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(54) **PRINTING APPARATUS, METHOD FOR CONTROLLING SAME, AND STORAGE MEDIUM**

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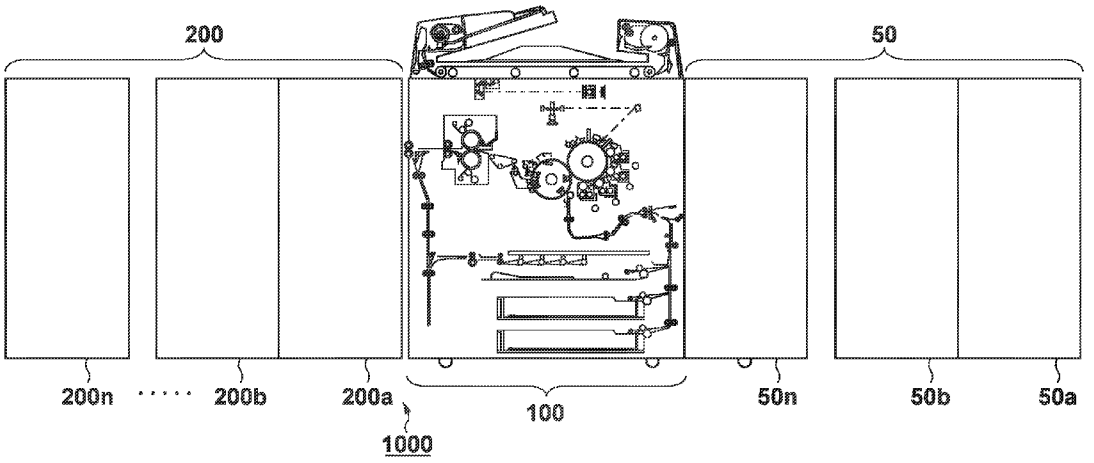
USPC **271/9.05**; 271/265.01

(57) **ABSTRACT**

A printing apparatus has a first storage unit, a second storage unit, a reception unit that receives a job, a switching unit that switches the storage unit that is used, from the storage unit currently in use to another storage unit holding the same type of sheets as the storage unit currently in use, when the remaining amount of sheets in the storage unit currently in use reaches a predetermined amount during the execution of the job, and a control unit that controls the timing at which blowing of air into the sheets held in the other storage unit is started, to vary this timing depending on whether the type of sheets held in the storage unit currently in use or in the other storage unit is the first type of sheets or the second type of sheets.



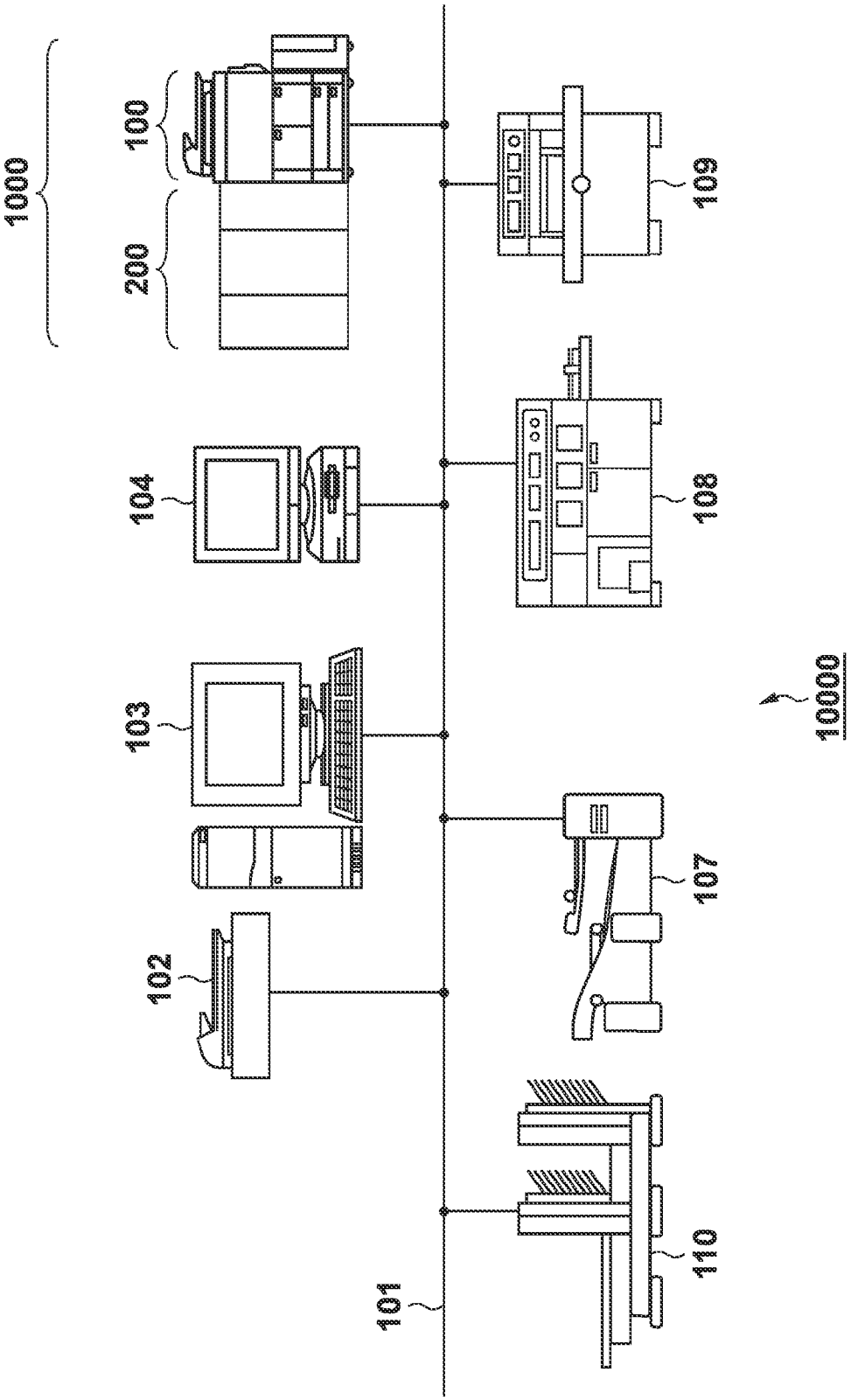


FIG. 1

FIG. 2

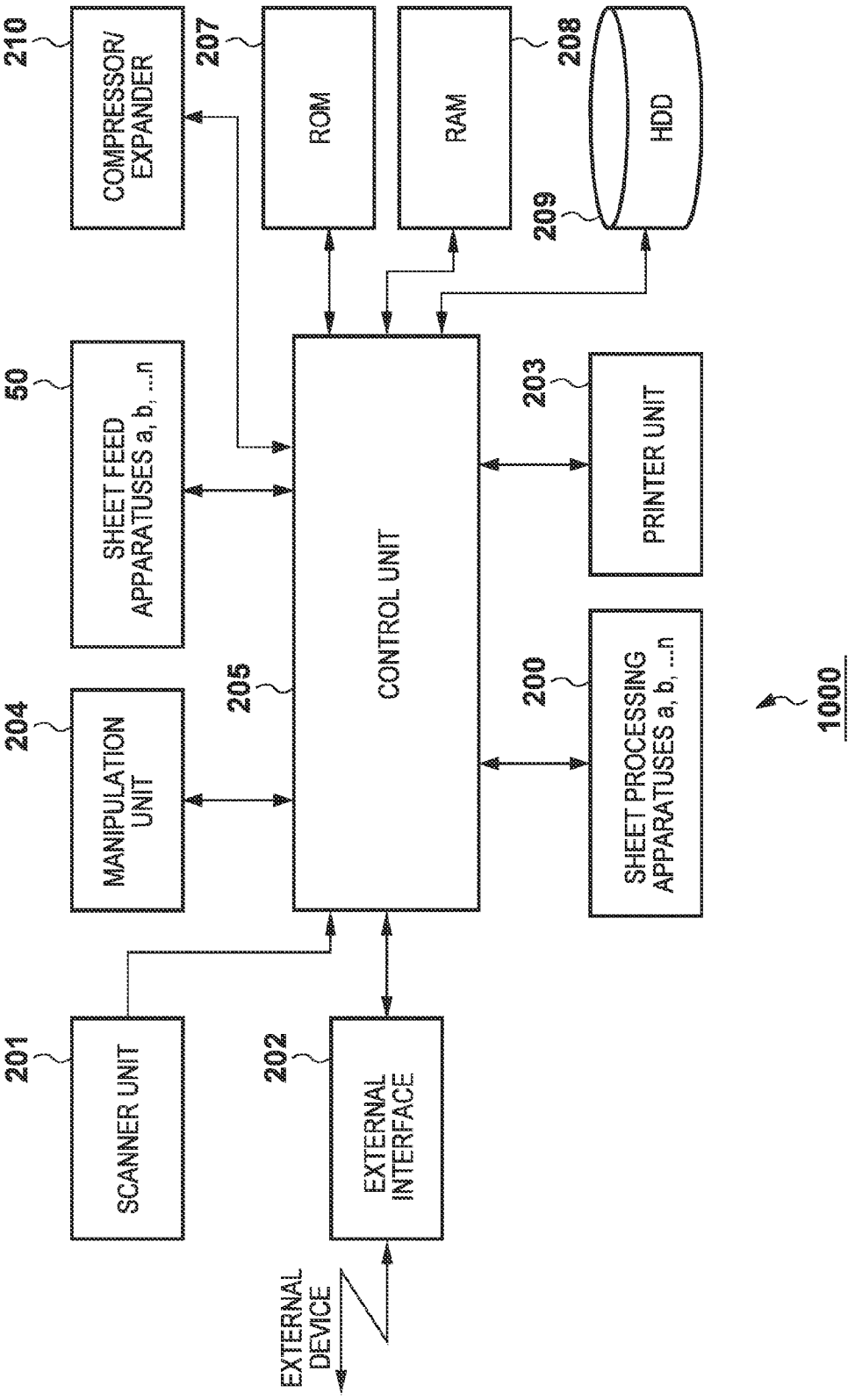

210
COMPRESSOR/ EXPANDER
207
ROM
RAM
208
HDD
209
50
SHEET FEED APPARATUSES a, b, ...n
CONTROL UNIT
203
PRINTER UNIT
204
MANIPULATION UNIT
205
200
SHEET PROCESSING APPARATUSES a, b, ...n
1000
201
SCANNER UNIT
202
EXTERNAL INTERFACE
EXTERNAL DEVICE

