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Inventor(s)

HATAKEYAMA; TAKUYA

PRINTING APPARATUS, AND CONTROL METHOD FOR PRINTING APPARATUS

Abstract

A printing apparatus that records, in a case where a remaining amount of a recording material in a consumable product mounted on the printing apparatus is less than a first predetermined amount, notification-transmitted information, to a first storage unit included in the mounted consumable product, and externally transmit a notification requesting a delivery of the consumable product, record the information indicating that the notification has been transmitted as information on the mounted consumable product to a second storage unit included in the printing apparatus, and perform, in a case where the consumable product is removed from the printing apparatus, and the information indicating that the notification has been transmitted is not recorded in the second storage unit, display on a display unit of the printing apparatus indicating that the notification has not been transmitted and prompting a user to mount the consumable product on the printing apparatus.

Inventors: HATAKEYAMA; TAKUYA (Kanagawa, JP)

Applicant: CANON KABUSHIKI KAISHA (Tokyo, JP)

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Background/Summary

BACKGROUND

Field

[0001] The present disclosure relates to a printing apparatus, and a control method for the printing apparatus.

Description of the Related Art

[0002] There exists a service of delivering consumable products to client users of printing apparatuses, such as printers and multifunction peripherals.

[0003] Japanese Patent Application Laid-open No. 2019-155742 discusses a technique of preventing a duplicate delivery of a consumable product. In the technique discussed in Japanese Patent Application Laid-open No. 2019-155742, in a case where the remaining amount in a consumable product is small and it is determined that the delivery of the consumable product is required, delivery history information is written in a memory included in the consumable product after transmission of a notification for requesting the delivery to a management server, whereby the duplicate delivery of the consumable product is prevented.

[0004] Some printing apparatuses have a configuration in which a consumable product is easily removable. In the case of the apparatus configuration in which the consumable product is easily removable from the printing apparatus, there arises an issue that the consumable product may be removed from the printing apparatus by a user.

[0005] In a case where the consumable product is removed from the printing apparatus, there is a possibility that notification transmission of a delivery request may be missed. With the conventional technique, in a case where the consumable product is removed from the printing apparatus before the notification transmission of a delivery request is performed, the notification transmission of a delivery request may not be issued at an appropriate timing. As a result, the consumable product may run out at a timing of using the printing apparatus.

SUMMARY

[0006] According to an aspect of the present disclosure, a printing apparatus including a display unit includes one or more memories storing instructions, and one or more processors that execute the stored instructions, which cause the printing apparatus to record, in a case where a remaining amount of a recording material in a consumable product mounted on the printing apparatus is less than a first predetermined amount, notification-transmitted information indicating that a notification requesting a delivery of the consumable product has been transmitted, to a first storage unit included in the mounted consumable product, and externally transmit the notification, record the information indicating that the notification has been transmitted as information on the mounted consumable product to a second storage unit included in the printing apparatus, based on the information recorded in the first storage unit, and perform, in a case where the consumable product is removed from the printing apparatus, and the information indicating that the notification has been transmitted is not recorded in the second storage unit, display on the display unit of the printing apparatus indicating that the notification has not been transmitted and prompting a user to mount the consumable product on the printing apparatus.

[0007] Further features of the present disclosure will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is a diagram illustrating an example of a system configuration according to an exemplary embodiment.

[0009] FIG. **2** is a diagram illustrating an example of an external appearance of an image forming apparatus according to the present exemplary embodiment.

[0010] FIG. **3** is a block diagram illustrating an example of a configuration of a consumable product management server.

[0011] FIG. **4** is a block diagram illustrating an example of a configuration of the image forming apparatus according to the present exemplary embodiment.

[0012] FIG. **5** is a diagram illustrating an example of a data configuration of information that is stored in each of storage areas in an ink tank non-volatile memory included in an ink tank mountable on the image forming apparatus.

[0013] FIG. **6** is a diagram illustrating an example of a data configuration of information that is stored in each of storage areas in a main body non-volatile memory provided in the image forming apparatus.

[0014] FIG. **7** is a flowchart illustrating an example of processing that is performed at a delivery timing of an ink tank in the image forming apparatus.

[0015] FIG. **8** is a flowchart illustrating an example of processing that is performed in the image forming apparatus when the ink tank is removed.

[0016] FIG. **9** is a diagram illustrating an example of a warning screen that is displayed when the ink tank is removed.

[0017] FIG. **10** is a diagram illustrating an example of a notification selection screen that is displayed when the ink tank is mounted.

[0018] FIG. **11** is a diagram illustrating an example of a notification timing screen on which a setting of a delivery request notification timing based on a remaining amount of each consumable product is changed.

[0019] FIG. **12** is a diagram illustrating a change screen on which a setting of a delivery request notification timing for an ink tank of a color is changed.

[0020] FIG. **13** is a diagram illustrating an example of a change screen on which a setting of a delivery request notification timing for all colors is changed.

[0021] FIG. **14** is a flowchart illustrating an example of processing that is performed to store information on the ink tank non-volatile memory in the main body non-volatile memory provided in the image forming apparatus at predetermined intervals.

[0022] FIG. **15** is a flowchart illustrating an example of processing that is performed to update information of an ink remaining amount stored in the ink tank non-volatile memory included in the ink tank.

