ink receivers to the suction portion. The suction path includes a plurality of first flow paths each connected to each of the plurality of ink receivers, a merging chamber in which the plurality of first flow paths merges together and that is linked to the suction portion, and ink separation walls that are provided in the merging chamber and are impinged on by airflows that have passed through the first flow paths so that the ink contained in the airflows is separated from the airflows.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an explanatory view showing a schematic configuration of a printer as an inkjet recording apparatus according to an embodiment of the present disclosure.

FIG. **2** is a plan view of a recording portion included in the above-described printer.

FIG. **3** is an explanatory view schematically showing a configuration in a vicinity of a conveyance path along which a sheet is conveyed from a paper feed cassette to a second conveyance unit via a first conveyance unit in the above-described printer.

FIG. **4** is a block diagram showing a hardware configuration of a main part of the above-described printer.

FIG. **5** is a schematic view showing an ink collector and a sheet conveyance region adjacent to the ink collector.

FIG. **6** is a sectional side view of the ink collector as cut in a direction orthogonal to a conveyance direction.

FIG. **7** is a sectional plan view of a waste ink tank constituting the ink collector.

FIG. **8** is a partially enlarged view of a vicinity of openings of a first conveyance belt included in the first conveyance unit.

FIG. **9** is a partially enlarged view, as viewed from above, of a vicinity of a merging chamber of a suction path in the waste ink tank.

FIG. **10** is an enlarged view of an ink separation wall provided in the merging chamber.

FIG. **11** is a view showing a modification example in which a first flow path includes a bent part.

FIG. **12** is a sectional side view of the suction path in the waste ink tank, showing another example of the bent part formed in the first flow path.

DETAILED DESCRIPTION

[1. Configuration of Inkjet Recording Apparatus]

With reference to the appended drawings, the following describes an embodiment of the present disclosure. FIG. **1** is an explanatory view showing a schematic configuration of a printer **100** as an inkjet recording apparatus according to the embodiment of the present disclosure. The printer **100** includes a paper feed cassette **2** that is a sheet housing portion. The paper feed cassette **2** is disposed on a lower side in a printer main body **1**. A sheet P that is an example of a recording medium is housed in the paper feed cassette **2**.

A paper feed device **3** is disposed on a downstream side of the paper feed cassette **2** in a sheet conveyance direction, i.e., at an upper right part of the paper feed cassette **2** in FIG. **1**. By the paper feed device **3**, the sheet P is fed out one by one separately toward an upper right side of the paper feed cassette **2** in FIG. **1**.

The printer **100** includes therein a first sheet conveyance path **4***a*. With respect to the paper feed cassette **2**, the first sheet conveyance path **4***a* is positioned on the upper right side, which corresponds to a paper feed direction of the paper feed cassette **2**. Via the first sheet conveyance path **4***a*, the sheet P fed out from the paper feed cassette **2** is conveyed vertically upward along a side surface of the printer main body **1**.

A registration roller pair **13** is provided at a downstream end of the first sheet conveyance path **4***a* in the sheet conveyance direction. Moreover, a first conveyance unit **5** and a recording portion **9** are disposed in immediate proximity to a downstream part of the registration roller pair **13** in the sheet conveyance direction. The sheet P fed out from the paper feed cassette **2** passes through the first sheet conveyance path **4***a* to reach the registration roller pair **13**. While correcting oblique feeding of the sheet P, the registration roller pair **13** feeds out the sheet P toward the first conveyance unit **5** (particularly, an after-mentioned first

conveyance belt **8**) in synchronization with an ink ejection operation executed by the recording portion **9**.

The sheet P fed out to the first conveyance unit **5** by the registration roller pair **13** is conveyed to an opposed position to the recording portion **9** (particularly, after-mentioned recording heads **17***a* to **17***c*) by the first conveyance belt **8**. Ink is ejected from the recording portion **9** to the sheet P so that an image is recorded thereon. At this time, ejection of the ink in the recording portion **9** is controlled by a control device **110** in the printer **100**.

A second conveyance unit **12** is disposed on a downstream side of the first conveyance unit **5** in the sheet conveyance direction (a left side in FIG. **1**). The sheet P on which the image has been recorded by the recording portion **9** is sent to the second conveyance unit **12**. The ink ejected to a surface of the sheet P is dried while the sheet P passes through the second conveyance unit **12**.

A decurler portion **14** is provided on a downstream side of the second conveyance unit **12** in the sheet conveyance direction and in a neighborhood of a left side surface of the printer main body **1**. The sheet P on which the ink has been dried by the second conveyance unit **12** is sent to the decurler portion **14** where a curl generated in the sheet P is corrected.