FIG. 3

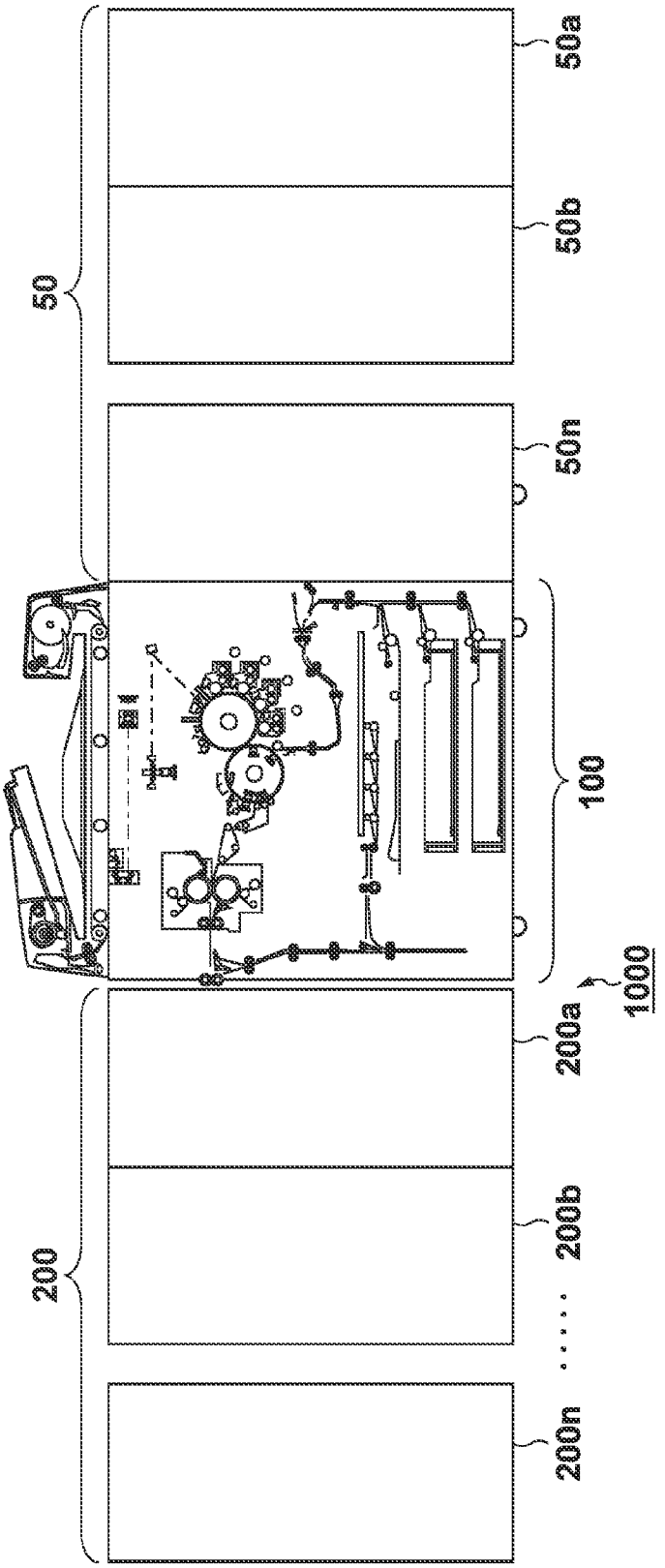


FIG. 4

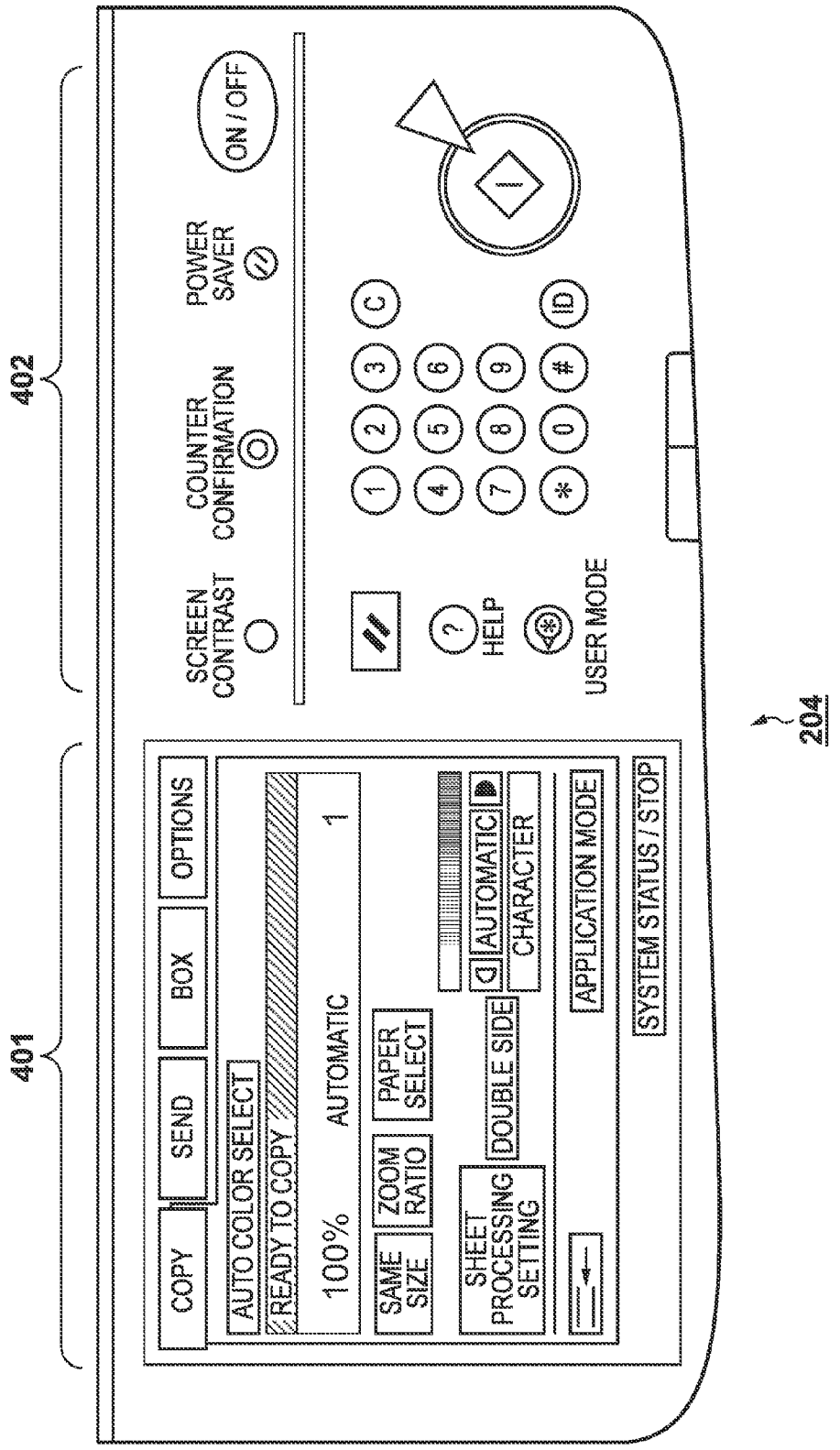

401
402
204
COPY
SEND
BOX
OPTIONS
AUTO COLOR SELECT
READY TO COPY
100%
AUTOMATIC
1
SAME SIZE
ZOOM RATIO
PAPER SELECT
SHEET PROCESSING SETTING
DOUBLE SIDE
AUTOMATIC
CHARACTER
APPLICATION MODE
SYSTEM STATUS / STOP
SCREEN CONTRAST
COUNTER CONFIRMATION
POWER SAVER
ON / OFF
HELP
USER MODE
1 2 3 C
4 5 6
7 8 9
* 0 # ID

FIG. 5

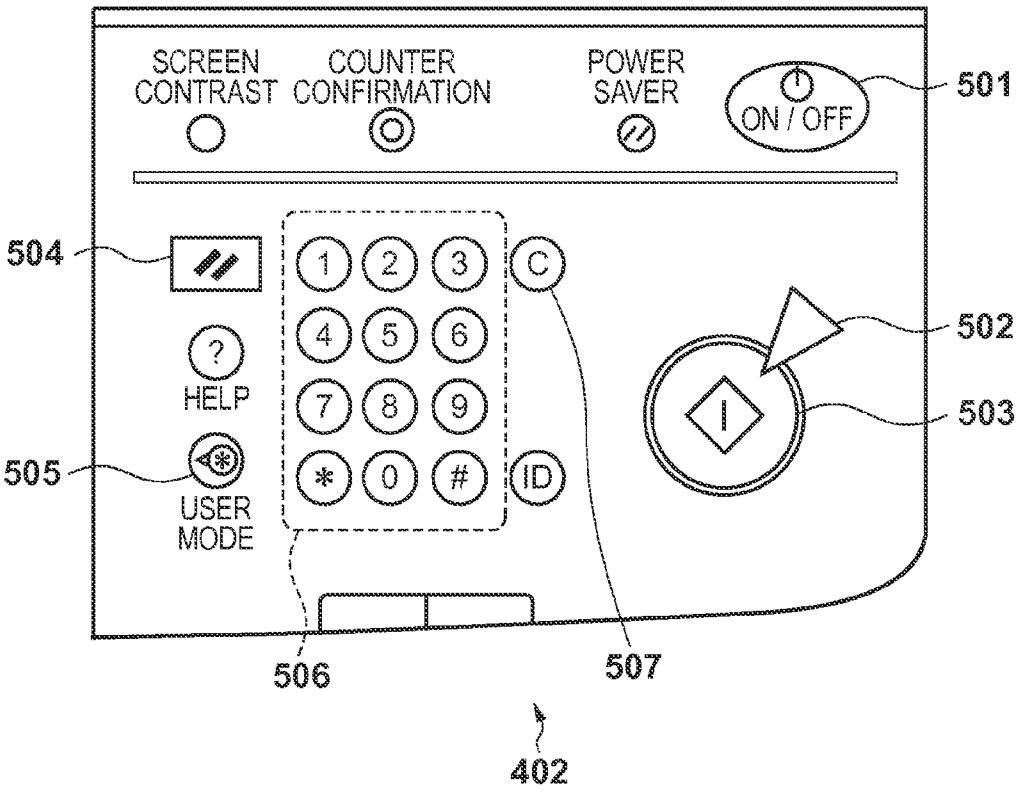
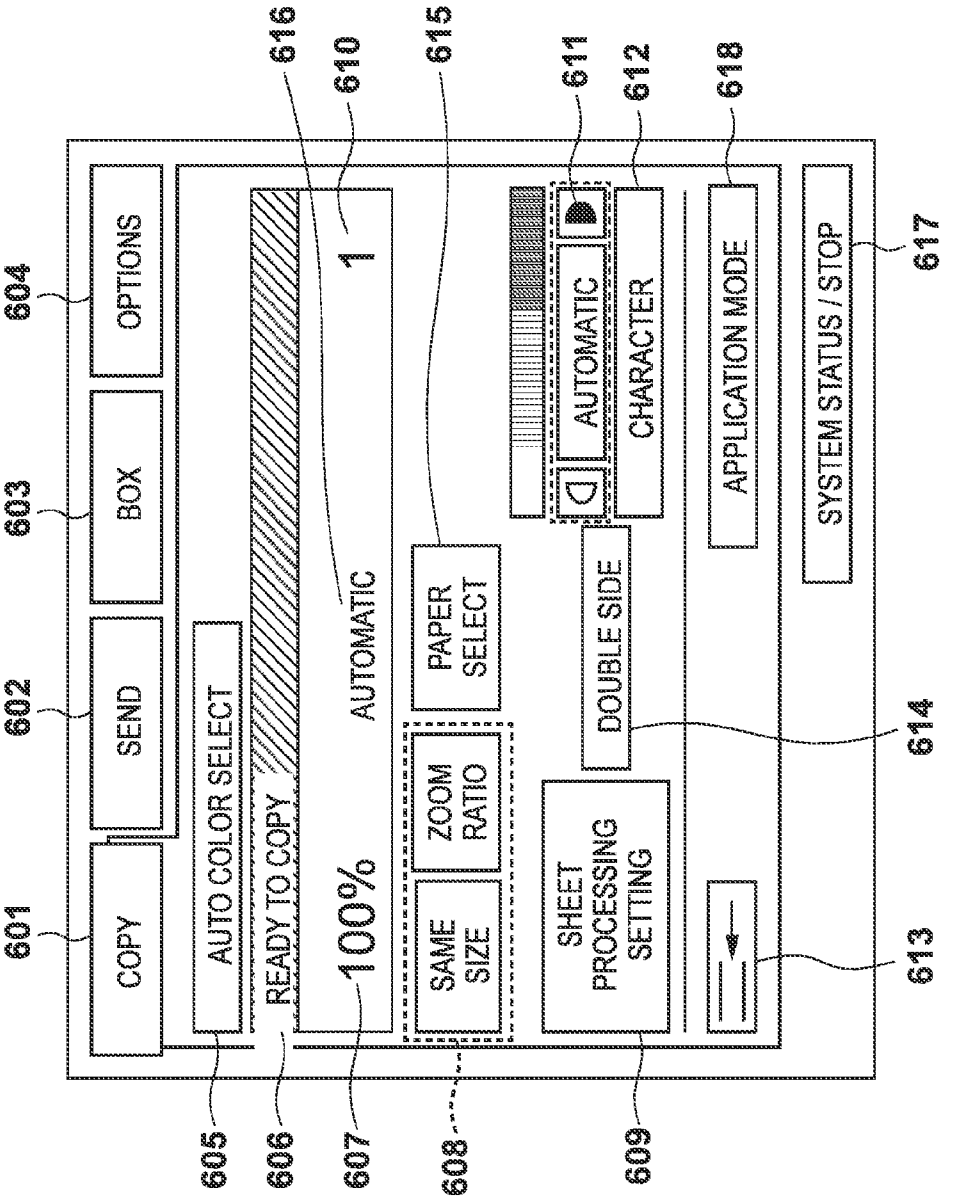