[0023] FIG. **16** is a flowchart illustrating an example of processing that is performed to update information on a start date of use in the ink tank non-volatile memory included in the ink tank.

DESCRIPTION OF THE EMBODIMENTS

[0024] Hereinafter, an exemplary embodiment for implementing the present disclosure will be described with reference to the drawings.

[0025] The relative arrangement of the components of the apparatus in the exemplary embodiments, the shape of the apparatus, and the like are merely examples, and the present disclosure is not limited to these. In the accompanying drawings, the same or similar components are denoted by the same reference numerals, and the redundant description will be omitted. In the exemplary embodiments, the printing apparatus (image forming apparatus) is a single-function printer having a printing function, but the printing apparatus is not limited to this.

[0026] The printing apparatus may be a copier including a printing function and a reading device for reading an image on a document, or a multi-function peripheral (MFP) including other

additional functions.

[0027] FIG. 1 is a diagram illustrating an example of a system configuration according to an exemplary embodiment of the present disclosure.

[0028] An image forming apparatus **100** is a printer or a multifunction peripheral (MFP) serving as an example of a printing apparatus according to the present exemplary embodiment. The image forming apparatus **100** is connected with Internet **106** and a consumable product management server **102** via a router integrated optical network unit (ONU) **105** so that the communication between them is performed.

[0029] The router integrated ONU **105** is connected to the Internet **106** via an optical line. The ONU is a terminal device of an optical line and has a function of mutually converting an optical signal of the optical line and an electrical digital signal.

[0030] The consumable product management server **102** is connected to the Internet **106**. The consumable product management server **102** includes a storage device described below and stores and manages data of start date of use information, remaining amount information, and delivery information, of various kinds of consumable products for each image forming apparatus managed thereby. The printing method of the image forming apparatus **100** in the present exemplary embodiment may be an electrophotographic method or an inkjet method and may be other methods. The consumable product that is a delivery target in the present exemplary embodiment is mainly a recording material container. More specifically, the recording material container is an ink cartridge, an ink tank, an ink bottle, a toner bottle, or a toner cartridge. The recording material container includes a non-volatile memory, and reading out from and writing to the non-volatile memory are possible by a control of a central processing unit (CPU) of the image forming apparatus **100** in a state where the recording material container is mounted on the image forming apparatus **100**. The details will be described below.

[0031] FIG. 2 is a diagram illustrating an example of an external appearance of the image forming apparatus **100**. The image forming apparatus **100** is merely an example of the present exemplary embodiment.

[0032] Two rolls of paper with a sheet **1** wound in a roll shape is set to the image forming apparatus **100**. The image forming apparatus **100** prints an image on the sheet **1** pulled out from a roll of paper selected from the two rolls of paper set in sheet feed devices **200** that are disposed one above the other. The sheet **1** on which printing has been performed is discharged to a stacker **3** disposed on an upper part of the image forming apparatus **100**. A user inputs various kinds of commands, such as a size designation of the sheet **1**, a switching between on-line and off-line, a setting of a paper discharge destination, and a switching between power on and off, to the image forming apparatus **100** by using various kinds of switches disposed on an operation panel **2**.

[0033] FIG. 3 is a block diagram illustrating an example of a configuration of the consumable product management server **102**.

[0034] The consumable product management server **102** includes a CPU **352**, a read only memory (ROM) **357**, a random access memory (RAM) **358**, a storage device **359**, a local area network interface (LAN I/F) unit **351**, an operation unit **353**, a display unit **354**, and the like.

[0035] The ROM **357** is a non-volatile memory for storing various kinds of programs that operate on the consumable product management server **102**, and data. The RAM **358** is a volatile memory that is used as a temporary work area by the CPU **352** executing various kinds of programs. The storage device **359** includes, for example, a plurality of hard disk drives configuring a redundant array of inexpensive disks (RAID) and stores various kinds of data. The CPU **352** reads out a program from the ROM **357** or the storage device **359** to the RAM **358** and executes the read program to control the consumable product management server **102**.

[0036] The LAN I/F unit **351** is an interface with an externally connected device via a network. The consumable product management server **102** is connected with the image forming apparatus **100** via the LAN I/F unit **351** to exchange execution commands or data with the image forming

apparatus **100**.

[0037] The operation unit **353** includes a plurality of switches including a power key. The display unit **354** includes a plurality of light-emitting diodes (LEDs).

[0038] An information acquisition unit **355** and a determination unit **356** are functions implemented by software and are realized by the CPU **352** reading out a program from the ROM **357** or the storage device **359** to the RAM **358** and executing the read program. The information acquisition unit **355** communicates with the image forming apparatus **100** via the LAN I/F unit **351** at any timing, to receive a delivery request notification (notification about a delivery request of a consumable product), or to acquire information about a start date of use of each consumable product in the image forming apparatus **100**, a remaining amount, the number of times of mounting the consumable product, and a delivery request notification transmitted flag. These pieces of information are acquired using command communications defined uniquely by each maker. The determination unit **356** determines the delivery of the consumable product, based on the information acquired by the information acquisition unit **355**. While not illustrated, the consumable product management server **102** includes various functions implemented by software, in addition to the information acquisition unit **355** and the determination unit **356**.

[0039] The consumable product management server **102** may be achieved by one computer, or a plurality of computers. For example, the consumable product management server **102** may have a configuration achieved using a cloud computing technology.

