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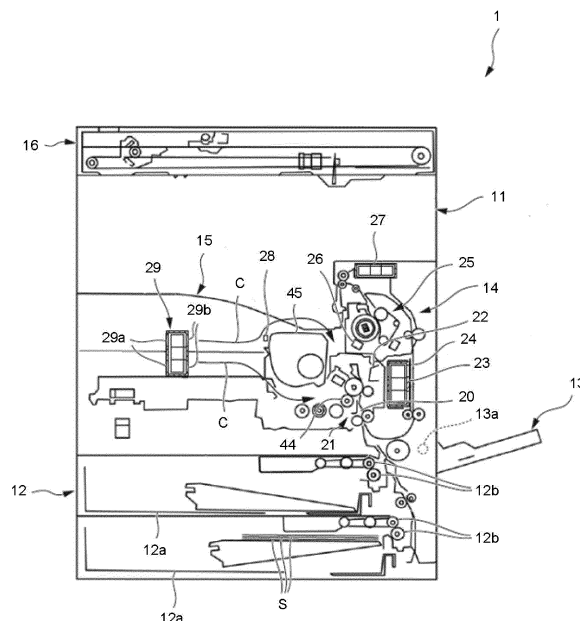
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(54) **IMAGE FORMING APPARATUS**

(57) In accordance with an embodiment, an image forming apparatus comprises a first fan, a filter section, a second fan, a fixing section and a control section. The first fan, which is provided with an air sucking port and an air exhaust port, sucks air in a casing. The filter section covers at least one of the air sucking port and the air exhaust port of the first fan. The second fan supplies air

to an airflow path of the casing leading to the first fan. The fixing section heats a sheet at a plurality of target temperatures. In a case of changing the target temperatures of the fixing section, the control section drives the second fan, or continues the driving of the second fan that has already been driven and drives the first fan during a period the second fan is driven.

FIG.1



Description

BACKGROUND

[0001] There has been proposed an image forming apparatus provided with a fan inside a casing thereof.

[0002] The image forming apparatus is also used in an environment that requires us to pay attention to generation of dust such as a clean room. On the other hand, the fan inside the casing is occasionally driven to cool components of the image forming apparatus. Herein, when the fan inside the casing of the image forming apparatus is driven, for example, the toner particles serving as the dust remained in the casing may flow out from a gap of the casing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003]

Fig. 1 is a cross-sectional view illustrating an example of the constitution of an image forming apparatus according to a first embodiment;

Fig. 2 is a cross-sectional view illustrating a transfer section and a fixing section shown in Fig. 1;

Fig. 3 is a cross-sectional view illustrating a filter section shown in Fig. 2;

Fig. 4 is a front view illustrating the fixing section shown in Fig. 2;

Fig. 5 is a functional block diagram illustrating the image forming apparatus shown in Fig. 1;

Fig. 6 is a flowchart illustrating an example of the operations of the image forming apparatus shown in Fig. 1; and

Fig. 7 is a flowchart illustrating an example of the operations of an image forming apparatus according to a second embodiment.

DETAILED DESCRIPTION

[0004] In accordance with an embodiment, an image forming apparatus comprises a first fan, a filter section, a second fan, a fixing section and a control section. The first fan which is provided with an air sucking port and an air exhaust port sucks air in a casing. The filter section covers at least one of the air sucking port and the air exhaust port of the first fan. The second fan sends wind to an airflow path of the casing leading to the first fan. The fixing section heats a sheet at a plurality of target temperatures. In a case of changing the target temperatures of the fixing section, the control section drives the second fan, or continues the driving of the second fan that is already in a driven state and drives the first fan during a period the second fan is driven.

[0005] The image forming apparatus may further comprise a charging section configured to charge a photoconductive drum.

[0006] The air sucking port of the first fan may be di-

rected to the charging section. The filter section may include an ozone filter capable of decomposing ozone.

[0007] The image forming apparatus may further comprise a guide configured to face a conveyance path of sheet and inside the casing to guide the sheet.

[0008] The first fan may be arranged at the same side as the guide with respect to the conveyance path.

[0009] The air sucking port of the first fan may be directed to the conveyance path.

[0010] The first fan may be driven in a case of conveying the sheet on the conveyance path.

[0011] The plurality of target temperatures may include a first target temperature and a second target temperature higher than the first target temperature.

[0012] The control section may drive the second fan in a case of changing a target temperature of the fixing section from the second target temperature to the first target temperature.

[0013] The image forming apparatus may further comprise a developing section cooling fan configured to cool at least one of a toner cartridge and a developing machine by sending wind to the airflow path.

[0014] The control section may drive, in a case of changing the target temperature of the fixing section, the first fan during a period the developing section cooling fan is driven when the developing section cooling fan is driven even after the second fan is stopped.

[0015] The airflow path may contain the conveyance path of sheet.

[0016] The second fan may cool the fixing section by sending wind to the conveyance path.

[0017] The image forming apparatus may further comprise a transfer section configured to transfer toner to the sheet.

[0018] The second fan may be positioned at a side opposite to the transfer section with respect to the fixing section. The second fan may move a part of air of the conveyance path towards the fixing section.

[0019] The first fan which is arranged between the transfer section and the fixing section may suck the air of the conveyance path.

[0020] The image forming apparatus may further comprise a third fan configured to send wind to the airflow path to make a flow of air towards the first fan in the airflow path.

[0021] The control section may drive the third fan during a period the second fan is driven in a case of changing the target temperature of the fixing section.

[0022] The airflow path may contain the conveyance path of sheet.

[0023] The second fan may cool the fixing section by sending wind to the conveyance path.

[0024] The third fan may be positioned at a side opposite to the first fan with respect to the conveyance path and sends wind towards the conveyance path.

[0025] The third fan can be driven at a first speed and a second speed faster than the first speed.

[0026] The control section may drive the third fan at

the second speed in a case of changing the target speed of the fixing section.

[0027] Hereinafter, the image forming apparatus according to the present embodiment is described with reference to the accompanying drawings.

(A first embodiment)

[0028] Fig. 1 is an example illustrating the constitution of an image forming apparatus 1 according to the first embodiment. The image forming apparatus 1 is, for example, an MFP (Multi-functional Peripheral). A sheet-like image receiving medium (hereinafter referred to as a "sheet") such as a paper is fed to the image forming apparatus 1. The image forming apparatus 1 reads an image formed in the sheet, and generates a digital data (image file) according to the read image. The image forming apparatus 1 forms an image on the sheet based on the digital data. The image forming apparatus 1 forms the image with a recording agent. A concrete example of the recording agent is toner. The recording agent is either a decolorable recording agent or a non-decolorable recording agent.

[0029] The toner material used as the decolorable recording agent has a decoloring function obtained by adding energy from outside. Adding energy from outside refers to adding an external stimulus such as a temperature, light of a specific wavelength, pressure and the like. The "decoloring" in the present embodiment refers to making the image, which is formed in a color (including not only chromatic color but also achromatic color such as white color, black color and the like) different from the ground color of the paper, invisible.

[0030] First, the entire constitution of the image forming apparatus 1 is described.

[0031] As shown in Fig. 1, as an example of the image forming apparatus 1, a casing 11, a sheet feed cassette section 12, a sheet feed tray 13, a printer section 14, a sheet discharge section 15, a scanner section 16 and a control section 17 (refer to Fig. 5) are arranged.

[0032] The casing (machine, case) 11 forms an external contour of the image forming apparatus 1. The casing 11 is, for example, formed into a boxed-shape. The casing 11 houses the sheet feed cassette section 12, the printer section 14, the scanner section 16 and the control section 17.