SCREEN CONTRAST
COUNTER CONFIRMATION
POWER SAVER
ON / OFF
501
504
1
2
3
C
4
5
6
?
HELP
7
8
9
502
503
505
*
0
#
ID
USER MODE
506
507
402

FIG. 6


601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
COPY
SEND
BOX
OPTIONS
AUTO COLOR SELECT
READY TO COPY
100%
AUTOMATIC
1
SAME SIZE
ZOOM RATIO
PAPER SELECT
SHEET PROCESSING SETTING
DOUBLE SIDE
AUTOMATIC
CHARACTER
APPLICATION MODE
SYSTEM STATUS / STOP

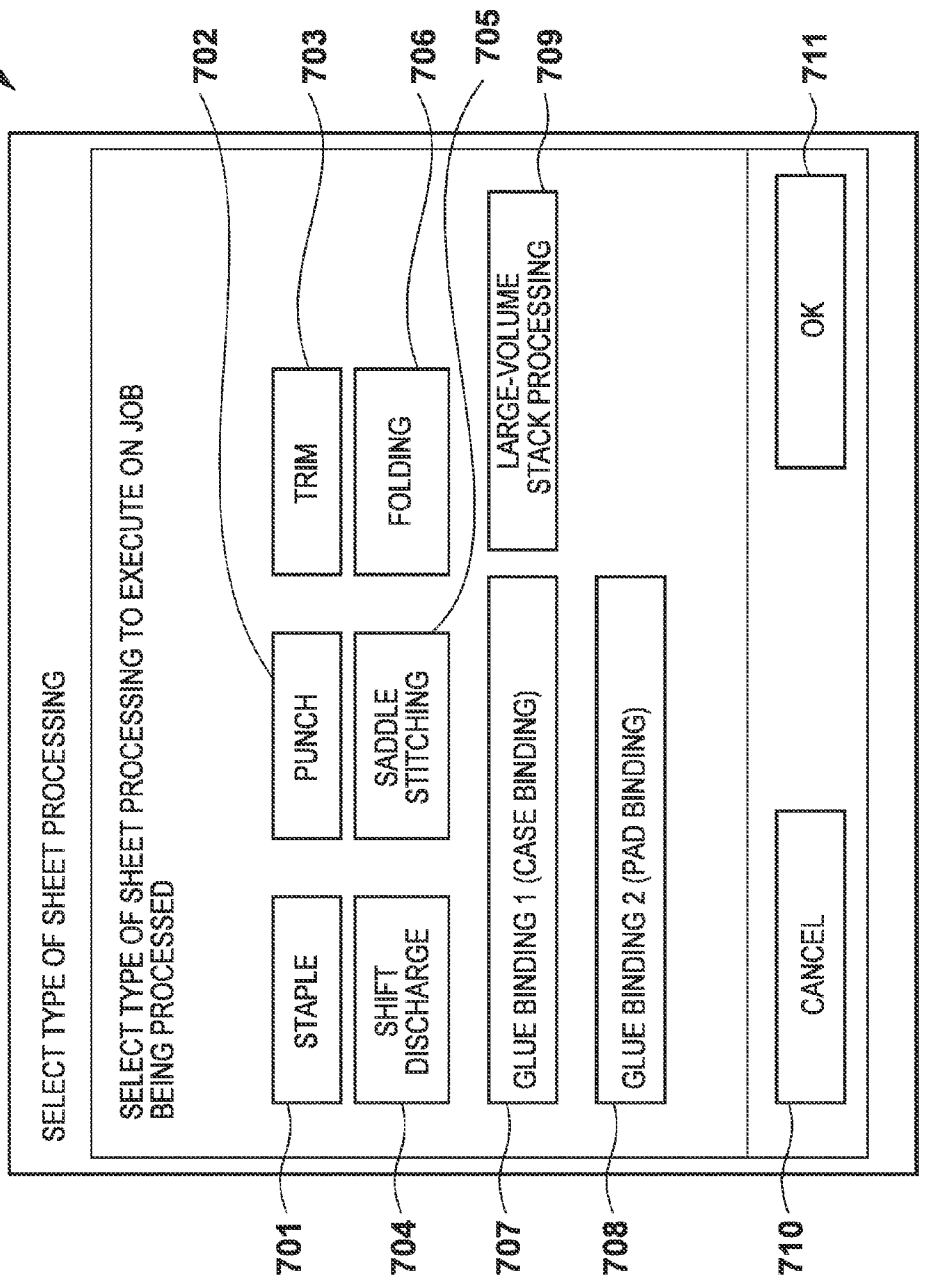

700
SELECT TYPE OF SHEET PROCESSING
SELECT TYPE OF SHEET PROCESSING TO EXECUTE ON JOB BEING PROCESSED
STAPLE
PUNCH
TRIM
LARGE-VOLUME STACK PROCESSING
SHIFT DISCHARGE
SADDLE STITCHING
FOLDING
GLUE BINDING 1 (CASE BINDING)
GLUE BINDING 2 (PAD BINDING)
CANCEL
OK
701
702
703
704
705
706
707
708
709
710
711

FIG. 7

FIG. 8

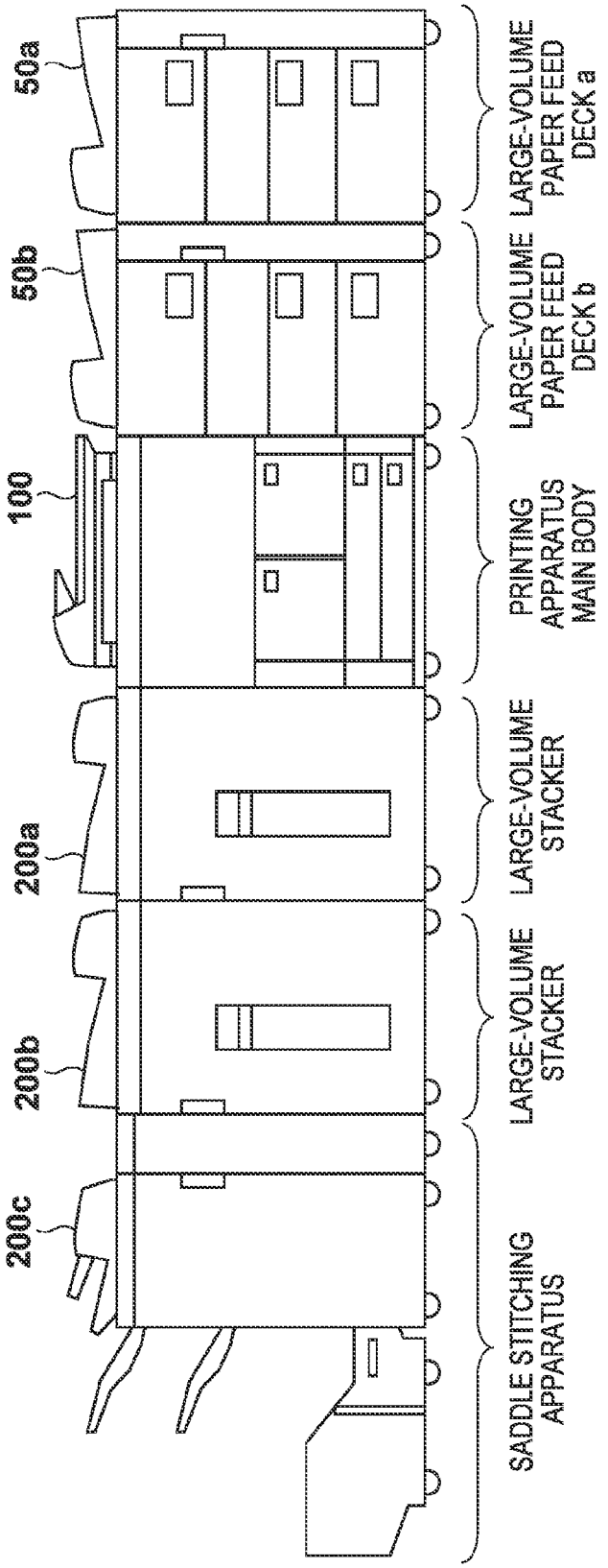

50a
50b
100
200a
200b
200c
LARGE-VOLUME PAPER FEED DECK a
LARGE-VOLUME PAPER FEED DECK b
PRINTING APPARATUS MAIN BODY
LARGE-VOLUME STACKER
LARGE-VOLUME STACKER
SADDLE STITCHING APPARATUS