A second sheet conveyance path **4***b* is provided on a downstream side of the decurler portion **14** in the sheet conveyance direction (an upper side in FIG. **1**). When duplex recording is not performed, the sheet P that has passed through the decurler portion **14** passes through the second sheet conveyance path **4***b* to be discharged onto a sheet discharge tray **15***a* provided outside a left side surface of the printer **100**. Below the sheet discharge tray **15***a*, there is provided a sub-discharge tray **15***b* onto which, as the sheet P, a sheet (a waste sheet) on which a printing failure or the like has occurred is discharged.

An inversion conveyance path **16** for performing duplex recording is provided in an upper part of the printer main body **1** and above the recording portion **9** and the second conveyance unit **12**. When duplex recording is performed, the sheet P that has passed through the second conveyance unit **12** and the decurler portion **14** after completion of recording on one side (a first side) thereof passes through the second sheet conveyance path **4***b* to be sent to the inversion conveyance path **16**.

The conveyance direction for conveying the sheet P sent to the inversion conveyance path **16** is switched for subsequent recording on the other side (a second side) of the sheet P. Then, the sheet P passes through the upper part of the printer main body **1** to be sent rightward and is further sent, with the second side up, again to the first conveyance unit **5** via the registration roller pair **13**. In the first conveyance unit **5**, the sheet P is conveyed to the opposed position to the recording portion **9**, and the ink is ejected from the recording portion **9** thereto so that an image is recorded on the second side. The sheet P after being subjected to the duplex recording sequentially passes through the second conveyance unit **12**, the decurler portion **14**, and the second sheet conveyance path **4***b* to be discharged onto the sheet discharge tray **15***a*.

Furthermore, a maintenance unit **19** and a cap unit **20** are disposed below the second conveyance unit **12**. When executing purging, the maintenance unit **19** horizontally moves to below the recording portion **9** to wipe off the ink extruded through ink ejection ports of each of recording heads and to collect the ink thus wiped off. The purging refers to an operation of forcibly extruding the ink through the ink ejection ports of each of the recording heads so as to discharge thickened ink, foreign matter, and air bubbles in the ink ejection ports. When capping ink ejection surfaces of the recording heads, the cap unit **20** horizontally moves to below the recording portion **9** and further moves upward so as to be attached to lower surfaces of the recording heads.

FIG. **2** is a plan view of the recording portion **9**. The recording portion **9** includes a head housing **10** and line heads **11**Y, **11**M, **11**C, and **11**K. In the head housing **10**, the line heads **11**Y to **11**K are held at a prescribed distance (for example, 1 mm) in level from a conveyance surface of the first conveyance belt **8**, which is an endless belt stretched over a plurality of rollers including a driving roller **6***a*, a driven roller **6***b*, and tension rollers **7***a* and **7***b* (see FIG. **3**). The driving roller **6***a* causes the first conveyance belt **8** to travel in the conveyance direction for conveying the sheet P (an arrow A direction). Driving of the driving roller **6***a* is controlled by a main control portion **110***a* (see FIG. **4**) of the control device **110**. The above-described plurality of rollers is disposed along a travelling direction of the first conveyance belt **8** in an order of the tension roller **7***a*, the tension roller **7***b*, the driven roller **6***b*, and the driving roller **6***a* (see FIG. **3**).

The line heads **11**Y to **11**K each include the plurality of (herein, three) recording heads **17***a* to **17***c*. The recording heads **17***a* to **17***c* are arrayed in a staggered manner along a sheet width direction (an arrow B-B' direction) orthogonal to the sheet conveyance direction (the arrow A direction). The recording heads **17***a* to **17***c* each have a plurality of ink ejection ports **18** (nozzles). The ink ejection ports **18** are arranged at equal intervals in a recording head width direction, namely, the sheet width direction (the arrow B-B' direction). From the line heads **11**Y to **11**K, ink of respective colors of yellow (Y), magenta (M), cyan (C), and black (K) is ejected through the ink ejection ports **18** of the recording heads **17***a* to **17***c* toward the sheet P being conveyed on the first conveyance belt **8**.

The recording heads **17***a* to **17***c* constituting each of the line heads **11**Y to **11**K are supplied with the ink of four different colors (yellow, magenta, cyan, and black) stored in ink tanks (not shown) so as to correspond to respective colors of the line heads **11**Y to **11**K.

Based on a control signal from the control device **110** (see FIG. **4**), in accordance with image data received from an external computer, the recording heads **17***a* to **17***c* eject the ink through the ink ejection ports **18** toward the sheet P being conveyed while being absorbed to the conveyance surface of the first conveyance belt **8**. Thus, on the sheet P on the first conveyance belt **8**, there is formed a color image in which the four different colors, which are yellow, magenta, cyan, and black, of ink are superimposed on each other.

