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(54) LIQUID EJECTING APPARATUS AND CONTROLLING METHOD FOR THE SAME

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(57) **ABSTRACT**

There is provided a liquid ejecting apparatus including: a head having a nozzle; a carriage; a receiver; and a controller. The controller is configured to execute: a first flushing processing; a second flushing processing including at least one of a discharge flushing driving and a non-discharge flushing driving of driving; and a printing processing. The first flushing processing is executed in a case that a first count value is not less than a first threshold value, the first count value being an elapsed time since a completion of the first flushing processing. The second flushing processing is executed in a case that a second count value is not less than a second threshold value, the second count value being an elapsed time since a completion of the printing processing.

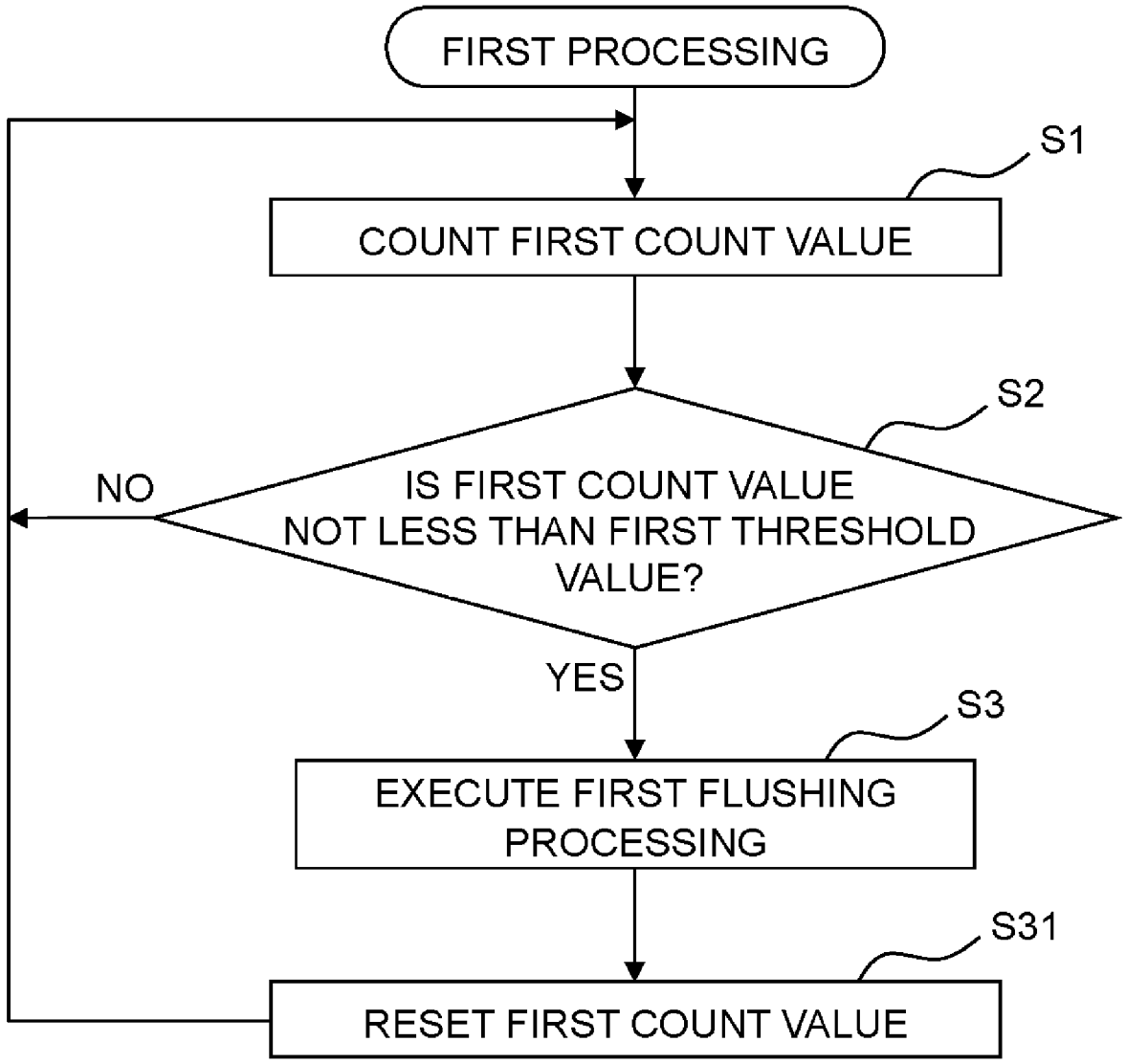


Fig. 1

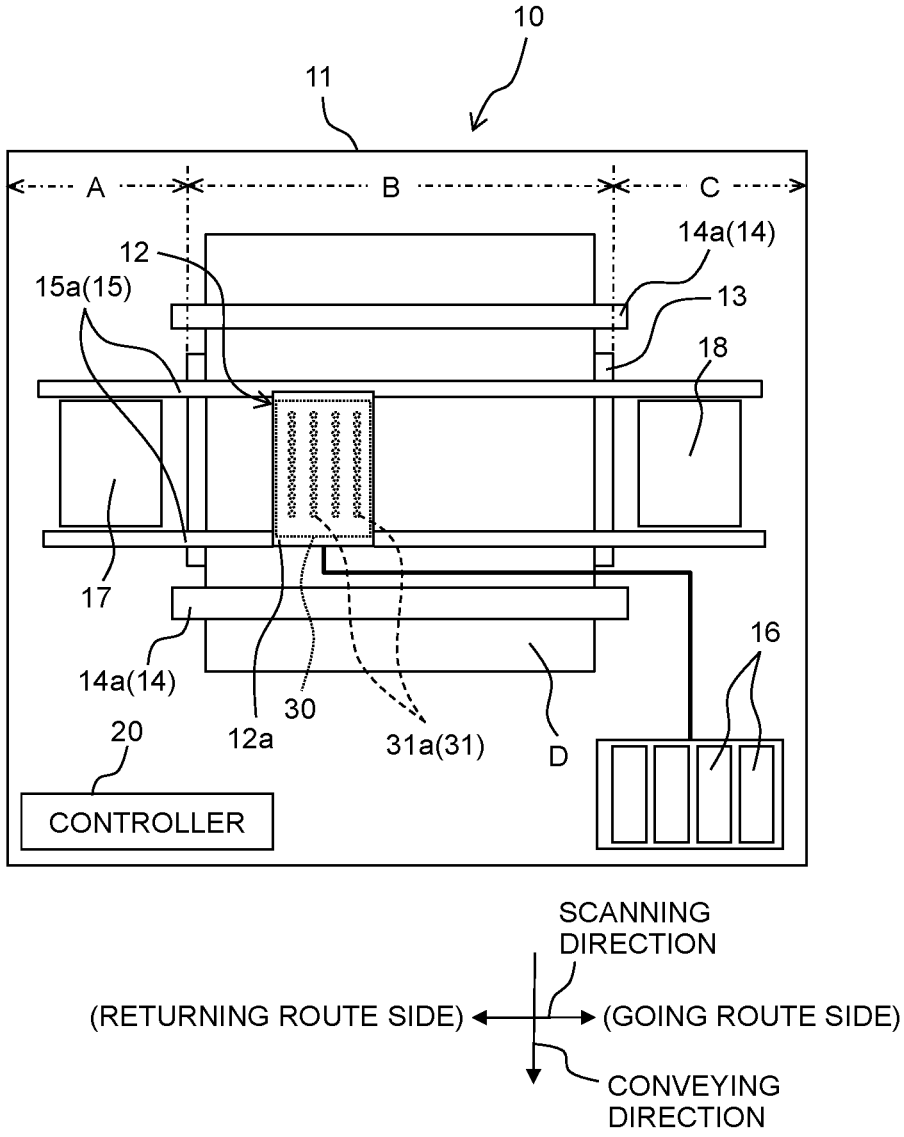

10
11
A
B
C
12
15a(15)
14a(14)
13
18
17
14a(14)
30
12a
31a(31)
D
16
20
CONTROLLER
SCANNING DIRECTION
(RETURNING ROUTE SIDE)
(GOING ROUTE SIDE)
CONVEYING DIRECTION