FIG. 9

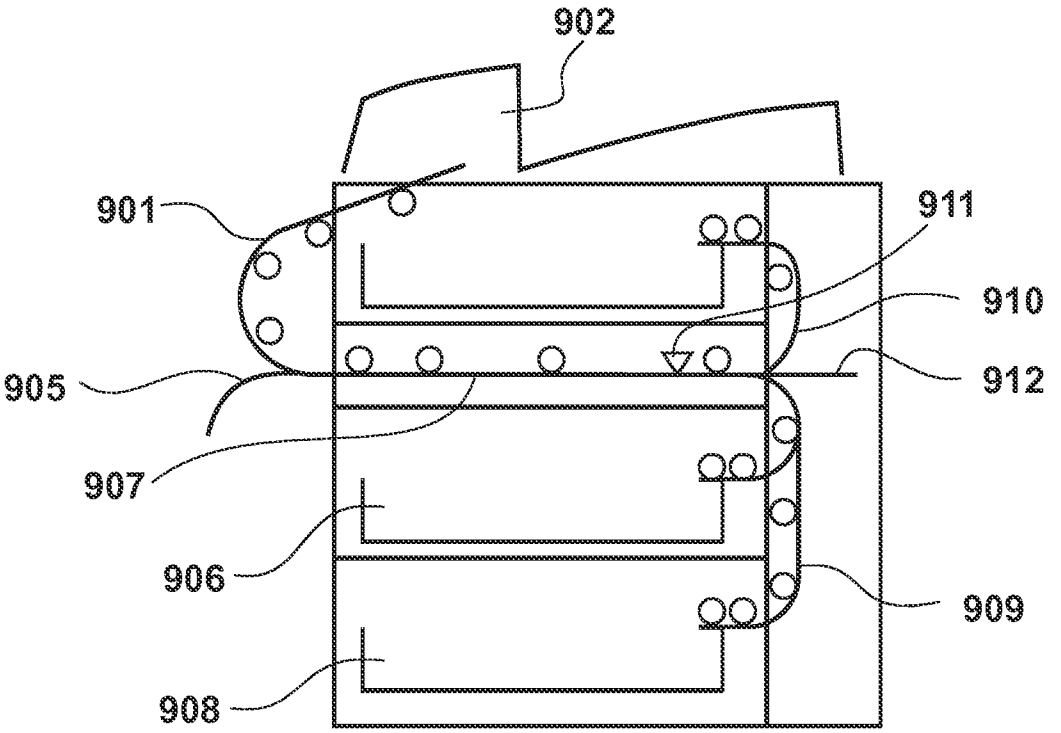


FIG. 10

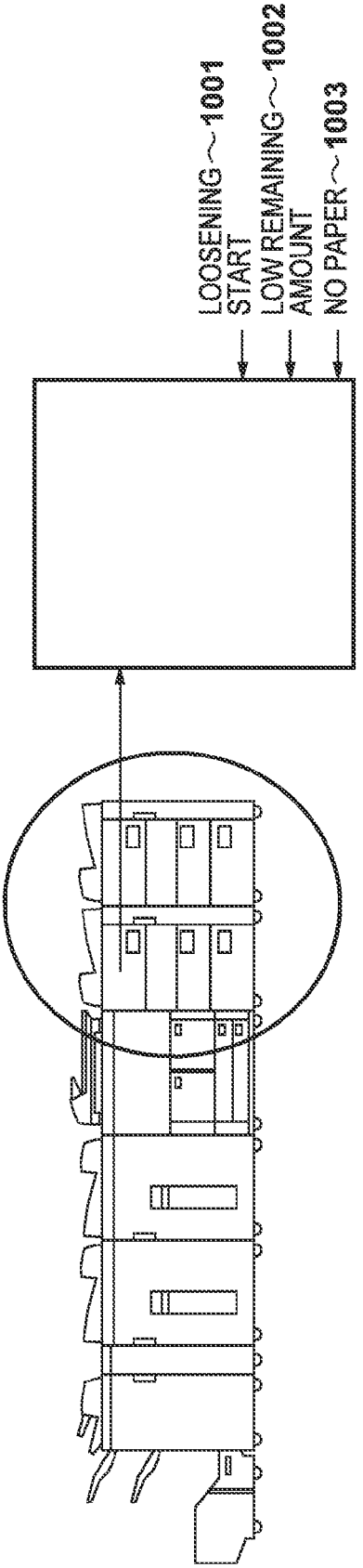

LOOSENING START 1001
LOW REMAINING AMOUNT 1002
NO PAPER 1003

FIG. 11

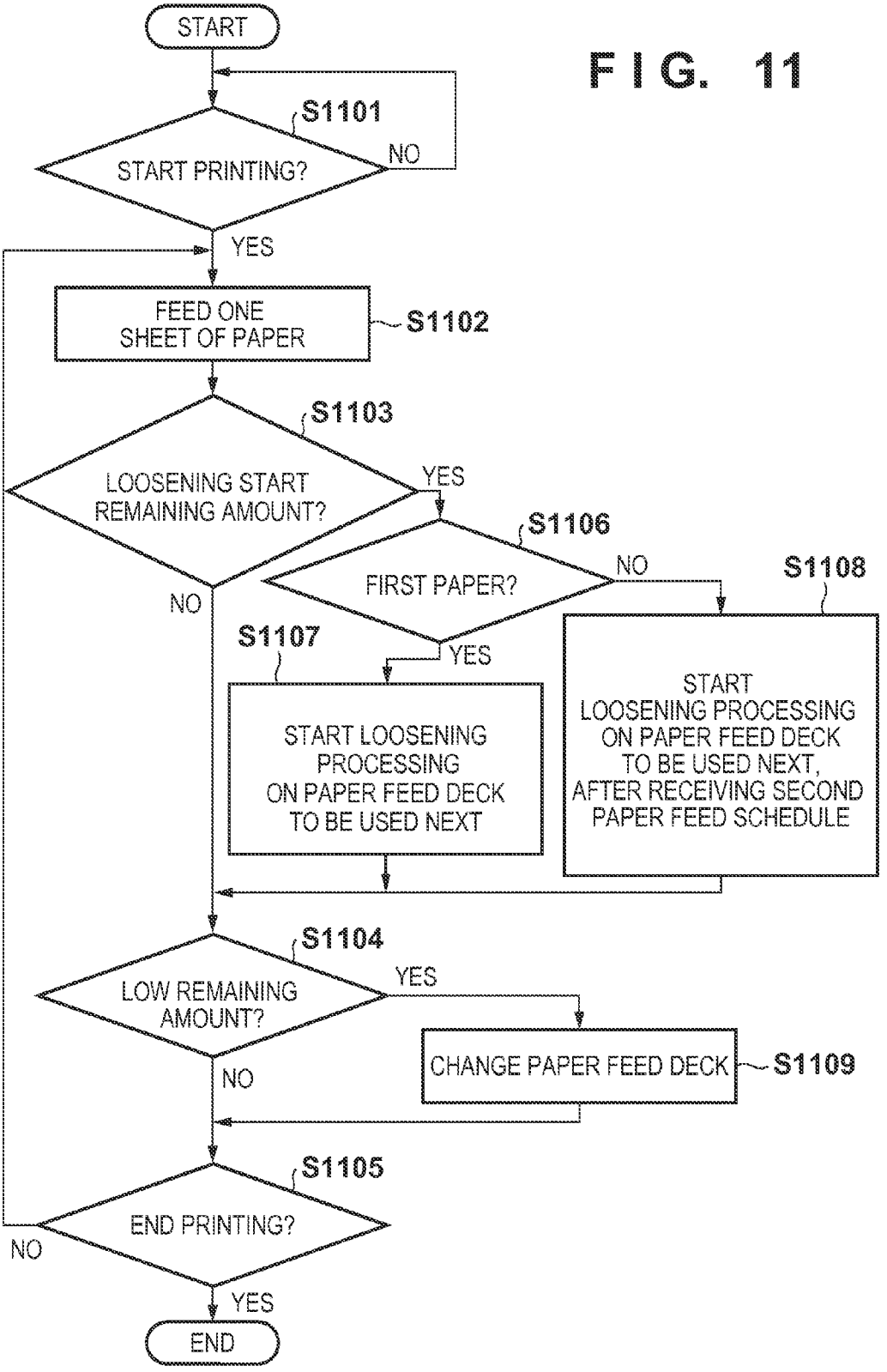
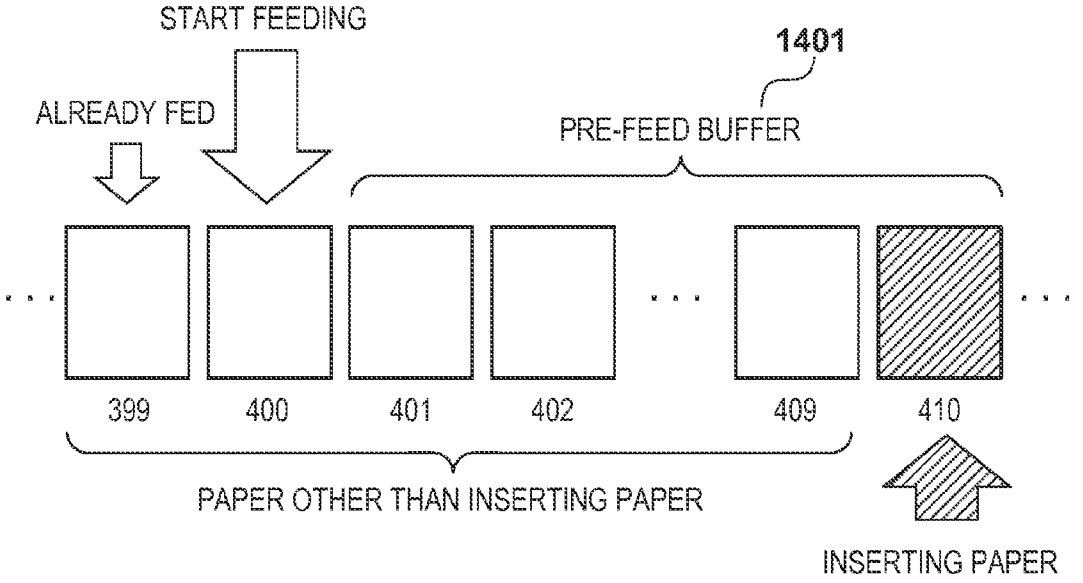

START
S1101
START PRINTING?
NO
YES
FEED ONE SHEET OF PAPER
S1102
S1103
LOOSENING START REMAINING AMOUNT?
YES
NO
S1106
FIRST PAPER?
NO
YES
S1107
START LOOSENING PROCESSING ON PAPER FEED DECK TO BE USED NEXT
S1108
START LOOSENING PROCESSING ON PAPER FEED DECK TO BE USED NEXT, AFTER RECEIVING SECOND PAPER FEED SCHEDULE
S1104
LOW REMAINING AMOUNT?
YES
NO
CHANGE PAPER FEED DECK
S1109
S1105
END PRINTING?
NO
YES
END

FIG. 12


START FEEDING
1401
ALREADY FED
PRE-FEED BUFFER
399
400
401
402
409
410
PAPER OTHER THAN INSERTING PAPER
INSERTING PAPER

PRINTING APPARATUS, METHOD FOR CONTROLLING SAME, AND STORAGE MEDIUM

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a printing apparatus, a method for controlling this apparatus, and a storage medium.

