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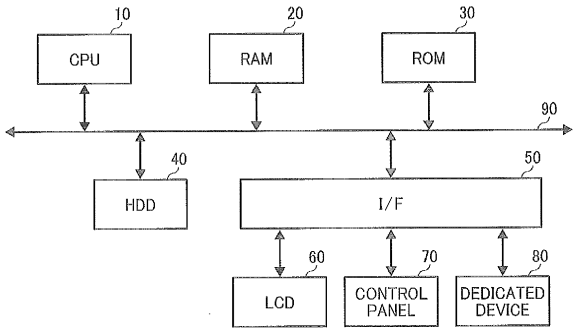
(54) IMAGE FORMING APPARATUS

(57) An image forming apparatus (1) in which multiple different type developers are usable includes an image forming unit (206); a cleaning device (213; 218); a collected developer passage (220); a rotatable developer conveyor (92) to transport developer collected by the cleaning device (213; 218) in the collected developer passage (220); a temporary developer container (225); a waste-developer container (226); and a controller (100) to control conveyance of the collected developer from the cleaning device (213; 218). The controller (100) refers to a developer type database in which each of the multiple different type developers is correlated with a conveyance condition to transport the collected developer. One of the multiple different type developers is set as the target developer, and the controller (100) changes the conveyance condition according to the developer type database when a content of an image output job indicates that a target developer is used.

FIG. 1



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Description

Technical Field

[0001] Embodiments of the present invention generally relate to an image forming apparatus, such as a copier, a printer, a facsimile machine, or a multifunction peripheral having at least two of copying, printing, facsimile transmission, plotting, and scanning capabilities.

Description of the Related Art

[0002] At present, use of information in the form of electronic data is increasing. Accordingly, printers and facsimile machines to output electronic data and image processing apparatus, such as scanners, to convert information into electronic data are widely used. Such an image processing apparatus often includes imaging, image forming, and communicating capabilities and configured as a multifunction peripheral (MFP) to be used as a printer, a facsimile machine, a scanner, and a copier.

[0003] Among such image processing apparatuses, there are apparatuses that employ electrophotography. In electrophotographic image formation, an image bearer such as a photoconductor is exposed to light to form an electrostatic latent image thereon, the electrostatic latent image is developed with toner into a toner image, and the toner image is transferred onto a recording medium such as a sheet of paper. There are electrophotographic image forming apparatuses that includes a waste-toner conveyance structure to collect and transport toner remaining on the image bearer. The image bearer includes a conveyor belt to transport the toner image before the toner image is transferred onto the sheet. The collected toner is either reused or discharged.

[0004] For example, the waste toner is discharged in a waste-toner container connected to the waste-toner conveyance structure. Further, a temporary container to store the waste toner may be provided in an image forming apparatus so that image formation can be continued for a given amount even when the waste-toner container is not connected to the apparatus.

[0005] If images are continuously output in a state in which the waste-toner container is removed from the image forming apparatus, it is possible that an excessive amount of waste toner exceeding the capacity of the temporary container is transported to the temporary container.

[0006] For example, in JP-2011-215593-A, to prevent such an inconvenience, a counter counts the time period during which images are output in the state in which the waste-toner container is removed, and image output is compulsively stopped when the count value reaches a threshold.

[0007] In JP-2011-215593-A, to properly set the timing of compulsive stop of image output, it is necessary to properly set the threshold of the count value. The threshold is set based on the amount per unit time of waste toner transported to the temporary container in accordance with flow properties of waste toner.

[0008] Additionally, there are image forming apparatuses in which multiple different type toners different in flow properties are usable. For example, in addition to cyan, magenta, yellow, and black toners, special toners such as transparent toner and white toner are used. It is possible that the special toner is different in flow properties from the cyan, magenta, yellow, and black toners.

[0009] In configurations in which multiple toners different in flow properties are used, a smaller amount of waste toner is transported per unit time in one case, and a greater amount of waste toner is transported per unit time in another case. Accordingly, the above-described threshold is not proper in some cases. It is possible that image output is compulsively stopped even when the temporary container is not fully filled with waste toner, and it is possible that the amount of waste toner transported to the temporary container exceeds the capacity of the temporary container, causing damage to the apparatus.

[0010] An object of the invention is to control accumulation of developer in a temporary container in an electrophotographic image forming apparatus in which multiple different developer types are usable.

SUMMARY

[0011] In order to achieve the above-described object, there is provided an image forming apparatus in which multiple different type developers are usable, according to claim 1. Advantageous embodiments are defined by the dependent claims.

[0012] Advantageously, the image forming apparatus includes an image forming unit to form an image on an image bearer with developer; a cleaning device to collect developer from the image bearer; a collected developer passage through which developer collected by the cleaning device is transported; a rotatable developer conveyor disposed in the collected developer passage to transport the collected developer therein; a temporary developer container connected to the collected developer passage, to temporarily store the collected developer; a waste-toner container removably connected to the temporary developer container; and a controller to control conveyance of the collected developer from the cleaning device. The controller refers to a developer type database in which each of the multiple different type developers is correlated with a conveyance condition to transport the collected developer, and one of the multiple different type developers is set as the target developer. The controller changes the conveyance condition according to the developer type database when a content of an image output job indicates that a target developer is used.

[0013] Accordingly, accumulation of developer in the temporary container is controlled in an image forming apparatus in which multiple different type developers are usable.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0014] 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 block diagram of a hardware configuration of an image forming apparatus according to an embodiment;
FIG. 2 is a schematic block diagram of a functional configuration of an image forming apparatus according to an embodiment;
FIG. 3 is a schematic entire view illustrating a configuration of a printing engine of an image forming apparatus according to an embodiment;
FIG. 4 is a schematic view of a structure for waste-toner conveyance in the image forming apparatus illustrated in FIG. 3;
FIG. 5 is a schematic cross-sectional view illustrating conveyance of toner poorer in flow properties;
FIG. 6 is a schematic cross-sectional view illustrating conveyance of toner better in flow properties;
FIG. 7 is a schematic cross-sectional view of toner lower in which flow properties, stored in a temporary reservoir according to an embodiment;
FIG. 8 is a schematic cross-sectional view of toner better in flow properties, stored in the temporary reservoir;
FIG. 9 is a block diagram illustrating circuitry to control conveyance of waste toner according to an embodiment;
FIG. 10 schematically illustrates a toner type database according to an embodiment;
FIG. 11 is a flowchart to control conveyance of waste toner according to an embodiment; and
FIG. 12 is a block diagram illustrating circuitry to control conveyance of waste toner according to another embodiment.

DETAILED DESCRIPTION

[0015] In describing preferred 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.

[0016] According to the embodiment described below, in an electrophotographic image forming apparatus in which multiple different developer types are usable, output of images are controlled in a state in which a container to contain developer to be disposed is removed from the image forming apparatus.

[0017] Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views thereof, a multicolor image forming apparatus according to an embodiment of the present invention is described.

[0018] FIG. 1 is a schematic block diagram of a hardware configuration of an image forming apparatus 1 according to the present embodiment.

[0019] The image forming apparatus 1 employs a tandem system including multiple photoconductor drums, and different type toners are usable.

[0020] As shown in FIG. 1, the image forming apparatus 1 according to the present embodiment is similar in hardware configuration to typical data processing devices such as computers and servers. That is, the image forming apparatus 1 includes a central processing unit (CPU) 10, a random access memory (RAM) 20, a read only memory (ROM) 30, a hard disk drive (HDD) 40, and an interface (I/F) 50, which are connected to each other via a bus 90. Further, a liquid crystal display (LCD) 60, serving as a display, a control panel 70, and dedicated devices 80 are connected to an interface 50.

[0021] The CPU 10 is a computation device and controls actions of the entire image forming apparatus 1. The RAM 20 is a volatile memory capable of high-speed data reading and writing. The RAM 20 is used as workspace when the CPU 10 processes data. The ROM 30 is a non-volatile storage medium dedicated to reading out and stores programs such as firmware. The HDD 40 is a non-volatile storage medium capable of data reading and writing, and an operating system (OS), various types of control programs, application programs, and the like are stored therein.

[0022] The interface 50 connects the bus 90 to the various types of hardware and networks and controls the bus 90, the hardware, and the networks. The LCD 60 is a visual user interface for users to check a status of the image forming apparatus 1. The control panel 70 is a user interface for users to input data to the image forming apparatus 1 and includes a keyboard, a mouse, and the like. The dedicated devices 80 are hardware to realize dedicated capabilities in the image forming apparatus 1 and correspond to a printing engine 160 to execute image output, a scanner 120 to read documents, and the like.

[0023] In the above-described hardware configuration, the CPU 10 executes computation according to programs read out into the RAM 20 from the ROM 30, the HDD 40, or recording media such as optical disks. Then, control software is implemented. With the implement control software and the above-described hardware configuration, a function block for the capabilities of the image forming apparatus 1 is configured.

[0024] Next, descriptions are given below of a functional configuration of the image forming apparatus 1 according to the present embodiment with reference to FIG. 2.

[0025] FIG. 2 is a schematic block diagram of the func-

tional configuration of the image forming apparatus 1.

[0026] In the configuration shown in FIG. 2, the image forming apparatus 1 includes a controller 100, an automatic document feeder (ADF) 110, the scanner 120, a document tray 130, a display panel 140, a sheet feeding table 150, the printing engine 160, an output tray 170, and a network interface (I/F) 180.

[0027] The controller 100 includes a main controller 101, an engine controller 102, an input/output (I/O) controller 103, an image processor 104, and a display controller 105. In the configuration shown in FIG. 2, the image forming apparatus 1 is a multifunction peripheral including the scanner 120 and the printing engine 160. It is to be noted that, in FIG. 2, solid liens represent electrical connections, and broken lines represent flow of sheets.

