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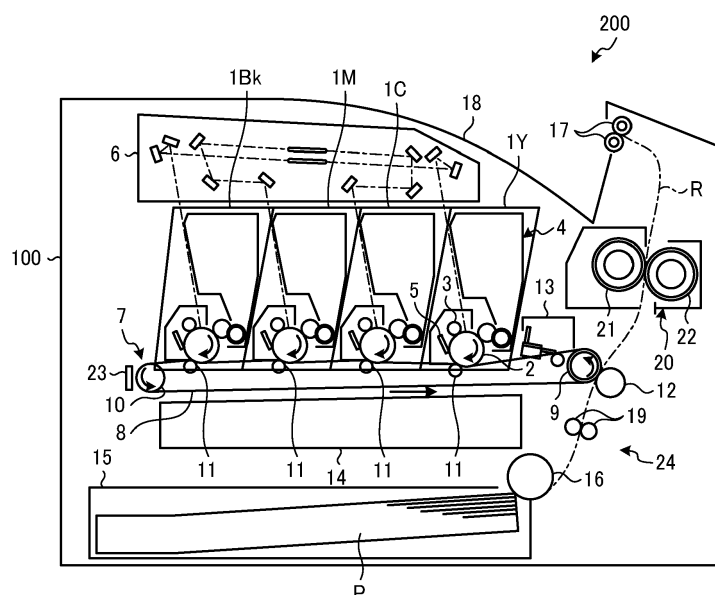
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(54) **IMAGE FORMING APPARATUS AND OPERATION DISPLAY METHOD**

(57) An image forming apparatus (200) includes a main body (100) including a main-body operation member (100a), a conveyor unit (24a; 24b) configured to be detachably attached to the main body (100) and including a conveyor-side operation member (24a1; 24b1), a sensor (109) disposed along a sheet conveyance passage (R) inside the image forming apparatus (200), to detect a sheet, a detection unit (104a) configured to detect, with

the sensor (109), an occurrence of a jam in the image forming apparatus (200); and a display control unit (102b). In response to a detection of the occurrence of the jam in the conveyor unit (24a; 24b) and a determination that a predetermined condition is satisfied, the display control unit (102b) displays operation guidance of at least the main-body operation member (100a).

FIG. 1



Description

Technical Field

[0001] Embodiments of the present disclosure relate to an image forming apparatus and an operation display method.

Description of the Related Art

[0002] There are image forming apparatuses that guide, on a display, a procedure to remove a jammed sheet (a recording medium) when jamming of sheet (hereinafter may be simply "jam") occurs.

[0003] For example, JP-2012-58588-A describes the following image forming apparatus. When a jam occurs, the image forming apparatus measures the time required for resolving the jam, stores, in a memory, a procedure with which the jam has resolved in a shortest time until then as a shortest jam resolving procedure. Next time the occurrence of jam is detected, the image forming apparatus displays the shortest jam resolving procedure on a control panel. According to JP-2012-58588-A, as a user can mirror the shortest jam resolving procedure viewing the display, the time required for resolving the jam can be shortened.

[0004] The procedure for resolving the jam to be presented on the display may be made more efficient. For example, if a piece torn from a recording sheet remains inside the apparatus, the piece of the recording sheet may cause a jam again. Therefore, depending on the resolving procedure, preventing the recording sheet from being torn can prevent the occurrence of another jam, thereby attaining streamlining of jam resolving. Further, when the user can remove the jammed sheet without bending over, a physical burden of the user is smaller, which is another streamlining of the jam resolving.

SUMMARY

[0005] In view of the foregoing, an object of the present disclosure is to provide an image forming apparatus and a method that can improve resolving of a jam.

[0006] In order to achieve the above-described object, there is provided an image forming apparatus as described in appended claims. Advantageous embodiments are defined by the dependent claims.

[0007] Advantageously, the image forming apparatus includes a main body including a main-body operation member; a conveyor unit configured to be detachably attached to the main body; a sensor disposed along a sheet conveyance passage inside the image forming apparatus and configured to detect a sheet; a detection unit configured to detect, with the sensor, an occurrence of a jam in the image forming apparatus; and a display control unit. The conveyor unit includes a conveyor-side operation member. In response to a detection of the occurrence of the jam in the conveyor unit and a determination

that a predetermined condition is satisfied, the display control unit displays operation guidance of at least the main-body operation member.

[0008] Additionally, there is provided a method for displaying an operation of an image forming apparatus that includes a detachably attachable conveyor unit. Advantageously, the method includes detecting an occurrence of a jam in the conveyor unit, and displaying operation guidance of at least an operation member of a main body of the image forming apparatus in response to the detecting and a determination that a predetermined condition is satisfied.

[0009] Accordingly, a jam can be resolved efficiently.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] A more complete appreciation of the disclosure and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a schematic view of an image forming apparatus according to an embodiment of the present disclosure;

FIG. 2 is a diagram illustrating a layout of a conveyor unit of the image forming apparatus illustrated in FIG. 1;

FIG. 3 is a block diagram illustrating an example of a functional configuration and a relating hardware configuration of the image forming apparatus illustrated in FIG. 1;

FIGS. 4A and 4B are diagrams illustrating examples of display of guidance to operate an operation member of an apparatus body of the image forming apparatus illustrated in FIG. 1;

FIGS. 5A and 5B are diagrams illustrating examples of display of guidance to operate of an operation member of a second-stage conveyor unit illustrated in FIG. 2;

FIGS. 6A and 6B are diagrams illustrating examples of display of guidance to operate an operation member of a third-stage conveyor unit illustrated in FIG. 2;

FIG. 7 is a flowchart illustrating an operation of the image forming apparatus including the conveyor unit illustrated in FIG. 2, when a sheet jamming occurs in the conveyor unit;

FIG. 8 is a flowchart illustrating another operation of the image forming apparatus including the conveyor unit illustrated in FIG. 2, when a sheet jamming occurs in the conveyor unit;

FIG. 9 is a flowchart illustrating an operation at the occurrence of jamming of an image forming apparatus according to a modified example, having the conveyor unit illustrated in FIG. 2; and

FIG. 10 is a block diagram illustrating an example of a hardware configuration applicable to the image

forming apparatus illustrated in FIG. 1 and the modified example.

[0011] The accompanying drawings are intended to depict embodiments of the present invention and should not be interpreted to limit the scope thereof. The accompanying drawings are not to be considered as drawn to scale unless explicitly noted.

DETAILED DESCRIPTION

[0012] In describing embodiments illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the disclosure of this patent specification is not intended to be limited to the specific terminology so selected, and it is to be understood that each specific element includes all technical equivalents that operate in a similar manner and achieve a similar result.

[0013] An image forming apparatus according to the present embodiment includes a display, and, when a recording sheet such as a paper is jammed (stuck in a conveyance passage), displays a procedure for removing the jammed recording sheet on the display.

[0014] The procedure for resolving the jam, to be displayed on the display is as follows for efficiency.

[0015] An image forming apparatus according to the embodiment described below includes a conveyor unit and, when a jam occurs, displays, not only guidance to operate an operation member of the conveyor unit, guidance to operate an operation member of a main body of the image forming apparatus, to streamline removal of the jammed sheet (resolving the jam).

[0016] Specifically, the image forming apparatus includes a plurality of operation members to be operated by a user to resolve the jam, stores, in a memory, operation guidance of the plurality of members in consideration of ease of jammed sheet removal in advance, and displays, on a display, the operation guidance in response to a detection of the occurrence of a jam. For example, when a jam occurs in a sheet feeding unit that is detachably attached to the main body, the image forming apparatus displays guidance to open the operation member (e.g., a cover) of the sheet feeding unit on the display. Then, the image forming apparatus displays, on the display, guidance to open the operation member (e.g., a cover) of the main body, guidance to remove the jammed sheet, and guidance to close the operation member. For example, the distance from a sheet detection sensor (e.g., a first bank sheet sensor 15a1 in FIG. 2) in the detachable conveyor unit to a registration sensor (e.g., a registration sensor 31 in FIG. 2), which is the closest to the sheet detection sensor, of a plurality of sheet sensors disposed along a conveyance passage in the image forming apparatus main body is long. Therefore, when a preceding sheet is jammed, the tip of a subsequent sheet may close to the registration sensor. In this case, by opening the cover of the main body, the jammed sheet can be easily removed from the main body

side. Further, the user needs not to bend over to remove the sheet jammed inside the detachable conveyor unit from the main body side. That is, displaying the operation guidance of a plurality of operation members in consideration of ease of jammed sheet removal on the display is advantageous in preventing a piece torn from a jammed recording sheet (e.g., a paper sheet) from remaining inside the apparatus, thereby preventing the recurrence of jamming. Accordingly, the jam resolving procedure can be streamlined. Further, displaying the operation guidance of a plurality of operation members in consideration of ease of jammed sheet removal on the display is advantageous can reduce sheet removal work of the user performed in a bending posture. Thus, the jam resolving procedure can be made efficient.

[0017] Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views thereof, embodiments according to the present disclosure are described. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

[0018] Referring to FIG. 1, an image forming apparatus 200 according to the present embodiment is described below. FIG. 1 is a schematic sectional view of the image forming apparatus 200. The image forming apparatus 200 illustrated in FIG. 1 is a color image forming apparatus.