In the printer **100**, in order to clean the ink ejection surfaces of the recording heads **17***a* to **17***c*, at a start of printing after long-term non-operation and between printing operations, in preparation for a subsequent printing operation, a recovery operation of the recording heads **17***a* to **17***c* is executed in which the ink is extruded (purged) through the ink ejection ports **18** of all the recording heads **17***a* to **17***c*, and the ink ejected to the ink ejection surfaces is wiped off by a wiper (not shown). The ink wiped off from the ink ejection surfaces is collected by after-mentioned ink collectors **31**Y to **31**K (see FIG. **3**).

FIG. **3** schematically shows a configuration in a vicinity of a conveyance path along which the sheet P is conveyed from the paper feed cassette **2** to the second conveyance unit **12** via the first conveyance unit **5**. Furthermore, FIG. **4** is a block diagram showing a hardware configuration of a main part of the printer **100**. In addition to the above-described

configuration, the printer **100** further includes a registration sensor **21**, a first sheet sensor **22**, a second sheet sensor **23**, and belt sensors **24** and **25**.

The registration sensor **21** detects the sheet P being conveyed by the paper feed device **3** from the paper feed cassette **2** to the registration roller pair **13**. The registration sensor **21** is positioned on an upstream side relative to the registration roller pair **13** in a feeding direction of the sheet P. Based on a result of the detection by the registration sensor **21**, the control device **110** (for example, a sheet feeding control portion **110***c*) controls a timing for starting rotation of the registration roller pair **13**. For example, based on a result of the detection by the registration sensor **21**, the control device **110** controls a timing for feeding, to the first conveyance belt **8**, the sheet P that has been subjected to skew (oblique feed) correction by the registration roller pair **13**.

The first sheet sensor **22** detects a position of the sheet P in the width direction thereof, which is being sent from the registration roller pair **13** to the first conveyance belt **8**. Based on a result of the detection by the first sheet sensor **22**, the control device **110** (for example, the main control portion **110***a*) can perform control in which the ink is ejected through, among the ink ejection ports **18** of the recording heads **17***a* to **17***c* of each of the line heads **11**Y to **11**K, a set of ink ejection ports **18** corresponding to a width of the sheet P so that an image is recorded on the sheet P.

The second sheet sensor **23** detects passing of the sheet P fed to the first conveyance belt **8** by the registration roller pair **13**. That is, the second sheet sensor **23** detects a position of the sheet P in the conveyance direction, which is being conveyed on the first conveyance belt **8**. The second sheet sensor **23** is positioned on an upstream side of the recording portion **9** and on a downstream side of the first sheet sensor **22** in the sheet conveyance direction. Based on a result of the detection by the second sheet sensor **23**, the control device **110** (for example, the main control portion **110***a*) can control a timing for ejecting the ink to the sheet P being conveyed to reach the position opposed to the line heads **11**Y to **11**K (the recording heads **17***a* to **17***c*) by the first conveyance belt **8**.

The belt sensors **24** and **25** are each a reference detection sensor that detects a reference specifying area (not shown) provided on the first conveyance belt **8**. The reference specifying area is a reference area for identifying every full revolution of the first conveyance belt **8**. Since a positional relationship between the reference specifying area and openings **80** (see FIG. **8**) is previously known, when the belt sensors **24** and **25** detect the reference specifying area on the first conveyance belt **8**, based on a position of the reference specifying area thus detected, there can be detected respective positions of the openings **80** (opening groups **82**) provided in the first conveyance belt **8** in the conveyance direction. Accordingly, the belt sensors **24** and **25** each function as an opening position detecting portion that detects the respective positions of the openings **80** of the first conveyance belt **8**.

A configuration may be adopted in which, at an end of the first conveyance belt **8** in a belt width direction thereof, marks are formed beforehand at positions corresponding to the opening groups **82**, and the belt sensors **24** and **25** detect the above-described marks, thus detecting the respective positions of the opening groups **82** (the openings **80**) corresponding to the above-described marks.

The belt sensor **24** is positioned on a downstream side of the recording portion **9** in the sheet conveyance direction (the travelling direction of the first conveyance belt **8**). In the sheet conveyance direction, the belt sensor **25** is positioned on an upstream side relative to the driven roller **6***b* over which the first conveyance belt **8** is stretched. While positioned between the driven roller **6***b* and the tension roller **7***b* in this embodiment, the belt sensor **25** may be positioned between the tension roller **7***a* and the tension roller **7***b*. The driven roller **6***b* is positioned on an upstream side with respect to the recording portion **9** in the travelling direction of the first conveyance belt **8**. The belt sensor **24** also has a function equivalent to that of the second sheet sensor **23**. Based on a result of the detection by the belt sensor **24** or **25**, the control device **110** (for example, the sheet feeding control portion **110***c*) can control the registration roller pair **13** to feed the sheet P to the first conveyance belt **8** at a prescribed timing.