[0040] FIG. **4** is a block diagram illustrating an example of a configuration of the image forming apparatus **100**.

[0041] The image forming apparatus **100** includes a controller unit **465** for printing and an engine unit **466**.

[0042] The controller unit **465** includes a LAN I/F unit **451**, a CPU **452**, a ROM **457**, a RAM **458**, a non-volatile RAM (NVRAM) **459**, a display operation unit **460**, and a consumable product mount/remove detection unit **461**.

[0043] The ROM **457** is a non-volatile memory for storing a control execution code (program), data, and the like, for the image forming apparatus **100**. The RAM **458** is a volatile memory that is used as a temporary working memory by the CPU **452** executing various kinds of programs and temporarily stores image data for printing when the CPU **452** executes control of the image forming apparatus **100**. The NVRAM **459** is a non-volatile memory for storing records of various kinds of data to be used for maintenance of the image forming apparatus **100** or information on images for printing. The CPU **452** reads out a program to the RAM **458** from the ROM **457** or the like and executes the read program to control the image forming apparatus **100**.

[0044] The LAN I/F unit **451** is an interface with an externally connected device via a network. The image forming apparatus **100** is connected with the consumable product management server **102** via the LAN I/F unit **451** to exchange execution commands or data with the consumable product management server **102**.

[0045] The display operation unit **460** includes a user interface, such as a liquid crystal display (LCD), LEDs, keys, and a touch panel. The user performs an execution operation and a setting operation of each function of the image forming apparatus **100** by using the display operation unit **460**. The CPU **452** controls an operation state and a display content of the display operation unit **460**. The consumable product mount/remove detection unit **461** uses a sensor to detect whether a consumable product is mounted or removed.

[0046] While, in the present exemplary embodiment, descriptions are given using an image forming apparatus that uses four color inks of black (Bk), cyan (C), magenta (M), and yellow (Y), the number of ink colors may be any number of colors. As described above, recording materials other than ink may be used.

[0047] On the engine unit **466**, a Y ink tank **471**, a C ink tank **473**, an M ink tank **475**, and a Bk ink tank **477** are removably mounted. Each of the ink tanks includes an ink tank non-volatile memory

as illustrated in FIG. 5 described below. The Y ink tank **471** includes a Y ink tank non-volatile memory **472**, the C ink tank **473** includes a C ink tank non-volatile memory **474**, the M ink tank **475** includes an M ink tank non-volatile memory **476**, and the Bk ink tank **477** includes a Bk ink tank non-volatile memory **478**. Via the engine unit **466**, the CPU **452** reads and writes information as illustrated in FIG. 5 described below from and to the non-volatile memory included in each of the ink tanks attached to the engine unit **466**. While components of ink contained in each of the ink tanks is not specifically limited, in the present exemplary embodiment, the ink is an aqueous pigment ink including pigment serving as a color material, water, and resin.

[0048] A determination unit **462** and a notification unit **463** are functions implemented by software and realized by the CPU **452** reading out a program from the ROM **457** or the like to the RAM **358** and executing the read program. When the consumable product is removed from the image forming apparatus **100**, the determination unit **462** determines whether a delivery request notification flag regarding the removed consumable product stored in a main body non-volatile memory is valid (ON) or invalid (OFF). In a case where the determination unit **462** determines that the delivery request notification flag in the main body non-volatile memory is invalid (OFF), the notification unit **463** issues a warning to the user. Although not illustrated, the image forming apparatus **100** has various kinds of functions implemented by software, in addition to the determination unit **462** and the notification unit **463**.

[0049] FIG. 5 is a diagram illustrating an example of a data configuration of information stored in each of storage areas in the non-volatile memory included in the ink tank mountable on the image forming apparatus **100**.

[0050] A start date of use **501** is a storage area where a start date and time of use of the ink tank is stored, and date and time information on the date and time when the ink tank is mounted on the image forming apparatus **100** is recorded.

[0051] An ink remaining amount **502** is a storage area where an ink remaining amount is stored. While the ink remaining amount is 100% when a new ink tank is mounted, the remaining amount reduces as the printing that consumes ink is performed, and when the ink tank is empty, the remaining amount reaches 0%.

[0052] A number of mounts **503** is a storage area where the number of times that the ink tank has been mounted is stored. When a new ink tank is mounted, the first count is performed, and when the ink tank is removed once and mounted again, the count value also increments.

[0053] A delivery request notification transmitted flag **504** is a storage area where whether an ink tank delivery request notification has been sent to the consumable product management server **102** is stored. The delivery request notification transmitted flag **504** is "0" indicating "OFF" that is an initial value in a state where the notification (delivery request notification) serving as a trigger of the delivery is not transmitted, and when the notification serving as the trigger of the delivery is performed, "1" is written therein.

[0054] FIG. 6 is a diagram illustrating an example of a data configuration of information that is stored in each of storage areas of the main body non-volatile memory (NVRAM **459**) included in the image forming apparatus **100**.

[0055] As illustrated in FIG. 6, an ink remaining amount, a delivery request notification transmitted flag, and a read out time are stored for each ink color in predetermined storage areas of the main body non-volatile memory. While the Y ink is described below as a representative example, descriptions of other color inks, such as the C ink, the M ink, and the Bk ink, are similar to that of the Y ink.