[0019] The image forming apparatus 200 includes four process units 1Y, 1C, 1M, and 1Bk that are attachable to and detachable from a main body 100. The process units 1Y, 1C, 1M, and 1Bk have the same configuration except for containing different color toners, i.e., yellow (Y), cyan (C), magenta (M), and black (Bk) toners, respectively, corresponding to decomposed color components of full-color images. Each of the process units 1Y, 1M, 1C, and 1Bk includes a photoconductor drum 2 as a latent image bearer, a charging roller 3 as a charging device to charge the surface of the photoconductor drum 2, a developing device 4 to supply toner (developer) to the surface of the photoconductor drum 2 to form a toner image thereon, and a cleaning blade 5 as a cleaner to clean the surface of the photoconductor drum 2.

[0020] In FIG. 1, an exposure device 6, as an electrostatic latent image forming device, to expose the surface of the photoconductor drum 2 is disposed above the process units 1Y, 1C, 1M, and 1Bk. The exposure device 6, the charging roller 3, and the developing device 4 function as an image forming device to form an image on the photoconductor drum 2. Below the process units 1Y, 1C, 1M, and 1Bk, a transfer device 7 is disposed.

[0021] The transfer device 7 includes an intermediate transfer belt 8 that is an endless belt as a transfer body. The intermediate transfer belt 8 is stretched around a drive roller 9 and a driven roller 10 and rotatable (able to run around) in the direction indicated by the arrow in the drawing.

[0022] Four primary transfer rollers 11, as primary

transfer devices, are disposed opposite the four photoconductor drums 2, respectively.

[0023] At the position opposite the corresponding photoconductor drum 2, each of the four primary transfer rollers 11 presses an inner surface of the intermediate transfer belt 8 against the corresponding photoconductor drum 2 to form a primary transfer nip where a pressed portion of the intermediate transfer belt 8 contacts the photoconductor drum 2.

[0024] A secondary transfer roller 12, as a secondary transfer device, is disposed opposite the drive roller 9.

[0025] The secondary transfer roller 12 is pressed against an outer surface of the intermediate transfer belt 8 to form a secondary transfer nip where the secondary transfer roller 12 contacts the intermediate transfer belt 8.

[0026] A belt cleaner 13 to clean the surface of the intermediate transfer belt 8 is disposed on the outer surface of the intermediate transfer belt 8 on the right end side in the drawing.

[0027] A waste toner drain tube is coupled to the belt cleaner 13 as well as an inlet of a waste toner container 14 below the transfer device 7.

[0028] On the outer surface of the intermediate transfer belt 8 on the left end side in FIG. 1, a density sensor 23 is disposed, as a density detector to detect the amount of toner adhering to the intermediate transfer belt 8.

[0029] Below the main body 100, a sheet tray 15 that contains recording sheets P, serving as recording media, and a sheet feeding roller 16 to feed the recording sheets P from the sheet tray 15 are disposed.

[0030] An upper section of the main body 100 includes an output roller pair 17 that ejects the recording sheet P to the outside, and an output tray 18 on which the ejected recording sheet P is stacked.

[0031] Further, inside the main body 100, a conveyance passage R is formed for guiding the recording sheet from the sheet tray 15 in the lower section to the output tray 18 in the upper section.

[0032] In the conveyance passage R, a registration roller pair 19 is disposed midway from the sheet feeding roller 16 to the secondary transfer roller 12.

[0033] Further, midway from the secondary transfer roller 12 to the output roller pair 17, a fixing device 20 is disposed to fix the image on the recording sheet.

[0034] The fixing device 20 includes a fixing belt 21, as a fixing rotator heated by a heater, and a pressure roller 22, as a pressure rotator that presses against the fixing belt 21.

[0035] The portion where the fixing belt 21 and the pressure roller 22 press against each other is referred to as a fixing nip.

[0036] In FIG. 1, the sheet feeding roller 16, the registration roller pair 19, the drive roller 9, the secondary transfer roller 12, the fixing belt 21, the pressure roller 22, and the output roller pair 17, which are disposed along the conveyance passage R starting from the sheet tray 15, together construct a conveyor unit 24. The main body 100 may be configured to enable the conveyor unit 24 to

be detachably attached thereto.

[0037] Although each of the sheet tray 15 and the conveyor unit 24 is in a single stage configuration in FIG. 1, an additional sheet tray and an additional conveyor unit may be installed below the sheet tray 15. That is, the main body 100 may be configured to enable a plurality of conveyor units to be attached thereto in a multi-stage manner.

[0038] Next, a description is given of a basic operation of the image forming apparatus 200 with reference to FIG. 1.

[0039] As an image forming operation starts, a driver rotates the photoconductor drums 2 of the process units 1Y, 1C, 1M, and 1Bk clockwise in FIG. 1. The charging rollers 3 uniformly charge the outer surfaces of the respective photoconductor drums 2 in a predetermined polarity.

[0040] The exposure device 6 emits laser beams onto the charged outer surfaces of the photoconductor drums 2, respectively, thus forming electrostatic latent images on the photoconductor drums 2.

[0041] At that time, the photoconductor drums 2 are exposed according to single-color image data, that is, yellow, cyan, magenta, and black image data decomposed from desired full-color image data.

[0042] The developing devices 4 supply respective color toner to the electrostatic latent images formed on the photoconductor drums 2, thereby developing the electrostatic latent images into visible toner images.

[0043] As a driver rotates the drive roller 9 counter-clockwise in the drawing, the intermediate transfer belt 8 rotates in the direction indicated by the arrow.

[0044] Each primary transfer roller 11 is applied with a voltage having a polarity opposite a polarity of the toner charge, controlled in constant-voltage or constant-current control.

[0045] Accordingly, a transfer electrical field is generated in each primary transfer nip between the primary transfer roller 11 and the corresponding photoconductor drum 2.

[0046] Then, the yellow, cyan, magenta, and black toner images formed on the photoconductor drums 2 of the process units 1Y, 1C, 1M, and 1Bk are primarily transferred from the photoconductor drums 2 onto the intermediate transfer belt 8 by the transfer electrical fields at the primary transfer nips and superimposed one atop another on the intermediate transfer belt 8.

[0047] Thus, a full-color toner image is formed on the surface of the intermediate transfer belt 8.

[0048] Residual toner adhering to the surface of each photoconductor drum 2 after the toner image is transferred is removed by the cleaning blade 5. Then, a discharger discharges the outer surface of the photoconductor drum 2, initializing the surface potential of the photoconductor drum 2 as preparation for subsequent image formation.

[0049] Meanwhile, in the lower section of the image forming apparatus 200, the sheet feeding roller 16 ro-

tates, thereby feeding the recording sheet P from the sheet tray 15 to the conveyance passage R.

[0050] The recording sheet P fed to the conveyance passage R is sent to the secondary transfer nip between the secondary transfer roller 12 and the drive roller 9 opposite to each other, by the registration roller pair 19

[0051] At that time, transfer voltage opposite to the charge polarity of the toner image on the intermediate transfer belt 8 is applied to the secondary transfer roller 12, and a transfer electrical field is generated in the secondary transfer nip.

[0052] The transfer electrical field generated in the secondary transfer nip transfers the toner images from the intermediate transfer belt 8 onto the recording sheet P at a time.

[0053] The recording sheet P bearing the toner image is conveyed to the fixing device 20 where the fixing belt 21 and the pressure roller 22 fix the toner image on the recording sheet P with heat and pressure.

[0054] The output roller pair 17 ejects the recording sheet P bearing the fixed toner image to the output tray 18.

[0055] Further, the toner remaining on the intermediate transfer belt 8 after the transfer is removed by the belt cleaner 13, and the removed toner is conveyed to the waste toner container 14 and collected therein.

[0056] Described above is the image forming operation to form a full-color toner image on the recording sheet P.

[0057] Next, a layout of a conveyance structure of the image forming apparatus 200 is described with reference to FIG. 2. FIG. 2 is a diagram illustrating a layout (conveyance layout) of the conveyor unit 24.

[0058] In the conveyance layout illustrated in FIG. 2, additional sheet trays 15a and 15b are installed below the sheet tray 15.

[0059] In the sheet tray 15, a feeding exit sensor 151 is disposed near an end of the sheet tray 15 on the conveyance passage R side. This structure enables detection of presence or absence of the sheet conveyed from the sheet tray 15 to the conveyance passage R.

[0060] In the sheet tray 15a, the first bank sheet sensor 15a1 is disposed near an end of the sheet tray 15a on the conveyance passage R side. This structure enables detection of presence or absence of the sheet conveyed from the sheet tray 15a to the conveyance passage R. Of a plurality of areas separated by alternate long and short dashed lines in FIG. 2, an area corresponding to the sheet tray 15a is referred to as a bank B 1.

[0061] In the sheet tray 15b, a second bank sheet sensor 15b1 is disposed near an end of the sheet tray 15b on the conveyance passage R side. This structure enables detection of presence or absence of the sheet conveyed from the sheet tray 15b to the conveyance passage R. Of the plurality of areas separated by alternate long and short dashed lines in FIG. 2, an area corresponding to the sheet tray 15b is referred to as a bank B2.

[0062] Above the first bank sheet sensor 15a1, the reg-

istration sensor 31, a fixing entry sensor 32, a fixing exit sensor 33, and a sheet ejection sensor 34 are sequentially disposed along the conveyance passage R. The presence or absence of the sheet can be detected until the sheet is ejected. In the case of double-sided printing, further, a double-sided exit sensor 35 is disposed along the conveyance passage R. Also in this case, the presence or absence of the sheet can be detected until the sheet is ejected.