[0033] The sheet feed cassette section 12 includes, for example, a plurality of sheet feed cassettes 12a and a plurality of pickup rollers 12b each of which is arranged to be corresponded to each sheet feed cassette 12a. The sheet feed cassette 12a is installed in the casing 11. The sheet feed cassette 12 can be taken out from the casing 11. Sheets S are stored in the sheet feed cassette 12a. The pickup roller 12b sends a sheet S from the sheet feed cassette 12a to the printer section 14.

[0034] The sheet feed tray 13 is, for example, arranged at the lateral side of the casing 11. Sheets S are supplied in the sheet feed tray 13. The sheet feed tray 13 is

equipped with a pickup roller 13a. The pickup roller 13a sends a sheet S from the sheet feed tray 13 to the printer section 14.

[0035] The printer section 14 forms an image on the sheet S. Specifically, the printer section 14 transfers the toner to the sheet S. Then, the printer section 14 fixes the transferred toner on the sheet S. The printer section 14 is, for example, a printer of a direct transfer system, and may be a printer of an intermediate transfer system instead of this. Further, the printer section 14 is described in detail later.

[0036] The sheet S passing through the printer section 14 is discharged to the sheet discharge section 15. The sheet discharge section 15 is, for example, formed on the external appearance of the casing 11. Further, the sheet discharge section 15 may be arranged by arranging a sheet discharge tray in the casing 11.

[0037] The scanner section 16 reads image information of an original as digital data. The image information read by the scanner section 16 is, for example, used by the printer section 14.

[0038] The control section (control circuit) 17 controls the whole image forming apparatus 1. The control section 17 controls various operations of the sheet feed cassette section 12, the sheet feed tray 13, the printer section 14 and the scanner section 16. Further, the control section 17 is also described in detail later.

[0039] Hereinafter, the printer section 14 and the control section 17 are described in detail. First, the printer section 14 is described.

[0040] As shown in Fig. 1, the printer section 14 includes a conveyance path 20 of the sheet S, a transfer section 21, a guide 22, an ozone fan 23, a filter section 24, a fixing section 25, a fixing section temperature sensor 26, a fixing section cooling fan 27, a developing section temperature sensor 28 and a developing section cooling fan 29.

[0041] First, the conveyance path 20 of the sheet S is described.

[0042] The conveyance path 20 is arranged inside the casing 11. The sheet S is conveyed along the conveyance path 20 inside the casing 11. The conveyance path 20 is from the sheet feed cassette section 12 and the sheet feed tray 13 to the sheet discharge section 15 via the transfer section 21 and the fixing section 25. Further, an airflow path 31 in which air can be flowed is formed inside the casing 11. The conveyance path 20 constitutes at least a part of the airflow path 31.

[0043] Next, the transfer section 21 is described.

[0044] The transfer section 21 is illustrated in detail at the lower portion of Fig. 2. The transfer section 21 includes a photoconductive drum 41, a charging section 42, an exposure section 43, a developing machine 44, a toner cartridge 45 (refer to Fig. 1) and a transfer roller 46.

[0045] The photoconductive drum 41 is an example of an image carrier. The photoconductive drum 41 has a photoconductor (photoconductive area) on the surface thereof. The photoconductor is, for example, an organic

photo conductor (OPC).

[0046] The charging section (charging charger) 42 faces the surface of the photoconductive drum 41. The charging section 42 charges the surface of the photoconductive drum 41. The charging section 42 is, for example, a scorotron type charged needle, and is not limited to this. When charging the photoconductive drum 41, the charging section 42 releases ozone. Thus, the air containing ozone is likely to be retained nearby the charging section 42.

[0047] The exposure section 43 irradiates the photoconductive drum 41 with laser. In this way, the exposure section 43 forms a latent image part corresponding to a printing pattern on the surface of the photoconductive drum 41.

[0048] The developing machine 44 supplies toner to the surface of the photoconductive drum 41. In this way, the toner is adhered to the latent image part of the photoconductive drum 41.

[0049] The toner cartridge (toner bottle) 45 housing toner is installed in the casing 11 and can be detached from the casing 11, for example. The toner cartridge 45 is connected to the developing machine 44. The toner cartridge 45 supplies toner to the developing machine 44. Further, in the present description, the combination of the developing machine 44 and the toner cartridge 45 is referred to as a developing section.

[0050] The transfer roller 46 faces the sheet S from a side opposite to the photoconductive drum 41. The sheet S passes through a space between the photoconductive drum 41 and the transfer roller 46. As a result, the toner is transferred to the sheet S from the surface of the photoconductive drum 41.

[0051] Next, the guide 22 is described.

[0052] The guide (conveyance guide) 22 is arranged inside the casing 11. The guide 22 faces the conveyance path 20, and guides the sheet S conveyed along the conveyance path 20. The guide 22 is, for example, positioned between the transfer section 21 and the fixing section 25. The guide 22 guides the sheet S which is conveyed from the transfer section 21 towards the fixing section 25.

[0053] Next, the ozone fan 23 is described.

[0054] The ozone fan 23 is arranged nearby the transfer section 21 inside the casing 11. The ozone fan 23 is an example of a "first fan". The ozone fan 23 sucks the air inside the casing 11 as indicated by an arrow A in Fig. 2. The ozone fan 23 exhausts the sucked air to the outside of the casing 11.

[0055] If described in detail, the casing 11 is provided with a housing section 52 for housing the ozone fan 23 between the conveyance path 20 and a side wall 51 of the casing 11. The housing section 52 includes a first opening port 53 and a second opening port 54. The first opening port 53 is arranged in such a manner that it is directed to the conveyance path 20 at a position between the transfer section 21 and the fixing section 25. The second opening port 54 is arranged to be directed to the side wall 51 of the casing 11. A plurality of opening ports 55

leading to the second opening port 54 is arranged in the side wall 51 of the casing 11. The housing section 52 is provided with a partition 56 in at least one part of a space between the housing section 52 and other space of the casing 11. By arranging such a partition 56, the ozone fan 23 can suck the air from the first opening port 53 efficiently. Further, the housing section 52 may be partitioned definitely from other space of the casing 11, and may be not partitioned definitely from other space of the casing 11.

[0056] The ozone fan 23 is housed in the housing section 52. The ozone fan 23 includes an air sucking port 23a and an air exhaust port 23b. The air sucking port 23a of the ozone fan 23 is directed to the conveyance path 20. The air sucking port 23a of the ozone fan 23 leads to the conveyance path 20 through the first opening port 53 of the housing section 52. In this way, the ozone fan 23 can suck the air in a space between the transfer section 21 and the fixing section 25 (the air in the conveyance path 20).

[0057] The air exhaust port 23b of the ozone fan 23 is directed to the side wall 51 of the casing 11. The air exhaust port 23b of the ozone fan 23 leads to outside of the casing 11 through the second opening port 54 of the housing section 52 and the opening ports 55 of the side wall 51. In this way, the ozone fan 23 can exhaust the sucked air to the outside of the casing 11.

[0058] Herein, the ozone fan 23 of the present embodiment is driven to remove the ozone inside the casing 11 as one of its purposes. As shown in Fig. 2, the air sucking port 23a of the ozone fan 23 is directed to the charging section 42 of the transfer section 21. In this way, the ozone fan 23 can suck the air around the charging section 42. The ozone fan 23 is driven in, for example, a printing mode of the image forming apparatus 1. The printing mode refers to a mode in which an image is formed on a sheet. In the printing mode, the image is transferred to the sheet by the transfer section 21, and the image formed on the sheet S is fixed by the fixing section 25.

[0059] Further, the ozone fan 23 of the present embodiment is also driven to stabilize the sheet S conveyed along the conveyance path 20. That is, the ozone fan 23 is positioned at the same side as the guide 22 with respect to the conveyance path 20. In a case in which the sheet S is conveyed along the conveyance path 20, the ozone fan 23 is driven to suck the air in the conveyance path 20. In this way, the ozone fan 23 can enable the sheet S to convey along the guide 22.