[0056] A Y ink remaining amount **601** is ink remaining amount information on the Y ink. A Y delivery request notification transmitted flag **602** is a delivery request notification transmitted flag of the Y ink. In the Y ink remaining amount **601** and the Y delivery request notification transmitted flag **602**, values read from the Y ink tank non-volatile memory at a predetermined cycle are stored. The time when these values are read out is stored in an area indicated by a Y read out time **603**.

[0057] Descriptions about a C ink remaining amount **604**, a C delivery request notification transmitted flag **605**, a C read out time **606**, an M ink remaining amount **607**, an M delivery request notification transmitted flag **608**, an M read out time **609**, a Bk ink remaining amount **610**, a Bk delivery request notification transmitted flag **611**, and a Bk read out time **612** are omitted because they are similar to the descriptions of the Y ink remaining amount **601**, the Y delivery request notification transmitted flag **602**, and the Y read out time **603**, respectively.

[0058] Hereinbelow, with reference to FIG. 7, processing of a delivery timing of an ink tank in the image forming apparatus **100** according to the present exemplary embodiment will be described below.

[0059] FIG. 7 is a flowchart illustrating an example of processing that is performed at a delivery timing of an ink tank in the image forming apparatus **100**. The processing of this flowchart is implemented by the CPU **452** reading out a program from the ROM **457** or the like to the RAM **358** and executing the read program. The processing of this flowchart is periodically executed for each ink tank mounted on the image forming apparatus **100**. The execution timings of the processing for the ink tanks may be the same or different. The term “periodically” may also refer to a case in which the execution timing is at a predetermined time intervals or each time the predetermined amount of printing is performed.

[0060] In step **S701**, the CPU **452** of the image forming apparatus **100** acquires the ink remaining amount **502** from the ink tank non-volatile memory of the processing target ink tank (hereinbelow, referred to as a target ink tank) and determines whether the ink remaining amount has reached a delivery setting value. The delivery setting value is set in advance and stored in the NVRAM **459** or the like.

[0061] In step **S701**, in a case where the CPU **452** determines that the ink remaining amount has not reached the delivery setting value (NO in step **S701**), the CPU **452** repeats the processing in step **S701** to perform control to continue monitoring of the ink remaining amount of the target ink tank.

[0062] In a case where the CPU **452** determines that the ink remaining amount has reached the delivery setting value (YES in step **S701**), the CPU **452** advances the processing to step **S710**.

[0063] In step **S710**, the CPU **452** determines whether the delivery request notification transmitted flag **504** stored in the ink tank non-volatile memory of the target ink tank is “OFF”.

[0064] In step **S710**, in a case where the CPU **452** determines that the delivery request notification transmitted flag **504** is “ON” (NO in step **S710**), the CPU **452** ends the processing of this flowchart.

[0065] In a case where the CPU **452** determines that the delivery request notification transmitted flag **504** is “OFF” (YES in step **S710**), the CPU **452** advances the processing to step **S702**.

[0066] In step **S702**, the CPU **452** writes “ON” to the delivery request notification transmitted flag **504** in the ink tank non-volatile memory of the target ink tank and advances the processing to step **S703**.

[0067] In step **S703**, the CPU **452** transmits a delivery request notification to the consumable product management server **102** and determines whether the delivery request notification has been successfully transmitted.

[0068] In step **S703**, in a case where the CPU **452** determines that the delivery request notification has not been transmitted successfully (NO in step **S703**), the CPU **452** advances the processing to step **S704**. In step **S704**, the CPU **452** stores the delivery request notification in a delivery waiting cue (e.g., set in the RAM **458**), and then advances the processing to step **S705**. In step **S705**, the CPU **452** waits for a predetermined time (e.g., 10 minutes) and then returns the processing to step **S703**.

[0069] In a case where the CPU **452** determines that the delivery request notification has been successfully transmitted (YES in step **S703**), the CPU **452** ends the processing of this flowchart. In this way, the series of steps ends.

[0070] Hereinbelow, with reference to FIG. 8, processing that is performed when an ink tank has been removed from the image forming apparatus **100** according to the present exemplary embodiment will be described.

[0071] FIG. 8 is a flowchart illustrating an example of processing that is performed when the ink tank has been removed from the image forming apparatus **100**. The processing of this flowchart is implemented by the CPU **452** reading out a program from the ROM **457** or the like to the RAM **358** and executing the read program. The processing of this flowchart is periodically performed for each of the ink tanks mounted on the image forming apparatus **100**. The execution timing of the processing for each of the ink tanks may be the same or different. The term “periodically” may also refer to a case in which the execution timing is at a predetermined time intervals or each time the predetermined amount of printing is performed.

[0072] In step **S801**, via the consumable product mount/remove detection unit **461**, the CPU **452** of the image forming apparatus **100** determines whether a processing target ink tank (hereinbelow, referred to as a target ink tank) has been removed.

[0073] In step **S801**, in a case where the CPU **452** determines that the target ink tank has not been removed (NO in step **S801**), the CPU **452** ends this flowchart.

[0074] In a case where the CPU **452** determines that the target ink tank has been removed (YES in step **S801**), the CPU **452** advances the processing to step **S802**. Alternatively, in response to the target ink tank being removed, an interrupt signal may be input to the CPU **452** from the consumable product mount/remove detection unit **461**, and the CPU **452** may execute the processing in step **S802** and the subsequent steps.