[0063] In FIG. 2, the sheet feeding roller 16, the registration roller pair 19, the drive roller 9, the secondary transfer roller 12, the fixing belt 21, the pressure roller 22, and the output roller pair 17, which are disposed along the conveyance passage R starting from the sheet tray 15, together construct the conveyor unit 24. A structure including a sheet feeding roller 16a and the sheet feeding roller 16, extending from the sheet tray 15a along the conveyance passage R, construct a conveyor unit 24a (a stage of a multi-stage conveyor unit). A structure including a sheet feeding roller 16b and the sheet feeding roller 16a, extending from the sheet tray 15b along the conveyance passage R, construct a conveyor unit 24b (a lower stage of the multi-stage conveyor unit). A sheet conveyance passage including the conveyance passage R extending from the sheet tray 15b is formed astride the detachable conveyor units 24a and 24b and the main body 100. FIG. 2 illustrates a layout of the multi-stage conveyor units 24, 24a, and 24b. In the multi-stage conveyor units 24, 24a, and 24b, the conveyor unit 24 is the first-stage conveyor unit, the conveyor unit 24a is the second-stage conveyor unit, and the conveyor unit 24b is the third-stage conveyor unit. The main body 100 (see FIG. 1) may be configured to enable the multi-stage conveyor units 24, 24a, and 24b to be detachably attached thereto.

[0064] Next, a description is given of a control block in the image forming apparatus 200, with reference to FIG. 3. FIG. 3 is a block diagram illustrating an example of a functional configuration of the image forming apparatus 200, together with relating hardware.

[0065] The image forming apparatus 200 includes a control panel 101 (controller), a controller control unit 102 (panel control unit), a communication interface 103, an engine control unit 104, a temperature sensor 105, a halogen heater 106, a pressure roller driver 107, a cam driver 108, a sensor group 109 (photosensors), an image writing control unit 110, an image forming process unit 111, and a memory 112 (storage unit). The controller control unit 102 includes an operation detection unit 102a and a display control unit 102b. The engine control unit 104 includes a jam detection unit 104a. For example, the memory 112 stores various data used by the engine control unit 104.

[0066] The controller control unit 102 includes a central processing unit (CPU), a read only memory (ROM), and a random access memory (RAM). The controller control unit 102 is connected to the engine control unit 104, the control panel 101, the communication interface 103, and

the like. The controller control unit 102 executes a control program installed in advance to control operation of the entire image forming apparatus 200 and input from the communication interface 103 and the control panel 101. For example, the operation detection unit 102a receives an instruction input by the user via the operation unit 101a, and performs various processing according to the instruction. Further, the controller control unit 102 receives a print job (image forming job) command and image data from, for example, an external host computer via the communication interface 103, and controls the engine control unit 104, thereby controlling an image forming operation for forming and outputting a monochrome or a color image on a sheet. The engine control unit 104 includes a CPU, a ROM, and a RAM. The engine control unit 104 executes a control program installed in advance to control the image forming process unit 111 and the image writing control unit 110 to perform an image forming process based on an instruction from the controller control unit 102. For example, in an image forming operation mode, the engine control unit 104 controls energization to the halogen heater 106 to keep the temperature of the fixing belt 21 detected by the temperature sensor 105 at a target temperature, and control the pressure roller driver 107, which is a driver that drives the pressure roller 22.

[0067] The engine control unit 104 controls the functions (scanning function and printing function) of the image forming apparatus 200. The jam detection unit 104a detects the occurrence of a jam (jammed sheet) with a sensor group 109 during printing. The sensor group 109 is a group of photosensors. The sensor group 109 includes the sensors 151, 15a1, 15b1, 31, 32, 33, 34, and 35 disposed along the conveyance passage R illustrated in FIG. 2. The jam detection unit 104a and the sensor group 109 serve as a detection unit. Each of the sensors 151, 15a1, 15b1, 31, 32, 33, 34, and 35 can be configured to detect that the recording sheet (paper) is present at the corresponding position for a predetermined time or longer, thereby detecting the occurrence of a jam (jammed sheet).

[0068] When the jam detection unit 104a detects the occurrence of a jam, the jam detection unit 104a notifies the controller control unit 102 of the occurrence of the jam. The display control unit 102b displays, on the display 101b of the control panel 101, information indicating the occurrence of sheet jamming and information indicating the procedure for removing the jammed sheet, in response to the notification of the occurrence of the jam.

[0069] For example, in the case of the first bank sheet sensor 15a1 in FIG. 2, the jam detection unit 104a illustrated in FIG. 3 detects the occurrence of a jam when the sheet does not reach the first bank sheet sensor 15a1 after the lapse of a predetermined time from the start of sheet feeding, or the sheet does not pass by the first bank sheet sensor 15a1 after the elapse of a predetermined time from when the sheet reaches the first bank sheet sensor 15a1. Then, the jam detection unit 104a

notifies the controller control unit 102 of the jam (sheet jamming) in the bank B1 (the conveyor unit 24a). Then, the display control unit 102b displays the jammed sheet removing procedure on the display 101b.

[0070] For example, it is assumed that, in response to a detection of the occurrence of jam (sheet jamming) in the bank B1 (conveyor unit 24a), the display control unit 102b sequentially displays, on the display 101b, guidance to operate a cover 24a1, as the operation member, of the bank B1 as illustrated in FIGS. 5A and 5B. At this time, when the leading end of the jammed recording sheet (paper) projects into the main body 100 from the bank B1, the jammed sheet removing procedure illustrated in FIGS. 5A and 5B does not guide the operation for the user to access the leading end of the jammed sheet. Accordingly, removal of the jammed sheet is difficult, and the sheet may be torn and remain inside the apparatus. Further, to remove the sheet from inside the cover 24a1 of the bank B1 (the conveyor unit 24a) as illustrated in FIGS. 5A and 5B, the user needs to bend over for the operation at a low position, resulting in a physical burden on the user.

[0071] By contrast, it is assumed that, in response to a detection of the occurrence of jam (sheet jamming) in the bank B1, the display control unit 102b sequentially displays, on the display 101b, guidance to operate a cover 100a, as the operation member, of the main body 100 as illustrated in FIGS. 4A and 4B. At this time, when the leading end of the jammed recording sheet (paper) projects into the main body 100 from the bank B1, according to the jammed sheet removing procedure illustrated in FIGS. 4A and 4B, the user opens the cover 100a of the main body 100 and can access the leading end of the jammed sheet. Accordingly, the user can easily remove the jammed sheet from the main body 100 side. That is, the jam (paper clogging) can be resolved efficiently. Further, when the jammed sheet is removed from the main body 100 side as illustrated in FIGS. 4A and 4B, the user can remove the sheet without bending over. That is, the jam (paper clogging) can be resolved efficiently.

[0072] Therefore, in the case where the occurrence of a jam (sheet jamming) in the bank B1 (conveyor unit 24a) is detected, the display control unit 102b sequentially displays, on the display 101b, the screens illustrating the jam resolving operations in the order from FIG. 4A to FIG. 4B, FIG. 5A, and FIG. 5B, thereby streamlining the jam resolving procedure.

[0073] Similarly in the case where the occurrence of a jam (sheet jamming) in the bank B2 (conveyor unit 24b) is detected, the jam resolving procedure can be streamlined when the display control unit 102b sequentially displays, on the display 101b, the screens illustrating the jam resolving operations in the order from FIG. 5A to FIG. 5B, FIG. 6A, and FIG. 6B.

[0074] FIGS. 4A and 4B are diagrams illustrating examples of displayed operations of the operation member of the main body 100 (a main-body operation member).

By sequentially displaying the screens in FIG. 4A to FIG. 4B on the display 101b, the operation to open the cover 100a on the main body 100 side is guided to the user. FIGS. 5A and 5B are diagrams illustrating examples of displayed operations of the operation member of the second-stage conveyor unit 24a or the bank B 1 (a conveyor-side operation member). By sequentially displaying the screens in FIG. 5A to FIG. 5B on the display 101b, the operation to open the cover 24a1 on the conveyor unit 24a (bank B1) is guided to the user. FIGS. 6A and 6B are diagrams illustrating examples of displayed operations of the operation member of the third-stage conveyor unit 24b or the bank B2 (a conveyor-side operation member). By sequentially displaying the screens in FIG. 6A to FIG. 6B on the display 101b, the operation to open the cover 24b1 of the conveyor unit 24b (bank B2) is guided to the user.

[0075] Next, a description is given below of the operation of the image forming apparatus 200 when the occurrence of a jam (sheet jamming) is detected in the configuration in which the bank B1 is attachable to and removable from the main body 100, with reference to FIG. 7. FIG. 7 is a flowchart illustrating a sequence of actions of the image forming apparatus 200.

[0076] In the image forming apparatus 200, first, the jam detection unit 104a is on standby until the sensor group 109 detects the occurrence of a jam. In response to a detection of the occurrence of a jam (sheet jamming), the jam detection unit 104a determines whether or not the jam is in the bank B1 (the detachable conveyor unit 24a) in S1-1. In response to a determination, by the jam detection unit 104a, that the jam is in the bank B 1, that is, the detachable conveyor unit 24a, (Yes in S1-1), the display control unit 102b displays operation guidance to open the cover 100a (the main-body operation member) of the main body 100 on the display 100b (S1-2). The display control unit 102b displays guidance (e.g., an instruction) to remove the jammed sheet from the main body 100 on the display 101b (S1-3). The display control unit 102b displays operation guidance to close the cover 100a of the main body 100 on the display 101b (S1-4). In response to reception of a display end request via the operation unit 101a, the operation detection unit 102a determines that the removal of the jammed sheet is successful (Yes in S1-5), and ends the process. The successful removal of the jammed sheet by the operation of the main-body operation member is an example of a predetermined condition.