[0060] Thus, the "first fan" is not limited to a fan which is used to remove the ozone. The "first fan" may be a fan which is mainly used to enable the sheet S to convey along the guide 22. The "first fan" may also be arranged for a purpose other than the two purposes described above.

[0061] Then, the filter section 24 is described.

[0062] The filter section 24 covers at least one of the air sucking port 23a and the air exhaust port 23b of the ozone fan 23. The filter section 24 of the present embod-

iment covers the air exhaust port 23b of the ozone fan 23. Fig. 3 is an example illustrating the filter section 24. The filter section 24 comprises, for example, a first filter 61 and a second filter 62.

[0063] The first filter 61 is an ozone filter capable of decomposing (absorbing, removing) ozone. For example, the first filter 61 contains a reactive catalyst. In this way, the first filter 61 has a function of ozone decomposition.

[0064] The second filter 62 is a filter for dust collection. For example, the second filter 62 is a filter capable of collecting the toner particles (dregs) suspended in the casing 11. In the present embodiment, the first filter 61 and the second filter 62 are overlapped. Further, the filter section 24 may be constituted by only either the first filter 61 or the second filter 62. For example, even the filter section 24 constituted only by the first filter 61 can also realize the dust collection function to some degree.

[0065] Next, the fixing section 25 is described.

[0066] Fig. 2 and Fig. 4 illustrate the detailed description of the fixing section 25. The fixing section 25 is positioned above the transfer section 21. The fixing section 25 is positioned between the transfer section 21 and the sheet discharge section 15 on the conveyance path 20. The fixing section 25 comprises a heat roller (fixing roller) 71, a press roller 72, a fixing belt 73 and a belt heat roller 74.

[0067] As shown in Fig. 4, the heat roller 71 is provided with a center lamp 71 a and a side lamp 71 b as one example. The center lamp 71 a and the side lamp 71 b are arranged inside the heat roller 71. Each of the center lamp 71 a and the side lamp 71 b heats the heat roller 71.

[0068] The fixing section 25 of the present embodiment is controlled to a plurality of target temperatures according to operation modes of the image forming apparatus 1. For example, the heat roller 71 is controlled to a fixing temperature (printing temperature) in the printing mode. In this way, the heat roller 71 applies heat to the sheet S. The fixing temperature is a temperature suitable for fixing toner in the sheet S. The fixing temperature is an example of a "first target temperature". As an example, the fixing temperature is about 90 degrees centigrade.

[0069] The press roller 72 applies pressure to the sheet S from a side opposite to the heat roller 71. Most part of the press roller 72 is made of metal material. The heat capacity of the press roller 72 is larger than that of the heat roller 71. The heat roller 72 has a function of maintaining the temperature of the fixing section 25 in the printing mode.

[0070] The fixing belt 73 guides the sheet S sent to the fixing section 25 to a space between the heat roller 71 and the press roller 72. The sheet S placed on the fixing belt 73 is nipped by the heat roller 71 and the press roller 72. In this way, the sheet S is heated and pressed. As a result, the toner transferred to the sheet S is fixed on the sheet S.

[0071] The belt heat roller 74 supports the fixing belt 73 together with the press roller 72. The belt heat roller

74 is provided with a belt lamp 74a. The belt lamp 74a which is arranged inside the belt heat roller 74 heats the fixing belt 73. Similar to the heat roller 71, the belt heat roller 74 is controlled to a fixing temperature in the printing mode.

[0072] In addition to a printing function, the image forming apparatus 1 of the present embodiment has a decoloring function. That is, the image forming apparatus 1 can be operated in both the printing mode and a decoloring mode. The decoloring mode refers to a mode in which heat is applied to an image formed with a decolorable recording agent on a sheet, and the image formed on the sheet is decolored. In the decoloring mode, the fixing section 25 (for example, the heat roller 71 and the belt heat roller 74) is controlled to a decoloring temperature higher than the fixing temperature described above. The decoloring temperature is a temperature at which the decolorable recording agent can be decolored. The decoloring temperature is an example of a "second target temperature". As one example, the decoloring temperature is about 130 degrees centigrade. The sheet S serving as a decoloring target is passed through the fixing section 25 that is controlled at the decoloring temperature to be decolored.

[0073] Further, in some products, the fixing temperature may be higher than the decoloring temperature. In this case, the decoloring temperature serves as an example of the "first target temperature", and the fixing temperature serves as an example of the "second target temperature".

[0074] Next, the fixing section temperature sensor 26 is described.

[0075] The fixing section temperature sensor (a first sensor, a first temperature sensor) 26 is arranged in the fixing section 25. The fixing section temperature sensor 26 detects a temperature of the fixing section 25. The fixing section temperature sensor 26 of the present embodiment includes a first thermistor 76 and a second thermistor 77. For example, the first thermistor 76 is connected with the heat roller 71. In this way, the first thermistor 76 detects the temperature of the heat roller 71. For example, the second thermistor 77 is connected with the fixing belt 73. In this way, the second thermistor 77 detects the temperature of the fixing belt 73. The detection result of the fixing section temperature sensor 26 is sent to the control section 17.

[0076] Further, the fixing section temperature sensor 26 may be any one of the first thermistor 76 and the second thermistor 77. Moreover, the fixing section temperature sensor 26 is not limited to the first thermistor 76 and the second thermistor 77. As another example, the fixing section temperature sensor 26 measures the temperature of the casing 11 at a position nearby the fixing section 25. In this way, the fixing section temperature sensor 26 may detect the temperature of the fixing section 25.

[0077] Next, the fixing section cooling fan 27 is described.

[0078] As shown in Fig. 2, the fixing section cooling fan 27 is arranged inside the casing 11. The fixing section cooling fan 27 is an example of a "second fan". The fixing section cooling fan 27 cools the fixing section 25 by sending wind to an airflow path 31 inside the casing 11 in a direction indicated by an arrow B as shown in Fig. 2. The fixing section cooling fan 27 is driven in a case of changing a target temperature of the fixing section 25. For example, the fixing section cooling fan 27 is driven in a case in which the image forming apparatus 1 is switched from the decoloring mode to the printing mode. In this way, the fixing section cooling fan 27 cools the fixing section 25 from the decoloring temperature to the fixing temperature.

[0079] If described in detail, the fixing section cooling fan 27 is provided with an air sucking port 27a and an air exhaust port 27b. The air sucking port 27a of the fixing section cooling fan 27 faces a wall 81 of the casing 11. For example, an opening port for obtaining the air outside the casing 11 is arranged in the wall 81. The fixing section cooling fan 27 sucks the air outside the casing 11 through the opening port of the casing 11.

[0080] The air exhaust port 27b of the fixing section cooling fan 27 is directed to the conveyance path 20 inside the casing 11. For example, the air exhaust port 27b of the fixing section cooling fan 27 is directed to the fixing section 25. The fixing section cooling fan 27 sends wind to the fixing section 25 through the conveyance path 20 to cool the fixing section 25. Specifically, the fixing section cooling fan 27 sends wind to the heat roller 71 and the press roller 72. In this way, the fixing section cooling fan 27 cools the heat roller 71 and the press roller 72.

[0081] More specifically, the fixing section cooling fan 27 sends wind to the fixing section 25 at a position between the fixing section 25 and the sheet discharge section 15. In this way, the fixing section cooling fan 27 moves a part of the air in a space between the fixing section 25 and the sheet discharge section 15 towards the fixing section 25. That is, the fixing section cooling fan 27 makes a flow of air in a direction opposite to the conveyance direction of the sheet S on the conveyance path 20. In this way, the fixing section cooling fan 27 sends wind to the fixing section 25.