[0075] In step **S802**, the CPU **452** determines whether the delivery request notification transmitted flag of the target color ink tank (any one of Y delivery request notification transmitted flag **602**, C delivery request notification transmitted flag **605**, M delivery request notification transmitted flag **608**, and Bk delivery request notification transmitted flag **611** in FIG. 6) stored in the main body non-volatile memory of the image forming apparatus **100** is “OFF”.

[0076] In step **S802**, in a case where the CPU **452** determines that the delivery request notification transmitted flag of the target color ink tank is “ON” (NO in step **S802**), the CPU **452** ends the processing of this flowchart.

[0077] In a case where the CPU **452** determines that the delivery request notification transmitted flag of the target color ink tank is “OFF” (YES in step **S802**), the CPU **452** advances the processing to step **S803**.

[0078] In step **S803**, the CPU **452** displays a warning screen as illustrated in FIG. 9 on the display operation unit **460**. Details of this warning screen will be described with reference to FIG. 9.

[0079] FIG. 9 is a diagram illustrating an example of the warning screen that is displayed when the ink tank has been removed in step **S803** in FIG. 8.

[0080] On the warning screen in FIG. 9, a warning prompt **901** is a message to warn that the delivery request notification of the removed color ink tank has not been transmitted to the consumable product management server **102**, and prompts the user to mount the removed ink tank. A YES button **902** is a button to be pressed by the user when the user has acknowledged the warning prompt **901**. In response to detection of the pressing performed on the YES button **902**, the CPU **452** advances the processing to step **S804** in FIG. 8.

[0081] In step **S804**, via the consumable product mount/remove detection unit **461**, the CPU **452** determines whether the target ink tank has been mounted.

[0082] In step **S804**, in a case where the CPU **452** determines that the target ink tank has not been mounted (NO in step **S804**), the CPU **452** ends the processing of this flowchart.

[0083] In a case where the CPU **452** determines that the target ink tank has been mounted (YES in step **S804**), the CPU **452** advances the processing to step **S805**.

[0084] In step **S805**, the CPU **452** determines whether the time until the notification timing of the mounted target ink tank comes is short. This determination is performed by the CPU **452** acquiring

the value of the ink remaining amount **502** from the ink tank non-volatile memory of the target ink tank and determining whether the difference between the ink remaining amount and the above-described delivery setting value is less than a predetermined value. In a case where the above-described difference is less than the predetermined value, the CPU **452** determines that the time until the notification timing comes is short.

[0085] In step **S805**, in a case where the CPU **452** determines that the time until the notification timing comes is not short (NO in step **S805**), the CPU **452** ends the processing.

[0086] In a case where the CPU **452** determines that the time until the notification timing comes is short (YES in step **S805**), the CPU **452** advances the processing to step **S806**.

[0087] In step **S806**, the CPU **452** displays a notification selection screen as illustrated in FIG. **10** on the display operation unit **460**. Details of this notification selection screen will be described with reference to FIG. **10**.

[0088] FIG. **10** is a diagram illustrating an example of the notification selection screen displayed in step **S806** in FIG. **8** when the ink tank is mounted.

[0089] In FIG. **10**, a confirmation prompt **1001** is a message asking the user whether to transmit the delivery request notification of the target ink tank to the consumable product management server **102**. A YES button **1002** is selected by the user in a case where the delivery request notification is to be transmitted to the consumable product management server **102**. A NO button **1003** is selected by the user in a case where the delivery request notification is not to be transmitted to the consumable product management server **102**. In response to the YES button **1002** or the NO button **1003** being pressed, the CPU **452** advances the processing to step **S807** in FIG. **8**.

[0090] In step **S807**, the CPU **452** determines whether transmitting the delivery request notification is selected i.e., the YES button **1002** is pressed, on the notification selection screen displayed in step **S806** described above.

[0091] In step **S807**, in a case where the CPU **452** determines that not transmitting the delivery request notification is selected, i.e., the NO button **1003** is pressed (NO in step **S807**), the CPU **452** ends the processing of this flowchart.

[0092] In a case where the CPU **452** determines that transmitting the delivery request notification is selected, i.e., the YES button **1002** is pressed (YES in step **S807**), the CPU **452** advances the processing to step **S808**.

[0093] In step **S808**, the CPU **452** writes "ON" to the delivery request notification transmitted flag **504** in the ink tank non-volatile memory of the target ink tank and advances the processing to step **S809**.

[0094] In step **S809**, the CPU **452** transmits delivery request notification information to the consumable product management server **102** and ends the processing of this flowchart. In this way, the series of steps ends.

[0095] With reference to FIGS. **11** to **13**, a function of changing a delivery request notification timing based on the remaining amount of each consumable product will be described.

[0096] FIG. **11** is a diagram illustrating an example of a delivery request notification timing screen on which a setting of the delivery request notification timing based on the remaining amount of each consumable product is changed. This screen is displayed on the display operation unit **460** in response to a predetermined user's operation to the display operation unit **460**.

[0097] On the delivery request notification timing screen in FIG. **11**, an all color collective setting button **1101** is used to collectively change the notification timings of all ink colors. In response to the button being pressed, a screen illustrated in FIG. **13** is displayed on the display operation unit **460**.