Fig. 2

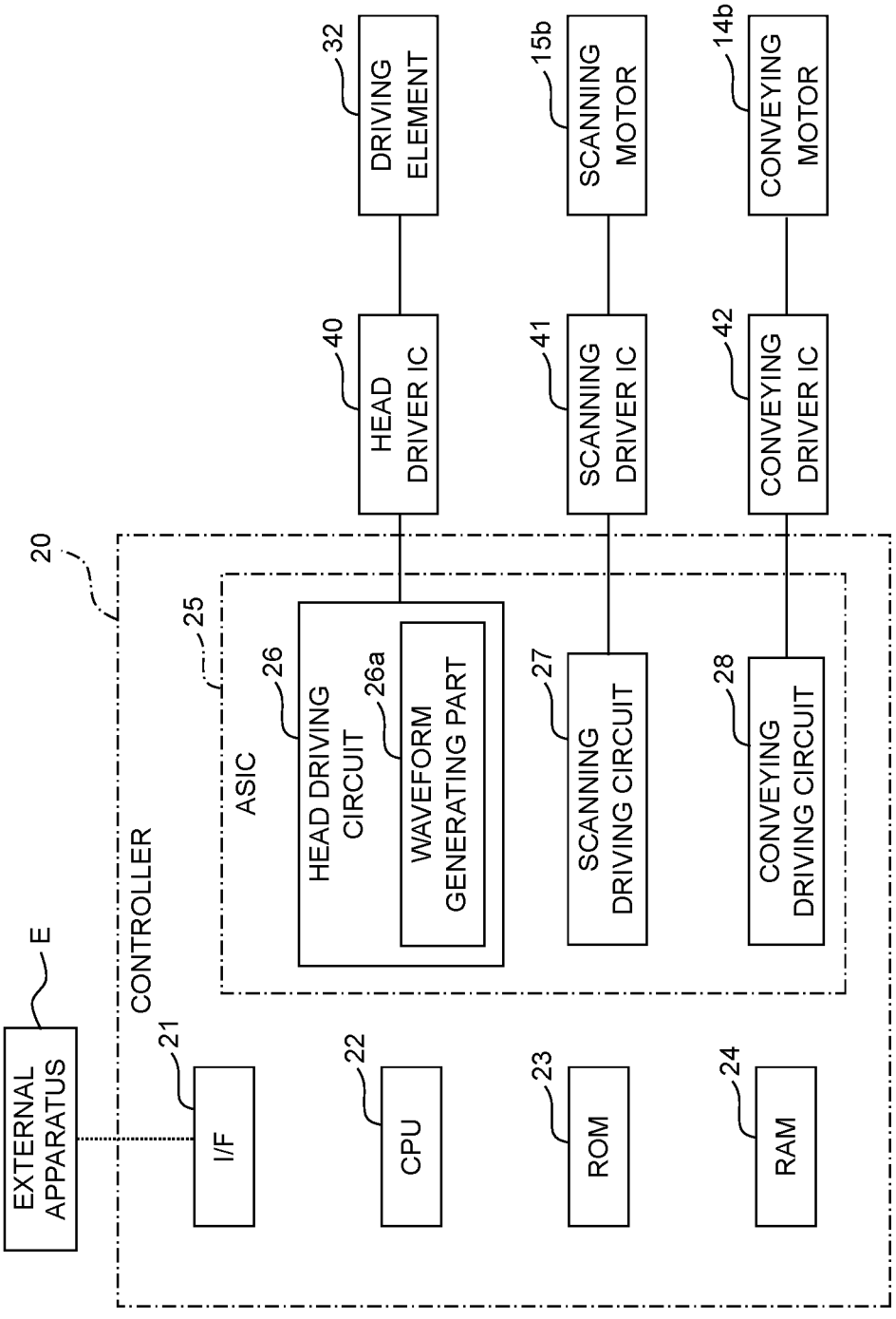

EXTERNAL APPARATUS
E
CONTROLLER
20
I/F
21
CPU
22
ROM
23
RAM
24
ASIC
25
HEAD DRIVING CIRCUIT
26
WAVEFORM GENERATING PART
26a
SCANNING DRIVING CIRCUIT
27
CONVEYING DRIVING CIRCUIT
28
HEAD DRIVER IC
40
SCANNING DRIVER IC
41
CONVEYING DRIVER IC
42
DRIVING ELEMENT
32
SCANNING MOTOR
15b
CONVEYING MOTOR
14b

Fig. 3A

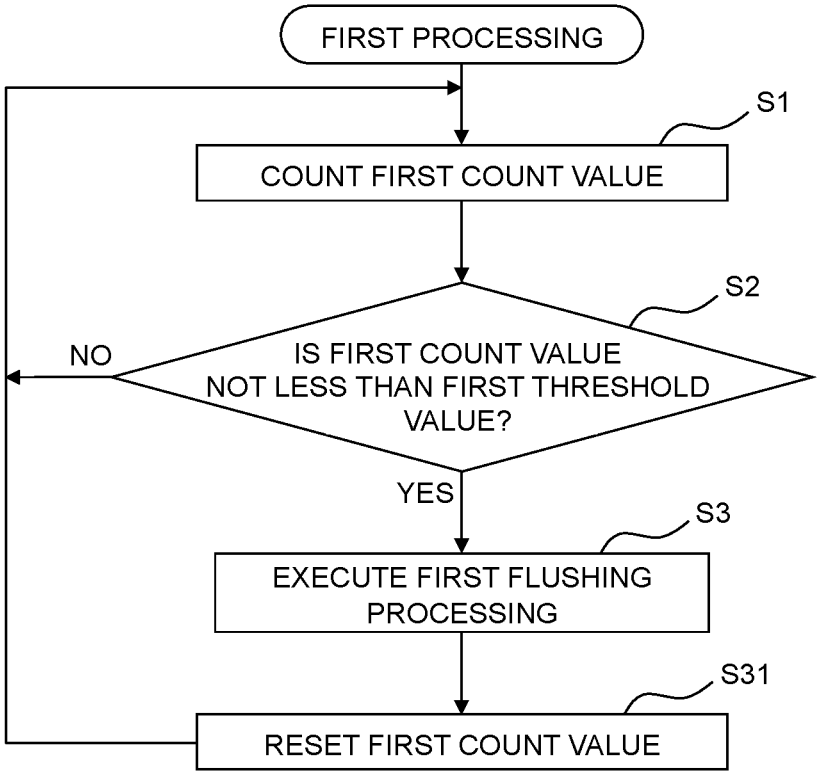

FIRST PROCESSING
S1
COUNT FIRST COUNT VALUE
S2
IS FIRST COUNT VALUE NOT LESS THAN FIRST THRESHOLD VALUE?
NO
YES
S3
EXECUTE FIRST FLUSHING PROCESSING
S31
RESET FIRST COUNT VALUE

Fig. 3B

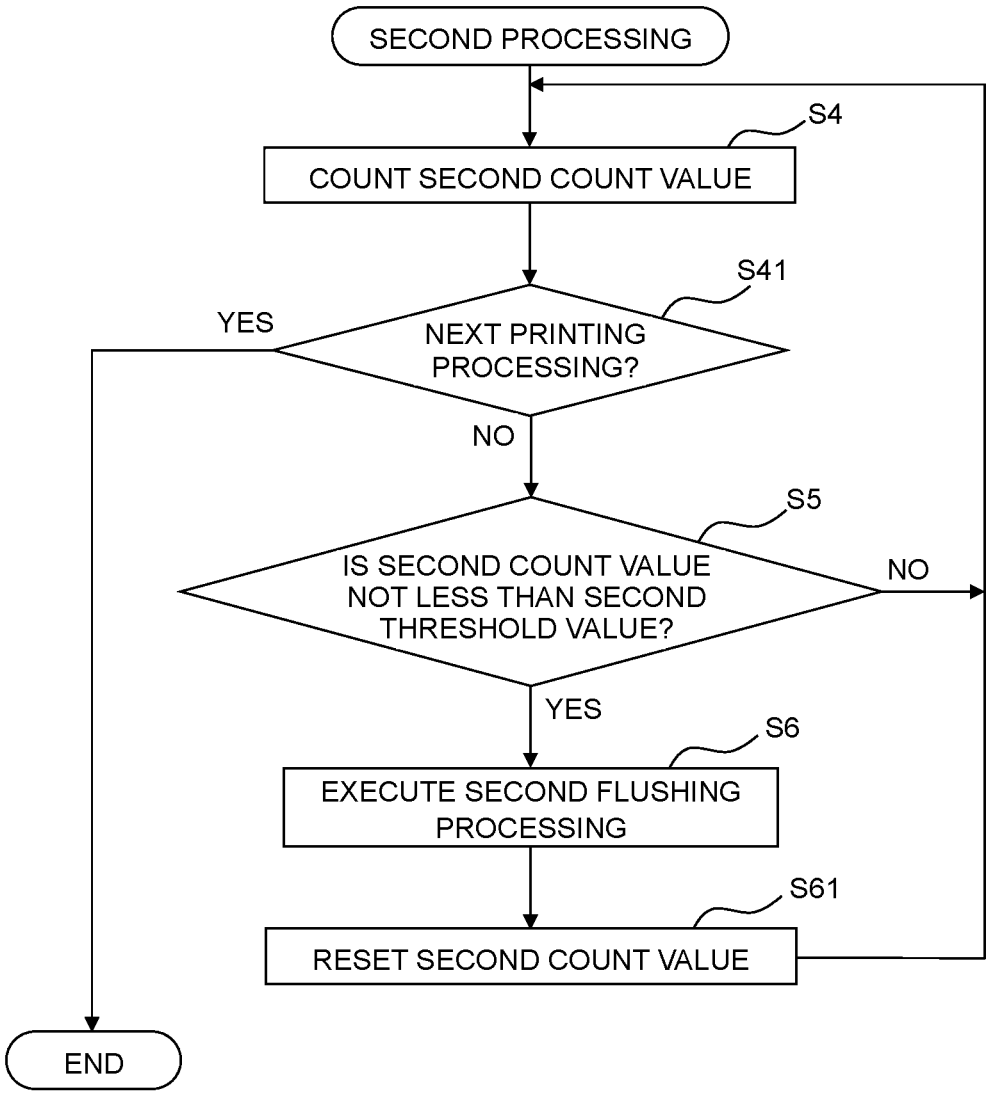

SECOND PROCESSING
S4
COUNT SECOND COUNT VALUE
S41
NEXT PRINTING PROCESSING?
YES
NO
S5
IS SECOND COUNT VALUE NOT LESS THAN SECOND THRESHOLD VALUE?
NO
YES
S6
EXECUTE SECOND FLUSHING PROCESSING
S61
RESET SECOND COUNT VALUE
END