Furthermore, a position of the sheet P is detected by the plurality of sensors (the first sheet sensor **22**, the second sheet sensor **23**), and the reference specifying area on the first conveyance belt **8** is detected by the plurality of sensors (the belt sensors **24** and **25**), and thus it also becomes possible to correct an error of the position thus detected or to detect an abnormality.

The first sheet sensor **22**, the second sheet sensor **23**, and the belt sensors **24** and **25**, which are described above, may be each formed of a transmissive or reflective optical sensor, a CIS (contact image sensor), or the like.

In addition, the printer **100** may have a configuration including a meandering detection sensor that detects meandering of the first conveyance belt **8**, in which based on a result of the detection thereby, the meandering of the first conveyance belt **8** is corrected.

Furthermore, the printer **100** further includes an operation panel **27**, a storage portion **28**, and a communication portion **29**.

The operation panel **27** is an operation portion for accepting inputs of various settings. For example, by operating the operation panel **27**, a user can input information on a size of the sheet P placed in the paper feed cassette **2**, namely, a size of the sheet P to be conveyed by the first conveyance belt **8**. Furthermore, by operating the operation panel **27**, a user can also input the number of the sheets P to be printed or provide an instruction to start a printing job. Furthermore, the operation panel **27** also has a function as a notification device that provides a notification about an operation status (image recording or after-mentioned flushing) of the printer **100**.

The storage portion **28** is a memory storing an operation program for the control device **110** and also storing various types of information and is configured by including a ROM (read-only memory), a RAM (random-access memory), a non-volatile memory, and so on. Information (for example, the information on the size of the sheet P or the number of the sheets P) set via the operation panel **27** is stored in the storage portion **28**.

The communication portion **29** is a communication interface for transmitting and receiving information between itself and an external device (for example, a personal computer (PC)). For example, when a user operates a PC to transmit a printing command together with image data to the printer **100**, the image data and the printing command, which are described above, are inputted to the printer **100** via the communication portion **29**. In the printer **100**, based on the above-described image data, the main control portion **110***a* can control the recording heads **17***a* to **17***c* to eject the ink so that an image is recorded on the sheet P.

Furthermore, the printer **100** of this embodiment includes the control device **110**. The control device **110** is configured

by including, for example, a CPU (central processing unit) and a memory. Specifically, the control device **110** includes the main control portion **110***a*, a flushing control portion **110***b*, the sheet feeding control portion **110***c*, and a maintenance control portion **110***d*. Needless to say, the control portions constituting the control device **110**, which are formed of a single CPU, may also be formed of separate CPUs.

The main control portion **110***a* controls operations of the various portions of the printer **100**. For example, driving of the rollers in the printer **100**, ejection of the ink from the recording heads **17***a* to **17***c* during image formation (other than during flushing), and so on are controlled by the main control portion **110***a*.

Based on detection of the respective positions of the openings **80** by the belt sensor **24** or **25**, the flushing control portion **110***b* controls the recording heads **17***a* to **17***c* to execute flushing.

The sheet feeding control portion **110***c* is a recording medium feeding control portion that controls the registration roller pair **13** as a recording medium feeding portion. For example, based on detection of the respective positions of the openings **80** by the belt sensor **24** or **25**, the sheet feeding control portion **110***c* controls the registration roller pair **13**. The sheet feeding control portion **110***c* can also control the registration roller pair **13** independently of detection of the respective positions of the openings **80** by the belt sensor **24** or **25** (regardless of the detection of the respective positions).

The maintenance control portion **110***d* controls the recording heads **17***a* to **17***c* to execute the above-described purging in which the ink is forcibly extruded through the ink ejection ports **18**. When controlling the recording heads **17***a* to **17***c* to execute the purging, the maintenance control portion **110***d* also controls driving of the above-described maintenance unit **19** (for example, so that the maintenance unit **19** moves to below the recording portion **9** and retreats therefrom).