[0028] The display panel 140 serves as both of an output interface to visually display the state of the image forming apparatus 1 and an input interface (i.e., a control panel) such as a touch panel for users to directly operate the image forming apparatus 1 or input data into the image forming apparatus 1. The network interface 180 in an interface for the image forming apparatus 1 to communicate with other devices. Examples usable as the network interface 180 include Ethernet® and USB (Universal Serial Bus) interfaces.

[0029] The controller 100 is configured by a combination of software and hardware as described above. The controller 100 controls the image forming apparatus 1 entirely.

[0030] The main controller 101 controls, that is, gives commands to, respective units of the controller 100. The engine controller 102 controls or drives driving units such as the printing engine 160, the scanner 120, and the like. The I/O controller 103 inputs signals and commands received via the network interface 180 and networks to the main controller 101. The main controller 101 controls the I/O controller 103 and accesses other devices via the network interface 180.

[0031] The image processor 104 is governed by the main controller 101 and generates drawing data according to print data included in input print jobs, which are commands to execute image output. The drawing data means data for the printing engine 160 to draw images in image formation. The drawing data is pixel data, that is, bit map data, in which the image to be output is expressed as data per pixel.

[0032] The print data included in print jobs means data in a data format recognizable by the image forming apparatus 1, converted by printer drivers installed in data processing devices such as computers. For example, the print data is described in PDL (Page Description Language). In other words, the print data is page data in which data of the page to be output is described.

[0033] An aspect of the present embodiment is generation of the drawing data according to the image processor 104, in particular, allocation of processing for efficient operation of the hardware of the image forming apparatus 1. The function of the image processor 104 is described in detail later. The display controller 105 causes the display panel 140 to display data or reports, to the main controller 101, data input thereto via the display panel 140.

[0034] When the image forming apparatus 1 operates as a printer, the I/O controller 103 receives a print job via the network interface 180. The I/O controller 103 forwards the print job to the main controller 101. Receiving the print job, the main controller 101 causes the image processor 104 to generate drawing data according to the print data included in the print job.

[0035] According to the drawing data generated by the image processor 104, the engine controller 102 causes the printing engine 160 to form an image on the sheet transported from the sheet feeding table 150. In other words, the printing engine 160 serves as an image forming device. In the present embodiment, the printing engine 160 is an electrophotographic image forming device. After the printing engine 160 forms an image thereon, the sheet is ejected to the output tray 170.

[0036] Further, when the image forming apparatus 1 operates as a copier, the image processor 104 generates drawing data based on the scanned data received by the engine controller 102 from the scanner 120 or data generated from the print job. According to the drawing data, the engine controller 102 drives the printing engine 160 similar to printing.

[0037] Next, descriptions are given below of the printing engine 160 according to the present embodiment with reference to FIG. 3.

[0038] FIG. 3 is a schematic side view of the printing engine 160 according to the present embodiment. It is to be noted that the suffixes Y, M, C, K, and P attached to each reference numeral indicate only that components indicated thereby are used for forming yellow, magenta, cyan, black, and special toner images, respectively.

[0039] The printing engine 160 shown in FIG. 3 is a so-called tandem system and includes image forming units 206Y, 206M, 206C. 206K, and 206P for respective colors, arranged along a conveyor belt 205 that is an endless belt. Specifically, the multiple image forming units (electrophotographic process units) 206Y, 206M, 206C, 206K, and 206P (hereinafter collectively "image forming units 206") are arranged in that order from the upstream side in the direction in which the conveyor belt 205 transports the image. In the image forming apparatus 1, sheets 204 of recording media are fed from the sheet feeding table 150 by a sheet feeding roller 202. On the conveyor belt 205, which is an intermediate transfer belt and an image bearer as well, an intermediate-transfer image to be transferred onto the sheet 204 is formed.

[0040] Additionally, a pair of registration rollers 203 stops the sheet 204 fed from the sheet feeding table 150 and forwards the sheet 204 to a secondary transfer position where the image is transferred from the conveyor belt 205, timed to coincide with image formation in the image forming units 206.

[0041] The multiple image forming units 206 have a

similar configuration except the color of toner images formed thereby. The image forming unit 206K forms black toner images, the image forming unit 206M forms magenta toner images, the image forming unit 206C forms cyan toner images, the image forming unit 206Y forms yellow toner images, and the image forming unit 206P forms special color toner images. The term "special color" used in this specification means a color used for a purpose such as image quality improvement and a color other than cyan, magenta, yellow, and black.

[0042] It is to be noted that the image forming unit 206Y is described in detail below as a representative since the image forming units 206Y, 206M, 206C, 206K, and 206P are similar in configuration. Thus, and descriptions of other image forming units 206M, 206C, 206K, and 206P, given subscripts "M", "C", "K", and "P", instead of "Y" in the drawings, are omitted.

[0043] The conveyor belt 205 is an endless belt looped around a driving roller 207 and a driven roller 208. A driving motor rotates the driving roller 207. The driving motor, the driving roller 207, and the driven roller 208 together constitute a driving unit to drive the conveyor belt 205.

[0044] Among the multiple image forming units 206, the image forming unit 206Y is the first to transfer toner images onto the conveyor belt 205. The image forming unit 206Y includes a photoconductor drum 209Y and components disposed around the photoconductor drum 209Y, namely, a charging device 210Y, an optical writing device 211, a developing device 212Y, a cleaning device 213Y, and a discharger. The optical writing device 211 directs light to the photoconductor drum 209Y, 209M, 209C, 209K, and 209P (collectively "photoconductor drums 209").

[0045] To form images, the charging device 210Y charges uniformly the outer circumferential face of the photoconductor drum 209Y in the dark, after which the optical writing device 211 directs light from a light source corresponding to a yellow image to the photoconductor drum 209Y, thus forming an electrostatic latent image thereon. The developing device 212Y develops the electrostatic latent image with yellow toner, thus forming a yellow toner image on the photoconductor drum 209Y.

[0046] The toner image is transferred by a transfer device 215Y onto the conveyor belt 205 at a primary transfer position (a primary transfer nip) where the photoconductor drum 209Y contacts or is closest to the conveyor belt 205. Thus, the yellow toner image is formed on the conveyor belt 205. Subsequently, the cleaning device 213Y removes toner remaining on the outer circumferential face of the photoconductor drum 209Y, and the discharger discharges the outer circumferential face of the photoconductor drum 209Y. Then, the photoconductor drum 209Y is on standby for subsequent image formation.

[0047] It is to be noted that, in another embodiment, the discharger is disposed upstream from the cleaning device 213Y in the direction in which the photoconductor drum 209Y rotates. Additionally, the cleaning device 213Y is not limited to a blade but may be a brush.

[0048] The yellow toner image formed on the conveyor belt 205 by the image forming unit 206Y is transported to the image forming unit 206M as the conveyor belt 205 is rotated by the rollers. The image forming unit 206M performs image forming processes similar to those performed by the image forming unit 206Y, thereby forming a magenta toner image on the photoconductor drums 209M, and the magenta toner image is transferred and superimposed on the yellow toner image.

[0049] The yellow and magenta toner images on the conveyor belt 205 are further transported to the image forming units 206C, 206K, and 206P, where cyan, black, and special toner images are formed on the photoconductor drums 209C, 209K, and 209P respectively, and the cyan, black, and special images are transferred on the superimposed toner image on the conveyor belt 205. Thus, an intermediate image in which a full color image is superimposed with special toner is formed on the conveyor belt 205.

[0050] The sheets 204 contained in the sheet feeding table 150 are sent out from the top sequentially. At a position where a sheet conveyance route leading therefrom is closest to a transfer roller 217, the intermediate toner image is transferred from the conveyor belt 205 onto the sheet 204. Thus, an image is formed on the sheet 204. The sheet 204 carrying the image is transported to a fixing device 216, where the image is fixed on the sheet 204. Then, the sheet 204 is discharged outside the image forming apparatus 1.

[0051] The conveyor belt 205 is provided with a belt cleaner 218. The cleaning devices 213, the belt cleaner 218, or both serve as cleaning devices to collect toner from an image bearer. The belt cleaner 218 can include a cleaning blade pressed against the conveyor belt 205 to scrape off toner from the surface of the conveyor belt 205 at a position downstream from the transfer roller 217 and upstream from the photoconductor drums 209 in the direction in which the conveyor belt 205 rotates (in the direction indicated by arrows indicating the direction of rotation of the driving roller 207 and the driven roller 208) as shown in FIG. 3. Thus, the belt cleaner 218 serves as the cleaning device to collect developer. The belt cleaner 218 is not limited to the blade but may be a brush.

[0052] The toner collected by the respective cleaning devices 213 of the image forming units 206 and that collected by the belt cleaner 218 are transported to one location and discharged as waste toner. A structure for waste toner in the printing engine 160 is described below with reference to FIG. 4. FIG. 4 is a schematic view of the structure for waste toner in the printing engine 160 according to the present embodiment.

[0053] As illustrated in FIG. 4, the cleaning devices 213Y, 213M, 213C, 213K, and 213P are connected to a first waste-toner channel 221, and the waste toner collected from the photoconductor drums 209 by the cleaning devices 213Y, 213M, 213C, 213K, and 213P is forwarded to the first waste-toner channel 221. The belt

cleaner 218 is connected to a second waste-toner channel 222, and the waste toner collected from the conveyor belt 205 by the belt cleaner 218 is forwarded to the second waste-toner channel 222.

[0054] The first waste-toner channel 221 and the second waste-toner channel 222 are connected to a third waste-toner channel 223. The waste toner is transported from the first and second waste-toner channels 221 and 222 by conveying screws 92A and 92B serving as rotatable developer conveyors provided therein to the third waste-toner channel 223. The rotatable toner conveyors are not limited to screws but can be coils, augers, paddles, or the like. The third waste-toner channel 223 is connected to a fourth waste-toner channel 224. The waste toner is transported from the third waste-toner channel 223 by a conveying screw serving as a rotatable developer conveyor disposed therein to the fourth waste-toner channel 224. The first, second, third, and fourth waste-toner channels 221, 222, 223, and 224 together serve as a collected developer passage 220 through which collected developer collected by the cleaning devices 213, the belt cleaner 218, or both is transported. For example, each of the first, second, third, and fourth waste-toner channels 221, 222, 223, and 224 can be a tube or pile, but the shape is not necessarily cylindrical but can be square or polygonal.