[0098] A cyan button **1102**, a magenta button **1103**, a yellow button **1104**, and a black button **1105** are buttons each of which are used to change the notification timing for the corresponding ink color. In response to any of these buttons being pressed, a screen illustrated in FIG. **12** is displayed on the display operation unit **460**.

[0099] An OK button **1106** is used to apply the setting value change on a display screen of a liquid crystal panel for changing the delivery request notification timing. In response to the button being pressed, the delivery request notification timing is changed.

[0100] A cancel button **1107** is used to cancel the setting value change without applying the setting value change performed on the display screen of the liquid crystal panel for changing the delivery request notification timing. In response to the button being pressed, the delivery request notification timing change is not performed, and the setting change is discarded.

[0101] FIG. **12** is a diagram illustrating an example of a change screen on which a setting of a delivery request notification timing for each individual color ink tank is changed. In FIG. **12**, as an example, a screen for changing the delivery request notification timing of the C ink tank **473** is illustrated as a representative. More specifically, the example in which a button with a name of Cyan (i.e., “Cyan” button **1102**) is pressed on the delivery request notification timing screen in FIG. **11** described above is illustrated.

[0102] For example, the user selects an option value on the change screen for one color from selection option setting values in 10% increments, such as 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, and 100% as illustrated in a selection field **1201**. While, in the present exemplary embodiment, the example of 10% increments is used, any numeral value increments, such as 15% and 76% other than 10% increments, may be used. For example, in a case where the option “20%” is selected in the selection field **1201** and an OK button **1202** is pressed, a timing at which the ink remaining amount of the target color ink tank reaches “20%” or less of the full state is set as the delivery request notification timing.

[0103] FIG. **13** is a diagram illustrating an example of a change screen for collectively changing the delivery request notification timings for all colors. In FIG. **13**, a case in which the all color collective setting button **1101** is pressed on the delivery request notification timing screen in FIG. **11** described above is illustrated as an example.

[0104] For example, the user selects an option value on the all color collective change screen from the selection option setting values in 10% increments, such as 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, and 100% as illustrated in a selection field **1301**. While, in the present exemplary embodiment, the example of 10% increments is used, any numeral value increments, such as 15% and 76% other than 10% increments, may be used. For example, in a case where an option “30%” is selected in the selection field **1301** and an OK button **1302** is pressed, a timing at which the ink remaining amount of any of the color ink tanks reaches “30%” or less of the full state is set as the delivery request notification timing.

[0105] With reference to FIG. **14**, processing of storing information stored in the non-volatile memory of the ink tank at predetermined intervals in the non-volatile memory (main body non-volatile memory) of the image forming apparatus will be described.

[0106] FIG. **14** is a flowchart illustrating an example of processing that is performed to store information stored in the ink tank non-volatile memory in the non-volatile memory (main body non-volatile memory) in the image forming apparatus **100** at predetermined intervals. The processing of this flowchart is implemented by the CPU **452** reading out a program from the ROM **457** or the like to the RAM **358** and executing the read program. The processing of this flowchart is executed for each ink tank mounted on the image forming apparatus **100**. The execution timing of the processing for each of the ink tanks may be the same or different.

[0107] In step **S1401**, the CPU **452** of the image forming apparatus **100** determines whether a predetermined time (e.g., 5 minutes) has elapsed since when the information in the ink tank non-volatile memory, which is a processing target ink tank (hereinbelow, referred to as a target ink tank), has been previously read and stored in the main body non-volatile memory of the image forming apparatus **100**. More specifically, the CPU **452** determines whether the predetermined time has elapsed from the read time of a target color ink corresponding to the target ink tank stored in the non-volatile memory of the image forming apparatus **100** (from any of the Y read out time **603**,

C read out time **606**, M read out time **609**, and Bk read out time **612** in FIG. 6). While, in the present exemplary embodiment, an example in which the predetermined time interval is 5 minutes is described, the predetermined time interval may be any time interval, such as 1 minute, 10 minutes, 20 minutes, and 1 hour.

[0108] In step **S1401**, in a case where the CPU **452** determines that the predetermined time has not elapsed yet (NO in step **S1401**), the CPU **452** repeats the processing in step **S1401** to perform control to continue checking the elapse of the predetermined time.

[0109] In a case where the CPU **452** determines that the predetermined time has elapsed (YES in step **S1401**), the CPU **452** advances the processing to step **S1402**.

[0110] In step **S1402**, the CPU **452** reads information on the ink remaining amount **502** in the non-volatile memory of the target ink tank and stores the read information in the RAM **458**.

[0111] In step **S1403**, the CPU **452** determines whether the ink remaining amount is successfully read from the ink tank non-volatile memory in step **S1402** described above.

[0112] In step **S1403**, in a case where the CPU **452** determines that the ink remaining amount has not been successfully read (NO in step **S1403**), the CPU **452** ends the processing of this flowchart.

[0113] In a case where the CPU **452** determines that the ink remaining amount has been successfully read (YES in step **S1403**), the CPU **452** advances the processing to step **S1404**.

[0114] In step **S1404**, the CPU **452** reads the information on the delivery request notification transmitted flag **504** from the target ink tank non-volatile memory and stores the read information in the RAM **458**.

[0115] In step **S1405**, the CPU **452** determines whether the delivery request notification transmitted flag **504** has been successfully read from the non-volatile memory of the ink tank in step **S1404** described above.