[0077] When the operation detection unit 102a does not accept the display end request for a predetermined time, the operation detection unit 102a determines that the removal of the jammed sheet is not successful (No in S1-5), and the display control unit 102b controls the display 101b to display operation guidance to open the cover 24a1 of the bank B1 (S1-6). The display control unit 102b displays guidance to remove the jammed sheet from the bank B1 on the display 101b (S1-7). The display control unit 102b displays operation guidance to close

the cover 24a1 of the bank B1 on the display 101b (S1-8).

[0078] In response to a determination, by the jam detection unit 104a, that the jam is not in the bank B1 (the detachable conveyor unit 24a), that is, the jam has occurred in the main body 100 (No in S1-1), the display control unit 102b displays the operation guidance to open the cover 100a of the main body 100 on the display 101b (S1-9). The display control unit 102b displays guidance to remove the jammed sheet from the main body 100 on the display 101b (S1-10). The display control unit 102b displays operation guidance to close the cover 100a of the main body 100 on the display 101b (S1-11).

[0079] In FIG. 7, when a jam in the bank B 1 is detected, first, guidance for removal of the sheet from the main body 100 is displayed on the display 101b, and then guidance for removal of the sheet from the bank B1 is displayed on the display 101b. As a result, when the front end of the sheet is inside the main body 100, the sheet can be removed from the main body 100. Thus, the sheet can be easily removed. Moreover, since the time during which the user acts at a low position is shortened or reduced, the physical burden can be reduced.

[0080] Next, a description is given below of the operation of the image forming apparatus 200 when the occurrence of a jam (sheet jamming) is detected in the configuration in which the banks B 1 and B2 are attachable to and removable from the main body 100, with reference to FIG. 8. FIG. 8 is a flowchart illustrating a sequence of actions of the image forming apparatus 200.

[0081] In the image forming apparatus 200, the jam detection unit 104a is on standby until the occurrence of a jam is detected. In response to detection of the occurrence of a jam (sheet jamming), the jam detection unit 104a determines whether or not the jam is in the bank B2 (the detachable conveyor unit 24b) in S2-1. In response to a determination, by the jam detection unit 104a, that the jam is in the bank B2 (the detachable conveyor unit 24b) (Yes in S2-1), the display control unit 102b displays operation guidance to open the cover 24a1 of the bank B 1 (the conveyor unit 24a one stage higher than the conveyor unit 24b) on the display 100b (S2-2). The display control unit 102b displays guidance to remove the jammed sheet from the bank B1 on the display 101b (S2-3). The display control unit 102b displays operation guidance to close the cover 24a1 of the bank B1 on the display 101b (S2-4). In response to reception of a display end request via the operation unit 101a, the operation detection unit 102a determines that the removal of the jammed sheet is successful (Yes in S2-5), and ends the process. When the operation detection unit 102a does not accept the display end request for a predetermined time, the operation detection unit 102a determines that the removal of the jammed sheet is not successful (No in S2-5), and the display control unit 102b controls the display 101b to display operation guidance to open the cover 24b1 of the bank B2 (S2-6). The display control unit 102b displays guidance to remove the jammed sheet from the bank B2 on the display 101b (S2-7). The display

control unit 102b displays operation guidance to close the cover 24b2 of the bank B2 on the display 101b (S2-8).

[0082] In response to a determination, by the jam detection unit 104a, that the position of the jam is not in the bank B2 (the detachable conveyor unit 24b) (No in S2-1), the processes from S1-1 in FIG. 7 are performed.

[0083] In FIG. 8, when a jam in the bank B2 (the conveyor unit 24b) is detected, first, guidance for removal of the sheet from the bank B 1 (the conveyor unit 24a) is displayed on the display 101b, and then guidance for removal of the sheet from the bank B2 is displayed on the display 101b. As a result, when the leading end of the sheet is in the bank B1, the sheet can be removed from the bank B 1, thereby facilitating the removal of the sheet. Moreover, since the time during which the user acts at a low position is shortened or reduced, the physical burden can be reduced.

[0084] As described above, in the present embodiment, at the occurrence of jamming, the image forming apparatus 200 displays, not only the guidance to operate the operation members of the conveyor units 24a and 24b, but also the guidance to operate the operation member of the main body 100 to which the conveyor units 24a and 24b is removably attached. That is, the image forming apparatus 200 displays, on the display 101b, the operation guidance of the plurality of components in consideration of ease of removal of the jammed sheet. This configuration can prevent the jammed sheet (for example, jammed paper) from being torn and left inside the apparatus and prevent jamming from occurring again, thereby streamlining the jam resolving procedure. Further, this configuration can prevent the user from bending over to remove the recording sheet (for example, paper), and the jam resolving procedure can be made efficient. That is, this configuration can streamline the procedure for resolving the jam to be displayed.

[0085] Further, the image forming apparatus 200 can detect the position of the leading end of the recording sheet (paper) at the occurrence of a jam, and determine whether to display, on the display 101b, the operation guidance of the operation member of the main body 100. For example, in the configuration in which the bank B 1 can be attached to and detached from the main body 100, when the occurrence of a jam (sheet jamming) is detected, the image forming apparatus 200 performs an operation illustrated in FIG. 9, different from that of FIG. 7 in the following points.

[0086] In response to a detection of a jam in the bank B1 (the detachable conveyor unit 24a) (Yes in S1-1), the jam detection unit 104a determines whether the recording sheet (paper) has reached the first bank sheet sensor 15a1 of the bank B1 (S3-1). In response to detection of reaching of the recording sheet (paper) at the first bank sheet sensor 15a1 of the bank B 1 (Yes in S3-1), the jam detection unit 104a determines whether a predetermined time or longer has elapsed from when the recording sheet reaches the first bank sheet sensor 15a1 of the bank B 1 (S3-2). The predetermined time is a value obtained by

dividing, with the sheet conveyance speed, the distance from the first bank sheet sensor 15a1 to a position at which the sheet can be removed from the leading end thereof by opening the cover 100a of the main body 100.

In response to a determination that the predetermined time or longer has elapsed from when the recording sheet (paper) reaches the first bank sheet sensor 15a1 of the bank B1 (Yes in S3-2), the processes in S1-2 and thereafter are performed in the same manner as in FIG. 7.

[0087] The above-described elapse of the predetermined time is an example of the predetermined condition.

[0088] In response to a determination that the recording sheet (paper) has not yet reached the first bank sheet sensor 15a1 of the bank B 1 (No in S3-1), or the predetermined time has not yet elapsed from when the recording sheet reaches the first bank sheet sensor 15a1 of the bank B1 (No in S3-2), the display control unit 102b displays operation guidance to open the cover 24a1 of the bank B1 on the display 101b (S3-3). The display control unit 102b displays guidance to remove the jammed sheet from the bank B1 on the display 101b (S3-4). The display control unit 102b displays operation guidance to close the cover 24a1 of the bank B1 on the display 101b (S3-5).

[0089] As described above, when a jam in the bank B 1 is detected, the jam detection unit 104a determines in S3-1 and S3-2 whether the sheet can be removed by opening the cover 100a of the main body 100. In response to a determination that the sheet cannot be removed by opening the cover 100a of the main body 100, the display control unit 102b does not display, on the display 101b, the guidance to operate the operation member of the main body 100 in S3-3 to S3-5. This configuration can prevent the user from performing an unnecessary operation.

[0090] In another embodiment, an image forming apparatus to which aspects of this disclosure are applicable is a multifunction peripheral (product or printer, referred to as "MFP") such as an MFP 900 illustrated in FIG. 10. FIG. 10 is a block diagram illustrating an example of a hardware configuration of the MFP 900 as the image forming apparatus to which aspects of this disclosure are applicable. As illustrated in FIG. 10, the MFP 900 includes a controller 910, a short-range communication circuit 920, an engine controller 930, a control panel 940, and a network interface (I/F) 950.

[0091] The controller 910 includes a central processing unit (CPU) 901 as a main processor, a system memory (MEM-P) 902, a north bridge (NB) 903, a south bridge (SB) 904, an application specific integrated circuit (ASIC) 906, a local memory (MEM-C) 907, a hard disk drive (HDD) controller 908, and a hard drive (HD) 909 as a storage. An Accelerated Graphics Port (AGP) bus 921 connects the NB 903 and the ASIC 906.

[0092] The CPU 901 controls the entire operation of the MFP 900. The NB 903 is a bridge that connects the CPU 901 with the system memory 902, the SB 904, and the AGP bus 921. The NB 903 includes a memory controller to control reading and writing from and in the sys-

tem memory 902, a peripheral component interconnect (PCI) master, and an AGP target.

[0093] The system memory 902 includes a read only memory (ROM) 902a and a random access memory (RAM) 902b. The ROM 902a stores data and program for implementing various functions of the controller 910. The RAM 902b is used to load the program and the data. The RAM 902b is also used as a drawing memory to store drawing data for printing. For the purpose of distribution, the program stored in the RAM 902b can be stored in any computer-readable recording medium, such as a compact disc-read only memory (CD-ROM), a compact disc-recordable (CD-R), or a digital versatile disk (DVD), in a file format installable or executable by a computer.