Fig. 4A

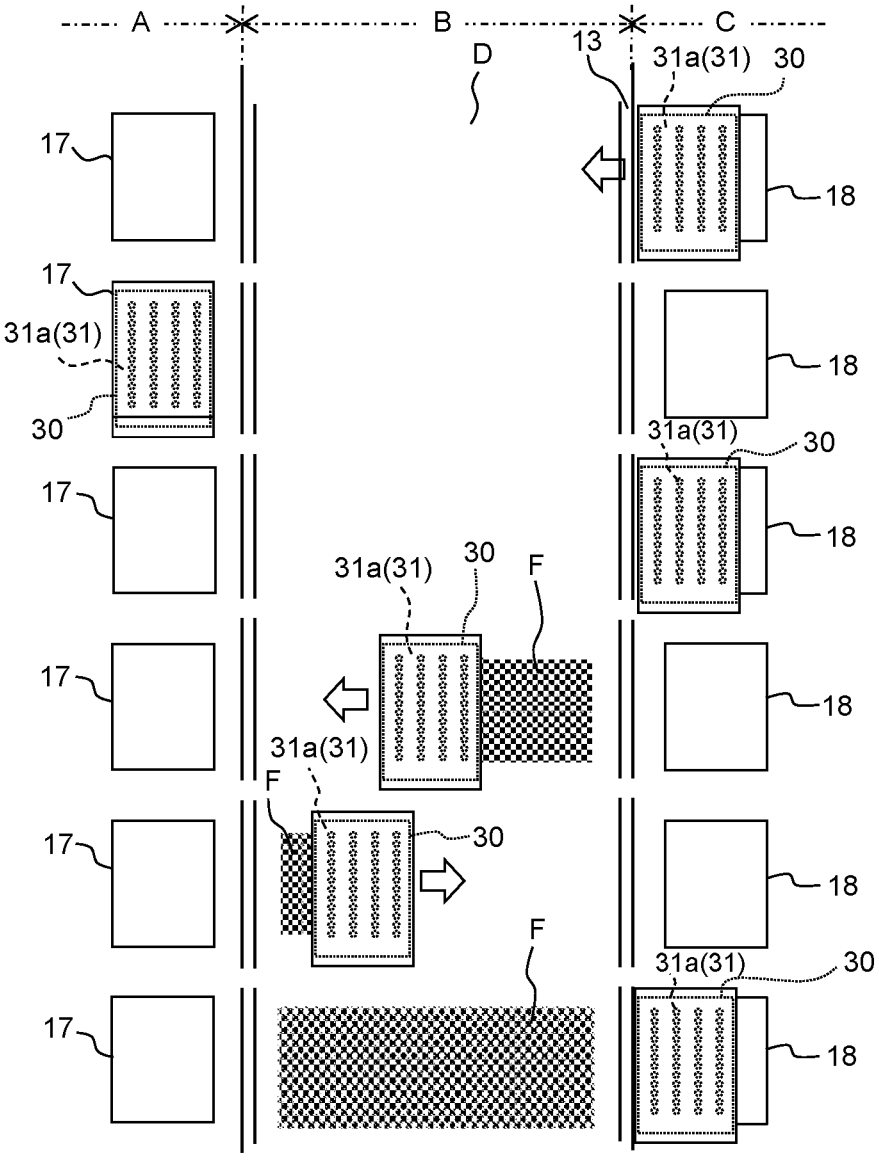
Fig. 4B

Fig. 4C

Fig. 4D

Fig. 4E

Fig. 4F



LIQUID EJECTING APPARATUS AND CONTROLLING METHOD FOR THE SAME

CROSS REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority from Japanese Patent Application No. **2020-014579**, filed on January **31**, **2020**, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] The present disclosure relates to a liquid ejecting apparatus and a controlling method for the same.

[0003] As a conventional liquid ejecting apparatus, an ink-jet recording apparatus of Japanese Patent Application Laid-open No. 2005-212232 is known. In this ink-jet recording apparatus, in a case that a bidirectional printing is executed and that band-shaped image data is accumulated for two bands, then image formation is performed by moving a recording head from a stand-by position to a recording area. Thus, even in such a case that a transfer stand-by state, etc. is provided during the accumulation of the image data for the two bands, the recording head stands by at the outside of the recording area during the transfer stand-by state. Therefore, by executing a preliminary discharge during the transfer stand-by state, any increase in the viscosity of an ink in a nozzle is suppressed, thereby preventing any unsatisfactory ejection of the ink in the recording head.

SUMMARY

[0004] Note that although the above-described preliminary discharge is effective as means for suppressing the increase in the viscosity of the ink in the nozzle, it is necessary to move the recording head out of the recording area in order to perform the preliminary discharge. Therefore, a printing time becomes longer in a case that the number of time(s) of the preliminary discharge increases. On the other hand, although an ink having a shorter drying time has been used in the recent years in response to a demand for increasing the printing speed, the use of such an ink has a tendency of promoting any increase in the viscosity of the ink.

[0005] The present disclosure has been made in view of such a situation, and an object of the present disclosure is to provide a liquid ejecting apparatus and a controlling method therefor each of which is capable of realizing a high-speed printing while suppressing any unsatisfactory ejection due to the increase in the viscosity of the liquid.

[0006] According to an aspect of the present disclosure, there is provided a liquid ejecting apparatus including:

[0007] a head having a nozzle configured to eject a liquid;

[0008] a carriage configured to move reciprocally the head in a scanning direction;

[0009] a receiver configured to receive the liquid discharged from the head in a flushing area; and

[0010] a controller;

[0011] wherein the controller is configured to execute:

[0012] a first flushing processing;

[0013] a second flushing processing including at least one of a discharge flushing driving of driving the head so as to cause the head to discharge the liquid to the receiver and a non-discharge flushing driving of driving the head so as to vibrate the liquid without discharging the liquid; and

[0014] a printing processing of driving the carriage and the head based on a print data such that the liquid is ejected in a printing area as the head is moved in the scanning direction;

[0015] the first flushing processing is executed in a case that a first count value is not less than a first threshold value, the first count value being an elapsed time since a completion of the first flushing processing; and

[0016] the second flushing processing is executed in a case that a second count value is not less than a second threshold value, the second count value being an elapsed time since a completion of the printing processing.

[0017] The present disclosure has the above-described configuration, and achieves an effect of providing a liquid ejecting apparatus and a controlling method therefor each of which is capable of realizing a high-speed printing while suppressing any unsatisfactory ejection due to the increase in the viscosity of the liquid.

[0018] The above-described object, other objects, features, and merits of the present disclosure will become apparent from the following detailed description of an embodiment as described below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] FIG. **1** is a schematic view of a liquid ejecting apparatus related to an embodiment of the present disclosure as viewed from thereabove.

[0020] FIG. **2** is a functional block diagram indicating the configuration of the liquid ejecting apparatus of FIG. **1**.

[0021] FIG. **3**A and FIG. **3**B are each a flow chart indicating an example of a controlling method for the liquid ejecting apparatus of FIG. **1**.

[0022] FIGS. **4**A, **4**B, **4**C, **4**D, **4**E, and **4**F are views for explaining a printing method by a liquid ejecting apparatus related to a seventh modification of the present disclosure.

EMBODIMENTS

[0023] In the following, an embodiment of the present disclosure will be specifically explained by referring to the drawings. Note that same or corresponding element through all the drawings in the following description are denoted by same reference numerals, and any overlapped explanation therefor will be omitted.

[0024] <Configuration of Image Recording Apparatus>

[0025] A liquid ejecting apparatus **10** related to an embodiment of the present disclosure is an apparatus which ejects (discharges) a liquid such an ink, as depicted in FIG. **1**; the liquid ejecting apparatus **10** is, for example, an ink-jet printer. The liquid ejecting apparatus **10** adopts a serial head system and includes: a casing **11**, a head unit **12**, a platen **13**, a conveying mechanism **14**, a scanning mechanism (scanner) **15**, a storing tank **16**, a receiving part (receiver) **17**, a maintenance unit **18** and a controller **20**.