[0082] Further, if the fixing temperature is higher than the decoloring temperature, the fixing section cooling fan 27 is driven in a case of switching from the printing mode to the decoloring mode.

[0083] Next, the developing section temperature sensor 28 is described.

[0084] As shown in Fig. 1, the developing section temperature sensor (toner temperature sensor, second sensor, second temperature sensor) 28 is arranged nearby the toner cartridge 45 or nearby the developing machine 44. In the present embodiment, the developing section temperature sensor 28 measures a temperature inside the casing 11 at a position nearby the toner cartridge 45. In this way, the developing section temperature sensor 28 detects a temperature of the toner cartridge 45. The

detection result of the developing section temperature sensor 28 is sent to the control section 17. Further, the developing section temperature sensor 28 may connect with the toner cartridge 45 to measure a temperature of the toner cartridge 45 directly instead of measuring the temperature nearby the toner cartridge 45. Moreover, the developing section temperature sensor 28 may detect the temperature of the developing machine 44 instead of the temperature of the toner cartridge 45.

[0085] Next, the developing section cooling fan 29 is described.

[0086] The developing section cooling fan (toner cooling fan) 29 is arranged inside the casing 11. The developing section cooling fan 29 cools at least one of the toner cartridge 45 and the developing machine 44 by sending wind to the toner cartridge 45 and the developing machine 44 in a direction indicated by an arrow C as shown in Fig. 1. The developing section cooling fan 29 is another example of a "second fan".

[0087] The developing section cooling fan 29 is arranged at a side opposite to the conveyance path 20 with respect to the toner cartridge 45 and the developing machine 44. The developing section cooling fan 29 is provided with an air sucking port 29a and an air exhaust port 29b. The air sucking port 29a of the developing section cooling fan 29 opens inside the casing 11. The air exhaust port 29b of the developing section cooling fan 29 is directed to the toner cartridge 45. The developing section cooling fan 29 sucks air inside the casing 11 to send it towards the toner cartridge 45 and the developing machine 44. The air exhausted from the developing section cooling fan 29 flows along the external shapes of the toner cartridge 45 and the developing machine 44 to cool the toner cartridge 45 and the developing machine 44.

[0088] If observed from other view of point, the developing section cooling fan 29 is positioned at a side opposite to the ozone fan 23 with respect to the conveyance path 20. The air exhaust port 29b of the developing section cooling fan 29 is directed to the conveyance path 20. Thus, the air from the developing section cooling fan 29 reaches the conveyance path 20 after cooling the toner cartridge 45 and the developing machine 44. During this process, the developing section cooling fan 29 makes a flow of air towards the ozone fan 23 on the conveyance path 20. In this way, the developing section cooling fan 29 also has a function of sweeping away ozone and dust retained on the conveyance path 20 to flow to the ozone fan 23.

[0089] If described in detail, the developing section cooling fan 29 is arranged between the ozone fan 23 and the fixing section cooling fan 27 at a height position inside the casing 11. Thus, parts of the wind from the developing section cooling fan 29 flows into the conveyance path 20 at a position between the transfer section 21 and the fixing section 25 after flowing along the external shape of the toner cartridge 45 (for example). The developing section cooling fan 29 sends wind in a direction intersecting a direction from the fixing section cooling fan 27 to-

wards the transfer section 21. In this way, if the air from the developing section cooling fan 29 flows into the conveyance path 20, the flow of wind from the fixing section cooling fan 27 towards the transfer section 21 is likely to be directed to the ozone fan 23.

[0090] For example, in the printing mode and the decoloring mode, the developing section cooling fan 29 cools the toner cartridge 45. In this way, it is possible to suppress the occurrence of defect since the temperature of the toner becomes high. Further, the toner cartridge 45 receives heat from the fixing section 25 of which the temperature is increased to the decoloring temperature, and is more prone to be at high temperature in the decoloring mode. Thus, the developing section cooling fan 29 may be driven in a case of switching from the decoloring mode to the printing mode and in a case of switching from the printing mode to the decoloring mode. Moreover, the developing section cooling fan 29 may start driving from a stopped state in a case of switching from the decoloring mode to the printing mode, or in a case of switching from the printing mode to the decoloring mode. Instead of this, the developing section cooling fan 29 may continue its driving from a state in which it has already been driven in the decoloring mode or in the printing mode in a case of switching from the decoloring mode to the printing mode, or in a case of switching from the printing mode to the decoloring mode.

[0091] The developing section cooling fan 29 may be rotated at a first speed and a second speed faster than the first speed. The developing section cooling fan 29 is driven at the first speed in a case in which, for example, the toner cartridge 45 is in a first state. The developing section cooling fan 29 is driven at the second speed in a case in which the toner cartridge 45 is in a second state higher in temperature than the first state. In this way, the developing section cooling fan 29 can cool the toner cartridge 45 efficiently.

[0092] Next, the control section 17 is described.

[0093] Further, in the following description, a case of switching from the decoloring mode to the printing mode is described as an example of a case of changing a target temperature of the fixing section 25. Further, in a case in which the fixing temperature becomes higher than the decoloring temperature, the following description of "printing mode" and "fixing temperature" may be respectively read as the description of "decoloring mode" and "decoloring temperature", and the description of "decoloring mode" and "decoloring temperature" may be respectively read as the description of "printing mode" and "fixing temperature".

[0094] Fig. 5 illustrates an example of a functional block diagram of the image forming apparatus 1. For example, the control section 17 controls the temperatures of the center lamp 71 a, the side lamp 71 b and the belt lamp 74 a of the fixing section 25 based on the detection result of the fixing section temperature sensor 26. In this way, the control section 17 controls the fixing section 25 to the fixing temperature in the printing mode. Further,

the control section 17 controls the fixing section 25 to the decoloring temperature in the decoloring mode.

[0095] Further, the control section 17 drives the fixing section cooling fan 27 to cool the fixing section 25 to the fixing temperature in a case of switching from the decoloring mode to the printing mode. That is, the control section 17 drives the fixing section cooling fan 27 until the fixing section 25 reaches the fixing temperature based on the detection result of the fixing section temperature sensor 26.

[0096] Herein, in a case of switching from the decoloring mode to the printing mode, the control section 17 of the present embodiment drives the fixing section cooling fan 27, and continues the driving of the ozone fan 23 during a period the fixing section cooling fan 27 is driven. That is, the control section 17 drives the fixing section cooling fan 27 and the ozone fan 23 until the temperature of the fixing section 25 reaches the fixing temperature based on the detection result of the fixing section temperature sensor 26. Further, in a case of switching from the decoloring mode to the printing mode, the control section 17 may continue the driving of the ozone fan 23 for only a given time after stopping the fixing section cooling fan 27.

[0097] Further, in order to avoid a high-temperature offset of the toner subjected to a decoloring processing in the decoloring mode, the control section 17 may drive the fixing section cooling fan 27. Further, the "high-temperature offset" refers to a phenomenon in which toner is peeled from the sheet of which the temperature becomes a high temperature and the toner is moved to the conveyance path 20 and the like. The control section 17 drives the fixing section cooling fan 27 based on, for example, a number of passing sheets or the detection result of the fixing section temperature sensor 26.

[0098] Further, the control section 17 drives the developing section cooling fan 29 to cool the toner cartridge 45 and the developing machine 44 in at least one of following cases: the printing mode, the decoloring mode, a case of switching from the decoloring mode to the printing mode and a case of switching from the printing mode to the decoloring mode. That is, the control section 17 monitors temperature information of the toner cartridge 45 (or temperature information of the developing machine 44) detected by the developing section temperature sensor 28. Then, if the temperature of the toner cartridge 45 (or the temperature of the developing machine 44) is increased to be higher than a given temperature, the control section 17 drives the developing section cooling fan 29 to cool the toner cartridge 45 and the developing machine 44.