[0055] The fourth waste-toner channel 224 is connected to a temporary reservoir 225 inside the printing engine 160 (i.e., the image forming apparatus 1). The waste toner is transported from the fourth waste-toner channel 224 to the temporary reservoir 225 by a conveying screw 92C serving as a rotatable developer conveyor disposed in the fourth waste-toner channel 224. The temporary reservoir 225 is connectable to a waste-toner bottle 226, serving as a waste-toner container. When the waste-toner bottle 226 is connected thereto, the waste toner is transported from the temporary reservoir 225 by a discharge screw 92D to the waste-toner bottle 226. The temporary reservoir 225 temporarily stores the waste toner in a state in which the waste-toner bottle 226 is not connected thereto. The conveying screws 92A, 92B, and 92C are also collectively referred to as "conveying screws 92".

[0056] As described above, in the image forming apparatus 1 according to the present embodiment, in addition to standard color toners (i.e., process toners) of yellow (Y), cyan (C), magenta (M), and black (K) toners, special toner is used. The type of toner is different between the special toner and cyan, magenta, yellow, and black toners. In the present embodiment, polymerization toner is used for cyan, magenta, yellow, and black toners, ; and pulverization toner is used for the special toner.

[0057] Compared with pulverized toner particles, pulverization toner particles are more uniform in size and advantageous in improving image quality. By contrast, due to variety in particle shape in addition to particle size, pulverization toner physically interferes with a component strongly, and removal of pulverized toner is easier.

[0058] These different type toners are different in flow properties in the collected developer passage 220 illustrated in FIG. 4.

[0059] It is to be noted that, in this specification, the term "flow properties" of toner or developer means ease of transport of toner or developer by the rotatable developer conveyor, and differences in flow properties are represented by differences in the weight of toner transported per unit time under similar conditions (i.e., screw rotation speed and the like).

[0060] FIG. 5 is a schematic cross-sectional view illustrating polymerization toner, for example, in the first waste-toner channel 221, in the collected developer passage 220.

[0061] As illustrated in FIG. 5, polymerization toner is relatively uniform in particle shape and spherical. Accordingly, polymerization toner is dense in the collected developer passage 220 and more easily transported by the conveying screw.

[0062] FIG. 6 is a schematic cross-sectional view illustrating pulverization toner in the collected developer passage 220.

[0063] As illustrated in FIG. 6, pulverization toner is less uniform in particle shape. Accordingly, pulverization toner is less dense in the collected developer passage 220 and is not transported easily. In other words, when the waste toner is pulverization toner, transport of waste toner through the collected developer passage 220 to the temporary reservoir 225 tends to be slow (i.e., the amount of transported per unit time is small). Thus, the difference in flow properties results in differences in the amount of waste toner transported to the temporary reservoir 225 in a given period.

[0064] FIG. 7 is a schematic cross-sectional view of the temporary reservoir 225 when polymerization toner is contained therein. As illustrated in FIG. 7, in the case of polymerization toner, which is better in flow properties, a greater amount of waste toner is transported per unit time, and it is possible that the temporary reservoir 225 is filled to capacity with waste toner in a shorter length of time.

[0065] FIG. 8 is a schematic cross-sectional view of the temporary reservoir 225 when pulverization toner is contained therein. As illustrated in FIG. 8, in the case of pulverization toner, which is poorer in flow properties, a smaller amount of waste toner is transported per unit time, and the temporary reservoir 225 is not filled to capacity within the time sufficient for the temporary reservoir 225 to be filled to capacity with polymerization toner.

[0066] When image formation is successively executed in a state in which the waste-toner bottle 226 illustrated in FIG. 4 is not connected to the temporary reservoir 225, waste toner accumulates in the temporary reservoir 225. If waste toner is continuously transported to the temporary reservoir 225 filled to capacity with waste toner, there is a risk of damage to the apparatus, such as damage to the conveying screws 92 disposed in the collected developer passage 220 or the conveying screw disposed

in the temporary reservoir 225. To inhibit such a risk, it is necessary to control the apparatus not to execute image formation after the temporary reservoir 225 is filled to capacity when image formation is continued in a state in which the waste-toner bottle 226 is not connected to the temporary reservoir 225.

[0067] Such control is relatively easy when the amount of waste toner in the temporary reservoir 225 is directly detectable using a sensor. The use of a sensor, however, increases the size and cost of the apparatus. By contrast, the amount of waste toner in the temporary reservoir 225 can be estimated by counting the length of time during which the conveying screws 92 in the collected developer passage 220 is driven, and the above-described control is feasible without the sensor.

[0068] However, the amount of waste toner in the temporary reservoir 225 is not accurately estimated by simply counting the driving time of the conveying screws 92 in the collected developer passage 220 in the case where multiple different type toners are used in the apparatus and the type of toner used changes depending on contents of print jobs as described above with reference to FIGS. 5 through 8. In view of the foregoing, the amount of waste toner in the temporary reservoir 225 is recognized as follows.

[0069] FIG. 9 is a block diagram of circuitry to control conveyance of waste toner in the controller 100 of the image forming apparatus 1 according to the present embodiment. As illustrated in FIG. 9, the main controller 101 includes a job manager 111, a job checker 112, a toner type input 113, a setting data memory 114, and a waste-toner conveyance setting unit 115. The engine controller 102 includes a waste-toner conveyance controller 121, a counter 122, and a bottle detector 123.

[0070] The job manager 111 acquires a print job and controls image output. Referring to the contents of the pint job acquired by the job manager 111, the job checker 112 ascertains the type of toner used in the print job. The job checker 112 according to the present embodiment determines whether the special toner (i.e., a target developer) used in the image forming unit 206P is used for the print job.

[0071] The toner type input 113 accepts setting of toner different in flow properties according to an input made by the user on the display panel 140. In the image forming apparatus 1 according to the present embodiment, the toner used in the image forming unit 206P is poorer in flow properties than cyan, magenta, yellow, and black toners.

[0072] The setting data memory 114 stores a toner type database, which may be preliminarily established. Further, according to the setting by the toner type input 113, the setting data memory 114 retrieves, from the toner type database, data to be referred to in the control operation. FIG. 10 is an example of the toner type database.

[0073] As illustrated in FIG. 10, the toner type database includes "toner type", "flow property", "conveyance speed", and "threshold". "Toner type" is information to distinguish one out of the multiple different type toners usable in the image forming apparatus 1. "Flow property" is data to indicate whether the flow property is good or poor regarding each toner type. "Conveyance speed" means a conveyance speed setting at which each toner type is to be conveyed as waste toner (i.e., a conveyance condition). "Threshold" means a threshold as a criterion, set for each toner type, to determine that the temporary reservoir 225 is filled to capacity. "Conveyance speed", "threshold", or both serve as conveyance conditions.

[0074] In the example illustrated in FIG. 10, Toner C is the special toner (target developer) as enclosed with broken lines in FIG. 10. In this case, the user inputs use of Toner C on the display panel 140. The toner type input 113 reports that Toner C is selected to the setting data memory 114.

[0075] The waste-toner conveyance setting unit 115 reports the conveyance speed setting according to the result generated by the job checker 112. When the job checker 112 ascertains use of the special toner, the waste-toner conveyance setting unit 115 retrieves the record of Toner C from the database illustrated in FIG. 10, stored in the setting data memory 114. The waste-toner conveyance setting unit 115 reports the record of toner type to the engine controller 102.

[0076] The waste-toner conveyance controller 121 controls driving of the conveying screws 92 in the collected developer passage 220 illustrated in FIG. 4. Further, the waste-toner conveyance controller 121 adjusts rotation of the conveying screw according to the setting input from the waste-toner conveyance setting unit 115, thereby conveying waste toner according to the setting of "conveyance speed'' defined in the database in FIG. 10.

[0077] It is to be noted that, in the collected developer passage 220, the conveyance speed of waste toner in a downstream waste-toner channel (e.g., the fourth waste-toner channel 224) can be made faster than the conveyance speed of waste toner in an upstream waste-toner channel (e.g., the first waste-toner channel 221).

[0078] The counter 122 measures or counts the time period during which the waste-toner conveyance controller 121 drives the conveying screws 92 in the collected developer passage 220 to transport waste toner. When a count value of the counter 122 reaches the threshold set in the database in FIG. 10, it is deemed that the temporary reservoir 225 is filled to capacity with waste toner, and the counter 122 outputs a stop signal to the main controller 101. Then, the job manager 111 compulsively stops image output. Further, the counter 122 adjusts the threshold of the count value according to "threshold" included in the toner type data record input from the waste-toner conveyance setting unit 115.

[0079] The bottle detector 123 is disposed on a side of the waste-toner bottle 226 as illustrated in FIG. 4. With the bottle detector 123, whether or not the waste-toner bottle 226 is connected to the temporary reservoir 225

is detected. When the waste-toner bottle 226 is not connected, the bottle detector 123 sends a count request to the counter 122. In response to the request from the bottle detector 123, the counter 122 counts the time during which the waste-toner conveyance controller 121 drives the conveying screws 92 in the collected developer passage 220 to transport waste toner.

[0080] As described above, the multiple elements illustrated in FIG. 9 operate in conjunction with each other and together serve as a controller to control waste toner conveyance, which includes conveying waste toner to the temporary reservoir 225 and discharging the waste toner from the temporary reservoir 225. An aspect of the present embodiment is to change the setting in controlling waste toner conveyance according to the print job.