[0026] The casing **11** accommodates the respective parts of the liquid ejecting apparatus **10** therein. In the casing **11**, a flushing area A, a printing area B and a maintenance area C are provided in a scanning direction. The flushing area A is arranged on one side in the scanning direction with respect to the printing area B, and the maintenance area C is

arranged on the other side in the scanning direction with respect to the printing area B. The printing area B is adjacent to the respective areas that are the flushing area A and the maintenance area C in the scanning direction, and is arranged between the flushing area A and the maintenance area C. Note that in the scanning direction, a side from the flushing area A toward the maintenance area C is referred to as a side of a going route (going route side), and a side opposite to the going route side is referred to as a side of a returning route (returning route side). Further, a conveying direction is a direction crossing (e.g., orthogonal to) the scanning direction.

[0027] The head unit **12** has a carriage **12***a* and a head **30**. The head **30** is mounted on the carriage **12***a* and moves reciprocally in the scanning direction together with the carriage **12***a*.

[0028] The head **30** has a channel forming body and a driving element **32** (FIG. **2**). In the channel forming body, a liquid channel is formed inside thereof, and a plurality of nozzles **31** of the liquid channel are opened in a lower surface (ejection surface or discharge surface) of the channel forming body. The plurality of nozzles **31** are aligned in the conveying direction so as to form a plurality of nozzle rows (e.g., four nozzle rows). As the driving element **32**, a piezoelectric element, a heating element which heats a liquid, etc., is used. In a case that the driving element **32** is driven and that a volume of the liquid channel is changed so as to cause the meniscus of an opening (a nozzle hole **31***a*) of each of the plurality of nozzles **31** to finely vibrate, thereby ejecting (discharging) a drop (liquid droplet) of the liquid therefrom. As a result, an image is recorded on a recording medium D. That is, the head **30** has the plurality of nozzles **31** via which the liquid is ejected (discharged).

[0029] The platen **13** is arranged in the printing area B; the platen **13** is a flat plate-shaped member, and the recording medium D is arranged on the upper surface of the platen **13**. The platen **13** determines a distance between the recording medium D and the ejection surface of the head **30** which is arranged to face (to be opposite to) the recording medium D. Note that although the side of the head **30** with respect to the platen **13** is referred to as the upper side, and the side opposite to this side is referred to as the lower side, the arrangement of the liquid ejecting apparatus **10** is not limited to or restricted by this.

[0030] The conveying mechanism **14** includes, for example, two conveying rollers **14***a* and a conveying motor **14***b* (FIG. **2**). The two conveying rollers **14***a* sandwich the platen **13** therebetween in the conveying direction and are arranged parallel to each other such that the rotation axes thereof extend in the scanning direction. The two conveying rollers **14***a* are connected to the conveying motor **14***b* and are rotated in a case that the conveying motor **14***b* is driven, thereby conveying the recording medium D on the platen **13** in the conveying direction.

[0031] The scanning mechanism **15** is a mechanism which causes the head **30** to move reciprocally in the scanning direction, and includes, for example, two guide rails **15***a*, a scanning motor **15***b* (FIG. **2**), an endless belt, etc. The carriage **12***a* of the head unit **12** is supported by the two guide rails **15***a* and is fixed to the endless belt. In a case that the scanning motor **15***b* is driven, the endless belt connected to the scanning motor **15***b* runs. This causes the carriage **12***a* to move reciprocally in the scanning direction within a predetermined scanning range, along the two guide rails **15***a*. The two guide rails **15***a* extend to span across an area between the flushing area A and maintenance area C, and the head **30** is movable between the flushing area A and the maintenance area C via the printing area B.

[0032] The storing tank **16** is, for example, a detachable cartridge, and is provided on each type of the liquid. For example, there are four pieces of the storing tank **16** and store black, yellow, cyan and magenta liquids, respectively. The respective four storing tanks **16** are connected to the liquid channel of the head **30**; each of the four storing tanks **16** supplies one of the liquids to nozzles **31** of a nozzle row corresponding thereto.

[0033] The receiving part (receiver) **17** is arranged in the flushing area A; the receiving part **17** is, for example, a rectangular-parallelepiped shaped container having a recessed part and opened toward the upper side. This opening faces the ejection surface of the head **30** which is arranged in the flushing area A, and the receiving part **17** receives the liquid discharged from the head **30** in the flushing area A. The recessed part may be provided with an absorbing body which absorbs the liquid.

[0034] The maintenance unit **18** is arranged in the maintenance area C and has a cap which performs maintenance of the head **30**, etc. The cap has, for example, a rectangular parallelepiped shape having a recessed part and opened toward the upper side. The opening faces the ejection surface of the head **30** which is arranged in the maintenance area C, and is capable of approaching to or retreating from the ejection surface. For this reason, the cap moves closely to the ejection surface and covers the ejection surface, and is capable of preventing the liquid from drying in the nozzle hole **31***a* of the ejection surface. Further, the cap is separated away from the ejection surface and exposes the ejection surface, and allows the liquid to be ejected from the nozzle hole **31***a* to perform the printing.

[0035] <Configuration of Controller>

[0036] As depicted in FIG. **2**, the controller **20** has an interface (I/F) **21**, a CPU **22**, a ROM **23**, a RAM **24** and an ASIC (Application Specific Integrated Circuit) **25**. The I/F **21** receives various kinds of data, such as print data, etc., from an external apparatus E such as a computer, a camera, a network, a recording medium, etc. The print data includes data indicating an image to be recorded on the recording medium, and data indicating a condition for forming (printing) an image.

[0037] The RAM **24** temporarily stores the various kinds of data. The various kinds of data are exemplified by the print data and data converted by the controller **20**. The ROM **23** stores a computer program and a control program for executing various kinds of data processing. Note that the computer program may be obtained from the external apparatus E via the I/F **21**, or may be stored in another recording medium.

[0038] The ASIC **25** has respective driving circuits **26** to **28** each of which drives one of the respective parts, and is electrically connected to a head driver IC **40**, a scanning driver IC **41** and a conveying driver IC **42**. The CPU **22** executes the computer program stored in the ROM **23** to thereby cause at least one of the CPU **22** and the ASIC **25** to control the head **30**, the conveying motor **14***b* and the scanning motor **15***b* so as to perform the variety of kinds of processing. For example, the controller **20** executes a first

flushing processing, a second flushing processing and a printing processing. These processings will be described later on.

[0039] The head driving circuit **26** has a waveform generating part **26***a*. The waveform generating part **26***a* generates respective waveform signals each of which defines a waveform of a driving signal to be outputted to the driving element **32**. The waveform signals include a waveform signal for printing (printing waveform signal), a waveform signal for discharge flushing (discharge flushing waveform signal) and a waveform signal for non-discharge flushing (non-discharge flushing waveform signal). The head driving circuit **26** selects, for example, one kind of waveform signal from the three kinds of waveform signals for each of the plurality of nozzles **31**, in accordance with the first and second flushing processings and the printing processing, and generates selection data. Note that the printing waveform signal includes a plurality of waveform signals in which amounts of the liquid to be ejected are mutually different. Therefore, in a case that the head driving circuit **26** selects the printing waveform signal, the head driving circuit **26** selects one kind of printing waveform signal from the plurality of kinds of printing waveform signals in accordance with the amount of the liquid for each drop based on the print data.

[0040] The head driving circuit **26** is connected to the head driver IC **40**, and the head driver IC **40** is connected to the driving element **32**. With this, the head driving circuit **26** controls the driving element **32** by the head driver IC **40**. The head driving circuit **26** outputs the waveform signal and the selection data thereof to the head driver IC **40**. Note that in the printing processing, the controller **20** converts the print data into data for printing such as raster data, and generates and outputs the selection data for each of the plurality of nozzles **31** and at each ejection period, based on this data.

[0041] The head driver IC **40** converts the waveform signal and the selection data into a driving signal for the driving element **32**, and outputs the driving signal to the driving element **32**. With this, the driving element **32** is driven to thereby change the volume of the pressure chamber of the liquid channel, which in turn applies a pressure to the liquid in the pressure chamber. As a result, the meniscus of the nozzle hole **31***a* communicating with the pressure chamber is finely vibrated by a non-discharge flushing driving signal based on the non-discharge flushing waveform signal. Further, a liquid droplet of a predetermined amount is discharged from the nozzle hole **31***a* by a discharge flushing driving signal based on the discharge flushing waveform signal. Furthermore, a liquid droplet of an amount corresponding to the print data is ejected from the nozzle hole **31***a*, by a printing driving signal based on the printing waveform signal.

[0042] The scanning driving circuit **27** outputs control data corresponding to each of the respective processings to the scanning driver IC **41**. The scanning driver IC **41** outputs a driving signal according to the control data to the scanning motor **15***b*, and controls the driving of the scanning motor **15***b*. Further, the conveying driving circuit **28** outputs control data corresponding to each of the respective processings to the conveying driver IC **42**. The conveying driver IC **42** outputs a driving signal corresponding to the control data to the conveying motor **14***b* so as to control the driving of the conveying motor **14***b*. With this, the driving timing, speed of rotation, amount of rotation, etc., of each of the scanning motor **15***b* and the conveying motor **14***b* are controlled.