[0099] Herein, the control section 17 of the present embodiment continues the driving of the ozone fan 23 during a period the developing section cooling fan 29 is driven. That is, in a case of switching from the decoloring mode to the printing mode, the control section 17 drives the developing section cooling fan 29, or continues the driving of the developing section cooling fan 29 that has al-

ready been driven. Then, in a case in which the driving of the developing section cooling fan 29 is continued after the fixing section cooling fan 27 is stopped, the ozone fan 23 is driven during a period the developing section cooling fan 29 continues the driving. Further, the control section 17 may continue the driving of the ozone fan 23 for only a given time after stopping the developing section cooling fan 29.

[0100] Next, an example of a processing of the control section 17 is described with reference to Fig. 6. The operations in a case of switching from the decoloring mode to the printing mode are described in the following description. Moreover, for facilitating the description, the ozone fan 23 is described as the "first fan", the fixing section cooling fan 27 is described as the "second fan", and the developing section cooling fan 29 is described as the "third fan" in Fig. 6. Further, it is exemplified as a concrete example in the following description that the developing section cooling fan 29 is driven to cool the toner cartridge 45.

[0101] In a case of switching from the decoloring mode to the printing mode, the control section 17 drives the fixing section cooling fan 27 to cool the fixing section 25 (ACT 111). Then, the control section 17 monitors the detection result of the fixing section temperature sensor 26 to determine whether or not the fixing section 25 is cooled to the fixing temperature (ACT 112).

[0102] In a case in which the temperature of the fixing section 25 is higher than the fixing temperature (NO in ACT 112), the control section 17 continues the driving of the fixing section cooling fan 27. On the other hand, in a case in which the temperature of the fixing section 25 becomes lower than the fixing temperature (YES in ACT 112), the control section 17 stops the driving of the fixing section cooling fan 27 (ACT 113).

[0103] Further, in a case of switching from the decoloring mode to the printing mode, the control section 17 determines, based on the detection result of the developing section temperature sensor 28, whether or not the temperature of the toner cartridge 45 becomes lower than a given temperature (ACT 121). The given temperature is a randomly set temperature for, for example, preventing a defect of toner.

[0104] In a case in which the temperature of the toner cartridge 45 is lower than the given temperature (YES in ACT 121), the control section 17 doesn't drive the developing section cooling fan 29. On the other hand, in a case in which the temperature of the toner cartridge 45 is higher than the given temperature (NO in ACT 121), the control section 17 drives the developing section cooling fan 29 (ACT 122). In this way, the toner cartridge 45 is cooled. Then, the control section 17 monitors the detection result of the developing section temperature sensor 28 to determine whether or not the toner cartridge 45 is cooled to the given temperature (ACT 123).

[0105] In a case in which the temperature of the toner cartridge 45 is higher than the given temperature (NO in ACT 123), the control section 17 continues the driving of

the developing section cooling fan 29. On the other hand, in a case in which the temperature of the toner cartridge 45 is lower than the given temperature (YES in ACT 123), the control section 17 stops the driving of the developing section cooling fan 29 (ACT 124).

[0106] Further, in a case of switching the decoloring mode to the printing mode, the control section 17 drives the ozone fan 23 (ACT 131). Then, the control section 17 determines whether or not at least one of the fixing section cooling fan 27 and the developing section cooling fan 29 is being driven (ACT 132).

[0107] In a case in which at least one of the fixing section cooling fan 27 and the developing section cooling fan 29 is being driven (NO in ACT 132), the control section 17 continues the driving of the ozone fan 23. The control section 17 repeats the determination operation in ACT 132 described above. Then, the control section 17 continues the driving of the ozone fan 23 until both the fixing section cooling fan 27 and the developing section cooling fan 29 are stopped. On the other hand, in a case in which both the fixing section cooling fan 27 and the developing section cooling fan 29 are stopped (YES in ACT 132), the control section 17 stops the driving of the ozone fan 23 (ACT 133).

[0108] For example, the operations of the processing in ACT 111, the processing in ACT 121 and the processing in ACT 131 described above are started at the same time. That is, the control section 17 sends commands to the fixing section cooling fan 27, the developing section cooling fan 29 and the ozone fan 23 substantially at the same time. Further, the operation in ACT 131 (the driving of the ozone fan 23) may be started prior to the operations in ACT 111 and in ACT 121 (the driving of the fixing section cooling fan 27 and the driving of the developing section cooling fan 29). If the ozone fan 23 is started prior to the fixing section cooling fan 27 and the developing section cooling fan 29, the air flowing from the fixing section cooling fan 27 or the developing section cooling fan 29 can be further sucked well by the ozone fan 23.

[0109] In accordance with the image forming apparatus 1 with such a constitution, it is possible to prevent the dust from flowing to the outside of the casing 11.

[0110] Herein, the image forming apparatus 1 is also used in an environment that is required to pay attention to occurrence of dust such as a clean room. In such a case, if the fixing section cooling fan 27 or the developing section cooling fan 29 is driven respectively driven separate from each other, there is a possibility that the toner particles retained inside the casing 11 flow from a gap of the casing 11 to the outside of the casing 11 as the dust.

[0111] Therefore, the image forming apparatus 1 of the present embodiment comprises an ozone fan 23, a filter section 24, a second fan (the fixing section cooling fan 27 or the developing section cooling fan 29), the fixing section 25 and the control section 17. The ozone fan 23 sucks the air inside the casing 11. The filter section 24 covers at least one of the air sucking port 23a and the air exhaust port 23b of the ozone fan 23. The second fan

sends wind to the airflow path 31 inside the casing 11 leading to the ozone fan 23. The fixing section 25 heats the sheet S at a plurality of target temperatures. The control section 17 drives, in a case of changing a target temperature of the fixing section 25, the second fan, or continues the driving of the second fan that has already been driven and continues the driving of the ozone fan 23 during a period the second fan is driven.

[0112] With such a constitution, even a flow of air containing the dust is generated through the driving of the second fan, the air can also be sucked by the ozone fan 23. That is, it is possible to exhaust the air containing the dust generated inside the casing 11 to the outside of the casing 11 through the filter section 24. Thus, it is possible to prevent the dust from flowing to the outside of the casing 11. That is, it is possible to realize the low dust generation of the image forming apparatus 1.

[0113] In the present embodiment, the second fan is provided with an air exhaust port directed to the airflow path 31. The aforementioned component is positioned between the air exhaust port of the second fan and the air sucking port 23a of the ozone fan 23 on the airflow path 31. That is, the ozone fan 23 is positioned at the downstream side of the aforementioned components in an airflow direction of the air from the second fan. Thus, the ozone 23 can efficiently suck the air sent by the second fan passing through the aforementioned components at the downstream side of the aforementioned components.

[0114] In the present embodiment, the fixing section 25 is positioned below the fixing section cooling fan 27. The ozone fan 23 is positioned further below the fixing section 25. The fixing section cooling fan 27 sends wind downward (in the direction of gravity). Thus, the dust soaring inside the casing 11 through the wind from the fixing section cooling fan 27 can face the ozone fan 23 along the direction of gravity. That is, the ozone fan 23 can suck the dust fell due to the gravity after soaring below the fixing section 25. In this way, the ozone fan 23 can further efficiently collect the dust inside the casing 11.

[0115] In the present embodiment, the image forming apparatus 1 further comprises the charging section 42 for charging the photoconductive drum 41. The air sucking port 23a of the ozone fan 23 is directed to the charging section 42. The filter section 24 includes a first filter 61 that can decompose ozone. With such a constitution, it is possible to prevent the dust from flowing to the outside of the casing 11 by using the ozone fan 23 that is used to remove the ozone generated from the charging section 42. In this way, compared to a case in which a fan for dust-prevention and a filter section are arranged separately, it is possible to reduce the number of components. Consequently, it is possible to reduce the cost of the image forming apparatus 1.