[0003] 2. Description of the Related Art

[0004] Japanese Patent Laid-Open No. 2008-222399 discloses a paper feed apparatus including an air paper feed mechanism that can stand up to large-volume printing and high-speed printing in a printing apparatus. This paper feed apparatus has an air paper feed mechanism, which is a mechanism for feeding paper by sending in air, and allows for high-speed paper feed. More specifically, in a printing apparatus, air is blown from the upper side of the paper stacked in the paper feed apparatus, which causes the top few sheets of paper to float up (loosen). After this, the printing apparatus uses a suction unit provided above the sheets of paper to pick up one sheet and feed it at the timing at which the paper is actually supposed to be fed.

[0005] However, the following problems were encountered in the prior art. Paper includes a first paper that is used frequently, and a second paper that is not used very often. For example, when executing a job that calls for inserting paper (inserting paper, slip sheets, etc.), paper used for the body corresponds to the first paper that is fed frequently, while the inserting paper corresponds to the second paper that is not used that often. With regard to the second paper, a long time may pass from the start of air blowing until the second paper is actually fed. This is because, after the air blowing is commenced, the first paper is fed continuously, during which time no second paper is fed.

[0006] In a case such as this, air ends up being blown at the second paper for a long time until the second paper is actually fed, and this dries out the second paper. This drying of the second paper can adversely affect toner fixability during printing on the second paper.

SUMMARY OF THE INVENTION

[0007] The present invention enables realization of preventing air from being blown onto sheets for a long period of time while smoothly switching sheet storage units having an air paper feed mechanism.

[0008] One aspect of the present invention provides a printing apparatus, comprising: a first sheet storage unit that stores a first type of sheets; a second sheet storage unit that stores a second type of sheets; a reception unit that receives a job in which the first type of sheets and the second type of sheets are used; a switching unit that switches the sheet storage unit that is used, from the sheet storage unit currently in use to another sheet storage unit holding the same type of sheets as the sheet storage unit currently in use, when the remaining amount of sheets in the sheet storage unit currently in use reaches a predetermined amount during the execution of the job; and a control unit that controls the timing at which blowing of air into the sheets held in the other sheet storage unit is started, so as to vary this timing depending on whether the type of sheets held in the sheet storage unit currently in use or in the other sheet storage unit is the first type of sheets or the second type of sheets.

[0009] Another aspect of the present invention provides a method for controlling a printing apparatus having a first sheet storage unit that stores a first type of sheets and a second sheet storage unit that stores a second type of sheets, the method comprising the steps of: using a reception unit to receive a job in which the first type of sheets and the second type of sheets are used; using a switching unit to switch the sheet storage unit that is used from the sheet storage unit currently in use to another sheet storage unit that holds the same type of sheets as the sheet storage unit currently in use, when the remaining amount of sheets in the sheet storage unit currently in use reaches a predetermined amount during the execution of the job; and using a control unit to control the timing at which blowing of air into the sheets held in the other sheet storage unit is started, so as to vary this timing depending on whether the type of sheets held in the sheet storage unit currently in use or in the other sheet storage unit is the first type of sheets or the second type of sheets.

[0010] Still another aspect of the present invention provides a computer-readable storage medium storing a computer program for executing on a computer the steps in the method for controlling a printing apparatus.

[0011] Further features of the present invention will be apparent from the following description of exemplary embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. **1** is a diagram illustrating an overall configuration example of a printing environment including a printing system according to an embodiment;

[0013] FIG. **2** is a diagram illustrating a configuration example of the printing system according to this embodiment;

[0014] FIG. **3** is a diagram illustrating a configuration example of the printing system according to this embodiment;

[0015] FIG. **4** is a diagram illustrating an example of a user interface unit according to this embodiment;

[0016] FIG. **5** is a diagram illustrating an example of the user interface unit according to this embodiment;

[0017] FIG. **6** is a diagram of an example of display control with respect to the user interface unit according to this embodiment;

[0018] FIG. **7** is a diagram of an example of display control with respect to the user interface unit according to this embodiment;

[0019] FIG. **8** is a diagram illustrating a configuration example of the printing system according to this embodiment;

[0020] FIG. **9** is a diagram illustrating an internal configuration example of a large-volume paper feed deck according to this embodiment;

[0021] FIG. **10** is a diagram illustrating feed deck switching processing depending on the remaining amount of the large-volume paper feed deck according to this embodiment;

[0022] FIG. **11** is a flowchart of an example of controlling the printing system according to this embodiment; and

[0023] FIG. **12** is a diagram illustrating an example of a printing job according to this embodiment.

DESCRIPTION OF THE EMBODIMENTS

[0024] Embodiments of the present invention will now be described in detail with reference to the drawings. It should be

noted that the relative arrangement of the components, the numerical expressions and numerical values set forth in these embodiments do not limit the scope of the present invention unless it is specifically stated otherwise.

[0025] Configuration of Printing System and Printing Environment

[0026] An embodiment according to the present invention will now be described through reference to FIGS. **1** to **12**. In this embodiment we will assume a printing environment that is different from an office environment, such as a POD environment. Therefore, the system environment for the entire site of a POD environment (a printing environment **10000** in FIG. **1**) including a printing system **1000** of this embodiment will be described here. This printing environment itself is also a feature of this embodiment, but this embodiment is not intended to limit the present invention to this printing environment. In this embodiment the printing environment **10000** to which the printing system **1000** can be applied is also suited to a POD environment, and will therefore be termed the POD system **10000**.

[0027] The POD system **10000** shown in FIG. **1** has the printing system **1000** of this embodiment, a server computer **103**, a client computer **104** (hereinafter referred to as a PC), a sheet folding apparatus **107**, a sheet cutting apparatus **109**, a saddle stitching apparatus **110**, a case binding apparatus **108**, and a scanner **102**. Thus, a plurality of apparatuses are readied for the POD system **10000**. The printing system **1000** also has a printing apparatus main body **100** and a sheet processing apparatus **200**. A multifunction device equipped with a plurality of functions, such as a copy function and a PC print function, is described in this embodiment as an example of the printing apparatus **100**, but a single-function printing apparatus having only a PC print function or a copy function may be used instead. A multifunction device will hereinafter be referred to as an MFP (multifunction peripheral).

[0028] In this embodiment, the sheet folding apparatus **107**, the sheet cutting apparatus **109**, the saddle stitching apparatus **110**, and the case binding apparatus **108** shown in FIG. **1** are defined as sheet processing apparatuses, just as with the sheet processing apparatus **200** of the printing system **1000**. This is because they are devices capable of executing sheet processing on the job sheets printed with the printing apparatus **100** of the printing system **1000**. For example, the sheet folding apparatus **107** executes folding processing for the job sheets printed with the printing apparatus **100**. The sheet cutting apparatus **109** executes cutting processing for sheets printed with the printing apparatus **100**, in sheet bundle units made up of a plurality of sheets. The saddle stitching apparatus **110** executes saddle stitching processing on job sheets printed with the printing apparatus **100**. The case binding apparatus **108** executes case binding processing on job sheets printed with the printing apparatus **100**. However, to execute the various sheet processing steps with these sheet processing apparatuses, it is necessary for an operator to retrieve the printed matter printed with the printing apparatus **100** from a paper discharge unit of the printing apparatus **100**, and to place this printed matter in the sheet processing apparatus that will be doing the processing.

[0029] Therefore, when using a sheet processing apparatus other than the sheet processing apparatus **200** with which this printing system **1000** is itself equipped, this will require the operator to intervene with work after the print processing by the printing apparatus **100**. In other words, when sheet processing entailed by a job printed by the printing apparatus **100** is executed by utilizing the sheet processing apparatus **200** with which this printing system **1000** is itself equipped, there is no need for the operator to intervene with work after the execution of print processing by the printing apparatus **100**. This is because the configuration is such that sheets printed with the printing apparatus **100** can be directly supplied (conveyed) from the printing apparatus **100** to the sheet processing apparatus **200**.

[0030] More specifically, a sheet conveyance path inside the printing apparatus **100** is linked to a sheet conveyance path inside the sheet processing apparatus **200**. Thus, the printing apparatus **100** and the sheet processing apparatus **200** with which this printing system **1000** is itself equipped are in a relation of being physically connected to one another. Also, the printing apparatus **100** and the sheet processing apparatus **200** are each equipped with a CPU and are able to exchange data back and forth. Thus, the printing apparatus **100** and the sheet processing apparatus **200** are in a relation of being electrically connected to one another.

[0031] Printing System Control Configuration

[0032] Next, the control configuration for this printing system **1000** will be described through reference to FIG. **2**. In this embodiment, of the various units shown in FIG. **2** and provided to the printing system **1000**, those units other than the sheet processing apparatus **200** (that is, a group of a series of sheet processing apparatuses that can be made up of a plurality of inline sheet processing apparatuses) are all provided to the printing apparatus **100**. In other words, the sheet processing apparatus **200** is a sheet processing apparatus that can be mounted to and removed from the printing apparatus **100**, and is designed to be configured as an option to the printing apparatus **100**. Consequently, in a POD environment, the effect is that, for example, a necessary number of required inline finishers can be provided. Therefore, the following configuration is adopted.

[0033] The printing apparatus **100** includes a scanner unit **201**, an external interface **202**, a printer unit **203**, a manipulation unit **204**, a control unit **205**, a ROM **207**, a RAM **208**, a hard disk drive (HDD) **209**, and a compressor/expander **210**. The printing apparatus **100** is connected to a plurality of sheet processing apparatuses **200** and a plurality of sheet feed apparatuses **50** (a first sheet storage unit, a second sheet storage unit, etc.). The printing apparatus **100** is equipped with a printing function for printing job data accepted from the scanner unit **201** or job data accepted from the PCs **103** and **104** or other such external apparatuses via the external interface **202**, with the printer unit **203** via the HDD. The printing apparatus **100** is an MFP type of printing apparatus thus equipped with a plurality of functions. The printing apparatus of this embodiment may have any configuration so long as it is capable of executing the various controls discussed in this embodiment, and may be either a printing apparatus capable of color printing or a printing apparatus capable of monochromatic printing.