[0094] The SB 904 connects the NB 903 to a PCI device and a peripheral device. The ASIC 906 is an integrated circuit (IC) for image processing having a hardware element for image processing and acts as a bridge that connects the AGP bus 921, a PCI bus 922, the HDD controller 908, and the local memory 907 to each other. The ASIC 906 includes a PCI target, an AGP master, an arbiter (ARB) as a central processor of the ASIC 906, a memory controller to control the local memory 907, a plurality of direct memory access controllers (DMACs), and a PCI unit. The DMACs is capable of converting coordinates of image data with a hardware logic. The PCI unit transfers data between a scanner unit 931 and a printer unit 932 through the PCI bus 922. The ASIC 906 may be connected to a universal serial bus (USB) interface, or the Institute of Electrical and Electronics Engineers 1394 (IEEE1394) interface.

[0095] The local memory 907 is used as a buffer storing image data to be copied or a buffer storing data to be coded. The HD 909 stores various image data, font data for printing, and form data. The HD 909 controls the reading or writing of data from or into the HD 909 under the control of the CPU 901. The AGP bus 921 is a bus interface for a graphics accelerator card, which is proposed to accelerate graphics processing. Through directly accessing the system memory 902 by high-throughput, speed of the graphics accelerator card is improved.

[0096] The short-range communication circuit 920 includes a short-range communication antenna 920a. The short-range communication circuit 920 communicates in compliance with near field communication (NFC), Bluetooth (registered trademark), or the like.

[0097] The engine controller 930 is, for example, a circuit board and includes the scanner unit 931 and the printer unit 932, to control a reading device (scanner) and an image forming engine such as photoconductor drums 2. The control panel 940 includes a panel display 940a and an operation device 940b. The panel display 940a is, e.g., a touch panel that displays current settings or a selection screen and that receives a user input. The operation device 940b is constructed of, e.g., a numeric keypad and a start key. The numeric keypad receives assigned values of image forming parameters such as an image density parameter. The start key receives an

instruction to start copying. The controller 910 controls the entire MFP 900 and controls, for example, drawing, communication, and input from the control panel 940. The scanner unit 931 or the printer unit 932 has a capability of image processing such as error diffusion and gamma conversion.

[0098] Note that, in response to an instruction to select a specific application through the control panel 940 by use of, e.g., an application switch key, the MFP 900 sequentially selects function of a document server, coping, printing, and facsimile transmission. When the document server function is selected, the operation mode is changed to a document box mode to store document data. With selection of the copy function, the operation mode is changed to a copy mode. With selection of the print function, the operation mode is changed to a printer mode. With selection of the facsimile function, the operation mode is changed to a facsimile mode.

[0099] The network I/F 950 controls data communication with an external device through a network. The short-range communication circuit 920 and the network I/F 950 are electrically connected to the ASIC 906 via the PCI bus 922.

[0100] Further, each of the functions of the described embodiments may be implemented by one or more processing circuits or circuitry. Here, the "processing circuit or circuitry" in the present specification includes a programmed processor to execute each function by software, such as a processor implemented by an electronic circuit, and devices, such as an application specific integrated circuit (ASIC), a digital signal processors (DSP), a field programmable gate array (FPGA), and conventional circuit modules arranged to perform the recited functions.

[0101] Programs to be executed on each apparatus or device according to the above-described embodiments can be recorded, as a file installable or executable by a computer, on a computer-readable recording medium, such as a CD-ROM, a flexible disk (FD), a CD-R, or a DVD and provided therefrom.

[0102] Such a program to be executed on each apparatus according to the above-described embodiments can be stored on a computer connected to a network, such as the Internet, to be downloaded from the computer via the network. Alternatively, the computer programs executed in the apparatus according to the above-described embodiments can be provided or distributed via a network such as the Internet.

[0103] Further, the program according to the embodiments of the present disclosure may be provided as being preloaded in a ROM and the like.

[0104] The program executed by the apparatus according to the above-described embodiments are in a modular configuration including the above-described units. As hardware, as the CPU (a processor) reads the program from the ROM and executes the program, the above-described functional units are loaded and implemented (generated) in a main memory.

[0105] Although the image forming apparatus according to the above-described embodiment is an MFP having at least two of copying, printing, scanning, and facsimile transmission, aspects of this disclosure are applicable to an image forming apparatus that is a copier, a printer, a scanner, or a facsimile machine.

[0106] Any one of the above-described operations may be performed in various other ways, for example, in an order different from the one described above.

[0107] The present invention can be implemented in any convenient form, for example using dedicated hardware, or a mixture of dedicated hardware and software. The present invention may be implemented as computer software implemented by one or more networked processing apparatuses. The processing apparatuses can include any suitably programmed apparatuses such as a general purpose computer, personal digital assistant, mobile telephone, such as a wireless application protocol (WAP) or third generation (3G) compliant phone, and so on. Since the present invention can be implemented as software, each and every aspect of the present invention thus encompasses computer software implementable on a programmable device. The computer software can be provided to the programmable device using any conventional carrier medium (carrier means). The carrier medium can include a transient carrier medium such as an electrical, optical, microwave, acoustic or radio frequency signal carrying the computer code. An example of such a transient medium is a transmission control protocol/internet protocol (TCP/IP) signal carrying computer code over an /internet protocol (IP) network, such as the Internet. The carrier medium can also comprise a storage medium for storing processor readable code such as a floppy disk, hard disk, CD ROM, magnetic tape device or solid state memory device.

Claims

1. An image forming apparatus (200) comprising:

a main body (100) including a main-body operation member (100a);
 a conveyor unit (24a; 24b) configured to be detachably attached to the main body (100), the conveyor unit (24a; 24b) including a conveyor-side operation member (24a1; 24b1);
 a sensor (109) disposed along a sheet conveyance passage (R) inside the image forming apparatus (200) and configured to detect a sheet;
 a detection unit (104a) configured to detect, with the sensor (109), an occurrence of a jam in the image forming apparatus (200); and
 a display control unit (102b) configured to display operation guidance of at least the main-body operation member (100a) in response to a detection, by the detection unit (104a), of the occurrence of the jam in the conveyor unit (24a;

24b) and a determination that a predetermined condition is satisfied.

2. The image forming apparatus (200) according to claim 1, wherein the conveyor unit (24a; 24b) is a multi-stage conveyor unit (24a; 24b) including a plurality of stages, and

wherein, in response to a detection, by the detection unit (104a), of an occurrence of a jam in a lower stage (24b) of the multi-stage conveyor unit (24a; 24b), the display control unit (102b) is configured to display operation guidance of an operation member (24b1) of the lower stage (24b) and operation guidance of an operation member (24a1) of a stage (24a) of the multi-stage conveyor unit (24a; 24b) that is one stage higher than the lower stage (24b).

3. The image forming apparatus (200) according to claim 1 or 2,

wherein, in response to the detection, by the detection unit (104a), of the occurrence of the jam in the conveyor unit (24a; 24b), the detection unit (104a) is configured to determine whether a predetermined time has elapsed from when the sensor (109) detects the sheet, and
 wherein the display control unit (102b) is configured to:

display the operation guidance of the conveyor-side operation member (24a1; 24b1) and the operation guidance of the main-body operation member (100a) in response to a determination that the predetermined time has elapsed from when the sensor (109) detects the sheet; and
 display the operation guidance of the conveyor-side operation member (24a1; 24b1), without displaying the operation guidance of the main-body operation member (100a), in response to a determination that the predetermined time has not elapsed from when the sensor (109) detects the sheet.

4. A method for displaying an operation of an image forming apparatus (200) including a detachably attachable conveyor unit (24a; 24b), the method comprising:

detecting (S1-1) an occurrence of a jam in the conveyor unit (24a; 24b); and
 displaying (SI-2, SI-6) operation guidance of at least an operation member (100a) of a main body (100) of the image forming apparatus (200) in response to the detecting and a determination that a predetermined condition is satisfied.

5. Carrier means carrying computer readable codes for controlling a computer to carry out the method ac-

ording to claim 4.