[0081] Next, descriptions are given below of control of waste toner conveyance according to the present embodiment with reference to FIG. 11. As illustrated in FIG. 11, at S1101 the job manager 111 receives a print job.

[0082] At S1102, the job checker 112 refers to the content of the print job and checks whether or target toner is used in the print job.

[0083] When the target toner, which in the present embodiment is the special toner, is used (Yes at S1102), at S1103, the job checker 112 refers to the content of the print job and determines whether or not the area of the image developed with the target toner is greater than a predetermined threshold area. The step S1103 is to determine whether to adjust the above-described conveyance condition corresponding to toner type.

[0084] Even when the special toner is used, the inconvenience described above with reference to FIGS. 7 and 8 does not arise as long as the amount of special toner used is small. Accordingly, the threshold area used at S1103 is set to a value equivalent to the predetermined amount of toner that can cause the inconvenience described with reference to FIGS. 7 and 8. In other words, the job checker 112 determines that the amount of toner used is equal to or greater than the predetermined amount when the image area developed with the target toner is greater than the threshold area. According to this determination, the job checker 112 determines to control the waste toner conveyance, in particular, change the conveyance condition, to avoid the inconvenience described with reference to FIGS. 5 to 8.

[0085] When the image area is equal to or greater than the threshold area (Yes at S1103), the job checker 112 reports that control of the waste toner conveyance is necessary to the waste-toner conveyance setting unit 115. At S1104, the waste-toner conveyance setting unit 115 acquires setting data from the setting data memory 114, that is, the record of toner type enclosed by broken lines in FIG. 10, and inputs the setting data to the engine controller 102. Then, the waste-toner setting, namely, the conveyance speed of waste toner, the threshold for the counter 122, and the like are changed.

[0086] Specifically, at S1104, the waste-toner conveyance setting unit 115 inputs the setting of "conveyance speed" to the waste-toner conveyance controller 121. Then, the setting according to which the waste-toner conveyance controller 121 controls the at least one of the conveying screws 92 in the collected developer passage 220 is changed. Additionally, the waste-toner conveyance setting unit 115 inputs the setting of "threshold" to the counter 122. Thus, the threshold for the counter 122, as the criterion to determine that the temporary reservoir 225 is filled to capacity, is changed.

[0087] After changing the settings of waste toner conveyance is completed, at S1105, the job manager 111 starts the print job. Upon the start of the print job, at S1106, the bottle detector 123 detects whether the waste-toner bottle 226 is connected to the temporary reservoir 225. When the bottle detector 123 detects the waste-toner bottle 226 (Yes at S1106), the job manager 111 and the engine controller 102 continue the print job. When the print job is completed (Yes at S1107), the main controller 101 completes the control of waste toner conveyance.

[0088] By contrast, when the bottle detector 123 does not detect the waste-toner bottle 226 (No at S1106), the bottle detector 123 outputs a signal indicating that the vaste-toner bottle 226 is not connected. In response to the signal, the waste-toner conveyance controller 121 stops driving of the discharge screw 92D to discharge waste toner from the temporary reservoir 225 to the waste-toner bottle 226. Additionally, at S1109, the counter 122 starts counting or measuring the driving time of the at least one of the conveying screws 92 in the collected developer passage 220 to recognize accumulation status of waste toner in the temporary reservoir 225 in the state in which the waste-toner bottle 226 is not connected thereto.

[0089] At S1110, the waste-toner conveyance controller 121 monitors the counting. While the count value (i.e., the driving time) is smaller than the threshold (No at S1110), the main controller 101 continues image formation until the print job is completed (Yes at S1112) and completes the control of waste toner conveyance. By contrast, when the count value reaches the threshold (Yes at S1110) while the print job continues (No at S1112), the counter 122 sends a stop signal to the job manager 111. Then, at S1111, the job manager 111 stops image output. With the above-described sequence of operations, the control of waste toner conveyance according to the present embodiment is completed.

[0090] As described above, the image forming apparatus 1 according to the present embodiment includes the temporary reservoir 225 to enable continuation of image formation even in the state in which the waste-toner bottle 226 (i.e., the waste-toner container) is removed from the apparatus. The image forming apparatus 1 inhibits the above-described inconvenience, caused by conveyance of waste toner to the temporary reservoir 225 in a state in which the temporary reservoir 225 is filled to capacity, as follows. The image forming apparatus 1 includes the counter 122 to count the time period

during which images are output in the state in which the waste-toner bottle 226 is removed, and image output is compulsively stopped when the count value reaches the predetermined threshold.

[0091] Additionally, when the job checker 112 determines that the predetermined toner type (for example, recorded in the database) is used for the print job, the conveyance condition settings (i.e., the speed at which waste toner is transported, the threshold of the counting, or the like) specific to that toner type are used to control the waste toner conveyance, or compulsive stop of image formation, or both. This control is advantageous in inhibiting the possibility that the temporary reservoir 225 being filled to capacity is not properly recognized based on a single threshold, which arises when multiple toner types different in flow properties are used. Thus, this control enables proper detection of the temporary reservoir 225 being filled to capacity.

[0092] In the description above, the conveyance speed and the threshold of the counting are used as the settings in the control of waste toner conveyance in the case where the multiple developer types different in flow properties are used. However, they are just examples and can be any item that enables detection of the temporary reservoir 225 being filled to capacity in accordance with flow properties of developer used. For example, the number of count values counted by the counter 122 per unit time may be changed in accordance with developer type.

[0093] Additionally, in the description above, the predetermined developer type is "Toner C" enclosed by broken liens in FIG. 10, which is poorer in flow properties. Accordingly, when the conveying screws 92 are driven at the standard speed, the conveyance of Toner C thereby is slower than other developer types (the amount of transported per unit time is smaller). In the embodiment described above, when Toner C is used, the speed of the conveying screws 92 is increased, and further the threshold as the criterion to determine that the temporary reservoir 225 is filled to capacity is increased according to the difference in the flow properties (the amount of transported per unit or bulk density in particular) between the target toner and other toners.

[0094] Alternatively, for example, "Toner D" and "Toner E" are better in flow properties, and transported faster (the amount of transported per unit time is greater) when the conveying screws 92 are driven at the standard speed. In this case, as illustrated in FIG. 10, the setting of the threshold is made smaller, according to the difference in the flow properties (the amount of transported per unit or bulk density in particular), to avoid operation of the apparatus in the state in which the temporary reservoir 225 is filled to capacity. In addition or alternatively, the speed of the conveying screw is reduced to elongate the period until the temporary reservoir 225 is filled to capacity according to the difference in the flow properties.

[0095] Additionally, in the above-described embodiment, the usage amount of the target toner is estimated based on the area of the image to be formed with the target toner (at S1103). By contrast, in a case where white toner is used on a recording medium lower in lightness, the density of white toner is higher as the lightness of the recording medium is lower. Accordingly, it is possible that the usage amount of toner changes in the range of several times even if the area is similar.

[0096] Accordingly, in another embodiment, the job checker 112 estimates the usage amount of the target toner based on the amount of toner adhering to unit area of the recording medium, that is, toner density on the recording medium. In this case, at S1103, the job checker 112 compares the density of the image formed with the target toner with the threshold and determines to control the waste toner conveyance according to toner type when the density is equal to or greater than the threshold. Alternatively, both of image area and the image density may be used for the determination.

[0097] Additionally, the above-described control is premised on the state in which the waste-toner bottle 226 is removed from the apparatus. The waste-toner bottle 226 is removed, for example, when the waste-toner bottle 226 is filled to capacity and replaced. Accordingly, in which the waste-toner bottle 226 is removed, the image forming apparatus 1 is not operated for a long time, and the waste-toner bottle 226 is to be connected to the temporary reservoir 225 soon.

[0098] At the point of time when the waste-toner bottle 226 is connected again, it is conceivable that the amount of accumulating toner in the temporary reservoir 225 is greater because the waste toner keeps accumulating therein until then. Therefore, when the bottle detector 123 detects that the waste-toner bottle 226 is connected again, it is preferable that the waste-toner conveyance controller 121 sets the speed at which waste toner is transported to the waste-toner bottle 226 from the temporary reservoir 225 to a higher setting than the standard setting.

[0099] Then, the waste toner is promptly discharged from the temporary reservoir 225 to the waste-toner bottle 226, thereby avoiding the state of the temporary reservoir 225 being filled to capacity, and relating inconveniences.

[0100] Additionally, in the description above, the driving time of the conveying screw counted by the counter 122 is compared with the threshold as an example to recognize the process of accumulation of waste toner in the temporary reservoir 225 as images are repeatedly output. Alternatively, the accumulation of waste toner in the temporary reservoir 225 may be recognized, for example, by counting the area of range to which respective color toners are transferred in the output image.

[0101] In the waster toner conveyance structure illustrated in FIG. 4, toner that is not transferred by the transfer device 215 onto the conveyor belt 205 but remains on the photoconductor drum 209 is removed by the cleaning device 213 and collected to the temporary reservoir 225. The amount of toner that is not transferred by the transfer

device 215 onto the conveyor belt 205 but remains on the photoconductor drum 209 is substantially constant.

[0102] Therefore, the amount of waste toner transported to the temporary reservoir 225 can be estimated based on the amount of toner that adheres to the photoconductor drum 209, that is, the areas of respective color toner images to be transferred to the sheet as an output image. Then, the state of the temporary reservoir 225 being filled to capacity is recognizable similarly by setting a proper threshold for the areas of images to be transferred.

[0103] To recognize the state of the temporary reservoir 225 being filled to capacity based on the image area, as illustrated in FIG. 12, the main controlled 101 is configured as illustrated in FIG. 9, and the engine controller 102 includes an output area acquisition unit 124 (i.e., an output area counter) instead of the counter 122. Further, the main controller 101 has a capability relating to the counting of image area.