[0043] <First Flushing Processing, Second Flushing Processing and Printing Processing>

[0044] The controller **20** executes the first flushing processing, the second flushing processing and the printing processing. The first flushing processing includes discharge flushing driving, and the second flushing processing includes at least one of the discharge flushing driving and the non-discharge flushing driving.

[0045] In the discharge flushing driving, the controller **20** drives the head **30** so as to cause the head **30** to discharge the liquid to the receiving part **17**. Here, the controller **20** controls the scanning motor **15***b* so as to move the head **30** in the scanning direction until the head **30** reaches the position above the receiving part **17** so that the ejection surface of the head **30** faces the upper opening of the receiving part **17**. Further, the controller **20** controls the driving element **32** by the discharge flushing driving signal so as to discharge a predetermined amount of the liquid from the nozzle(s) **31**. The discharged liquid is accommodated in the receiving part **17**. As described above, since the liquid is discharged from the nozzle(s) **31**, it is possible to suppress any increase in the viscosity of the liquid in the nozzle(s) **31**.

[0046] In the non-discharge flushing driving, the controller **20** drives the head **30** so as to cause the liquid to finely vibrate without being discharged. Here, the controller **20** controls the driving element **32** by the non-discharge flushing driving signal, and applies the pressure to the liquid to finely vibrate the meniscus of the nozzle(s) **31** so as not to discharge the liquid from the nozzle(s) **31**. Thus, the liquid in the nozzle(s) **31** is stirred or agitated, thereby making it possible to lower the viscosity (increased viscosity) of the liquid.

[0047] In the printing processing, the controller **20** drives the scanning mechanism **15** and the head **30**, based on the print data, so as to eject the liquid in the printing area B while moving the head **30** in the scanning direction. Here, the controller **20** controls the scanning motor **15***b* so as to move the head **30** in the scanning direction in the printing area B. Further, the controller **20** controls the driving element **32** by the printing driving signal so as to eject an amount, of the liquid, corresponding to the print data from the nozzle(s) **31**. The ejected liquid forms a dot (an image) on the recording medium D arranged in the printing area B.

[0048] Thus, the printing processing includes a scanning operation and a liquid ejecting operation. The printing processing and a conveying operation of conveying the recording medium D in the conveying direction by a predetermined amount are alternately repeated as one pass, thereby advancing the printing. The printing is a bidirectional printing in which the printing processing is performed when the head **30** is moved to each of one side and the other side in the scanning direction.

[0049] For example, the printing is executed for each print data (each of a plurality of pieces of the print data) of a predetermined amount (e.g., an amount corresponding to one pass). In this case, the head **30** ejects the liquid, based on the print data, while moving in the printing area B toward one side of the going route side and the returning route side in the scanning direction. As a result, dots are formed in the scanning direction by the liquid ejected for each of the plurality of pieces of the print data, and an image (pass image) is formed on the recording medium D. Subsequently,

by the conveying operation, the recording medium D is moved in the conveying direction relative to the head **30**. By alternately repeating this, a plurality of pieces of the pass image are arranged side by side in the conveying direction to thereby form an image corresponding to the print data.

[0050] <Controlling Method of Liquid Ejecting Apparatus>

[0051] For example, before the printing is started, the head **30** is arranged in the maintenance area C and the ejection surface is covered by the cap of the maintenance unit **18**. This prevents the liquid in each of the plurality of nozzles **31** which are opened in the ejection surface from being dried.

[0052] In a case that the controller **20** obtains the print data, the controller **20** starts the printing. Accordingly, before the controller **20** starts the printing, the controller **20** removes the cap from the head **30** to expose the ejection surface. Then, the controller **20** moves the head **30** from the maintenance area C to the flushing area A in the conveying direction toward the returning route side. In this flushing area A, the controller **20** executes the first flushing processing. Note that, in this situation, although the printing is executed after the cap is removed and then the first flushing processing is executed, it is allowable to execute the printing after the cap is removed, without executing the first flushing processing.

[0053] In the printing, the controller **20** stores, in the RAM **24**, a predetermined amount (e.g., the amount corresponding to one pass) of the print data and executes the printing processing based on the print data. In the printing processing, the controller **20** causes the driving element **32** to execute the liquid ejecting operation for each of a plurality of pieces of the print data, and causes the liquid to be ejected from the nozzles **31**. Further, according to the stored print data of one pass, the controller **20** causes the head **30** to eject the liquid while causing the head **30** to move in the printing area B toward one side among the going route side and the returning route side in the scanning direction, to thereby form the pass image on the recording medium D. While executing the printing processing, the controller **20** executes the first flushing processing as depicted in FIG. **3**A and the second flushing processing as depicted in FIG. **3**B.

[0054] Specifically, as depicted in FIG. **3**A, the controller **20** executes the discharge flushing driving of the first flushing processing, then the controller **20** counts, as a first count value, an elapsed time elapsed since the execution of the flushing driving and the completion of the first flushing processing (step S**1**). Subsequently, the controller **20** determines whether or not the first count value is not less than a first threshold value (step S**2**). The first threshold value is determined previously by a simulation, an experiment, etc., based on the property of the liquid, the amount of the liquid to be ejected by the printing processing, etc., and is, for example, 60 seconds. Note that, in a case that the printing is performed without executing the first flushing processing after the cap has been removed at a time of starting the printing, it is allowable to count the first count value as an elapsed time elapsed from a point of time when the cap has been removed.

[0055] In a case that the first count value is less than the first threshold value (step S**2**: NO), the controller **20** returns to the processing of step S**1**, and continues the counting of the first count value. On the other hand, in a case that the first count value is not less than the first threshold value (step S**2**: YES), the controller **20** moves the head **30** to the flushing area A and executes the first flushing processing (step S**3**). Then, the controller **20** resets the first count value (step S**31**), and starts the counting of the first count value (step S**1**) again.

[0056] Further, as depicted in FIG. **3**B, the controller **20** execute the liquid ejecting operation for each of the plurality of pieces of the print data in the printing processing, and eject the amount, of the liquid, corresponding to the print data from the nozzles **31**. The controller **20** executes the liquid ejecting operation so as to perform the printing processing, and then the controller **20** counts, as a second count value, an elapsed time elapsed since the completion of the printing processing (step S**4**); in a case that next printing processing is not started (step S**41**: NO), the controller **20** determines whether or not the second count value is not less than a second threshold value (step S**5**). The second threshold value is determined previously by a simulation, an experiment, etc., based on a moving speed of the head **30**, an ejection frequency of the liquid, etc., and is, for example, 6 seconds. In a case that next printing processing is started (step S**41**: YES), the controller **20** ends the processing.

[0057] Here, in a case that such a state is provided wherein the print data can be continuously obtained by the controller **20** without any interruption, the controller **20** obtains next print data during a period (time period) which is less (shorter) than the second threshold value since a previous liquid ejecting operation (completion of the printing processing), and the controller **20** is capable of executing a next liquid ejecting operation (next printing processing) based on the obtained print data for the next liquid ejecting operation. Therefore, the second count value will be less than second threshold value (step S**5**: NO), the controller **20** returns to the processing of step S**4**, and continues the counting of the second count value. In other words, the next printing processing is executed before the second count value reaches not less than the second threshold value in step S**5**.

[0058] On the other hand, for example, in a case that the controller **20** cannot obtain the print data due to a failure in the wireless communication, etc., the liquid ejecting operation based on the print data is interrupted, and the second count value reaches not less than the second threshold value (step S**5**: YES). In such a case, a state that the liquid is not ejected from the nozzles **31** is continued, and the liquid exposed in the nozzle holes **31***a* is dried, which in turn increases the viscosity of the liquid in the nozzles **31**. In order to suppress the occurrence of such an increase in the viscosity, the controller **20** executes the second flushing processing (Step S**6**). Then, the controller **20** resets the second count value (step S**61**), and starts the counting of the second count value (step S**4**) again.

[0059] Here, in a case that the discharge flushing driving is executed as the second flushing processing, the controller **20** moves the head **30** to the flushing area A and causes the liquid to be discharged from the head **30**. Further, in a case that the non-discharge flushing driving is executed as the second flushing processing, the controller **20** causes the liquid to finely vibrate so as not to be discharged the from the head **30**, when the controller **20** determines that the second count value is not less than the second threshold value.

[0060] In this manner, in the case that the first count value, which is the elapsed time elapsed since the completion of the first flushing processing, is not less than the first threshold value, the controller **20** executes the first flushing process-

ing. Further, in the case that the second count value, which is the elapsed time elapsed since the completion of the printing processing and until the starting of the next printing processing, is not less than the second threshold value, the controller **20** executes the second flushing processing. The second count value is counted during a period of time in which a liquid ejecting processing for the printing processing is not performed, and is not counted during a period of time in which the liquid ejecting processing for the printing processing is performed.

[0061] According to this, the ejection of the liquid by the printing processing is regarded as a kind of the discharge flushing, and it is possible to set the first threshold value, which is set on the premise that the printing processing is continuously executed, to be longer. As a result, it is possible to reduce the number of time(s) and the time (duration of time) of the first flushing processing, and to realize a high-speed printing.