[0116] In the present embodiment, the image forming apparatus 1 further comprises the guide 22 for guiding the sheet S. The ozone fan 23 is arranged at the same side as the guide 22 with respect to the conveyance path

20. The air sucking port 23a of the ozone fan 23 is directed to the conveyance path 20. The ozone fan 23 is driven in a case in which the sheet S is conveyed on the conveyance path 20. With such a constitution, it is possible to prevent the dust from flowing to the outside of the casing 11 by using a fan that is used to enable the sheet S to be conveyed along the guide 22. In this way, it is possible to reduce the number of components. Consequently, it is possible to reduce the cost of the image forming apparatus 1.

[0117] In the present embodiment, the plurality of target temperatures of the fixing section 25 includes a first target temperature and a second target temperature. The second target temperature is higher than the first target temperature. The control section 17 drives the second fan in a case of changing the temperature of the fixing section 25 from the second target temperature to the first target temperature. With such a constitution, in a case in which the temperature of the fixing section 25 is changed from the second target temperature to the first target temperature, even a flow of air containing dust is generated with the cooling of the fixing section 25, the dust can be collected by the filter section 24.

[0118] In the present embodiment, the image forming apparatus 1 further comprises the developing section cooling fan 29. The developing section cooling fan 29 sends wind to the airflow path 31 to cool at least one of the toner cartridge 45 and the developing machine 44. Herein, the wind from the developing section cooling fan 29 blows around the toner cartridge 45 and the developing machine 44. The air passing around the toner cartridge 45 and the developing machine 44 is likely to contain the toner particles serving as the dust.

[0119] Thus, in a case of changing a target temperature of the fixing section 25, the control section 17 of the present embodiment drives the ozone fan 23 during a period the developing section cooling fan 29 is driven when the developing section cooling fan 29 is driven even after the second fan is stopped. With such a constitution, even if a flow of air containing the dust is generated inside the casing 11 through the developing section cooling fan 29, the air can be sucked by the ozone fan 23. That is, the air containing the dust generated inside the casing 11 through the driving of the developing section cooling fan 29 can be exhausted to the outside of the casing 11 through the filter section 24. In this way, it is possible to further prevent the dust from flowing to the outside of the casing 11.

[0120] In the present embodiment, the airflow path 31 includes the conveyance path 20 of the sheet S. With such a constitution, by using the conveyance path 20 of the sheet S, the air from the second fan can be smoothly guided towards the ozone fan 23. In this way, it is possible to further efficiently suck the air containing the dust with the ozone fan 23.

[0121] In the present embodiment, the fixing section cooling fan 27 is arranged at a side opposite to the transfer section 21 with respect to the fixing section 25. The

fixing section cooling fan 27 moves a part of the air of the conveyance path 20 towards the fixing section 25. The ozone fan 23 sucks the air of the conveyance path 20 at a position between the transfer section 21 and the fixing section 25. With such a constitution, the air flowing from the fixing section 25 to the transfer section 21 can be sucked by the ozone fan 23 before reaching the transfer section 21. In this way, it is possible to reduce a possibility that the dust is adhered to the transfer section 21 and thus the transfer section 21 gets dirty.

(A second embodiment)

[0122] Next, an image forming apparatus 1 of the second embodiment is described with reference to Fig. 7. The image forming apparatus 1 of the present embodiment is different from the image forming apparatus 1 of the first embodiment in the control of the control section 17 relating to the driving of the developing section cooling fan 29. The other constitutions of the image forming apparatus 1 are the same as those in the first embodiment.

[0123] Similar to the first embodiment, the developing section cooling fan 29 also has a function of sweeping away the dust retained on the conveyance path 20 to flow to the ozone fan 23. The present embodiment focuses on this function of the developing section cooling fan 29. That is, the control section 17 drives the developing section cooling fan 29 in a positive manner during a period the fixing section cooling fan 27 is driven. The developing section cooling fan 29 is an example of a "third fan".

[0124] Fig. 7 illustrates an example of the processing of the control section 17. Further, the operations same as or similar to those in the first embodiment are applied with the same reference numerals, and therefore the description thereof is not provided. Further, the operations of the fixing section cooling fan 27 and the ozone fan 23 are the same as those in the first embodiment.

[0125] Further, in the following description, a case of switching from the decoloring mode to the printing mode is described as an example of a case of changing a target temperature of the fixing section 25. Further, in a case in which the fixing temperature becomes higher than the decoloring temperature, the following description of the "printing mode" and the "fixing temperature" may be respectively read as the description of the "decoloring mode" and the "decoloring temperature", and the description of the "decoloring mode" and the "decoloring temperature" may be respectively read as the description of the "printing mode" and the "fixing temperature".

[0126] In a case of switching from the decoloring mode to the printing mode, the control section 17 drives the developing section cooling fan 29 to make a flow of air towards the ozone fan 23 inside the casing 11 (ACT 221). That is, the control section 17 drives the developing section cooling fan 29 to sweep away the dust retained on the conveyance path 20 to the ozone fan 23.

[0127] Similar to the first embodiment, the developing

section cooling fan 29 can be driven at a first speed and a second speed faster than the first speed. The first speed is a speed at which the developing section cooling fan 29 is driven in a case in which the toner cartridge 45 is in a first state. The second speed is a speed at which the developing section cooling fan 29 is driven in a case in which the toner cartridge 45 is in a second state higher in temperature than the first state.

[0128] In a case of switching from the decoloring mode to the printing mode, the control section 17 drives the developing section cooling fan 29 at the second speed regardless of the state (for example, the first state or the second state described above) of the toner cartridge. In this way, it is possible to make a relative strong flow of air towards the ozone fan 23 inside the casing 11. Then, the control section 17 determines whether or not the fixing section cooling fan 27 is being driven (ACT 222).

[0129] In a case in which the fixing section cooling fan 27 is driven (NO in ACT 222), the control section 17 continues the driving of the developing section cooling fan 29. Then, the control section 17 repeats the determination operation in ACT 222 described above, and continues the driving of the developing section cooling fan 29 until the fixing section cooling fan 27 is stopped. On the other hand, in a case in which the driving of the fixing section cooling fan 27 is stopped (YES in ACT 222), the control section 17 stops the driving of the developing section cooling fan 29 (ACT 223).

[0130] For example, the operations of the processing in ACT 111, the processing in ACT 221 and the processing in ACT 131 are started at the same time. That is, the control section 17 sends commands to the fixing section cooling fan 27, the developing section cooling fan 29 and the ozone fan 23 substantially at the same time. Further, the operation in ACT 131 (driving of the ozone fan 23) may be started prior to the operations in ACT 111 and in ACT 221 (driving of the fixing section cooling fan 27 and driving of the developing section cooling fan 29). If the ozone fan 23 is started prior to the fixing section cooling fan 27 and the developing section cooling fan 29, the air flowing from the fixing section cooling fan 27 or the developing section cooling fan 29 can be further sucked well by the ozone fan 23.

[0131] In accordance with the image forming apparatus 1 with the constitution described above, similar to the first embodiment, it is possible to prevent the dust from flowing to outside of the casing 11. Further, in the present embodiment, in a case of changing a target temperature of the fixing section 25, the control section 17 drives the developing section cooling fan 29 during a period the fixing section cooling fan 27 is driven. With such a constitution, it is possible to guide the air containing dust to the ozone fan 23 more efficiently. In this way, it is possible to further prevent the dust from flowing to the outside of the casing 11.