[0104] The job checker 112 has a capability to calculate the area of each of cyan, magenta, yellow, black, and special toner images in addition to the above-described capability to ascertain toner type. The waste-toner conveyance setting unit 115 inputs the areas of respective color toner images thus calculated to the engine controller 102 together with the above-described setting data.

[0105] For example, the job checker 112 calculates the respective color image areas referring to the respective color drawing data. In the drawing data, the pixel constituting the image is indicated as either chromatic or achromatic regarding each color. Accordingly, the job checker 112 acquires the image area by counting the number of chromatic pixels in each of the respective color drawing data. In addition, in a case where the data of each pixel includes density data, weighting may be made according to density data so that the density is considered in calculating the image area to estimating the amount of waste toner,

[0106] In the engine controller 102, the output area acquisition unit 124 acquires the respective color image areas and counts the image area. When the count value of the output area acquisition unit 124 reaches the threshold acquired from the main controller 101, the stop signal is transmitted similarly.

[0107] As described above, the amount in total of waste toner accumulating in the temporary reservoir 225 corresponds to the area of toner image formed on the photoconductor drum 209. However, pulverization toner and polymerization toner differs in particle shape from each other as described above with reference to FIGS. 5 through 8. Therefore, even when the amount of toner corresponds to an identical image area, the bulk occupied by the toner in the temporary reservoir 225 is different between pulverization toner particles, between which a greater amount of clearances are present and polymerization toner particles, between which a smaller amount of clearances are present.

[0108] In other words, at the count value at which the temporary reservoir 225 is filled to capacity with pulverization toner, there remains a margin when the waste toner accumulating there is polymerization toner. By contrast, at the count value at which the temporary reservoir 225 is filled to capacity with polymerization toner, the amount of polymerization toner accumulating in the temporary reservoir 225 exceeds the capacity of the temporary reservoir 225, and there is a risk of damage to the apparatus or malfunction of the apparatus. Accordingly, when pulverization toner is used, it is necessary to set the threshold to a lower setting so that the state of the temporary reservoir 225 being filled to capacity is recognized earlier.

[0109] Additionally, the amount of toner contained in the temporary reservoir 225 changes depending on the transfer efficiency of the transfer device 215 transferring the toner image onto the conveyor belt 205. Compared with polymerization toner, pulverization toner is lower in transfer efficiency, and the amount of pulverization toner collected as waste toner is greater than polymerization toner. Accordingly, even when the image area is identical, in the case where pulverization toner is used, it is necessary to set the threshold to a lower setting so that the state of the temporary reservoir 225 being filled to capacity is recognized earlier.

[0110] Thus, in a configuration in which the state of the temporary reservoir 225 being filled to capacity is determined by counting the area of images to be output, the effects similar to those attained by the above-described embodiment are available by changing the threshold, the conveyance speed, or both when used of specific developer is recognized.

[0111] In such a case, in the case of toner type, such as pulverization toner, that is greater in volume when accumulating in the temporary reservoir 225, the "threshold" in FIG. 10 is reduced, that is, set to a smaller setting to bring forward the determination of the temporary reservoir 225 being filled to capacity. By contrast, in the case of toner type, such as polymerization toner, that is smaller in volume when accumulating in the temporary reservoir 225, the "threshold" in FIG. 10 is increased, that is, set to a larger setting to delay the determination of the temporary reservoir 225 being filled to capacity.

[0112] It is to be noted that, although the driving time and the image area are counted in FIGS. 9 and 12, respectively, alternatively, both of the driving time and the image area may be counted so that the determination of the temporary reservoir 225 being filled to capacity is made based on both of them. This configuration can improve the accuracy of determination or reliably inhibit transport of waste toner to the temporary reservoir 225 exceeding the capacity of the temporary reservoir 225.

[0113] It is to be noted that the steps in the above-described flowchart may be executed in an order different from that in the flowchart. Further, any one of the above-described and other example features of the present invention may be embodied in the form of an apparatus, method, system, computer program and computer pro-

gram product. For example, the aforementioned methods may be embodied in the form of a system or device, including, but not limited to, any of the structure for performing the methodology illustrated in the drawings.

[0114] Even further, any of the aforementioned methods may be embodied in the form of a program. The program may be stored on a computer readable media and is adapted to perform any one of the aforementioned methods when run on a computer device (a device including a processor). Thus, the storage medium or computer readable medium, is adapted to store information and is adapted to interact with a data processing facility or computer device to perform the method of any of the above mentioned embodiments.

Claims

1. An image forming apparatus (1) in which multiple different type developers are usable, the image forming apparatus (1) comprising:

an image forming unit (206) to form an image on an image bearer (209; 205) with developer;
a cleaning device (213; 218) to collect developer from the image bearer (209; 205);
a collected developer passage (220) through which collected developer collected by the cleaning device (213; 218) is transported;
a rotatable developer conveyor (92) disposed in the collected developer passage (220) to transport the collected developer therein;
a temporary developer container (225) connected to the collected developer passage (220), to temporarily store the collected developer;
a waste-developer container (226) removably connected to the temporary developer container (225); and
a controller (100) to control conveyance of the collected developer from the cleaning device (213; 218),
wherein the controller (100) refers to a developer type database in which each of the multiple different type developers is correlated with a conveyance condition to transport the collected developer, and one of the multiple different type developers is set as a target developer, and
the controller (100) changes the conveyance condition according to the developer type database when a content of an image output job indicates that the target developer is used.

2. The image forming apparatus (1) according to claim 1, further comprising:

a detector (123) to detect the waste-developer container (226) being connected to the temporary developer container (225); and
a counter (122) to count a time period during which image output is executed in a state in which the waste-developer container (226) is not connected to the temporary developer container (225) according to an output from the detector (123),
wherein the conveyance condition includes a threshold of a count value the time period counted by the counter (122),
the controller (100) stops image formation by the image forming unit (206) when the count value reaches the threshold, and
the controller (100) changes the threshold when the content of the image output job indicates that the target developer is used.

3. The image forming apparatus (1) according to claim 2, wherein the developer type database includes a first developer and a second developer poorer in flow properties than the first developer, the second developer set as the target developer, and
the controller (100) changes the threshold to an increased value when the second developer is used.

4. The image forming apparatus (1) according to claim 2, wherein the developer type database includes a first developer set as the target developer and a second developer poorer in flow properties than the first developer, and the controller (100) changes the threshold to a reduced value when the first developer is used.

5. The image forming apparatus (1) according to claim 1, further comprising:

a detector (123) to detect the waste-developer container (226) being connected to the temporary developer container (225); and
a counter (122) to count an area of an image output in a state in which the waste-developer container (226) is not connected to the temporary developer container (225) according to an output from the detector (123),
wherein the conveyance condition includes a threshold of a count value of the area count by the counter (122),
the controller (100) stops image formation by the image forming unit (206) when the count value of the area counted by the counter (122) reaches the threshold, and
the controller (100) changes the threshold when the content of the image output job indicates that the target developer is used.

6. The image forming apparatus (1) according to claim 5, wherein the developer type database includes a first developer and a second developer greater in bulk than the first developer when stored in the tem-

porary developer container (225), the second developer set as the target developer, and
the controller (100) changes the threshold to a reduced value when the second developer is used.

7. The image forming apparatus (1) according to claim 5, wherein the developer type database includes a first developer set as the target developer and a second developer greater in bulk than the first developer when stored in the temporary developer container (225), and
the controller (100) changes the threshold to an increased value when the first developer is used.

8. The image forming apparatus (1) according to claim 1 or 2, wherein the conveyance condition includes a conveyance speed at which the rotatable developer conveyor (92) transports the collected developer, and
the controller (100) changes the conveyance speed when the content of the image output job indicates that the target developer is used.

9. The image forming apparatus (1) according to claim 8, wherein the developer type database includes a first developer and a second developer poorer in flow properties than the first developer, the second developer set as the target developer, and
the controller (100) changes the conveyance speed to an increased speed when the second developer is used.

10. The image forming apparatus (1) according to claim 8, wherein the developer type database includes a first developer set as the target developer and a second developer poorer in flow properties than the first developer, and
the controller (100) changes the conveyance speed to a reduced speed when the first developer is used.

11. The image forming apparatus (1) according to any one of claims 1 through 10, wherein the controller (100) comprises a memory (114) to store the developer type database; and
the image forming unit (206) comprises a developing device (212) to contain the developer,
wherein the developer type database includes a setting of the conveyance condition correlated to the developer contained in the developing device (212), and
when the content of the image output job indicates that the target developer is used, the controller (100) changes the conveyance condition according to the setting in the developer type database stored in the memory.

12. The image forming apparatus (1) according to any one of claims 1 through 11, wherein the controller (100) changes the conveyance condition when a usage amount of the target developer is equal to or greater than a predetermined amount.

13. The image forming apparatus (1) according to claim 12, wherein the controller (100) determines that the usage amount of the target developer is equal to or greater than the predetermined amount when the content of the image output job indicates that an area of an image developed with the target developer is equal to or greater than a predetermined area.

14. The image forming apparatus (1) according to claim 12, wherein the controller (100) determines that the usage amount of the target developer is equal to or greater than the predetermined amount when the content of the image output job indicates that an image developed with the target developer has an image density equal to or greater than a threshold density.