[0062] Further, in a case that the printing processing is interrupted and that the second count value is not less than the second threshold value, the second flushing processing is executed. As a result, it is possible to reduce any increase in the viscosity of the liquid in the nozzles **31**, thereby making it possible to suppress the occurrence of any unsatisfactory ejection caused due to the increase in the viscosity.

[0063] Further, the first threshold value is greater than the second threshold value. Therefore, since an interval between the first flushing processings becomes long, it is possible to realize a high-speed printing. In addition, the liquid is ejected by the printing processing in the interval between the first flushing processings, thereby making it possible to suppress any unsatisfactory ejection due to the increase in the viscosity of the liquid.

[0064] Note that the determination in each of step S**2** and step S**5** may be executed every time the printing processing based on the print data corresponding to one pass is completed. Alternatively, the determination may be executed after the print data corresponding to a next one pass is obtained and before the start of the printing processing for the next pass. The printing processing by such a print data corresponding to the one pass is completed or finished in a case that the head **30** is located at an end (end part) of the printing area B, or is located in the flushing area A or in the maintenance area C, and the printing processing of the next pass is started from here. Thus, the determination is made in a case that the head **30** is stopped at the end part of the print area B, or in the flushing area A or in the maintenance area C.

[0065] Note, however, that the timing of the determination is not limited to this. The determination may be executed always during the printing. Alternatively, the determination may be executed every time the head **30** is positioned in (at) the flushing area A. In such a situation, in a case that the controller **20** determines that the first count value is not less than the first threshold value, it is possible to execute the discharge flushing driving, without moving the head **30** to the flushing area A.

[0066] Note that the first flushing processing may include non-discharge flushing driving in addition to or instead of the discharge flushing. That is, the first flushing processing may include at least one of the discharge flushing and the non-discharge flushing.

[0067] <First Modification>

[0068] In a liquid ejecting apparatus **10** according to a first modification, in a case that the first count value is not less than the first threshold value and that the controller **20** executes the first flushing processing, the controller **20** resets the first count value and the second count value; on the other hand, in a case that the second count value is not less than the second threshold value and that the controller **20** executes the second flushing processing, the controller **20** resets the second count value without resetting the first count value. That is, the controller resets the first count value and the second count value in a case that the first flushing processing has been executed, and reset the second count value without resetting the first count value in a case that the second flushing processing has been executed.

[0069] For example, in the flow chart of FIG. **3**A, in a case that the first count value is not less than the first threshold value (step S**2**: YES), the controller **20** executes the first flushing processing (step S**3**). Then, the controller **20** resets the first count value and the second count value, and then returns to step Si and to step S**4** of FIG. **3**B, and counts the each of the first and second count values.

[0070] The discharge flushing driving is executed by this first flushing processing, and the liquid is discharged from the nozzles **31**. Therefore, any increase in the viscosity of the liquid in the nozzles **31** is reduced, and there is provided a state that the printing can be executed. Therefore, not only the first count value is reset, but also the second count value is reset. As a result, the second count value does not reach the second threshold value immediately after the first flushing processing, and any wasteful (unnecessary) execution of the second flushing processing can be reduced.

[0071] Further, in the flow chart of FIG. **3**B, in a case that the second count value is not less than the second threshold value (step S**5**: YES), the controller **20** executes the second flushing processing (step S**6**). The controller **20** then resets the second count value and returns to step S**4**, without resetting the first count value, and counts the second count value.

[0072] For example, in a case that the non-discharge flushing driving is executed in the second flushing processing, although the liquid in the nozzles **31** is agitated or stirred to thereby reduce the viscosity (increased viscosity) of the liquid, a reduction amount of the viscosity of the liquid in the non-discharge flushing driving is smaller than that in the discharge flushing driving. Therefore, by continuing the counting of the elapsed time elapsed since the completion of the first flushing processing, the discharge flushing driving of the first flushing processing can be executed at an appropriate timing, thereby making it possible to maintain the viscosity of the liquid to be low.

[0073] Note that the first flushing processing may include non-discharge flushing driving in addition to or instead of the discharge flushing. That is, the first flushing processing may include at least one of the discharge flushing and the non-discharge flushing.

[0074] <Second Modification>

[0075] In a liquid ejecting apparatus **10** according to a second modification, at least one of an amount of the liquid to be discharged in the discharge flushing driving and a number of times of the discharging of the liquid to be performed in the discharge flushing is greater in the case of the second flushing processing than that (those) in the case of the first flushing processing. Note that the second flushing processing includes the discharge flushing driving, and may

further include the non-discharge flushing driving in addition to the discharge flushing driving.

[0076] Specifically, in one time of the discharge flushing driving, the liquid is discharged from the nozzles **31** one time or a plurality of times. The number of time(s) of this operation of discharging the liquid (liquid discharging operation) may be greater in the second flushing processing than that in the first flushing processing. As a result, the liquid discharging operation is executed in the discharge flushing driving of the second flushing processing by a number of time(s) which is greater than that in the discharge flushing driving of the first flushing processing.

[0077] In addition, the amount of the liquid discharged from each of the nozzles **31** in one time of the discharge flushing driving in the second flushing processing may be greater than that in the first flushing processing. In such a case, the amount of the liquid discharged in one time of the liquid discharging operation may be greater in the second flushing processing than that in the first flushing processing. In a case that the liquid discharging operation is executed a plurality of times in one time of the discharge flushing driving, a total amount of the liquid discharged from each of the nozzles **31** in the plurality of times of the liquid discharging operation may be greater in the second flushing processing than that in the first flushing processing.

[0078] The printing processing is continuously executed prior to such a first flushing processing, and the liquid is ejected from the nozzles **31** by the printing processing. In contrast, the liquid is not ejected from the nozzles **31** prior to the second flushing processing during a time period corresponding to not less than the second threshold value and thus the viscosity of the liquid is higher than that in a state before the first flushing processing. Therefore, by increasing the discharge amount and/or the discharge number of time(s) in the second flushing processing to be greater than that (those) in the first flushing processing, it is possible to maintain the viscosity of the liquid to be low.

[0079] <Third Modification>

[0080] In a liquid ejecting apparatus **10** according to a third modification, in a case that the first count value is not less than the first threshold value and that the second count value is not less than the second threshold value, the controller **20** executes the second flushing processing without executing the first flushing processing.

[0081] For example, the controller **20** executes the discharge flushing driving in the second flushing processing. Note that in the second flushing processing, it is allowable to execute the non-discharge flushing driving in addition to the discharge flushing driving. The discharge amount of the liquid and/or the discharge number of time(s) in the second flushing processing is greater than that (those) in the first flushing processing. In this case, the viscosity (increased viscosity) of the liquid in the nozzles **31** is further reduced by the second flushing processing than by the first flushing processing. As a result, a printable state in which the printing is executable is provided without executing the first flushing processing, thereby making it possible to reduce any wasteful or unnecessary execution of the first flushing processing.

[0082] <Fourth Modification>

[0083] In a liquid ejecting apparatus **10** according to a fourth modification, the first flushing processing includes the non-discharge flushing driving. In a case that the first count value reaches the first threshold value, the controller **20** executes the non-discharge flushing driving in the first flushing processing.

[0084] Specifically, the controller **20** executes the determination as to whether or not the first count value is not less than the first threshold value always during the printing. The first flushing processing includes the discharge flushing driving and the non-discharge flushing driving. Since there is no limitation regarding a place or location at which the non-discharge flushing is executed, the controller **20** executes the non-discharge flushing driving in a case that the first count value reaches the first threshold value. Further, since the discharge flushing driving is executed in the flushing area A, after the controller **20** has executed the non-discharge flushing driving and in a case that the first count value exceeds the first threshold value (specifically, for example, after the head **30**, which has been moving while executing the non-discharge flushing reaches the flushing area A), the controller **20** executes the discharge flushing. Furthermore, in a case that the discharge flushing driving is executed, the controller **20** resets the first count value and then counts, as the first count value, an elapsed time elapsed since (the execution of) the discharge flushing driving.

[0085] In this manner, even in a case that the head **30** is positioned at a location different from the flushing area A, such as the printing area B or the maintenance area C, the controller **20** can execute the non-discharge flushing driving of the first flushing processing at an appropriate timing. By such a non-discharge flushing driving, it is possible to suppress the increase in the viscosity of the liquid in the nozzles **31**. Further, the controller **20** can reduce the viscosity (increased viscosity) of the liquid in the nozzles **31** by executing the discharge flushing driving.

[0086] <Fifth Modification>

[0087] In a liquid ejecting apparatus **10** according to a fifth modification, in a case that the second count value reaches the second threshold value, the controller **20** executes the non-discharge flushing driving in the second flushing processing.

[0088] Specifically, the second flushing processing includes the non-discharge flushing driving. The controller **20** executes the determination as to whether or not the second count value is not less than the second threshold value always during the printing. Since there is no limitation regarding a place or location at which the non-discharge flushing is executed, the controller **20** executes the non-discharge flushing driving in a case that the second count value reaches the second threshold value.