[0034] The scanner unit **201** reads an original image and subjects the image data thus read to image processing. The external interface **202** sends and receives image data and the like to and from a facsimile, a networked device, or a dedicated external apparatus. The HDD **209** stores image data for a plurality of print jobs accepted from the scanner unit **201** and/or the external interface **202**. The printer unit **203** subjects a printing medium to print processing of data for a print job stored in the HDD **209**. The manipulation unit **204** has a display unit and corresponds to an example of a user interface

unit provided to this printing system **1000**. Another example of a user interface unit provided to this printing system **1000** is a keyboard, mouse, etc., and a display unit of an external apparatus such as the PCs **103** and **104**.

[0035] The control unit (CPU) **205**, which is an example of a control unit provided to this printing system **1000**, comprehensively controls the processing, operation, and so forth of the various units with which this printing system **1000** is equipped. Various kinds of control programs needed in this embodiment are stored in the ROM **207**. The ROM **207** also stores a display control program for displaying various kinds of user interface screens on the display unit of the manipulation unit **204**, including the user interface screen shown in the drawings.

[0036] The control unit **205** reads and executes the programs in the ROM **207**, so that the various operations described in this embodiment will be executed by this printing apparatus. A program or the like for interpreting PDL (page description language) code data received from an external apparatus (**103** or **104**, etc.) via the external interface **202**, and executing an operation to develop raster image data (bitmap image data) is also stored in the ROM **207**. The ROM **207** is a read-only memory, and various kinds of programs, such as the above-mentioned programs or programs for boot sequence, font information, and so forth, are stored ahead of time. The RAM **208** is a readable and writable memory, and stores setting information, various kinds of programs, and image data sent from the scanner unit **201** or the external interface **202** via a memory controller (not shown).

[0037] The HDD (hard disk) **209** is a large-capacity storage apparatus that stores image data compressed by the compressor/expander **210**. This HDD **209** is configured so that it can hold a plurality of sets of data, such as print data for the job to be processed. The control unit **205** performs control so that the data for the job to be processed, inputted through the scanner unit **201**, the external interface **202**, or any of various other input units, can be printed by the printer unit **203** through the HDD **209**. The control unit **205** also performs control so that data can be sent to an external apparatus through the external interface **202**. Thus, various kinds of output processing of data for the job to be processed, which is stored on the HDD **209**, are controlled by the control unit **205** so as to be executable. The compressor/expander **210** compress and expand image data and so forth stored in the RAM **208** and the HDD **209**, by various compression formats, such as JBIG or JPEG. Based on the above configuration, the control unit **205** also controls the operation of the inline sheet processing apparatuses **200**, as illustrated in FIG. **1**.

[0038] Apparatus Configuration of Printing System (Mainly Mechanism Configuration)

[0039] Next, the configuration (mainly the mechanism configuration) of this printing system **1000** will be described through reference to FIG. **3**. As discussed above, with this printing system **1000**, a plurality of inline sheet processing apparatuses can be connected in a cascade to the printing apparatus **100**. Any number of the inline sheet processing apparatuses that can be connected to the printing apparatus **100** can be installed, according to the environment in which they will be used, to improve the effect of this embodiment, under certain restrictions.

[0040] Therefore, to make the description clearer, in FIGS. **2** and **3** we will assume that N-number of the sheet processing apparatuses **200** can be connected as a group of a series of sheet processing apparatuses. Starting from the first sheet processing apparatus, these are numbered as sheet processing apparatuses **200***a*, **200***b*, and so on, with the N-th sheet processing apparatus numbered as the sheet processing apparatus **200***n*. As shown in FIG. **3**, the printing apparatus **100** according to this embodiment can be connected to sheet feed apparatuses **50***a* to **50***n* that feed sheets to the printing apparatus **100**, and to the sheet processing apparatuses **200***a* to **200***n*, which are post-processing apparatuses that perform processing on the sheets after the printing apparatus **100**. The number of inline sheet processing apparatuses connected can be determined as needed, such as connecting three or five apparatuses. Naturally, a POD environment in which a manager decides that an inline sheet processing apparatus is unnecessary because it improves the utilization efficiency of offline sheet processing apparatuses is also assumed. For example, the printing apparatus **100** of this embodiment can of course be utilized even when no inline sheet processing apparatus is used.

[0041] Also, when a plurality of inline sheet processing apparatuses are cascade connected to the printing apparatus **100**, for example, the order in which these sheet processing apparatuses are connected can be varied and decided arbitrarily by a certain user, such as the manager, within a restricted range. The above configuration, however, is one intended to improve user convenience, so it is not necessarily an essential condition. In other words, the present invention should not be interpreted as being restricted to this configuration. As an example, this system configuration may be one in which the number of inline sheet processing apparatuses that can be used with this printing system **1000**, and the order in which these apparatuses are connected, are limited indiscriminately. As long as at least one of the various job controls can be executed, all system configurations and apparatus configurations are encompassed by the present invention.

[0042] Configuration of Manipulation Unit

[0043] Next, the manipulation unit **204**, which corresponds to an example of a user interface unit provided to the printing apparatus **100** of this printing system **1000**, will be described through reference to FIGS. **4** to **6**. The manipulation unit **204** includes a key input unit **402** that can be manipulated by the user with hard keys, and a touch panel unit **401**, which is an example of a display unit that can be manipulated by the user with soft keys (display keys).

[0044] As shown in FIG. **5**, the key input unit **402** is equipped with a manipulation unit power switch **501**. The control unit **205** controls the system so as to selectively switch between standby mode and sleep mode in response to user operation of the manipulation unit power switch **501**. Standby mode is the normal operating state, and sleep mode is a state in which programs are stopped in an interrupt waiting state to prepare for network printing, facsimile, and so forth, and power consumption is thereby reduced. The control unit **205** controls the system so that user operation of the manipulation unit power switch **501** can be accepted when a main power switch (not shown) that supplies power to the entire system is in its on state.

[0045] A start key **503** is used to allow the user to input a command to the printing apparatus to start job processing of the type directed by the user, such as a transmission operation or the copying of a job that is to be processed. A stop key **502** is used to allow the user to input a command to the printing apparatus to stop the processing of an accepted job. A keypad **506** is used to allow the user to set numerical values for various kinds of setting. A clear key **507** is used to clear

various parameters, such as the numerical values set by the user via the keypad **506**. A reset key **504** nullifies all of the various settings made by the user for the job being processed, and allows a command to return the set values to their default state to be accepted from the user. A user mode key **505** is used to change the system setting screen for each user.

[0046] FIG. **6** is a touch panel unit (hereinafter referred to as a display unit) **401** corresponding to an example of a user interface provided by this printing system. The display unit **401** comprises an LCD (liquid crystal display unit) and a touch panel display composed of transparent electrodes affixed over this LCD. The display unit **401** has both the function of receiving various settings from the operator, and the function of presenting information to the operator. For example, when it is detected that the user has pressed a place on the LCD corresponding to a display key in an active display state, the control unit **205** allows the display of a manipulation screen corresponding to key operation on the display unit **401**, according to a display control program stored ahead of time in the ROM **207**. FIG. **6** is an example of the initial screen displayed on the display unit **401** when the printing apparatus **100** is in standby mode (a state in which no job is supposed to be processed by the printing apparatus).

[0047] When a copy tab **601** on the display unit **401** shown in FIG. **6** is pressed by the user, the control unit **205** displays on the display unit **401** a manipulation screen of the copy functions comprised by this printing apparatus. When a send tab **602** is pressed by the user, the control unit **205** displays on the display unit **401** a manipulation screen of the data send functions, such as fax and email transmission, comprised by the printing apparatus **100**. When a box tab **603** is pressed by the user, the control unit **205** displays on the display unit **401** a manipulation screen of the box functions comprised by this printing apparatus.

[0048] A box function is a function that makes use of a plurality of data memory boxes (hereinafter referred to as "boxes") that can be utilized independently for each user, and which are virtually provided ahead of time to the HDD **209**. With this function, the control unit **205** allows the user to select the box desired by the user, out of a plurality of boxes, via the user interface unit, and allows the desired manipulation to be accepted from the user. For example, the control unit **205** controls the system so that text data for the job accepted from the scanner unit **201** of this printing apparatus is stored on the HDD **209**, for the box selected by the user, in response to a user directive inputted through the manipulation unit **204**. Also, text data for a job from an external apparatus (such as the PC **103** or **104**) accepted via the external interface **202** can also be stored in the box designated by the user, according to a user directive for the external apparatus designated through the user interface unit of the external apparatus. Also, the control unit **205** causes the printer unit **203** to print the job data stored in the box, in the output form desired by the user, according to a user directive from the manipulation unit **204**. The control unit **205** also sends the job data stored in the box to an external apparatus, in the output form desired by the user, according to a user directive from the manipulation unit **204**.

[0049] To allow the user to carry out these various box manipulations, the control unit **205** controls the system so as to enable the display of a manipulation screen for the box functions on the display unit **401** in response to pressing of the box tab **603** by the user. Also, when the user has pressed an expansion tab **604** on the display unit **401** in FIG. **6**, the control unit **205** displays on the display unit **401** a screen for setting expansion functions, such as scanner settings. When a system monitor key **617** is pressed by the user, a display screen for notifying the user of the MFP state or situation is displayed on the display unit **401**.

[0050] A color selection setting key **605** is a display key used to enable the user to select ahead of time between color copy, black and white copy, and auto select. A zoom ratio setting key **608** is used to display on the display unit **401** a setting screen that allows the user to carry out zoom ratio settings, such as same size, expanded size, and reduced size.

[0051] When a double-side key **614** is pressed by the user, the control unit **205** displays on the display unit **401** a screen that allows the user to set whether to print on one side or on both sides by the print processing of the job to be printed. When a paper selection key **615** is pressed, the control unit **205** displays on the display unit **401** a screen that allows the user to set the paper feeder required for the print processing of the job to be printed, the size of the paper (sheet size), and the type of paper (sheet type, media type). When the user presses a key **612**, the control unit **205** displays on the display unit **401** a screen that allows the user to select the image processing mode suited to the original image, such as character mode or photograph mode. When the user presses a density setting key **611**, the control unit **205** adjusts the contrast of the output image for the job being printed.

[0052] Also, the control unit **205** executes a display that allows the user to confirm the operating state of the event that is currently underway in the printing apparatus **100**, such as standby state, warming up, printing, jammed, error, etc., in a status display area **606** of the display unit **401**. Information that allows the user to confirm the print zoom ratio of the job being processed is displayed in a display area **607**. Information that allows the user to confirm the paper feed mode or the size of the paper for the job being processed is displayed in a display area **616**. Information that allows the user to confirm the number of sets to be printed for the job being processed, or information that allows the user to confirm how many sheets have been printed during a print operation is displayed in a display area **610**. Thus, the control unit **205** displays on the display unit **401** various kinds of information to be conveyed to the user.