FIG. 1

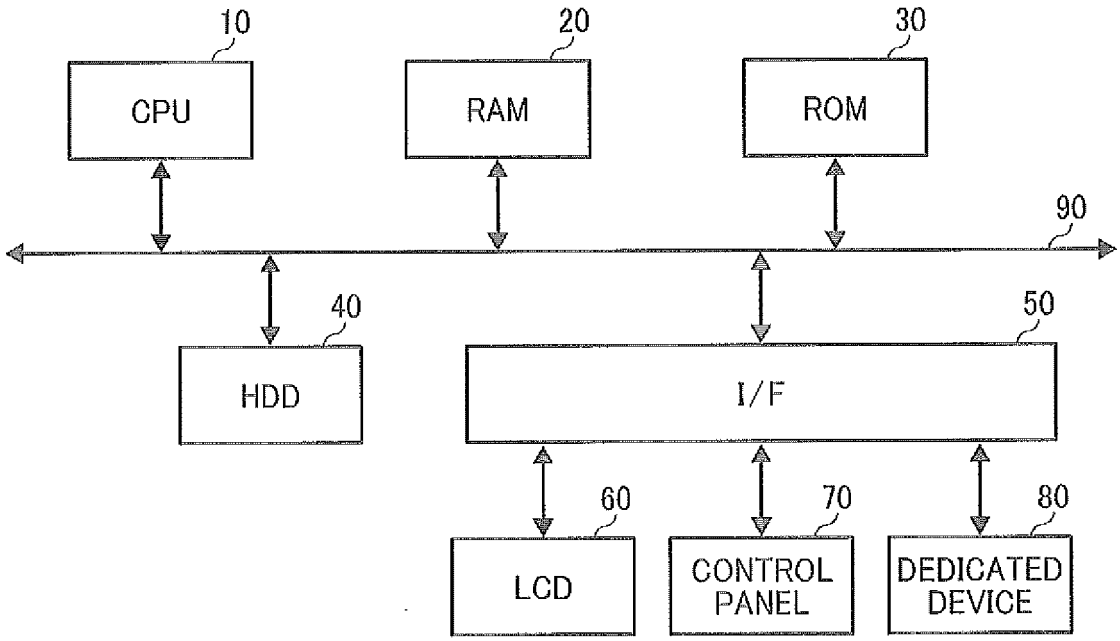

10
CPU
20
RAM
30
ROM
90
40
HDD
50
I/F
60
LCD
70
CONTROL PANEL
80
DEDICATED DEVICE

FIG. 2

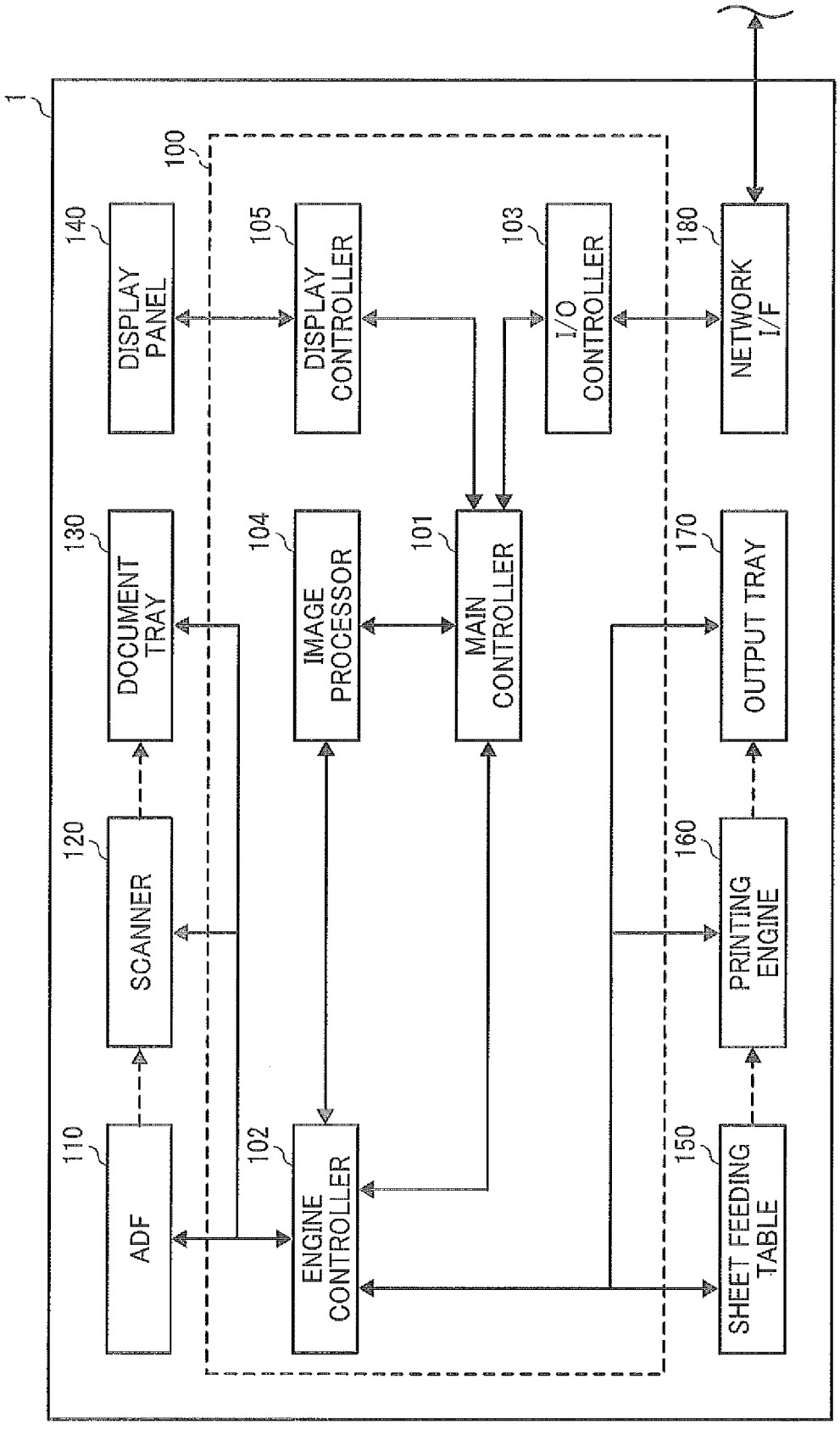

1
100
140
DISPLAY PANEL
105
DISPLAY CONTROLLER
103
I/O CONTROLLER
180
NETWORK I/F
130
DOCUMENT TRAY
104
IMAGE PROCESSOR
101
MAIN CONTROLLER
170
OUTPUT TRAY
120
SCANNER
160
PRINTING ENGINE
110
ADF
102
ENGINE CONTROLLER
150
SHEET FEEDING TABLE

FIG. 3

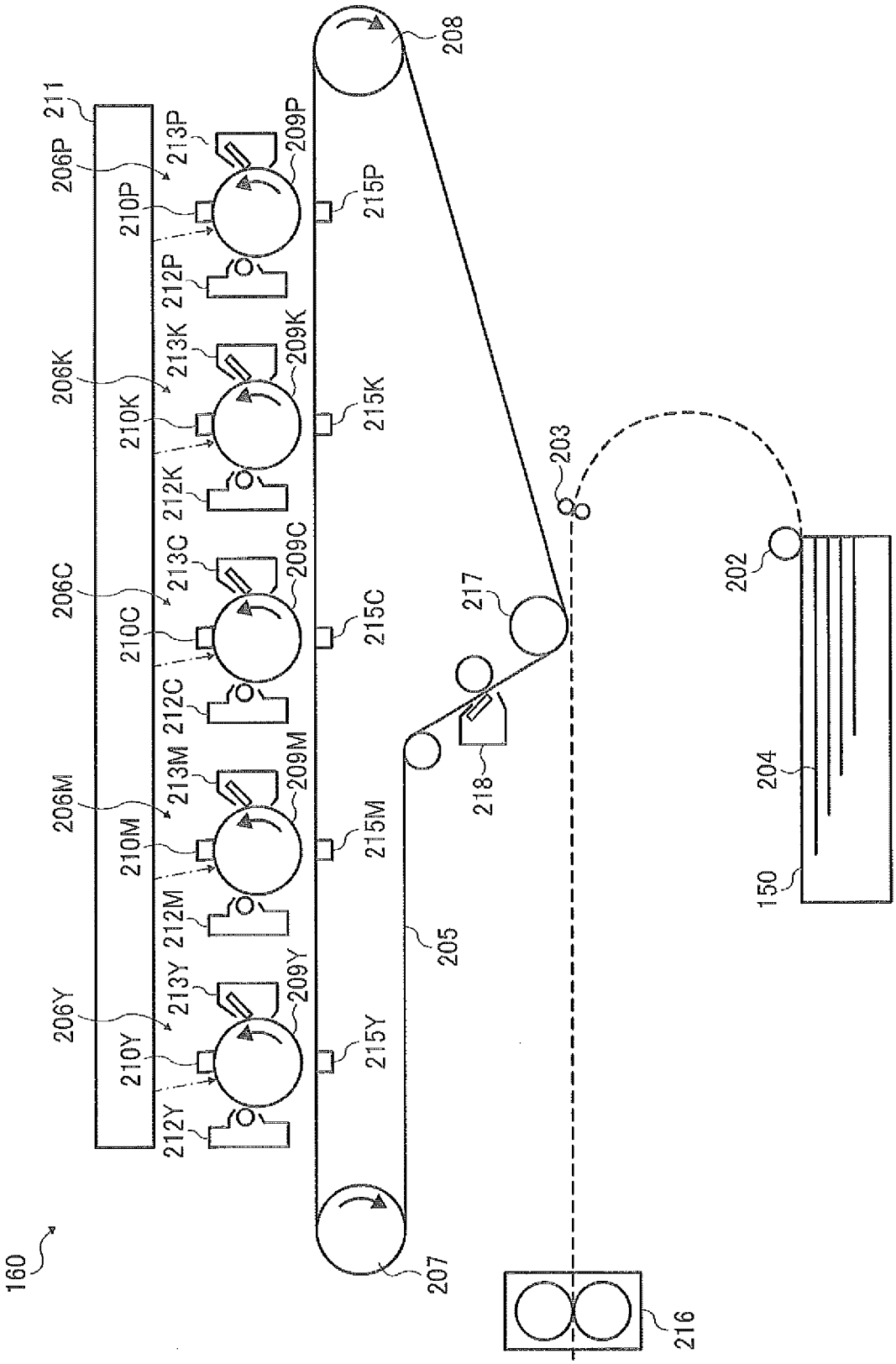

160
211
206P
213P
209P
208
210P
215P
212P
206K
213K
209K
210K
215K
212K
206C
213C
209C
210C
215C
212C
206M
213M
209M
210M
215M
212M
206Y
213Y
209Y
210Y
215Y
212Y
205
207
217
218
203
202
204
150
216