[0089] In this manner, even in a case that the head **30** is positioned at a location different from the flushing area A, such as the printing area B or the maintenance area C, the controller **20** can execute the non-discharge flushing driving of the second flushing processing at an appropriate timing. By such a non-discharge flushing driving, it is possible to maintain the liquid viscosity of the liquid in the nozzles **31** to be low.

[0090] Note that the second flushing processing may include the discharge flushing driving, in addition to the non-discharge flushing driving. In this case, the discharge flushing driving is executed after the non-discharge flushing driving has been executed and after the second count value exceeds the second threshold value (specifically, for example, after the head **30**, which has been moving while executing the non-discharge flushing reaches the flushing

area A). Thus, the liquid is removed from the nozzles **31**, thereby making it possible to reduce the viscosity (increased viscosity) of the liquid in the nozzles **31**.

[0091] Further, after the controller **20** executes the second flushing processing, the controller **20** resets the second count value, and then counts, as the second count value, the elapsed time elapsed since the completion of the discharge flushing driving.

[0092] <Sixth Modification>

[0093] In a liquid ejecting apparatus **10** according to a sixth modification, each of the first flushing processing and the second flushing processing includes the discharge flushing driving and the non-discharge flushing driving. In a print image-priority mode in which print image quality is prioritized over print efficiency, the controller **20** executes the discharge flushing driving and the non-discharge flushing driving in each of the first flushing processing and the second flushing processing. In a print efficiency-priority mode in which the print efficiency is prioritized over the print image quality, the controller **20** executes the discharge flushing driving or the non-discharge flushing driving in the second flushing processing.

[0094] Specifically, the print data includes a first command executing the printing in the print image quality-priority mode, and a second command executing the printing in the print efficiency-priority mode. The print efficiency-priority mode is a mode in which the print efficiency, which is at least one of a speed of performing the printing on the recording medium D and an amount of the liquid to be ejected (liquid ejection amount) from the nozzles **31** so as to form an image on the recording medium D, is prioritized over a quality of the image (image quality) to be recorded on the print medium D. The print image quality-priority mode is a mode in which the image quality is prioritized over the print efficiency. Therefore, the image quality in the print image quality-priority mode is higher than that in the print efficiency-priority mode. The printing speed in the print efficiency-priority mode is faster than that in the print image quality-priority mode, and the liquid ejection amount in the printing efficiency-priority mode is smaller than that in the print image quality-priority mode.

[0095] The controller **20** obtains print data and determines whether the print data includes the first command or the second command. In a case that the print data includes the first command, the controller **20** executes the printing processing based on the print data and in the print image quality-priority mode. Here, the controller **20** executes the first flushing processing in a case that the first count value is not less than the first threshold value; on the other hand, the controller **20** executes the second flushing processing in a case that the second count value is not less than the second threshold value. Both the discharge flushing driving and the non-discharge flushing driving are executed in either one of the first flushing processing and the second flushing processing. In this case, it is allowable that the controller **20** executes the non-discharge flushing driving in a case that each of the first and second count values reaches the threshold value thereof, and that after the controller **20** has executed the non-discharge flushing driving, the controller **20** moves the head **30** to the flushing area A, and then the controller **20** executes the discharge flushing driving.

[0096] On the other hand, in a case that the print data includes the second command, the controller **20** executes the printing processing based on the print data and in the print efficiency-priority mode. Here, the controller **20** executes the first flushing processing in a case that the first count value is not less than the first threshold value; on the other hand, the controller **20** executes the second flushing processing in a case that the second count value is not less than the second threshold value. In this second flushing processing, the controller **20** executes either one of the discharge flushing driving and the non-discharge flushing driving.

[0097] As described above, in the print efficiency-priority mode, by executing either one of the non-discharge flushing driving and the discharge flushing driving, it is possible to reduce a driving power and to improve the print efficiency while reducing the viscosity (increased viscosity) of the liquid. In contrast, in the print image quality-priority mode, by executing the non-discharge flushing driving and the discharge flushing driving, it is possible to further reduce the viscosity of the liquid in the nozzles **31**, to suppress the occurrence of any unsatisfactory ejection due to the increase in the viscosity, and to execute the printing in high image quality.

[0098] Further, in the second flushing processing, the non-discharge flushing driving may be executed without executing the discharge flushing driving. As a result, it is not necessary to move the head **30** to the flushing area A and to discharge the liquid, and thus the printing speed can be further increased. Further, since the liquid is not discharged, it is possible to suppress the amount of the consumed liquid.

[0099] Note that the controller **20** may change the first threshold value and the second threshold value, depending on the modes. For example, it is possible to make the respective threshold values in the print image quality-priority mode to be shorter (or smaller) than in a mode different therefrom. As a result, in the print image quality-priority mode, it is possible to further suppress the viscosity of the liquid in the nozzles **31** to be low, thus to suppress the occurrence of the unsatisfactory ejection due to the increase in the viscosity of the liquid, and to suppress any decrease in the image quality. On the other hand, in the print efficiency-priority mode, it is possible to reduce the number of time(s) of the discharge flushing driving, and to reduce the amount of discharged liquid and to shorten the printing time.

[0100] <Seventh Modification>

[0101] A liquid ejecting apparatus **10** according to a seventh modification further includes a maintenance unit **18** configured to perform maintenance for the head **30**. The controller **20** performs the printing processing based on print data obtained for each pass; in a case that the second count value is not less than the second threshold value when the head **30** is located at a position closer to the maintenance unit **18** than to the receiving part **17**, the controller **20** moves the head **30** to the receiving part **17**, without executing the printing processing, and executes the discharge flushing driving in the second flushing processing.

[0102] Specifically, the maintenance unit **18** is, for example, a cap which covers the ejection surface, and is arranged in the maintenance area C. For example, the head **30** ejects the liquid while moving from the flushing area A to the maintenance area C toward the going route side, thereby executing the printing processing. After the execution of this printing processing, the head **30** is positioned in the maintenance area C, as depicted in FIG. **4**A; in this situation the controller **20** receives printing information of a next pass. There is, however, such a case that the controller **20** is not capable of receiving the printing information due

to, for example, any unsatisfactory communication, etc., and that the second count value becomes to be not less than the second threshold value.

[0103] In such a case, the controller **20** then interrupts the printing processing and moves the head **30** from the maintenance area C to the flushing area A toward the returning route side. Further, as depicted in FIG. **4**B, the controller **20** arranges the head **30** above the receiving part **17** in the flushing area A, and executes the discharge flushing driving of the second flushing processing.

[0104] Further, in a case that the controller **20** receives printing information of a next pass, the controller **20** moves the head **30** to the maintenance area C toward the going route side, as depicted in FIG. **4**C. Then, as depicted in FIG. **4**D, the controller **20** causes the liquid to be ejected based on the received pass information, while moving the head **30** from the maintenance area C to the flushing area A toward the returning route side, thereby executing the printing processing. As a result, an image F is formed on the recording medium D.

[0105] In this manner, after the discharge flushing driving of the second flushing processing, the printing processing of the next pass is executed. With this, since the next pass is not subjected to the printing in a state that the viscosity of the liquid in the nozzles **31** is increased, it is possible to suppress the decrease in the image quality.

[0106] Note that, in the foregoing description, as depicted in FIGS. **4**C and **4**D, after the controller **20** returns the head **30** to the maintenance area C, the controller **20** forms a next pass image (an image of the next pass) while moving the head **30**, in the next pass, in the original direction (toward the returning route side). However, a method of forming the next pass image is not limited to this.

[0107] For example, in a case that the second count value is not less than the second threshold value when the head **30** is located at a position closer to the maintenance unit **18** than to the receiving part **17**, and the controller **20** executes the discharge flushing driving, it is allowable that the controller **20** restarts the printing processing based on remaining print data which remains without being executed (based on the print data for a latest pass remained due to an interruption of the printing processing for the latest pass), while moving the head **30** from the receiving part **17** to the maintenance unit **18**. That is, the controller **20** restarts, after the discharge flushing driving, the printing processing based on the print data for a latest pass remained due to an interruption of the printing processing for the latest pass, while moving the head from the receiver to the maintenance unit.

[0108] With this, after the controller **20** executes the discharge flushing driving in FIG. **4**B, the controller **20** causes the liquid to be ejected to thereby execute the printing processing based on the received information regarding the next pass while moving the head **30** from the flushing area A to the maintenance area C toward the going route side, as depicted in FIG. **4**E. With this, as depicted in FIG. **4**F, an image F, which is to be originally printed while the head **30** is being moved toward the returning route side, is subjected to the printing while the head **30** is being moved toward the going route side. In such a manner, since the head **30** is not returned to the maintenance area C as depicted in FIGS. **4**B and **4**C, a time required for returning the head **30** to the maintenance area C can be omitted, thereby making it possible to increase the print efficiency.

[0109] Note that in the above-described configuration, the determination as to whether or not the second count value is not less than the second threshold value is executed in a case that the head **30** is positioned in the maintenance area C. In contrast to this, it is also allowable to execute the determination as to whether or not the second count value is not less than the second threshold value in a case that the head **30** is located at the position closer to the maintenance unit **18** than to the receiving part **17**.