Furthermore, as shown in FIG. **3**, the printer **100** includes the ink collectors **31**Y, **31**M, **31**C, and **31**K provided on an inner circumferential surface side of the first conveyance belt **8**. When flushing is executed by the recording heads **17***a* to **17***c*, the ink collectors **31**Y to **31**K receive and collect the ink that has been ejected from the recording heads **17***a* to **17***c* and then passed through the openings **80** of the first conveyance belt **8**. Accordingly, the ink collectors **31**Y to **31**K are each provided at a position opposed, via the first conveyance belt **8**, to the recording heads **17***a* to **17***c* of a corresponding one of the line heads **11**Y to **11**K.

The second conveyance unit **12** includes a second conveyance belt **12***a* and a dryer **12***b*. The second conveyance belt **12***a* is stretched over two rollers that are a driving roller **12***c* and a driven roller **12***d*. The sheet P that has been conveyed by the first conveyance unit **5** and to which the ink has been ejected by the recording portion **9** so that an image is recorded thereon is conveyed by the second conveyance belt **12***a*, while being dried by the dryer **12***b* during the conveyance, to the above-described decurler portion **14**.

[2. Details of Ink Collector]

Next, a detailed description is given of a configuration of the ink collectors **31**Y to **31**K. FIG. **5** is a schematic view showing the ink collector **31**Y and a sheet conveyance region adjacent to the ink collector **31**Y. For the sake of convenience of explanation, the first conveyance belt **8** is not shown in FIG. **5**. While the following description is directed to a configuration in a vicinity of the ink collector **31**Y, the ink collectors **31**M to **31**K are also similar in configuration to the ink collector **31**Y, and thus a duplicate description thereof is omitted.

The ink collector **31**Y is disposed between a pair of side surface frames **100***a* so as to be opposed to the recording heads **17***a* to **17***c* constituting the line head **11**Y (see FIG. **2**). On an upper surface of the ink collector **31**Y, there are provided ink receivers **32***a* to **32***c* that receive ink droplets ejected from the recording heads **17***a* to **17***c*, respectively.

A suction fan **40** that is a suction portion is installed in each of two locations on one of the side surface frames **100***a*, and one end of a suction duct **37** is connected thereto. The suction duct **37** has a plurality of suction ports **41** provided at the other end thereof. The suction ports **41** are disposed to be opposed to an inner circumferential surface of the first conveyance belt **8** (see FIG. **3**). The first conveyance belt **8** has numerous air suction holes **8***a* (see FIG. **8**) provided therein. When the suction fan **40** is activated, air on an outer circumferential surface side of the first conveyance belt **8** is sucked via the suction holes **8***a*. To be more specific, air in a sheet suction region R (a region shaded by dots in FIG. **5**) excluding the ink receivers **32***a* to **32***c* is sucked. By this configuration, the sheet P is conveyed while being absorbed to the conveyance surface of the first conveyance belt **8** by suction air generated in the sheet suction region R.

FIG. **6** is a sectional side view of the ink collector **31**Y as cut in a direction orthogonal to the conveyance direction (a sectional view taken in a direction of arrows C and C' in FIG. **5**). FIG. **7** is a sectional plan view of a waste ink tank **33** constituting the ink collector **31**Y. The waste ink tank **33** is linked to the ink receivers **32***a* to **32***c*. To be more specific, the waste ink tank **33** is disposed below the ink receivers **32***a* to **32***c*. A suction path **35** and an ink collection path **36** are provided in the waste ink tank **33**.

The suction path **35** is made of, for example, a resinous material and includes first flow paths **35***a* and a merging chamber **35***b*. The suction path **35** may further include a second flow path **35***c*. The first flow paths **35***a* communicate with the ink receivers **32***a* to **32***c*. In the merging chamber **35***b*, three first flow paths **35***a* communicating with the ink receivers **32***a* to **32***c* merge into a single flow path. The merging chamber **35***b* is linked to the suction fan **40**. To be more specific, an upper end of the second flow path **35***c* communicates with the merging chamber **35***b*, and a lower end thereof is open in the suction duct **37**. By the above-described configuration, the ink receivers **32***a* to **32***c* are connected to the suction fan **40** via the suction path **35** and the suction duct **37**.

Ink droplets contained in an airflow passing through the suction path **35** impinge on inner wall surfaces of the first flow paths **35***a* and the merging chamber **35***b* to be accumulated below. The ink thus accumulated in a lower part of the waste ink tank **33** is discharged outside by the ink collection path **36**.

The ink collection path **36** includes an inclined part **36***a* and an ink discharging tube **36***b*. The inclined part **36***a* is formed below and adjacently to the first flow paths **35***a* and the merging chamber **35***b*, and the ink discharging tube **36***b* is connected to a lowermost point (a bottom) of the inclined part **36***a*. Ink droplets adhering to the inner wall surfaces of the first flow paths **35***a* and the merging chamber **35***b* flow downward along the inner wall surfaces and then flow along the inclined part **36***a* to be gathered in one location (the lowermost point). Further, the ink droplets pass through the ink discharging tube **36***b* to be collected in a waste ink collection bottle (not shown).