FIG. 4

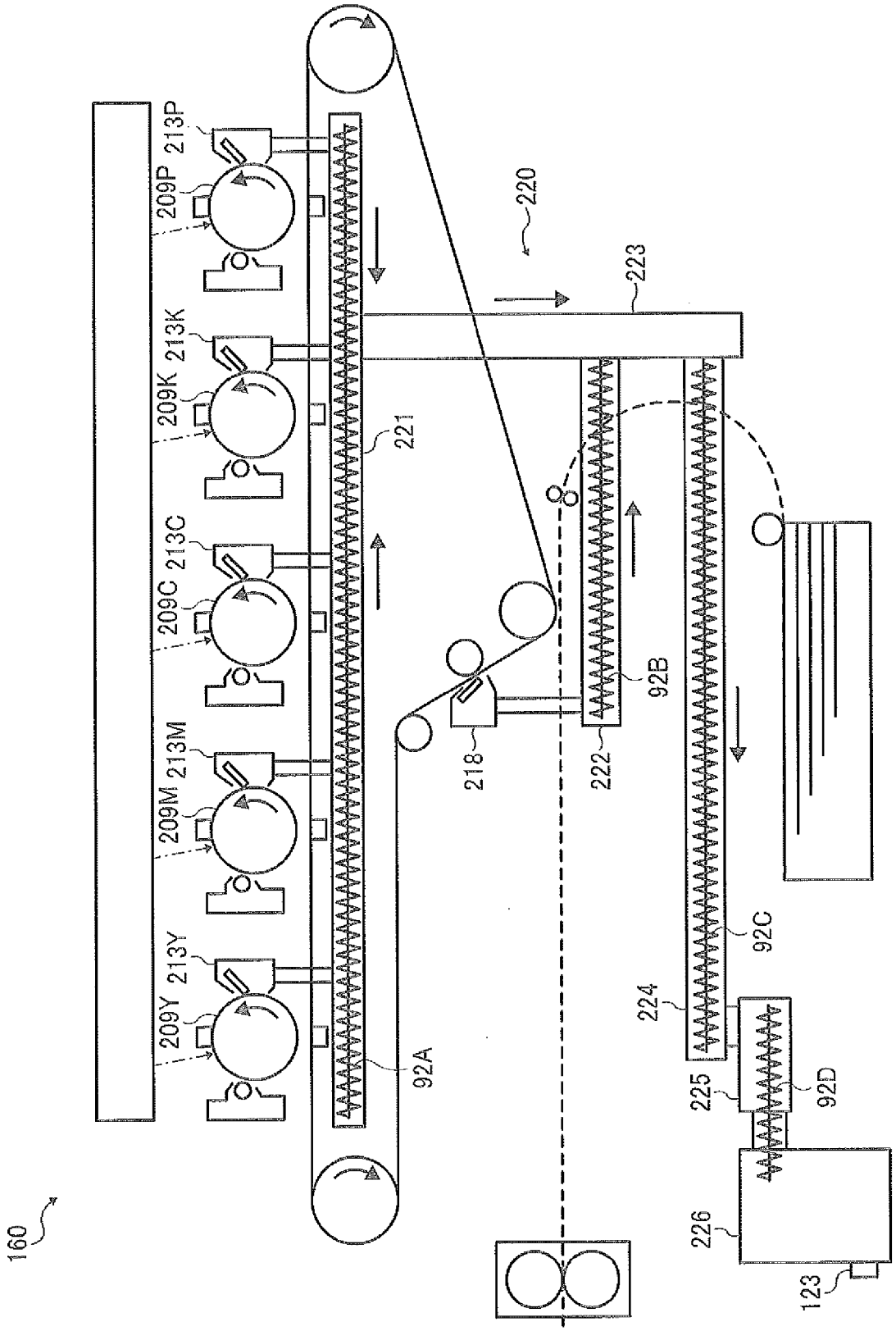

160
209Y
213Y
209M
213M
209C
213C
209K
213K
209P
213P
92A
221
220
223
92B
222
218
92C
224
225
92D
226
123

FIG. 5

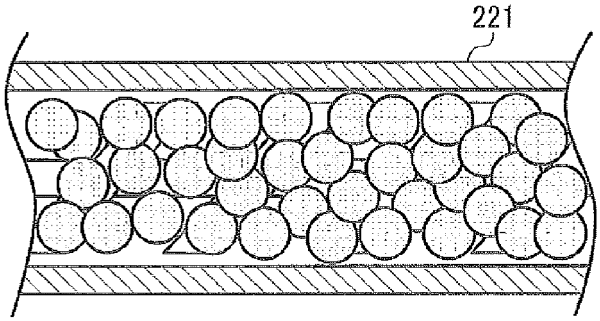


FIG. 6

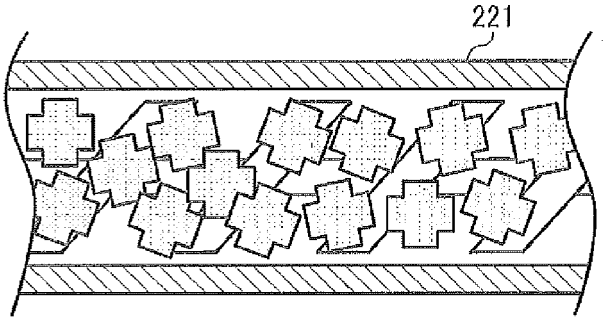


FIG. 7

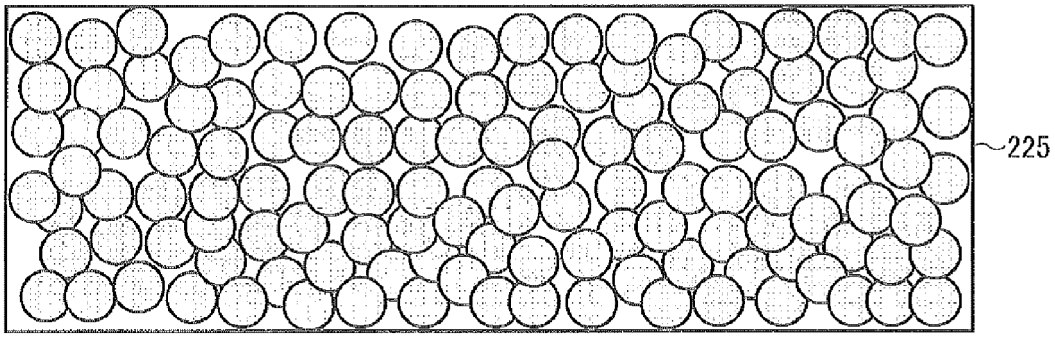


FIG. 8

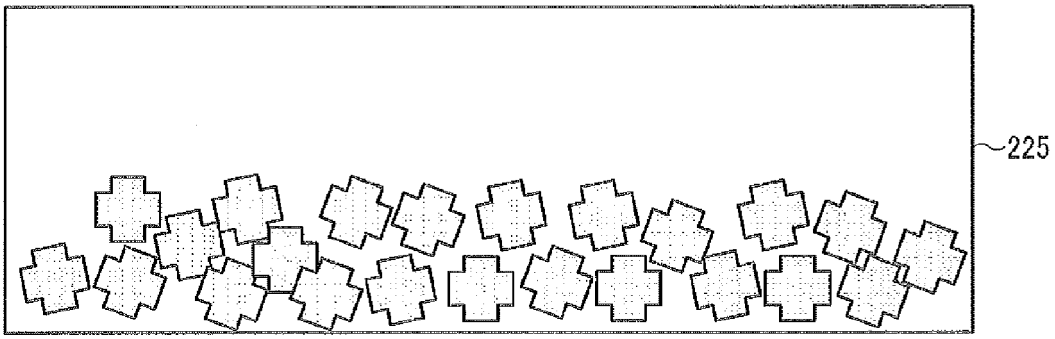


FIG. 9

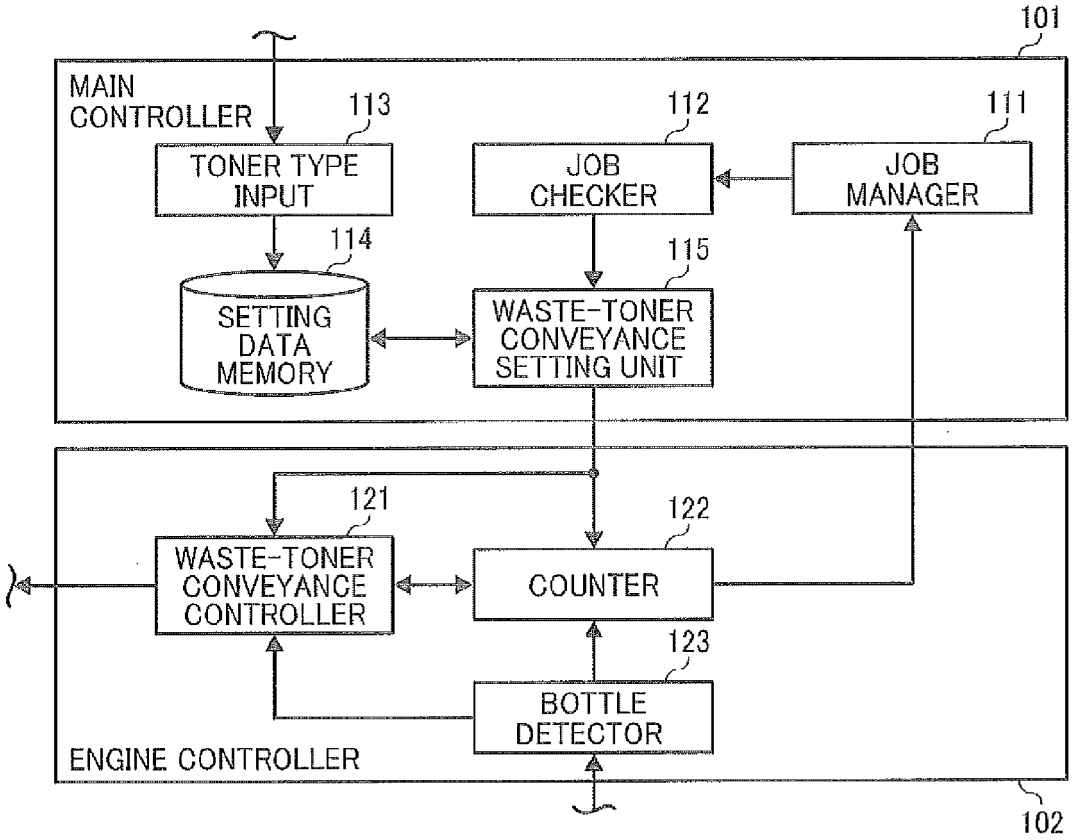


FIG. 10

TONER TYPE	FLOW PROPERTY	CONVEYANCE SPEED	THRESHOLD
TONER A	STANDARD	STANDARD	STANDARD
TONER B	POOR	HIGH	STANDARD
TONER C	POOR	HIGH	INCREASE
TONER D	GOOD	STANDARD	DECREASE
TONER E	GOOD	SLOW	STANDARD

FIG. 11

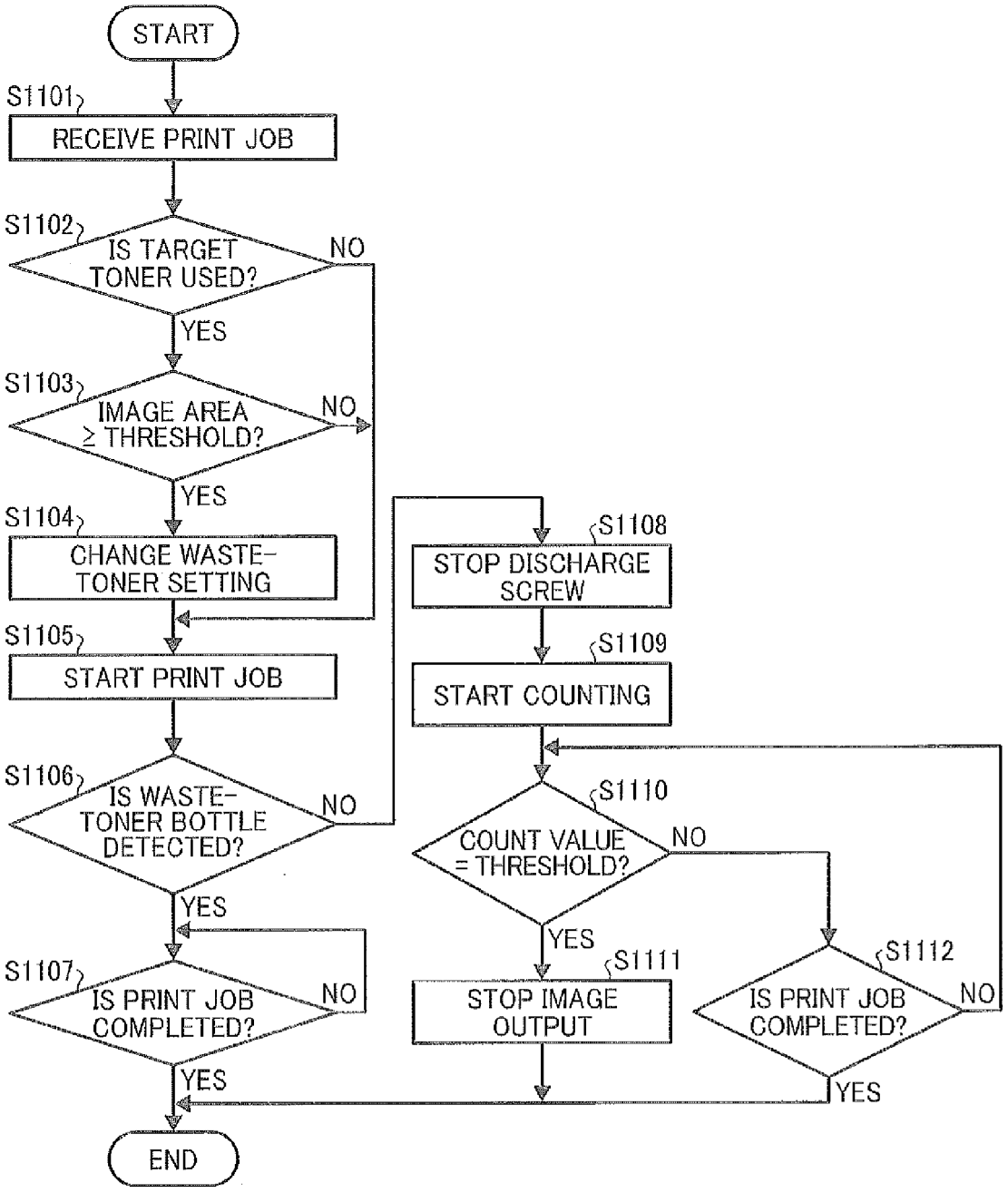
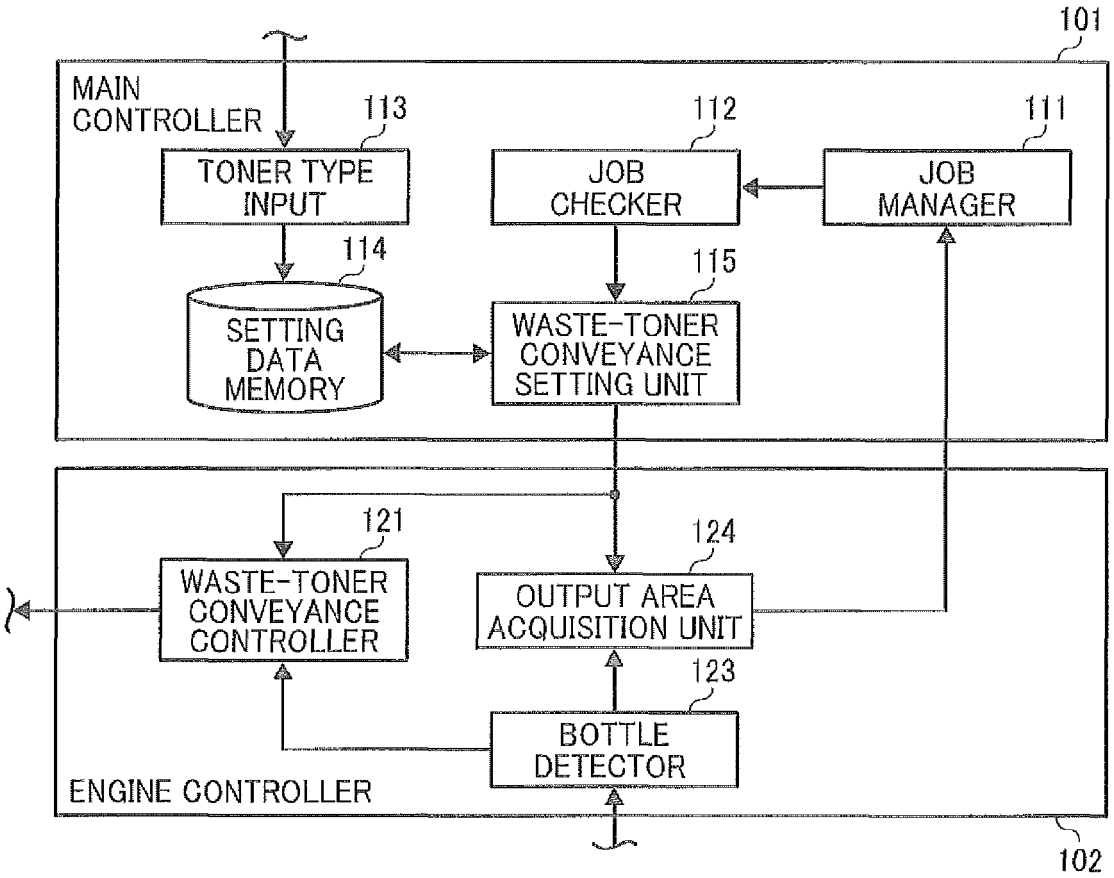

START
S1101
RECEIVE PRINT JOB
S1102
IS TARGET TONER USED?
NO
YES
S1103
IMAGE AREA ≥ THRESHOLD?
NO
YES
S1104
CHANGE WASTE-TONER SETTING
S1105
START PRINT JOB
S1106
IS WASTE-TONER BOTTLE DETECTED?
NO
YES
S1107
IS PRINT JOB COMPLETED?
NO
YES
END
S1108
STOP DISCHARGE SCREW
S1109
START COUNTING
S1110
COUNT VALUE = THRESHOLD?
NO
YES
S1111
STOP IMAGE OUTPUT
S1112
IS PRINT JOB COMPLETED?
NO
YES

FIG. 12


101
MAIN CONTROLLER
113
TONER TYPE INPUT
112
JOB CHECKER
111
JOB MANAGER
114
SETTING DATA MEMORY
115
WASTE-TONER CONVEYANCE SETTING UNIT
121
WASTE-TONER CONVEYANCE CONTROLLER
124
OUTPUT AREA ACQUISITION UNIT
123
BOTTLE DETECTOR
ENGINE CONTROLLER
102

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2011215593 A **[0006] [0007]**