[0132] In the present embodiment, the fixing section cooling fan 27 sends wind towards the conveyance path 20 to cool the fixing section 25. The developing section

cooling fan 29 is positioned at a side opposite to the ozone fan 23 with respect to the conveyance path 20. The developing section cooling fan 29 sends wind towards the conveyance path 20. With such a constitution, since the air from the developing section cooling fan 29 flows into the conveyance path 20, it is likely to generate the flow of air towards the ozone fan 23 on the conveyance path 20. Thus, the flow of air flowing from the fixing section cooling fan 27 to the conveyance path 20 is easily to be directed to the ozone fan 23. In this way, the dust inside the casing 11 can be further efficiently collected by the filter section 24.

[0133] As stated above, the image forming apparatuses 1 in the first embodiment and in the second embodiment are described. However, the embodiment of the image forming apparatus 1 is not limited to these. For example, the embodiment of the image forming apparatus 1 may combine the first embodiment with the second embodiment. That is, in the second embodiment, even after the driving of the fixing section cooling fan 27 is stopped, the control section 17 may continue the driving of the developing section cooling fan 29 in a case in which the temperature of the toner cartridge 45 is higher than the given temperature.

[0134] In accordance with at least one embodiment described above, the image forming apparatus comprises a first fan configured to suck air inside a casing, a filter section configured to cover at least one of an air sucking port and an air exhaust port of the first fan, a second fan configured to send wind to an airflow path inside the casing leading to the first fan, a fixing section configured to heat a sheet at a plurality of target temperatures, and a control section configured to drive, in a case of changing a target temperature of the fixing section, the second fan, or to continue the driving of the second fan that has already been driven and drive the first fan during a period the second fan is driven. In this way, even a flow of air containing the dust inside the casing generates through the driving of the second fan, it is possible to exhaust the air to the outside of the casing through the filter section. Thus, it is possible to prevent the dust from flowing to the outside of the casing.

[0135] While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the invention. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the invention. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope of the invention.

Claims

1. An image forming apparatus, comprising:

a first fan configured to be provided with an air sucking port and an air exhaust port and to suck air in a casing;
a filter section configured to cover at least one of the air sucking port and the air exhaust port of the first fan;
a second fan configured to supply air to an airflow path of the casing leading to the first fan;
a fixing section configured to heat a sheet at a plurality of target temperatures; and
a control section configured to drive, in a case of changing the target temperatures of the fixing section, the second fan, or to continue the driving of the second fan that has already been driven and drive the first fan during a period the second fan is driven.

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

a charging section configured to charge a photoconductive drum, wherein
the air sucking port of the first fan is directed to the charging section; and
the filter section includes an ozone filter capable of decomposing ozone.

3. The image forming apparatus according to claim 1 or 2, further comprising:

a guide configured to face a conveyance path of sheet and inside the casing to guide the sheet, wherein
the first fan is arranged at the same side as the guide with respect to the conveyance path, the air sucking port of the first fan is directed to the conveyance path and the first fan is driven in a case of conveying the sheet on the conveyance path.

4. The image forming apparatus according to any one of claims 1 to 3, wherein
the plurality of target temperatures includes a first target temperature and a second target temperature higher than the first target temperature; and
the control section drives the second fan in a case of changing a target temperature of the fixing section from the second target temperature to the first target temperature.

5. The image forming apparatus according to claim 4, further comprising:

a developing section cooling fan configured to cool at least one of a toner cartridge and a developing machine by sending wind to the airflow path, wherein
the control section drives, in a case of changing

the target temperature of the fixing section, the first fan during a period the developing section cooling fan is driven when the developing section cooling fan is driven even after the second fan is stopped.

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6. The image forming apparatus according to any one of claims 1 to 5, wherein
the airflow path contains the conveyance path of sheet; and
the second fan cools the fixing section by sending wind to the conveyance path. 10
7. The image forming apparatus according to claim 6, further comprising: 15

a transfer section configured to transfer toner to the sheet;
the second fan is positioned at a side opposite to the transfer section with respect to the fixing section, and moves a part of air of the conveyance path towards the fixing section; and
the first fan which is arranged between the transfer section and the fixing section sucks the air of the conveyance path. 20 25
8. The image forming apparatus according to claim 1, further comprising:

a third fan configured to send wind to the airflow path to make a flow of air towards the first fan in the airflow path, wherein
the control section drives the third fan during a period the second fan is driven in a case of changing the target temperature of the fixing section. 30 35
9. The image forming apparatus according to claim 8, wherein
the airflow path contains the conveyance path of sheet;
the second fan cools the fixing section by sending wind to the conveyance path; and
the third fan is positioned at a side opposite to the first fan with respect to the conveyance path and sends wind towards the conveyance path. 40 45
10. The image forming apparatus according to claim 8 or 9, wherein
the third fan can be driven at a first speed and a second speed faster than the first speed; and
the control section drives the third fan at the second speed in a case of changing the target speed of the fixing section. 50 55