While herein there is provided the ink collection path **36** for collecting the ink accumulated in the waste ink tank **33**, instead of the ink collection path **36**, an ink absorber such as a melamine sponge may be disposed in the waste ink tank **33**. In such a case, the ink absorbed by the ink absorber is directly stored in the waste ink tank **33** so as to be discarded or collected when the waste ink tank **33** is replaced.

[3. Details of First Conveyance Belt]

Next, a description is given of details of the first conveyance belt **8** of the first conveyance unit **5**. FIG. **8** is a partially enlarged view of a vicinity of the openings **80** of the first conveyance belt **8** used in the printer **100**.

This embodiment employs a negative pressure suction method in which the sheet P is conveyed while being absorbed to the first conveyance belt **8** by negative pressure suction using the suction fan **40**. To this end, over an entire region of the first conveyance belt **8**, the numerous suction holes **8***a* are formed to pass therethrough an airflow (suction air) for absorbing the sheet P to the first conveyance belt **8** by the negative pressure suction.

The first conveyance belt **8** has the plurality of openings **80** for passing therethrough the ink ejected through the nozzles (the ink ejection ports **18**) of the recording heads **17***a* to **17***c* during flushing. In this embodiment, there are formed the opening groups **82** each composed of two rows of a plurality of openings **80** disposed along the belt width direction. In each of the opening groups **82**, the openings **80** in one row are disposed so as to partly overlap the openings **80** in the other row in the belt width direction (the arrow B-B' direction).

While in this embodiment, as shown in FIG. **8**, the openings **80** are circular in shape as viewed in plan, the openings **80** may have a rectangular shape or a hole shape elongated (for example, an elliptical shape) in the belt width direction (the arrow B-B' direction). The number of the openings **80** in the one row may be equal to the number of the openings **80** in the other row.

The plurality of opening groups **82**, each of which is shown in FIG. **8**, is formed within one cycle of the first conveyance belt **8**. In the conveyance direction, the opening groups **82** are formed not at equal intervals but irregularly at respective positions corresponding to a size of the sheet P to be conveyed. That is, in the sheet conveyance direction, intervals between adjacent ones of the opening groups **82** are not constant but vary. In this case, a maximum interval between each pair of adjacent ones of the opening groups **82** in the sheet conveyance direction is longer than a length, in the sheet conveyance direction, of the sheet P of a printable minimum size (for example, an A4 size in landscape orientation) placed on the first conveyance belt **8**.

When the recording heads **17***a* to **17***c* execute flushing, the ink ejected through the ink ejection ports **18** of the recording heads **17***a* to **17***c* passes through the openings **80** of any of the opening groups **82**. Accordingly, the flushing is executed over the entire head width by the recording heads **17***a* to **17***c*, and thus it becomes possible to reduce clogging due to drying of the ink in all the ink ejection ports **18**.

[4. Configuration of Merging Chamber in Waste Ink Tank]

Next, a description is given of a configuration of the merging chamber **35***b* in the waste ink tank **33** constituting each of the ink collectors **31**Y to **31**K, which characterizes the printer **100** of this embodiment. FIG. **9** is a partially enlarged view, as viewed from above, of a vicinity of the merging chamber **35***b* of the suction path **35** in the waste ink tank **33**.

As shown in FIG. **9**, ink separation walls **50** are provided in the merging chamber **35***b*. In this embodiment, the ink separation walls **50** are disposed in one-to-one correspondence with the plurality of (herein, three) first flow paths **35***a*. The ink separation walls **50** are disposed to be inclined with respect to the first flow paths **35***a*.

When airflows (indicated by broken-line arrows in FIG. **9**) passing through the first flow paths **35***a* to flow into the merging chamber **35***b* impinge on the ink separation walls **50**, misted ink contained in the airflows contacts the ink separation walls **50** and adheres thereto as ink droplets. The adhering ink droplets flow down along the ink separation walls **50** and, from a bottom of the merging chamber **35***b*, pass through the ink collection path **36** (see FIG. **6**) to be discharged outside the ink collectors **31**Y to **31**K. The airflows from which the ink has been separated pass through the second flow path **35***c* and the suction duct **37** (see FIG. **6**) to be discharged outside the printer main body **1** by the suction fan **40**.

By the above-described configuration, it is possible, by using a simple configuration, to efficiently separate misted ink contained in an airflow from the airflow. Accordingly, the misted ink is prevented from reaching the suction fan **40**, and thus it is also possible to suppress a failure of the suction fan **40**. Furthermore, it is also possible to suppress contamination inside the printer **100** caused by the misted ink.