[0116] In step **S1405**, in a case where the CPU **452** determines that the delivery request notification transmitted flag **504** has not been successfully read (NO in step **S1405**), the CPU **452** ends the processing of this flowchart.

[0117] In a case where the CPU **452** determines that the delivery request notification transmitted flag **504** has been successfully read (YES in step **S1405**), the CPU **452** advances the processing to step **S1406**.

[0118] In step **S1406**, the CPU **452** writes the information on the ink remaining amount and the information on the delivery request notification transmitted flag **504** stored in the RAM **458** in steps **S1402** and **S1404** in the non-volatile memory (NVRAM **459**) of the image forming apparatus **100** described with reference to FIG. 6. Then, the processing of this flowchart ends. In step **S1406**, as the information on the consumable product (ink tank) identified by the target ink color, for example, the information on the ink remaining amount and the delivery request notification transmitted flag **504** is stored in the main body non-volatile memory. In identifying the consumable product, the consumable product may be managed using a unique identification number of each ink tank other than the color.

[0119] With reference to FIG. 15, processing of updating the information on the ink remaining amount **502** in the non-volatile memory include in the ink tank illustrated in FIG. 5 will be described.

[0120] FIG. 15 is a flowchart illustrating an example of processing of updating the information on the ink remaining amount **502** in the non-volatile memory included in the ink tank. The processing of this flowchart is implemented by the CPU **452** reading out a program from the ROM **457** or the like to the RAM **358** and executing the read program. The processing of this flowchart is performed periodically. The term “periodically” may also refer to a case in which the execution timing is at a predetermined time intervals or each time the predetermined amount of printing is performed.

[0121] In step **S1501**, the CPU **452** of the image forming apparatus **100** checks whether ink is consumed by ink filling.

[0122] In step **S1501**, in a case where the CPU **452** determines that the ink is consumed by the ink filling (YES in step **S1501**), the CPU **452** advances the processing to step **S1502**. In step **S1502**, the CPU **452** calculates the ink amount consumed by the ink filling for each color, and then advances the processing to step **S1507**.

[0123] The processing to be performed in step **S1507** and the subsequent steps will be described below.

[0124] In a case where the CPU **452** determines that the ink is not consumed by the ink filling (NO in step **S1501**), the CPU **452** advances the processing to step **S1503**.

[0125] In step **S1503**, the CPU **452** checks whether ink is consumed by printing.

[0126] In step **S1503**, in a case where the CPU **452** determines that the ink is consumed by the printing (YES in step **S1503**), the CPU **452** advances the processing to step **S1504**. In step **S1504**, the CPU **452** calculates the ink amount consumed by the printing for each color, and then advances the processing to step **S1507**.

[0127] In a case where the CPU **452** determines that the ink is not consumed by the printing (NO in step **S1503**), the CPU **452** advances the processing to step **S1505**. In step **S1505**, the CPU **452** checks whether ink is consumed by head cleaning.

[0128] In step **S1505**, in a case where the CPU **452** determines that the ink is consumed by the head cleaning (YES in step **S1505**), the CPU **452** advances the processing to step **S1506**. In step **S1506**, the CPU **452** calculates the ink amount consumed by the head cleaning for each color, and then advances the processing to step **S1507**.

[0129] In a case where the ink is not consumed by the head cleaning (NO in step **S1505**), the CPU **452** ends the processing of this flowchart.

[0130] After the calculation of each of the ink consumed amounts in steps **S1502**, **S1504**, and **S1506**, then in step **S1507**, the CPU **452** reads out the ink remaining amount **502** from the non-volatile memory included in the ink tank of the color with the ink consumed therefrom.

[0131] In step **S1508**, the CPU **452** calculates a current ink remaining amount based on the ink remaining amount read in step **S1507** described above and the calculated ink consumed amount described above.

[0132] In step **S1509**, the CPU **452** executes writing processing of the ink remaining amount calculated in step **S1508** described above in the non-volatile memory included in the ink-consumed color ink tank, and then ends the processing of this flowchart.

[0133] With reference to FIG. **16**, processing of updating information on the start date of use **501** stored in the non-volatile memory included in the ink tank illustrated in FIG. **5** will be described.

[0134] FIG. **16** is a flowchart illustrating an example of processing of updating the information on the start date of use **501** in the non-volatile memory included in the ink tank. The processing of this flowchart is implemented by the CPU **452** reading out a program from the ROM **457** or the like to the RAM **358** and executing the read program. The processing of this flowchart is performed periodically.

[0135] In step **S1601**, via the consumable product mount/remove detection unit **461**, the CPU **452** of the image forming apparatus **100** determines whether a processing target ink tank (hereinbelow, referred to as a target ink tank) has been mounted.

[0136] In step **S1601**, in a case where the CPU **452** determines that the target ink tank has not been mounted (NO in step **S1601**), the CPU **452** ends the processing of this flowchart.

[0137] In a case where the CPU **452** determines that the target ink tank has been mounted (YES in step **S1601**), the CPU **452** advances the processing to step **S1602**. Alternatively, in response to the target ink tank being mounted, an interrupt signal may be input to the CPU **452** from the consumable product mount/remove detection unit **461**, and the CPU **452** may execute the processing in step **S1602** and the subsequent steps.

[0138] In step **S1602**, the CPU **452** checks whether the date and time information is recorded in the start date of use **501** of the ink tank non-volatile memory of the target ink tank.