[0053] When the user presses an interrupt key **613**, the control unit **205** stops the printing of the job being printed by the printing apparatus **100**, and enables execution of the printing of the job of the corresponding user. When an application mode key **618** is pressed, the control unit **205** displays on the display unit **401** a screen for setting various kinds of image processing, layouts, etc., such as page consecutive copying, setting the cover and inserting paper, reduced layout, and image movement.

[0054] Display Control

[0055] An example of display control related to sheet processing with the manipulation unit **204** will now be described. The control unit **205** causes display for enabling requests to execute sheet processing by the sheet processing apparatuses **200** to be accepter from the user to be executed by the user interface unit, as the setting for the job being processed. A display that enables the directive for causing this display to be executed by the user interface unit to be accepted itself from the user is also executed by the user interface unit. For example, the control unit **205** displays a sheet processing setting key **609** seen in FIG. **6** on the display unit **401**. When this sheet processing setting key **609** is pressed by the user, the

control unit **205** causes the display unit **401** to execute a display that allows the sheet processing desired by the user, from among the sheet processing selection candidates that can be executed using the sheet processing apparatus, to be specified by the user himself/herself.

[0056] For example, in this embodiment, the display of the screen shown in FIG. **7** on the display unit **401** is executed in response to the pressing of the sheet processing setting key **609** by the user. The control unit **205** controls the system to enable acceptance of a request to execute the sheet processing that is supposed to be executed by the sheet processing apparatuses **200** on the sheets printed in the job being processed, via the display in FIG. **7**. The control unit **205** determines candidates for sheet processing apparatuses that can be selected via the display in FIG. **7** according to what kind of sheet processing apparatuses the printing system **1000** is equipped with. For example, with the display in FIG. **7**, it is permitted to accept from the user a request to execute certain types of sheet processing, out of the plurality of types of sheet processing listed below, for the sheets printed by the printer unit **203**.

[0057] In the user interface control in FIG. **7**, the control unit **205** controls the manipulation unit **204** so that a plurality of types of sheet processing can be selected. The reason for this is that utilizing the inline sheet processing apparatuses with which the printing system **1000** is equipped allows these nine types of sheet processing to be selectively executed.

[0058] In other words, the user interface unit is controlled so that sheet processing corresponding to the types that cannot be executed by the printing system **1000** will not become candidates for selection in the display in FIG. **7**. For example, if the printing system **1000** is not equipped with a single sheet processing apparatus capable of selectively executing processing for case binding or pad binding, or if such apparatus is malfunctioning, keys **707** and **708** are controlled so that they cannot be selected. For example, the control unit **205** executes a grayed out display or other such shaded display. Consequently, no request to execute this sheet processing is accepted from the user. That is, if the printing system **1000** is equipped with a sheet processing apparatus capable of executing a different type of sheet processing other than the above-mentioned nine candidates, the display key for enabling the acceptance of the request to execute this sheet processing is put in an active display state in the display in FIG. **7**. Consequently, it is permitted to accept a request to execute this sheet processing from the user. Display control such as this also prevents accidental operation by the user, by allowing execution along with job processing control in this embodiment.

[0059] Also, by executing this control, the control unit **205** acquires system configuration information identifying what kind of sheet processing apparatuses the printing system **1000** is equipped with as the sheet processing apparatuses **200**. Furthermore, status information and so forth identifying whether or not an error has occurred in these sheet processing apparatuses **200**, etc., is also utilized in the above-mentioned control. The control unit **205** acquires this information by manual input from the user through the user interface unit, for example, or it is automatically acquired on the basis of signals outputted by the apparatuses themselves through signal lines when the sheet processing apparatuses **200** are connected to the printing apparatus **100**. Premised on this configuration, the control unit **205** causes the display unit **401** to execute the display in FIG. **7**, using a display content based on the information thus acquired.

[0060] The printing system **1000** is configured so as to be able to accept requests to print the job being processed, and requests to execute sheet processing required by this job, from the PCs **103** and **104** or other such external apparatus. When a job thus comes in from an external apparatus, the system is controlled so as to cause the display unit of the external apparatus that sent the print data to execute display of the same functions as in the display in FIG. **7**. As an example of this, a printer driver setting screen is displayed on the display unit of a computer such as the PC **103** or the PC **104** as discussed below. When display is thus executed by the user interface of an external apparatus, the control unit of the apparatus executes the above-mentioned control. For instance, when a printer driver user interface screen, which will be discussed below, is displayed on the display unit of the PC **103** or the PC **104**, most of the control is performed by the CPU of that PC.

[0061] Configuration of Large-Volume Paper Feed Deck

[0062] Next, an example of the configuration of the large-volume paper feed deck serving as the sheet feed apparatus **50** will be described through reference to FIGS. **8** and **9**. FIG. **8** shows an example of the configuration of the printing system **1000**. As shown in FIG. **8**, the printing apparatus **100** is connected to large-volume paper feed decks **50***a* and **50***b* that supply sheets. FIG. **9** is a cross section of an example of the configuration of the large-volume paper feed deck **50***a*.

[0063] The large-volume paper feed deck **50***a* is broadly divided into five sheet conveyance paths. More specifically, these conveyance paths include a buffer path **905** (which is the conveyance path to the printing apparatus **100**), an escape path **901**, an upper vertical path **910**, a lower vertical path **909**, and a cascade path **912**. These five sheet conveyance paths are provided internally.

[0064] The cascade path **912** is a conveyance path for receiving sheets from a previous apparatus. The upper vertical path **910** is a conveyance path for conveying sheets fed from an upper cassette deck **903**. The lower vertical path **909** is a conveyance path for conveying sheets fed from a middle cassette deck **906** and a lower cassette deck **908**. The straight path **907** shown in FIG. **9** is a sheet conveyance path for sending sheets received from the upper vertical path **910** and the lower vertical path **909** on to a subsequent apparatus. With this unit, sheets fed from something other than the sheet processing apparatuses are conveyed through the cascade path **912** from the upstream apparatus to the downstream apparatus.

[0065] The escape path **901** is used when paper is discharged instead of being conveyed to a downstream apparatus. For example, when a jam occurs in a subsequent sheet processing apparatus, or when multiple feed of sheets is detected by a multiple feed detecting sensor **911**, sheets are conveyed to the escape path **901** and discharged from an escape tray **902**. A plurality of sheet detecting sensors required to detect jams or multiple feed of sheets, or the sheet conveyance situation, are provided to the sheet conveyance path inside these large-volume paper feed decks. The term "multiple feed" as used in this embodiment means that at least parts of two or more sheets being processed by the printing system **1000** (called printing media or recording media) are conveyed in a state of overlapping over the sheet conveyance path inside the printing system **1000**.

[0066] A CPU, which is not shown, inside the large-volume paper feed deck sends the control unit **205** sheet detection information from these sensors via signal lines for data communication with the control unit **205** (the signal lines that put the sheet feed apparatuses **50** and the control unit **205** in an electrically connected relation in FIG. **2**). The control unit **205** ascertains the sheet conveyance situation or the occurrence of a jam inside a large-volume paper feed deck on the basis of this information from the large-volume paper feed deck. As to the system configuration of this printing system **1000**, we can also imagine a case in which another sheet feed apparatus is cascade connected between the sheet feed apparatuses **50** and the printing apparatus **100**. In this case, information from the sensors of this large-volume paper feed deck is sent to the control unit **205** via the CPU of the above-mentioned other sheet feed apparatus.

[0067] The escape tray **902** is a stacking unit in which sheets conveyed from the escape path **901** are stacked. This escape tray **902** is provided with sensors for detecting that the tray is full of sheets, and the CPU, which is not shown, inside the large-volume paper feed deck sends the control unit **205** output information from the sensor. The control unit **205** ascertains stacking information about the sheets in the escape tray **902** on the basis of this information from the large-volume paper feed deck.

[0068] The large-volume paper feed deck has the upper cassette deck **903**, the middle cassette deck **906**, and the lower cassette deck **908** (which can hold **1000** sheets, for example) as paper feed units that store the sheets required for print processing. Each of the paper feed units can store sheets of various sizes and materials, and has a curl correcting function, an air heater function, and a loosening fan function. With the air heater function, a heater is turned on depending on the humidity inside the cassette and on material information about the sheets sent from the control unit **205**. The loosening fan function adjusts the amount of air flow of a sheet suction fan. The curl correcting function allows the sheets to be corrected for positive curl (bulging downward) and reverse curl (bulging upward). The large-volume paper feed deck **50***b* has the same configuration, so it will not be described in detail.

[0069] Paper Feed Stage Switching

[0070] Next, the processing for paper feed stage switching in the large-volume paper feed decks will be described through reference to FIGS. **10**. **1001** to **1003** indicate the remaining amounts of paper in various states within the large-volume paper feed deck.

[0071] The loosening start remaining amount **1001** indicates the remaining amount that serves as the reference for starting loosening processing in the paper feed deck to be used next. The low remaining amount **1002** indicates the remaining amount that serves as the reference for changing the paper feed deck being used to the paper feed deck candidate to be used next. The "paper feed deck to be used next" here refers to a paper feed deck in which has been placed paper of the same size as that in the paper feed deck used previously. The control unit **205** recognizes a paper feed deck in which has been placed paper of the same size as that in the paper feed deck used previously, and designates said paper feed deck as the paper feed deck candidate to be used next. A paper feed deck in which has been placed paper of the same size and the same type may be chosen as the paper feed deck to be used next.

[0072] With a conventional printing system, the air loosening of the paper feed deck to be used next is started when the remaining amount of paper reaches the loosening start remaining amount **1001**, regardless of the type of paper placed in the paper feed cassette in use.

[0073] With a printing system such as this, problems are encountered when the paper that is fed in the execution of a job includes paper that is fed frequently (first paper) and paper that is not fed very often, such as inserting paper, slip sheets, or other such inserting paper (second paper).

[0074] It takes longer for the second paper to be actually fed after the start of air blowing. This is because after the air blowing is started, the feed of first paper continues until the remaining amount of the paper feed deck holding the second paper reaches the low remaining amount **1002**, and during this time the second paper is not fed.

[0075] In such a case, air ends up being blown at the second paper for a long time, until the second paper is actually fed, and this dries out the second paper. If the second paper dries out, this affects fixability in printing on the second paper.

[0076] In view of this, it is an object of the printing system according to this embodiment to provide a way to prevent air from being blown at paper for a long time, while smoothly switching sheet storage units having an air paper feed mechanism.

[0077] More specifically, during the execution of a print job in which paper is fed from a large-volume paper feed deck, when the remaining amount of paper of this paper feed deck reaches the loosening start remaining amount **1001**, the control unit **205** controls the system as follows. If a first type of paper is held in this paper feed deck, the control unit **205** controls the system so that loosening processing is started on the paper feed deck to be used next, when the remaining amount of paper reaches the loosening start remaining amount **1001**.