Moreover, disposing a filter for trapping the ink in the second flow path **35***c* or the suction duct **37** makes it unlikely that the ink adheres to the filter. This also eliminates the possibility that a force for holding the sheet P by absorption and a force for sucking ink droplets during flushing are decreased due to clogging of the filter.

Furthermore, when viewed from an upstream side in a flow direction of airflows flowing through the first flow paths **35***a*, the ink separation walls **50** protrude in an identical direction from one side toward the other side of the first flow paths **35***a* in a horizontal direction (from a right side to a left side in FIG. **9**) orthogonal to the flow direction. Thus, upon impinging on the ink separation walls **50**, the airflows are turned to and flow in the identical direction (a clockwise direction in FIG. **9**) along the ink separation walls **50**. This prevents the airflows that have flowed into the merging chamber **35***b* from interfering with each other, thus allowing the airflows to smoothly flow into the second flow path **35***c*.

FIG. **10** is an enlarged view of one of the ink separation walls **50** provided in the merging chamber **35***b*. While FIG. **10** shows a left one of the ink separation walls **50** in FIG. **9** provided so as to correspond to one of the first flow paths **35***a* communicating with the ink receiver **32***a*, the other two ink separation walls **50** are similar in configuration thereto, and thus a duplicate description thereof is omitted.

The smaller an inclination angle θ of the ink separation walls **50** with respect to the first flow paths **35***a*, the more likely it becomes that airflows flowing through the first flow paths **35***a* impinge on the ink separation walls **50**. In this case, while an ink separation effect is improved, a pressure loss caused by the ink separation walls **50** is increased to decrease the force for sucking ink droplets. On the other hand, the larger the inclination angle θ of the ink separation walls **50**, the smaller the pressure loss becomes. In this case, while a decrease in the force for sucking ink droplets is suppressed, the ink separation effect is decreased. In order to enhance the ink separation effect while maintaining the sucking force constant, the inclination angle θ of the ink separation walls **50** is set to preferably 30° to 60° and more preferably 45°.

In order for airflows flowing from the first flow paths **35***a* into the merging chamber **35***b* to reliably impinge on the ink

separation walls **50**, preferably, a distal end of each of the ink separation walls **50** protrudes beyond an inner wall surface of a corresponding one of the first flow paths **35***a* on an opposite side thereto. That is, a protrusion length (a projection length of the ink separation walls **50** with respect to the first flow paths **35***a*) L**1** of the ink separation walls **50** in a width direction of the first flow paths **35***a* is not less than an inner diameter L**2** of the first flow paths **35***a*.

[5. Modification Example of First Flow Path]

FIG. **11** is a view showing a modification example in which the one of the first flow paths **35***a* communicating with the ink receiver **32***a* includes a bent part **51**. While not shown in FIG. **11**, each of the other first flow paths **35***a* communicating with the ink receivers **32***b* and **32***c* also includes the bent part **51** of a similar configuration.

The bent part **51** is bent in a U shape (in an accordion shape), and thus it is likely that misted ink contained in airflows passing through the first flow paths **35***a* contacts an inner wall surface of the bent part **51**. The misted ink that has contacted the inner wall surface of the bent part **51** flows down as ink droplets along the inner wall surface to be collected by the ink collection path **36** (see FIG. **6**).

When the ink separation walls **50** are provided in the merging chamber **35***b* and the first flow paths **35***a* each include the bent part **51**, it is possible to more efficiently separate misted ink contained in airflows flowing through the first flow paths **35***a* from the airflows. While herein the first flow paths **35***a* each include a single bent part **51**, the first flow paths **35***a* may each include two or more bent parts **51**.

FIG. **12** is a sectional side view of the suction path **35** in the waste ink tank **33**, showing another example of the bent part **51** formed in each of the first flow paths **35***a*. In the example shown in FIG. **12**, a bent part **51** is formed by folding each of the first flow paths **35***a* into layers stacked in an up-down direction.

Since each of the first flow paths **35***a* is folded into layers stacked in the up-down direction, it is possible to extend the each of the first flow paths **35***a* without requiring an increased space in a height direction. Furthermore, each of the first flow paths **35***a* is folded plural times (herein, twice) to have a folded part, and thus it becomes likely that misted ink contained in airflows passing through the first flow paths **35***a* contacts the folded part. Accordingly, it is possible, by using a simple and space-saving configuration, to efficiently separate misted ink contained in airflows from the airflows.