[0139] In step S1602, in a case where the CPU 452 determines that the date and time information is recorded in the start date of use 501 of the ink tank non-volatile memory (YES in step S1602), the CPU 452 ends the processing of this flowchart without updating the date and time information on the start date of use 501 of the target ink tank non-volatile memory.

[0140] In a case where the CPU 452 determines that the date and time information is not recorded in the start date of use 501 of the ink tank non-volatile memory (NO in step S1602), the CPU 452 advances the processing to step S1603.

[0141] In step S1603, the CPU 452 acquires the date and time information on the image forming apparatus 100.

[0142] In step S1604, the CPU 452 records the date and time information on the image forming apparatus 100 acquired in step S1603 in the start date of use 501 of the ink tank non-volatile memory included in the target ink tank, and then ends the processing of this flowchart.

[0143] As described above, according to the present exemplary embodiment, the notification miss (delivery request transmission miss) of requesting the consumable product delivery is prevented even with the device configuration in which the consumable product is easily removable. As a result, the occurrence of consumable product shortage is prevented.

[0144] According to the present disclosure, the notification miss of requesting the consumable product delivery and the occurrence of the consumable product shortage are prevented.

OTHER EMBODIMENTS

[0145] Embodiment(s) of the present disclosure can also be realized by a computer of a system or apparatus that reads out and executes computer executable instructions (e.g., one or more programs) recorded on a storage medium (which may also be referred to more fully as a ‘non-transitory computer-readable storage medium’) to perform the functions of one or more of the above-described embodiment(s) and/or that includes one or more circuits (e.g., application specific integrated circuit (ASIC)) for performing the functions of one or more of the above-described embodiment(s), and by a method performed by the computer of the system or apparatus by, for example, reading out and executing the computer executable instructions from the storage medium to perform the functions of one or more of the above-described embodiment(s) and/or controlling the one or more circuits to perform the functions of one or more of the above-described embodiment(s). The computer may comprise one or more processors (e.g., central processing unit (CPU), micro processing unit (MPU)) and may include a network of separate computers or separate processors to read out and execute the computer executable instructions. The computer executable instructions may be provided to the computer, for example, from a network or the storage medium. The storage medium may include, for example, one or more of a hard disk, a random-access memory (RAM), a read only memory (ROM), a storage of distributed computing systems, an optical disk (such as a compact disc (CD), digital versatile disc (DVD), or Blu-ray Disc™ (BD)), a flash memory device, a memory card, and the like.

[0146] While the present disclosure has been described with reference to exemplary embodiments, it is to be understood that the disclosure 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.

[0147] This application claims the benefit of Japanese Patent Application No. 2024-019665, filed Feb. 13, 2024, which is hereby incorporated by reference herein in its entirety.

Claims

1. A printing apparatus including a display unit, comprising: one or more memories storing instructions, and one or more processors that execute the stored instructions, which cause the printing apparatus to: record, in a case where a remaining amount of a recording material in a consumable product mounted on the printing apparatus is less than a first predetermined amount,

notification-transmitted information indicating that a notification requesting a delivery of the consumable product has been transmitted, to a first storage unit included in the mounted consumable product, and externally transmit the notification; record the information indicating that the notification has been transmitted as information on the mounted consumable product to a second storage unit included in the printing apparatus, based on the information recorded in the first storage unit; and perform, in a case where the consumable product is removed from the printing apparatus, and the information indicating that the notification has been transmitted is not recorded in the second storage unit, display on the display unit of the printing apparatus indicating that the notification has not been transmitted and prompting a user to mount the consumable product on the printing apparatus.

2. The printing apparatus according to claim 1, wherein in a case where mounting of the removed consumable product on the printing apparatus is detected after the display is performed, in response to receipt of a user's selection indicating that the notification is to be transmitted, the notification is transmitted.

3. The printing apparatus according to claim 2, wherein in a case where mounting of the removed consumable product on the printing apparatus is detected after the display is performed, based on a fact that a difference between the remaining amount of the recording material in the consumable product and the first predetermined amount is less than a second predetermined amount, and in response to receipt of the user's selection, the notification is transmitted.

4. The printing apparatus according to claim 1, wherein on the printing apparatus, the consumable product for each of a plurality of colors of recording materials is mounted, and wherein, based on a determination of whether the remaining amount of the recording material in the consumer product of each of the plurality of colors is less than the first predetermined amount, the notification is transmitted for the consumable product of a color with the remaining amount of the recording material being less than the first predetermined amount among the consumable products of the plurality of colors.

5. A control method of a printing apparatus including a display unit, comprising: record, in a case where a remaining amount of a recording material in a consumable product mounted on the printing apparatus is less than a first predetermined amount, notification-transmitted information indicating that a notification requesting a delivery of the consumable product has been transmitted, to a first storage unit included in the mounted consumable product, and externally transmit the notification; record the information indicating that the notification has been transmitted as information on the mounted consumable product to a second storage unit included in the printing apparatus, based on the information recorded in the first storage unit; and perform, in a case where the consumable product is removed from the printing apparatus, and the information indicating that the notification has been transmitted is not recorded in the second storage unit, display on the display unit of the printing apparatus indicating that the notification has not been transmitted and prompting a user to mount the consumable product on the printing apparatus.