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FIG. 1

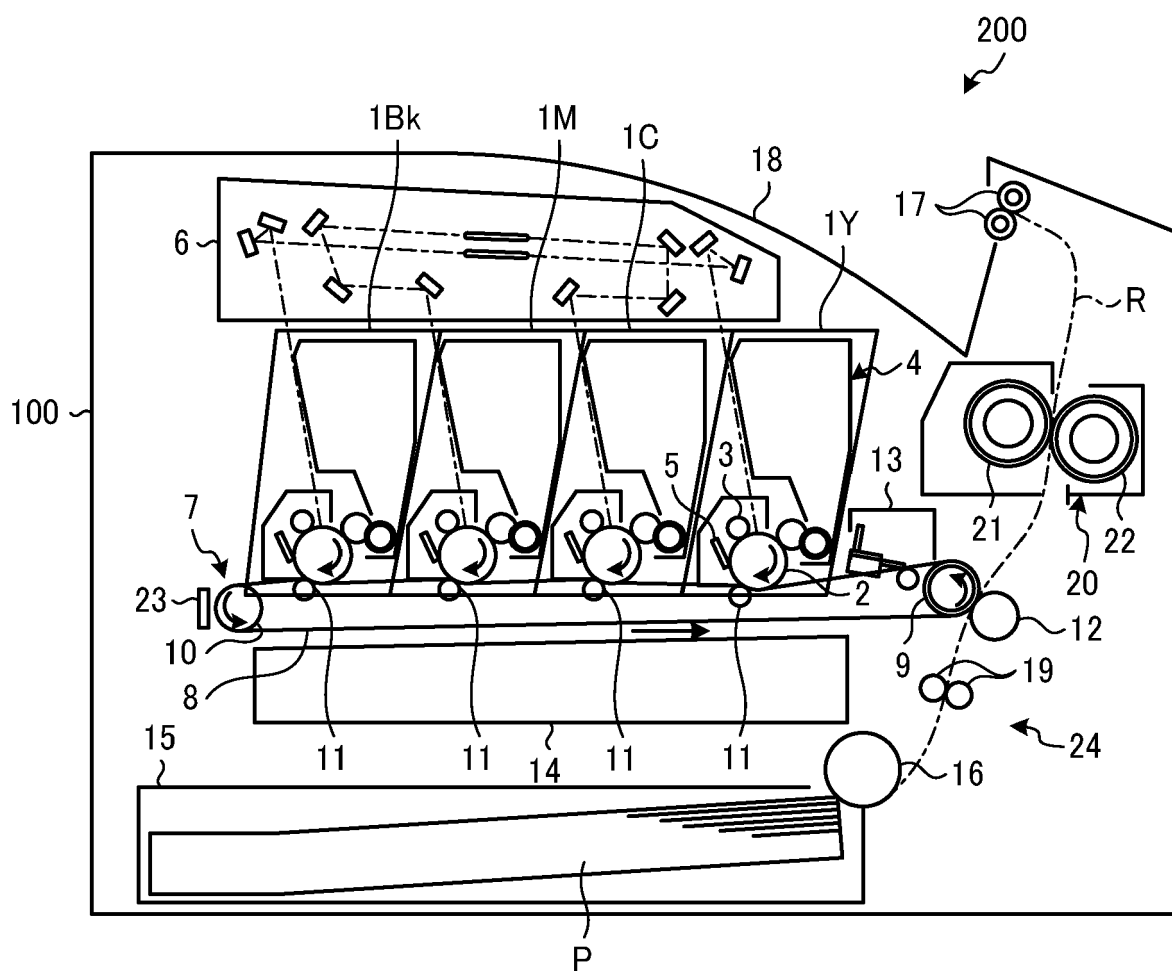


FIG. 2

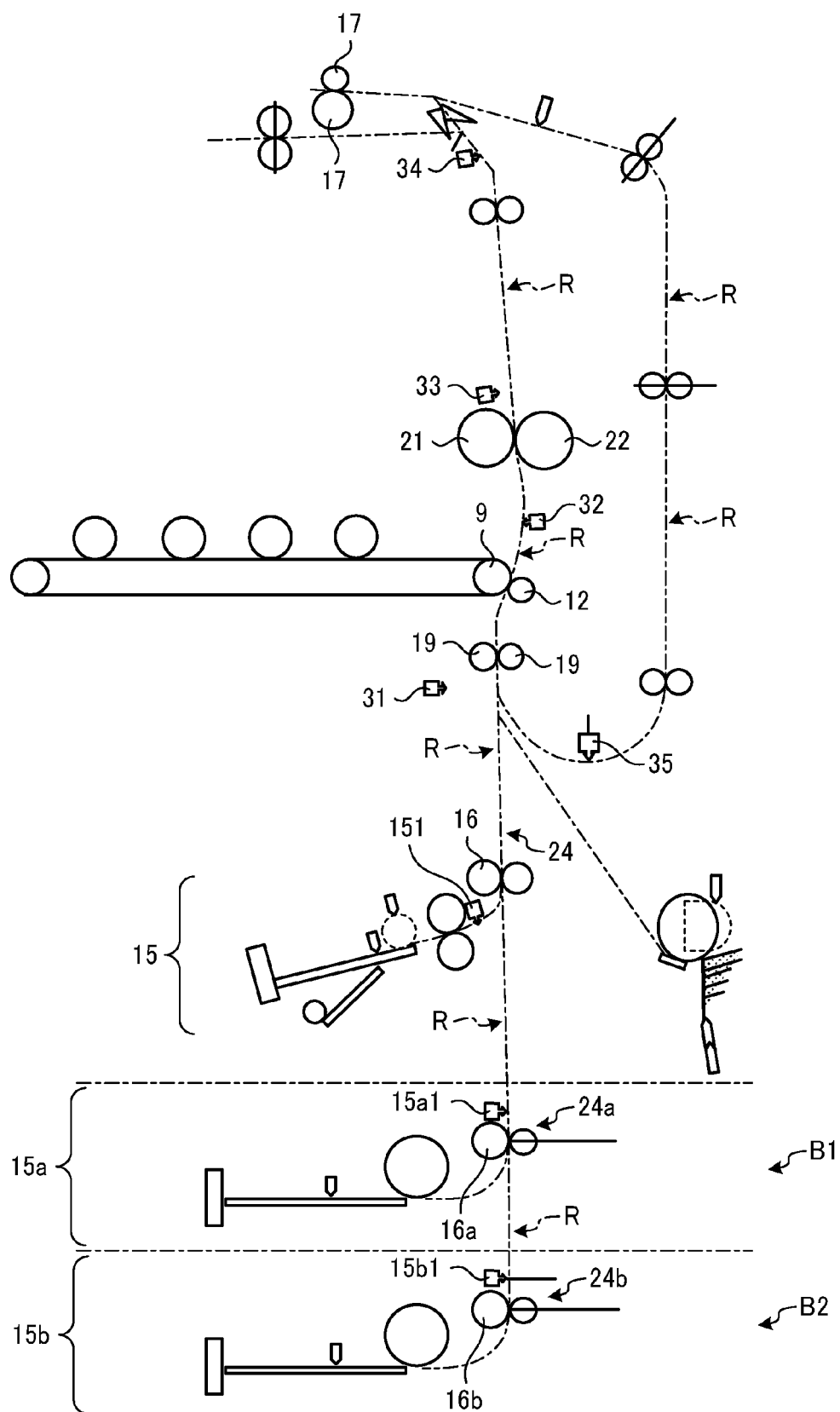


FIG. 3

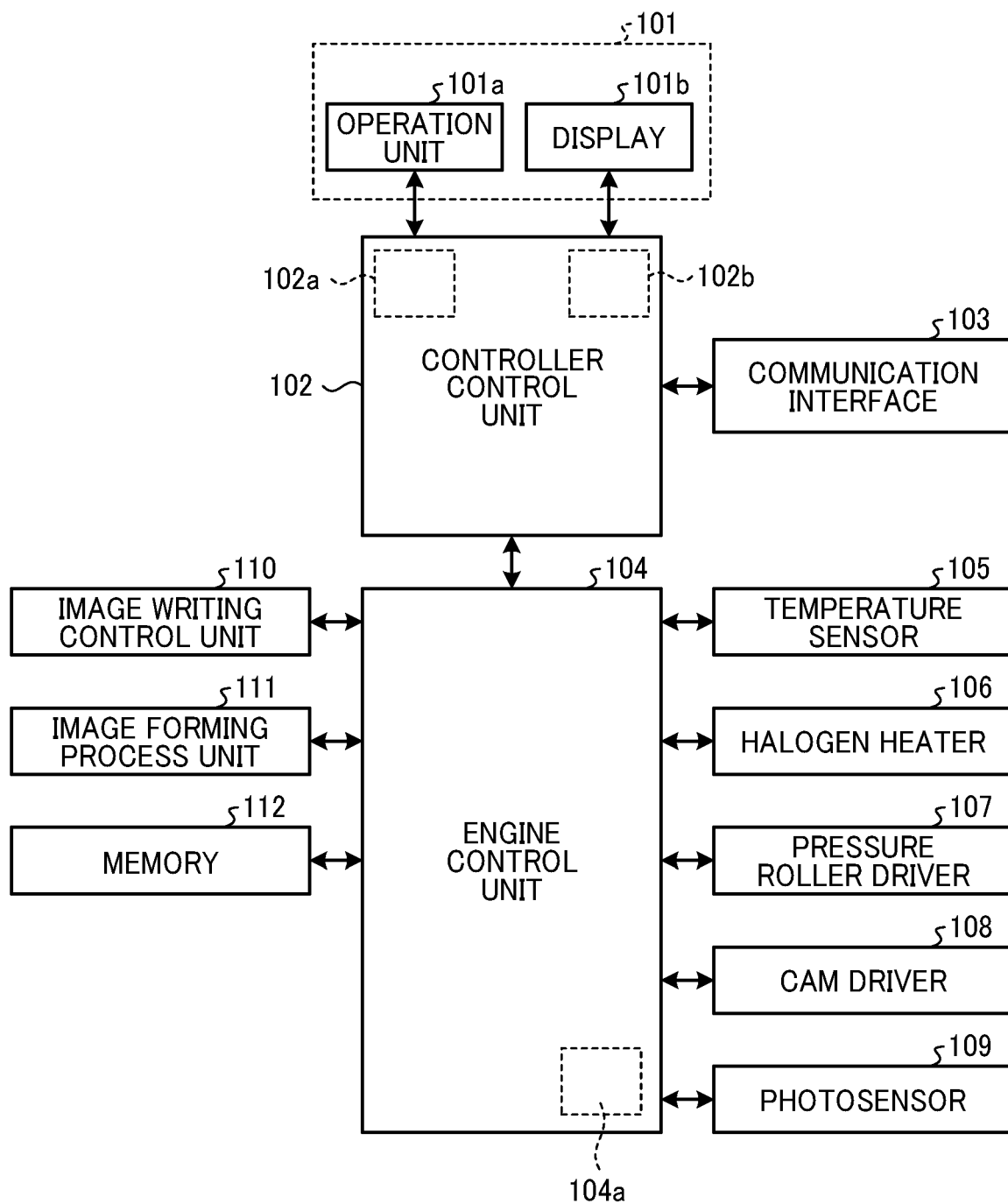


FIG. 4A

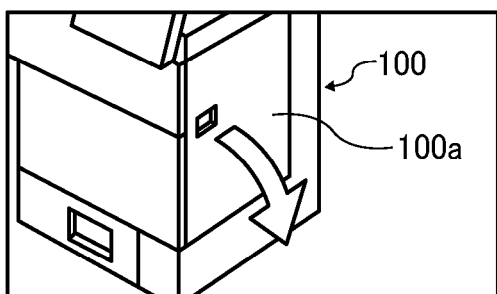


FIG. 4B

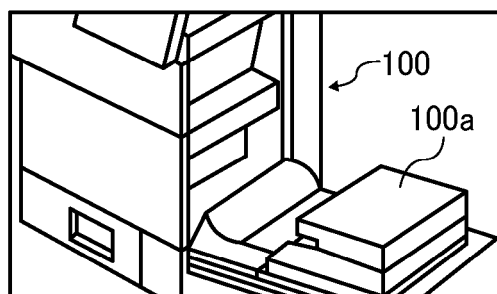


FIG. 5A

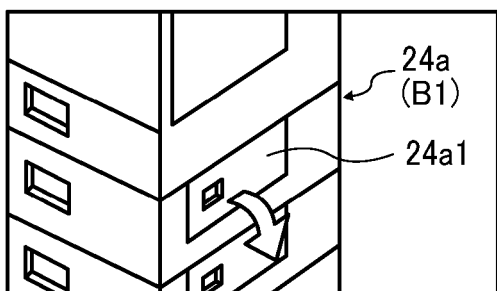


FIG. 5B

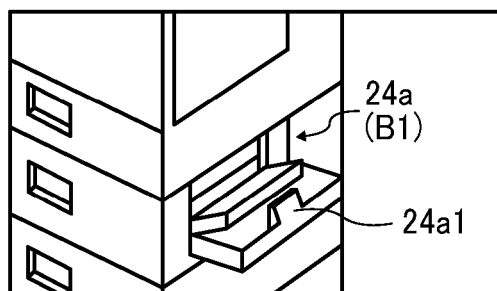


FIG. 6A

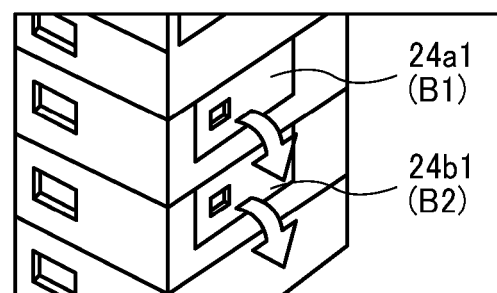


FIG. 6B