The bent part **51** is not limited in shape to the shapes shown in FIG. **11** and FIG. **12**, and as long as one or more parts bent at substantially a right angle or an acute angle are included as the bent part(s) **51**, efficiency in separating misted ink is improved compared with a structure without the bent part **51**. For example, a shape formed by bending each of the first flow paths **35***a* in an L shape is also encompassed by the bend part **51** described herein.

Furthermore, while in each of the examples shown in FIG. **11** and FIG. **12**, the inner wall surface of the bent part **51** is bent at a right angle, the bent part **51** may have a rounded (curved) inner wall surface. In a case where the bent part **51** has the rounded inner wall surface, while separability of misted ink is somewhat decreased, a pressure loss caused when an airflow passes through the bent part **51** is decreased. This suppresses a decrease in the force for sucking ink droplets in each of the ink receivers **32***a* to **32***c*.

[6. Others]

The present disclosure is not limited to the foregoing embodiment and can be variously modified without departing from the spirit of the present disclosure. For example, while the foregoing embodiment describes the case where the sheet P is conveyed while being absorbed to the first conveyance belt **8** by the negative pressure suction using the suction fan **40** and the suction duct **37**, a configuration may be adopted in which the first conveyance belt **8** is charged so that the sheet P is conveyed while being absorbed to the first conveyance belt **8** by electrostatic absorption (an electrostatic absorption method). In that case, the suction fan **40** is used only to suck the ink in the ink collectors **31**Y to **31**K.

Furthermore, while the foregoing embodiment describes the configuration using the first conveyance belt **8** in which the opening groups **82** each composed of the plurality of openings **80** are disposed irregularly at respective positions corresponding to a sheet size in the sheet conveyance direction, there can also be used the first conveyance belt **8** in which the opening groups **82** are arranged at constant intervals in the sheet conveyance direction (the arrow A direction)

Furthermore, while the foregoing embodiment describes the example using, as an inkjet recording apparatus, a color printer that uses ink of four different colors to record a color image, an ink collection mechanism of the embodiment of the present disclosure can be used also in a case of using a monochrome printer that uses black ink to record a monochrome image.

The present disclosure is usable in an inkjet recording apparatus such as an inkjet printer.

What is claimed is:

1. An inkjet recording apparatus, comprising:

a recording head including a plurality of nozzles for ejecting ink;

an endless conveyance belt that has a plurality of openings for the ink ejected from the recording head to pass through and conveys a recording medium;

a control portion that controls driving of the recording head and the conveyance belt so as to execute flushing in which, at a timing different from a timing contributing to image recording, the ink is ejected through the nozzles of the recording head to pass through any of the plurality of openings;

an ink collector that is disposed to be opposed to the recording head via the conveyance belt and collects the ink that has passed through the openings during execution of the flushing; and

a suction portion that sucks air in the ink collector,

wherein

the ink collector includes:

a plurality of ink receivers that receives the ink that has passed through the openings; and

a suction path leading from each of the ink receivers to the suction portion, and

the suction path includes:

a plurality of first flow paths each connected to each of the plurality of ink receivers;

a merging chamber in which the plurality of first flow paths merges together and that is linked to the suction portion; and

ink separation walls that are provided in the merging chamber and are impinged on by airflows that have passed through the first flow paths so that the ink contained in the airflows is separated from the airflows.

2. The inkjet recording apparatus according to claim **1**, wherein

the ink separation walls are disposed in one-to-one correspondence with the plurality of first flow paths, and

the ink separation walls are disposed to be inclined with respect to the first flow paths.

3. The inkjet recording apparatus according to claim **2**, wherein

an inclination angle of the ink separation walls with respect to the first flow paths is 30° to 60°.

4. The inkjet recording apparatus according to claim **2**, wherein

a projection length of the ink separation walls with respect to the first flow paths is larger than an inner diameter of the first flow paths.

5. The inkjet recording apparatus according to claim **2**, wherein

when viewed from an upstream side in a flow direction of airflows flowing through the first flow paths, the plurality of ink separation walls protrude in an identical direction from one side toward another side of the first flow paths in a horizontal direction orthogonal to the flow direction.

6. The inkjet recording apparatus according to claim **1**, wherein

the first flow paths each include a bent part bent at least once at substantially a right angle or an acute angle.

7. The inkjet recording apparatus according to claim **6**, wherein

the bent part is formed by bending each of the first flow paths in a U shape.

8. The inkjet recording apparatus according to claim **6**, wherein

the bent part is formed by folding each of the first flow paths plural times into layers stacked in an up-down direction.

9. The inkjet recording apparatus according to claim **1**, wherein

the suction path includes a second flow path having an upper end communicating with the merging chamber and a lower end communicating with the suction portion.

* * * * *