[0110] For example, the controller **20** successively obtains print data and performs the determination. Accordingly, in a case that the reception of the print data is stagnated in a state that the head is in the print area B, and the second count value reaches the second threshold value, the controller **20** moves the head **30** to the receiving part **17**, and executes the discharge flushing driving. Then, in a case that the controller **20** moves the head **30** from the receiving part **17** toward the going route side, the controller **20** executes the printing processing, based on print data (print process data) which remains without being executed after interruption of the printing, while moving the head **30** from the receiving part **17** toward the going route side.

[0111] Note that all the above-described embodiment and modifications may be combined with each other, provided that the embodiment and modifications are not mutually exclusive. For example, the third modification may be applied to the second modification, the fourth modification may be applied to the first to third modifications, the fifth modification may be applied to the first to fourth modifications, the sixth modification may be applied to the first to fifth modifications, and the seventh modification may be applied to the first to sixth modifications.

[0112] Further, many improvements and/or another embodiment of present disclosure will be apparent, from the foregoing explanation, to those skilled in the art. Accordingly, the foregoing explanation should be construed as illustrative only, and is provided for the purpose of teaching those skilled in the art the best mode for carrying out present invention. The details of the configuration and/or function of the present disclosure may be substantially changed, without departing from the spirit of the present invention.

[0113] The liquid ejecting apparatus and the controlling method for the same are useful as a liquid ejecting apparatus and a controlling method for the same, etc., each of which is capable of realizing high-speed printing while suppressing any unsatisfactory ejection due to the increase in the viscosity of the liquid.

What is claimed is:

1. A liquid ejecting apparatus comprising:

a head having a nozzle configured to eject a liquid;

a carriage configured to move reciprocally the head in a scanning direction;

a receiver configured to receive the liquid discharged from the head in a flushing area; and

a controller;

wherein the controller is configured to execute:

a first flushing processing;

a second flushing processing including at least one of a discharge flushing driving of driving the head so as to cause the head to discharge the liquid to the receiver and a non-discharge flushing driving of driving the head so as to vibrate the liquid without discharging the liquid; and

a printing processing of driving the carriage and the head based on a print data such that the liquid is ejected in a printing area as the head is moved in the scanning direction;

the first flushing processing is executed in a case that a first count value is not less than a first threshold value, the first count value being an elapsed time since a completion of the first flushing processing; and

the second flushing processing is executed in a case that a second count value is not less than a second threshold value, the second count value being an elapsed time since a completion of the printing processing.

2. The liquid ejecting apparatus according to claim **1**, wherein the first threshold value is greater than the second threshold value.

3. The liquid ejecting apparatus according to claim **1**, wherein the controller is configured to:

reset the first count value and the second count value, in a case that the first count value is not less than the first threshold value, and that the first flushing processing has been executed; and

reset the second count value without resetting the first count value, in a case that the second count value is not less than the second threshold value, and that the second flushing processing has been executed.

4. The liquid ejecting apparatus according to claim **1**, wherein the first flushing processing includes the discharge flushing driving, and at least one of an amount of the liquid to be discharged in the discharge flushing driving and a number of times of the discharging of the liquid to be performed in the discharge flushing driving is greater in the second flushing processing than in the first flushing processing.

5. The liquid ejecting apparatus according to claim **4**, wherein, in a case that the first count value is not less than the first threshold value and the second count value is not less than the second threshold value, the controller is configured to execute the second flushing processing without executing the first flushing processing.

6. The liquid ejecting apparatus according to claim **1**, wherein the first flushing processing includes the non-discharge flushing driving; and

in a case that the first count value reaches the first threshold value, the controller is configured to execute the non-discharge flushing driving in the first flushing processing.

7. The liquid ejecting apparatus according to claim **1**, wherein, in a case that the second count value reaches the second threshold value, the controller is configured to execute the non-discharge flushing driving in the second flushing processing.

8. The liquid ejecting apparatus according to claim **1**, wherein each of the first flushing processing and the second flushing processing includes the discharge flushing driving and the non-discharge flushing driving;

the controller is configured to execute the discharge flushing driving and the non-discharge flushing driving in each of the first flushing processing and the second flushing processing in a mode of prioritizing a print image quality over a print efficiency, and execute the discharge flushing driving or the non-discharge flushing driving in the second flushing processing in a mode of prioritizing the print efficiency over the print image quality.

9. The liquid ejecting apparatus according to claim **1**, further comprising a maintenance unit configured to perform a maintenance for the head;

the controller is configured to:

execute the printing processing based on the print data obtained for each pass; and

move the head to the receiver without executing the printing processing and execute the discharge flushing driving in the second flushing processing, in a case that the second count value is not less than the second threshold value as the head is located at a position closer to the maintenance unit than to the receiver.

10. The liquid ejecting apparatus according to claim **9**, wherein, the controller is configured to restart, after the discharge flushing driving having been executed in a case that the second count value is not less than the second threshold value as the head is located at the position closer to the maintenance unit than to the receiver, the printing processing based on the print data for a latest pass remained due to an interruption of the printing processing for the latest pass, while moving the head from the receiver to the maintenance unit.

11. A method of controlling a liquid ejecting apparatus,

the liquid ejecting apparatus including:

a head having a nozzle configured to eject a liquid;

a carriage configured to move reciprocally the head in a scanning direction;

a receiver configured to receive the liquid discharged from the head in a flushing area; and

a controller configured to execute:

a first flushing processing;

a second flushing processing including at least one of a discharge flushing driving of driving the head so as to cause the head to discharge the liquid to the receiver and a non-discharge flushing driving of driving the head so as to vibrate the liquid without discharging the liquid; and

a printing processing of driving the carriage and the head based on a print data such that the liquid is ejected in a printing area as the head is moved in the scanning direction;

the method comprising:

causing the controller to execute the first flushing processing in a case that a first count value is not less than a first threshold value, the first count value being an elapsed time since a completion of the first flushing processing; and

causing the controller to execute the second flushing processing in a case that a second count value is not less than a second threshold value, the second count value being an elapsed time since a completion of the printing processing.

12. A liquid ejecting apparatus comprising:

a head having a nozzle configured to eject a liquid;

a carriage configured to move reciprocally the head in a scanning direction;

a receiver configured to receive the liquid discharged from the head in a flushing area; and

a controller;

wherein the controller is configured to execute:

a first flushing processing;

a second flushing processing including at least one of a discharge flushing driving of driving the head so as to cause the head to discharge the liquid to the

receiver and a non-discharge flushing driving of driving the head so as to vibrate the liquid without discharging the liquid; and

a printing processing of driving the carriage and the head based on a print data such that the liquid is ejected in a printing area as the head is moved in the scanning direction;

in a case that a first period is elapsed since a completion of the first flushing processing, a next first flushing processing is executed; and

in a case that the printing processing is not started within a second period since a completion or stopping of the printing processing, the second flushing processing is executed.

13. The liquid ejecting apparatus according to claim **12**, wherein the first period is longer than the second period.

14. The liquid ejecting apparatus according to claim **12**, wherein the controller is configured to:

reset a count of the first period and a count of the second period, after executing the first flushing processing; and

reset the count of the second period without resetting the count of the first period, after executing the second flushing processing.

15. The liquid ejecting apparatus according to claim **12**, wherein the first flushing processing includes the discharge flushing driving, and at least one of an amount of the liquid to be discharged in the discharge flushing driving and a number of times of the discharging of the liquid to be performed in the discharge flushing driving is greater in the second flushing processing than in the first flushing processing.

16. The liquid ejecting apparatus according to claim **15**, wherein, in a case that the first period is elapsed since the completion of the first flushing processing and the second period is elapsed since the completion or stopping of the printing processing without restarting a next printing processing, the controller is configured to execute the second flushing processing without executing the first flushing processing.

17. The liquid ejecting apparatus according to claim **12**, wherein the first flushing processing includes the non-discharge flushing driving; and

in a case that the first period is elapsed since the completion of the first flushing processing, the controller is configured to execute the non-discharge flushing driving in the next first flushing processing.

18. The liquid ejecting apparatus according to claim **12**, wherein, in a case that the second period is elapsed since the completion or stopping of the printing processing without restarting a next printing processing, the controller is configured to execute the non-discharge flushing driving in the second flushing processing.

19. The liquid ejecting apparatus according to claim **12**, wherein each of the first flushing processing and the second flushing processing includes the discharge flushing driving and the non-discharge flushing driving;

the controller is configured to execute the discharge flushing driving and the non-discharge flushing driving in each of the first flushing processing and the second flushing processing in a mode of prioritizing a print image quality over a print efficiency, and execute the discharge flushing driving or the non-discharge flushing driving in the second flushing processing in a mode of prioritizing the print efficiency over the print image quality.

20. The liquid ejecting apparatus according to claim **12**, further comprising a maintenance unit configured to perform a maintenance for the head;

the controller is configured to:

execute the printing processing based on the print data obtained for each pass; and

move the head to the receiver without executing the printing processing and execute the discharge flushing driving in the second flushing processing, in a case that the head is located at a position closer to the maintenance unit than to the receiver when the second period is elapsed since the completion or stopping of the printing processing without restarting a next printing processing.

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