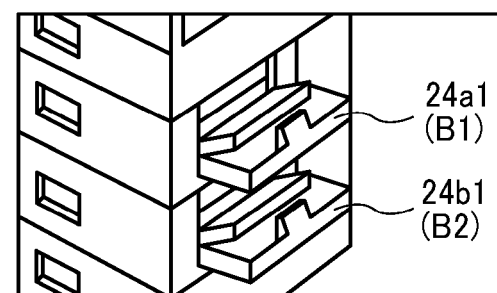


FIG. 7

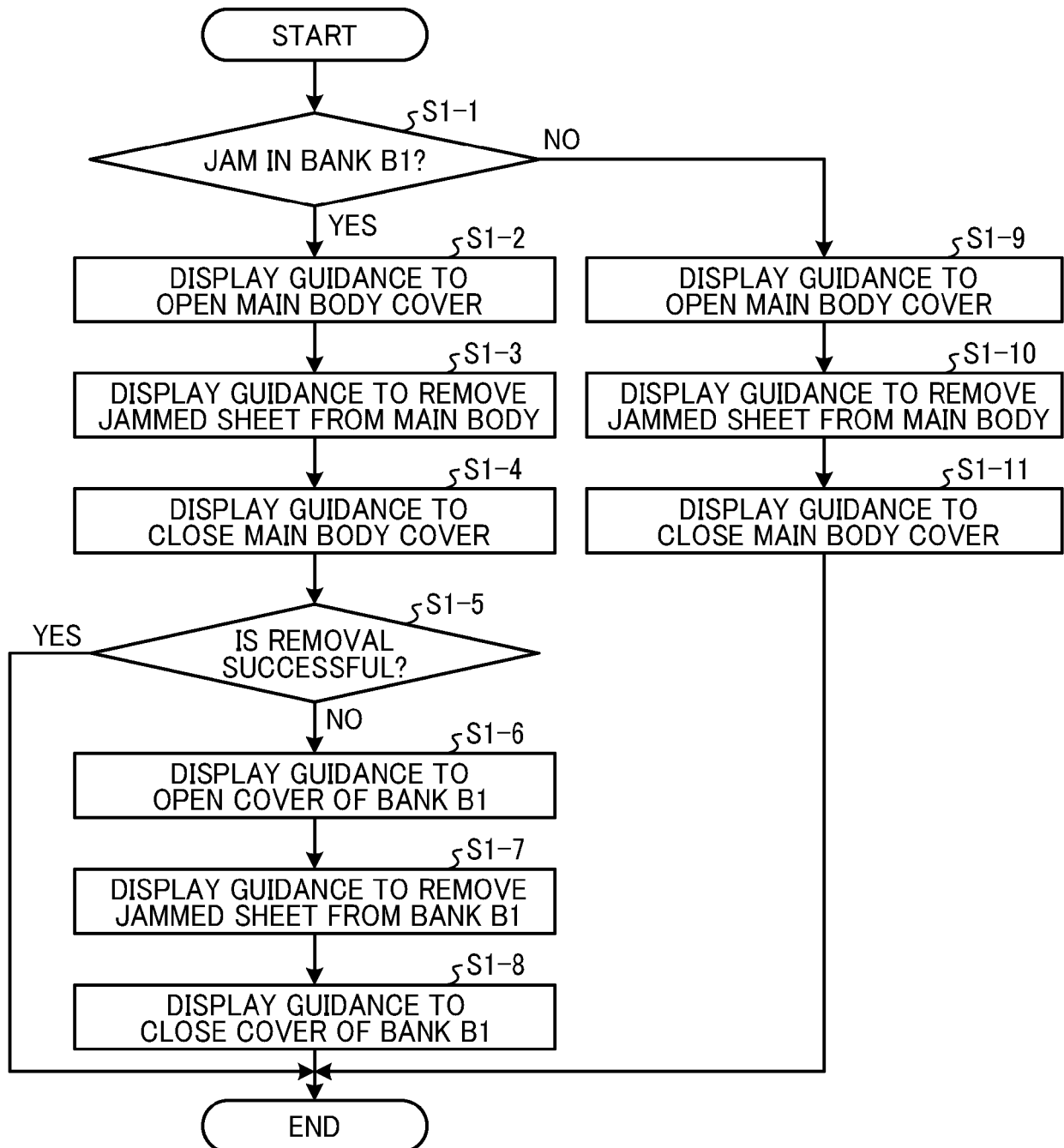


FIG. 8

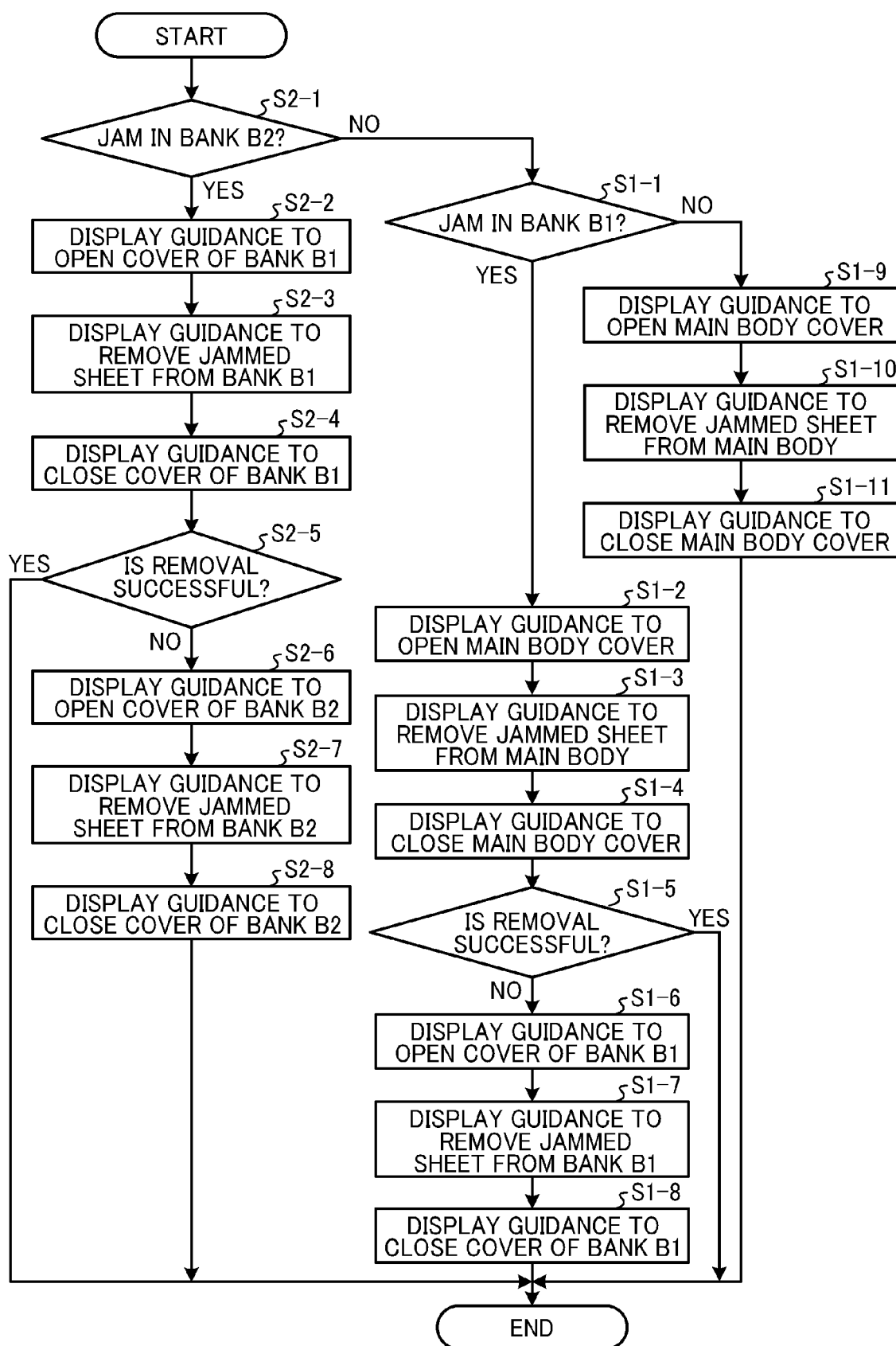


FIG. 9

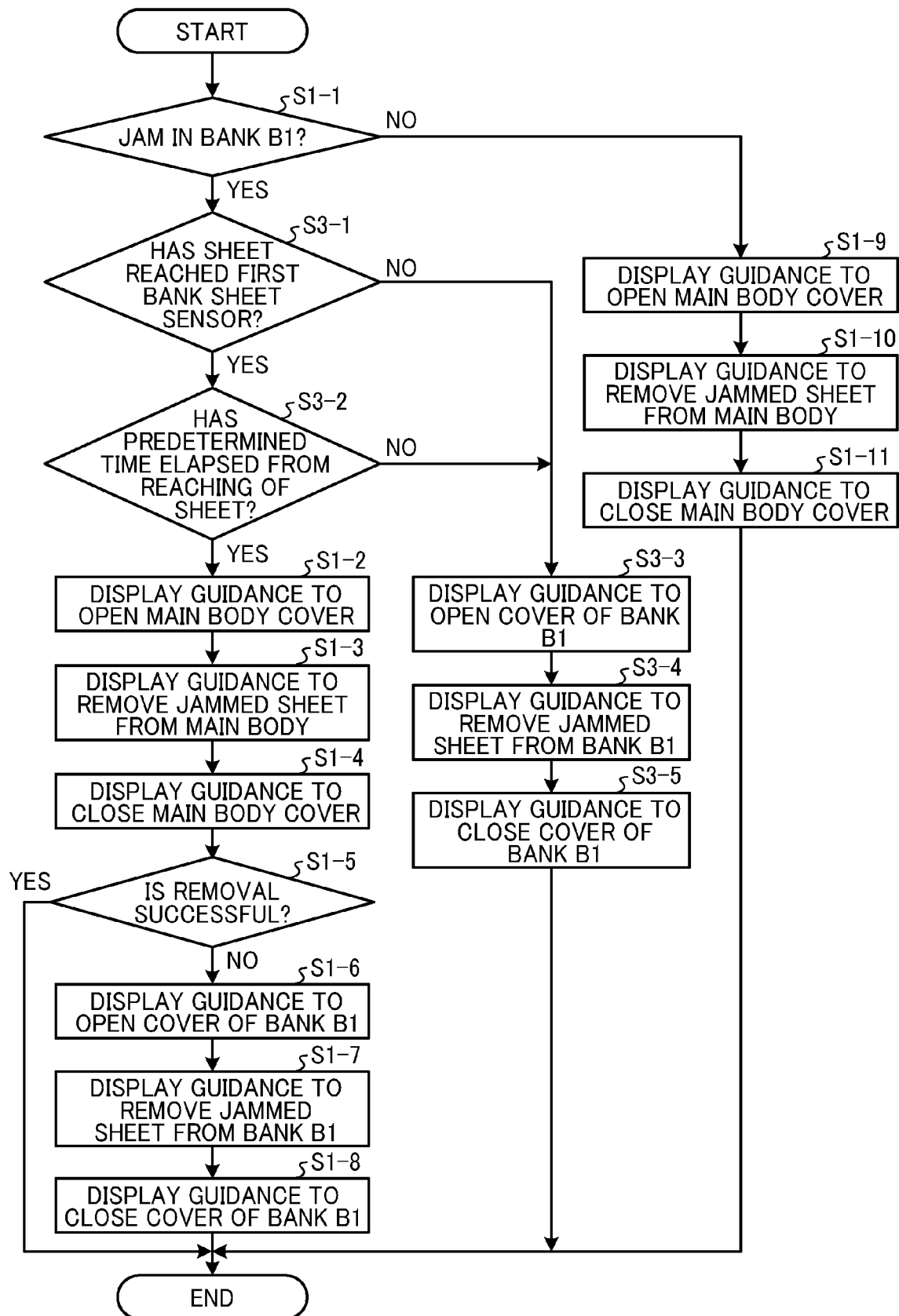
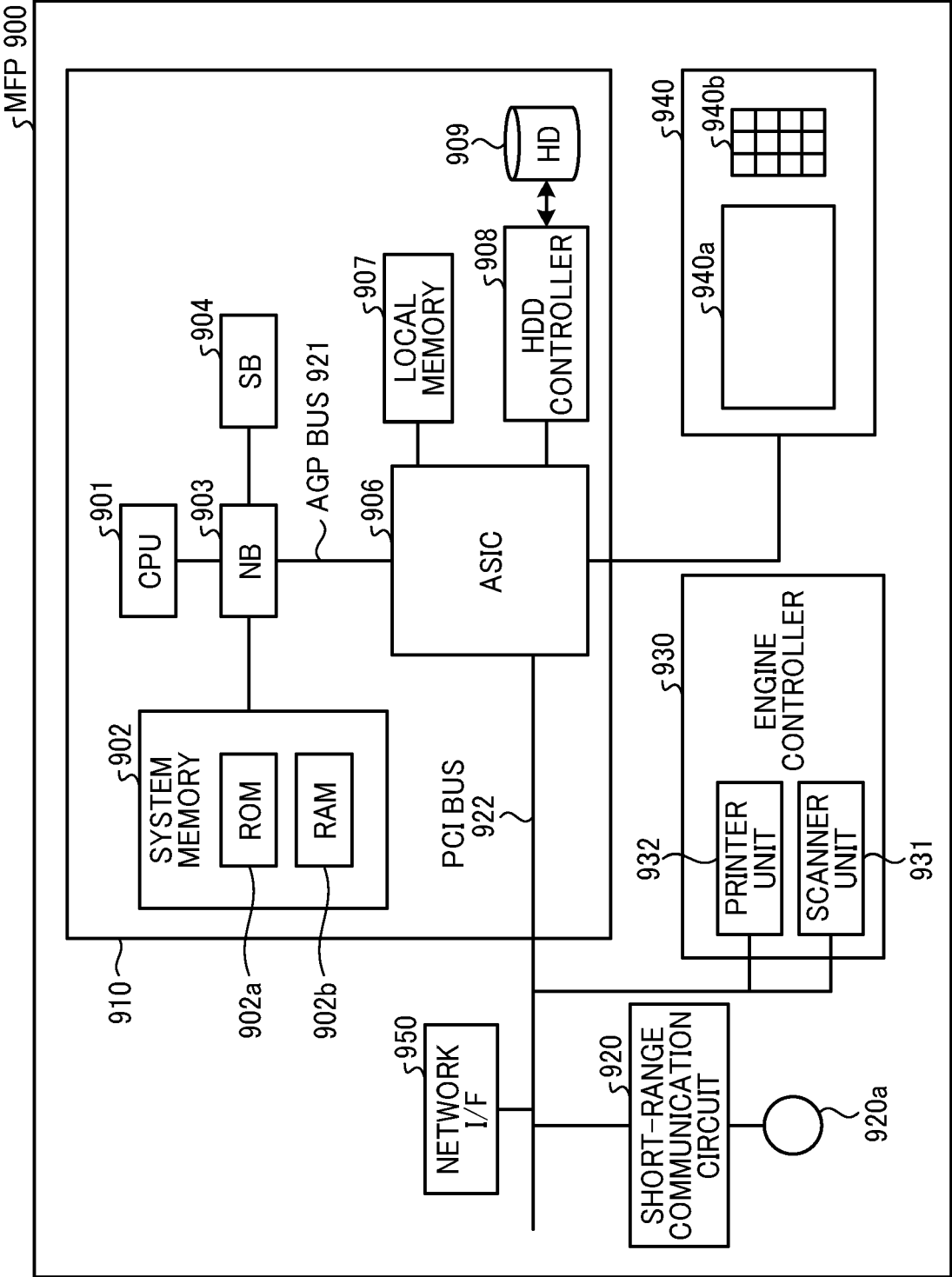


FIG. 10





EUROPEAN SEARCH REPORT

 Application Number
 EP 20 19 9544

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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X	US 2018/004147 A1 (MATSUI NORIAKI [JP] ET AL) 4 January 2018 (2018-01-04) * paragraph [0027] - paragraph [0080]; figures 1-17 *	1-5	INV. G03G15/00
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			G03G
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 26 March 2021	Examiner Rubio Sierra, F
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 20 19 9544

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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26-03-2021

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