[0078] On the other hand, if a second type of paper is held in this paper feed deck, the control unit **205** does at that point not start loosening processing on the paper feed deck to feed next even though the remaining amount of paper has reached the loosening start remaining amount **1001**. The control unit **205** starts loosening processing on the paper feed deck to feed next on the condition that it has been determined that the second type of paper will be fed after the remaining amount of paper reaches the loosening start remaining amount **1001**. The control unit **205** uses a pre-feed buffer **1401** shown in FIG. **12** to determine whether or not the second type of paper is to be fed. This pre-feed buffer **1401** is provided to the RAM **208** and is managed by the control unit **205**. FIG. **12** shows an example of the situation for a plurality of sheets of continuous paper feed. This shows the point at which the 399th sheet of paper has been fed from the paper feed deck, and the 400th sheet of paper is being fed. The 401st to 410th sheets of paper are scheduled to be fed in the pre-feed buffer **1401**.

[0079] How the pre-feed buffer **1401** is used will now be described. First, the control unit **205** readies image data to be printed on each sheet of paper in the HDD **209**. The control unit **205** sends the pre-feed buffer **1401** a paper feed schedule indicating the type of paper on which this image data is to be printed (first paper or second paper), and the feed source of the paper, when the image data preparation is complete. Meanwhile, at the point when paper feed becomes possible, the control unit **205** extracts paper feed schedules from the pre-feed buffer **1401** on a first-in first-out basis, and feeds one sheet of paper from the paper feed source indicated by the

extracted paper feed schedule. Using the pre-feed buffer **1401** in this way affords smooth paper feed and allows the print order of image data to be maintained. Also, the pre-feed buffer **1401** can store feed schedules for 10 sheets of paper, and the feed schedules for sheets that have actually been fed are deleted from the pre-feed buffer **1401**. This allows new paper feed schedules to be stored. That is, paper that is fed according to the paper feed schedule stored in the pre-feed buffer **1401** can be said to be paper fed no later than when 10 sheets of paper are fed to the printing apparatus.

[0080] If the amount of paper held in the paper feed deck reaches the low remaining amount **1002**, the control unit **205** changes the paper feed deck used for the job, and paper is fed from the next paper feed deck.

[0081] Thus, the control unit **205** uses the loosening start remaining amount **1001** as a trigger to perform loosening processing on the next paper feed deck, and uses the low remaining amount **1002** as a trigger to feed paper from the next paper feed deck, and this prevents a decrease in the performance of paper feed processing. The term "loosening processing" here refers to processing that loosens the sheets and reduces frictional resistance between the paper and the paper feed roller by blowing air from the upper side of the paper stack. Consequently, paper feed processing can be executed faster in the actual feed of paper from this paper feed deck. **1003** indicates a state in which there is no paper.

[0082] More specifically, when the remaining amount of paper stacked in the paper feed deck reaches the loosening start remaining amount **1001** (a predetermined remaining amount), the above-mentioned loosening fan function is switched on at the paper feed deck where the next paper feed is scheduled, and air is blown onto the stacked paper. Consequently, when the paper remaining amount actually reaches **1002** and the paper feed deck is switched to start the paper feed operation, the stacked paper will already have been loosened, reducing the frictional resistance between the paper and the paper feed roller. Therefore, the paper can be sent out faster. Also, compared to when the paper is conveyed by the paper feed roller alone, there is less wear of the paper feed roller, so paper feed can be performed stably for a longer period of time.

[0083] FIG. **10** is a schematic representation of the remaining amount of paper using the bottom of the paper feed deck as a reference. Actually, a lifting mechanism is provided for bringing the top of the paper in the paper feed deck closer to the paper feed opening, and the paper is fed from the top side in a state in which the paper is lifted up. Accordingly, the control unit **205** uses a sensor, which is not shown, to detect the lift height, and determines the remaining amount of paper in each paper feed deck according to this lift height.

[0084] Print Job Control

[0085] Next, the system configuration in FIG. **8** in this embodiment will be described through reference to FIG. **11**, focusing on the operation when a large print job is specified that includes inserting paper (inserting paper, slip sheets) aside from the body in a bookbinding job or the like. The processing described below is realized by the control unit **205** reading a control program stored in the ROM **207** or the HDD **209** to the RAM **208** and executing this program. Also, the processing described below may be realized by the CPU provided to the large-volume paper feed deck. Furthermore, in this embodiment, a copy job of printing with the printer unit **203** an image of an original read by the scanner unit **201** is described as an example, but this may be applied to a print job of executing printing on the basis of print data received from the PC **103** through the external interface **202**.

[0086] First, the user uses the manipulation unit **204** of the printing apparatus **100** to set the size and type of paper to be used in the job. In this embodiment, as shown in FIG. **12**, inserting paper or other such inserting paper is specified to be inserted aside from the body, and pages where the inserting paper is to be inserted are also specified. The term "inserting paper" here refers to paper that is inserted between printed matter for confirming quantities and so forth. In the example of FIG. **12**, the number of output sheets is set to at least 501 copies, and a plurality of sheets (relatively few compared to the body) of inserting paper are set as the second type of paper aside from the first type of paper that is used for the body, on pages 3, 6, . . . , 501.

[0087] When the user finishes making these settings, whether or not a print directive has been accepted through the manipulation unit **204** is determined by the control unit **205** in S**1101** shown in FIG. **11**. If a print directive has been accepted, the control unit **205** executes the job and starts the image printing operation. In S**1102**, if the image to be printed on one sheet of paper is ready, the control unit **205** feeds one sheet of paper from the paper feed deck holding the paper that matches the size and type of paper set by the user.

[0088] In S**1103**, the control unit **205** confirms whether or not the remaining amount of paper in the paper feed deck holding the paper fed in S**1102** has reached the loosening start remaining amount **1001**. If it has, the processing proceeds to S**1106**, and if it has not, the processing proceeds to S**1104**.

[0089] In S**1106**, the control unit **205** determines whether or not the paper held in the paper feed deck whose remaining amount of paper has reached the loosening start remaining amount **1001** is the first paper (normal paper, or paper other than inserting paper). If the control unit **205** determines it to be the first paper, the processing proceeds to S**1107**, and otherwise the processing proceeds to S**1108**.

[0090] In S**1107**, the control unit **205** immediately starts loosening processing for the paper feed deck to be used next, and the processing proceeds to S**1104**. On the other hand, if the processing proceeds to S**1108**, the control unit **205** does not immediately start loosening processing for the paper feed deck to be used next. In S**1108**, the control unit **205** confirms that a second paper feed schedule is in the pre-feed buffer **1401**, and then controls the system so as to start loosening processing for the paper feed deck to be used next. In S**1108**, if there is a second paper feed schedule in the pre-feed buffer **1401**, the control unit **205** immediately starts loosening processing for the paper feed deck to be used next. On the other hand, if in S**1108** there is not already a second paper feed schedule in the pre-feed buffer **1401**, the control unit **205** waits to accept a feed schedule, and then starts loosening processing for the paper feed deck to be used next. The processing then proceeds to S**1104**.

[0091] Then, in S**1104**, the control unit **205** determines whether or not the remaining amount of paper in the paper feed deck holding the paper fed in S**1102** has reached the low remaining amount **1002**. If the control unit **205** determines that this amount has been reached, the processing proceeds to S**1109**, and otherwise the processing returns to S**1105**.

[0092] In S**1109**, the control unit **205** switches the paper feed deck determined in S**1104** to have reached the low remaining amount **1002** to the candidate paper feed deck to be used next. The control unit **205** then moves the processing to S**1105**. In S**1105**, the control unit **205** determines whether or

not printing has been finished for all of the pages of the job, and if it is determined that printing has not been finished, the processing proceeds to S1102, and otherwise the processing is concluded.

[0093] Controlling the system in this way allows for smooth switching of sheet storage units having an air paper feed mechanism. It also prevents the paper from being dried out by air blown at the paper for an extended period of time, and the fixability of the toner to the paper from decreasing.

Other Embodiments

[0094] Aspects of the present invention can also be realized by a computer of a system or apparatus (or devices such as a CPU or MPU) that reads out and executes a program recorded on a memory device to perform the functions of the above-described embodiment(s), and by a method, the steps of which are performed by a computer of a system or apparatus by, for example, reading out and executing a program recorded on a memory device to perform the functions of the above-described embodiment(s). For this purpose, the program is provided to the computer for example via a network or from a recording medium of various types serving as the memory device (e.g., computer-readable medium).

[0095] While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

[0096] This application claims the benefit of Japanese Patent Application No. 2011-243974 filed on Nov. 7, 2011, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. A printing apparatus, comprising:
- a first sheet storage unit that stores a first type of sheets;
- a second sheet storage unit that stores a second type of sheets;
- a reception unit that receives a job in which the first type of sheets and the second type of sheets are used;
- a switching unit that switches the sheet storage unit that is used, from the sheet storage unit currently in use to another sheet storage unit holding the same type of sheets as the sheet storage unit currently in use, when the remaining amount of sheets in the sheet storage unit currently in use reaches a predetermined amount during the execution of the job; and
- a control unit that controls the timing at which blowing of air into the sheets held in the other sheet storage unit is started, so as to vary this timing depending on whether the type of sheets held in the sheet storage unit currently in use or in the other sheet storage unit is the first type of sheets or the second type of sheets.

2. The printing apparatus according to claim **1**,
- wherein in switching the first sheet storage unit to another first sheet storage unit, the control unit starts the blowing of air into the sheets held in the other first sheet storage unit when the remaining amount of sheets stored in the first sheet storage unit reaches a specific amount, and
- in switching the second sheet storage unit to another second sheet storage unit, the control unit starts the blowing of air into the sheets held in the other second sheet storage unit when the remaining amount of sheets stored in the second sheet storage unit reaches a specific amount, and information about the second type of sheets has been set in a buffer that stores information about sheets scheduled to be fed.

3. The printing apparatus according to claim **2**,
- wherein the control unit does not blow air into the sheets held in the other second sheet storage unit when there is no information about the second type of sheets in the buffer, and
- the control unit starts blowing air into the sheets held in the other second sheet storage unit when there is information about the second type of sheets in the buffer.

4. The printing apparatus according to claim **1**,
- wherein the printing job is a bookbinding job, and
- the first type of sheets is body paper, and the second type of sheets is inserting paper.

5. A method for controlling a printing apparatus having a first sheet storage unit that stores a first type of sheets and a second sheet storage unit that stores a second type of sheets, said method comprising the steps of:
- using a reception unit to receive a job in which the first type of sheets and the second type of sheets are used;
- using a switching unit to switch the sheet storage unit that is used from the sheet storage unit currently in use to another sheet storage unit that holds the same type of sheets as the sheet storage unit currently in use, when the remaining amount of sheets in the sheet storage unit currently in use reaches a predetermined amount during the execution of the job; and
- using a control unit to control the timing at which blowing of air into the sheets held in the other sheet storage unit is started, so as to vary this timing depending on whether the type of sheets held in the sheet storage unit currently in use or in the other sheet storage unit is the first type of sheets or the second type of sheets.

6. A computer-readable storage medium storing a computer program for executing on a computer the steps in the method for controlling a printing apparatus according to claim **5**.

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