FIG.1

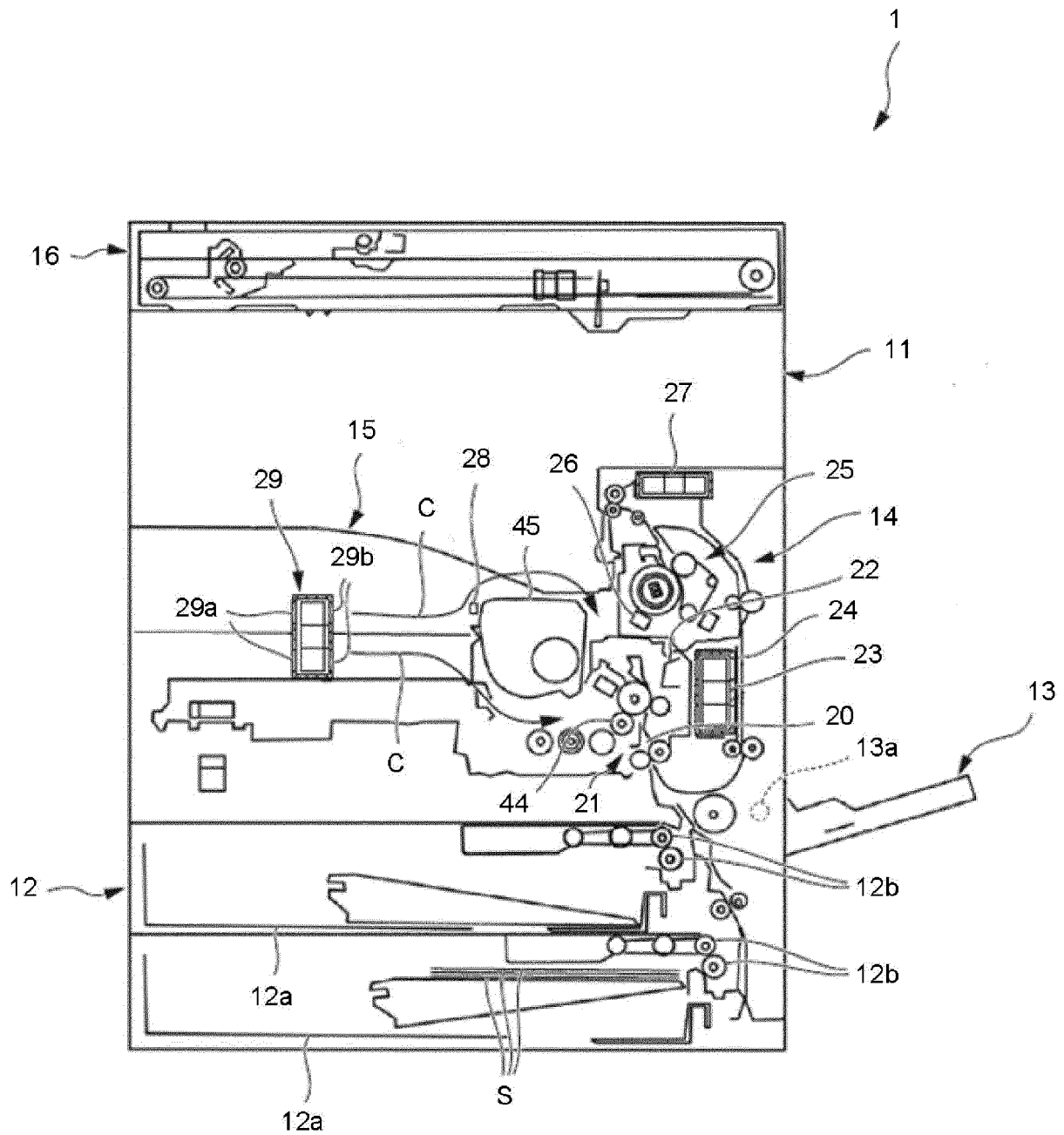


FIG.2

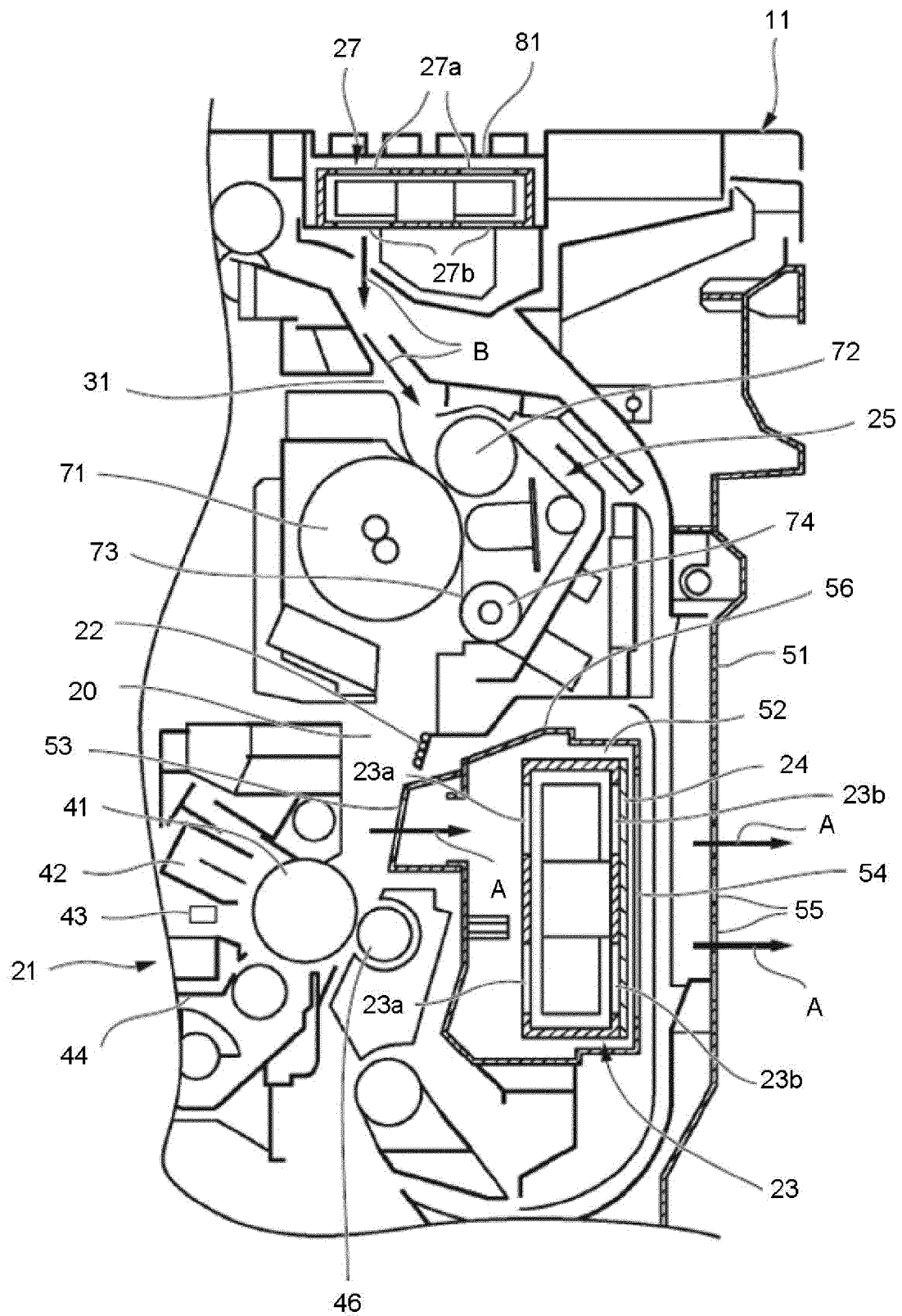


FIG.3

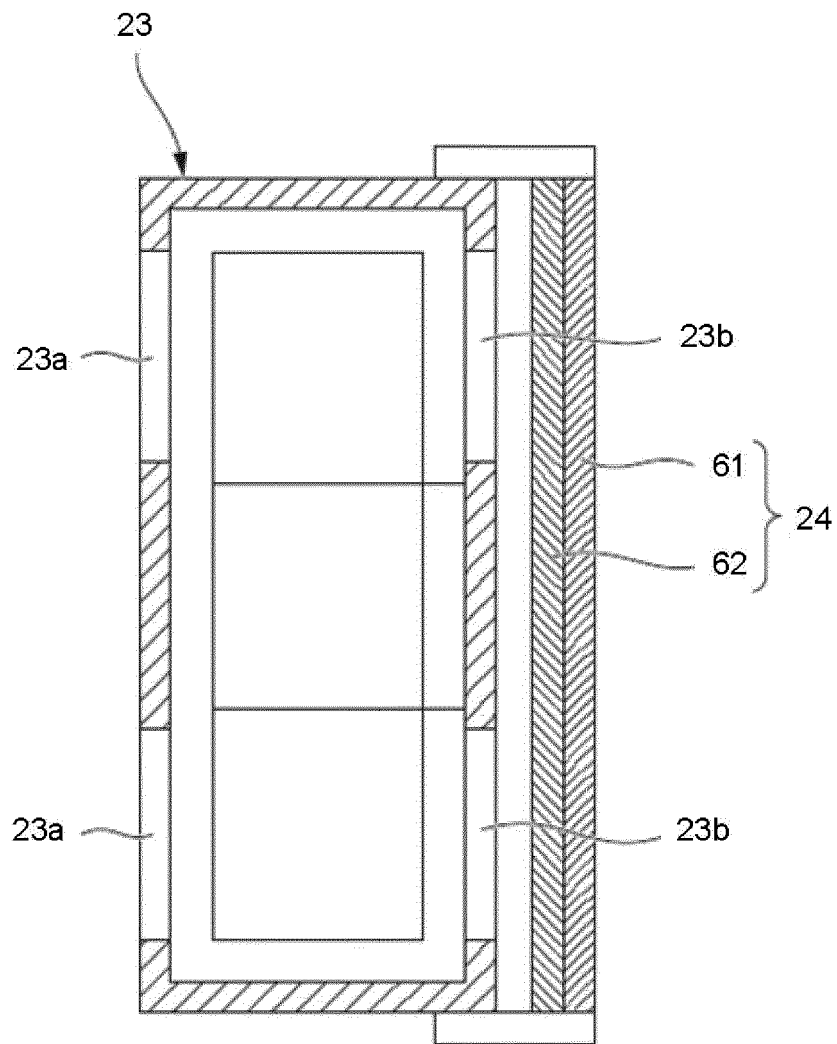


FIG.4

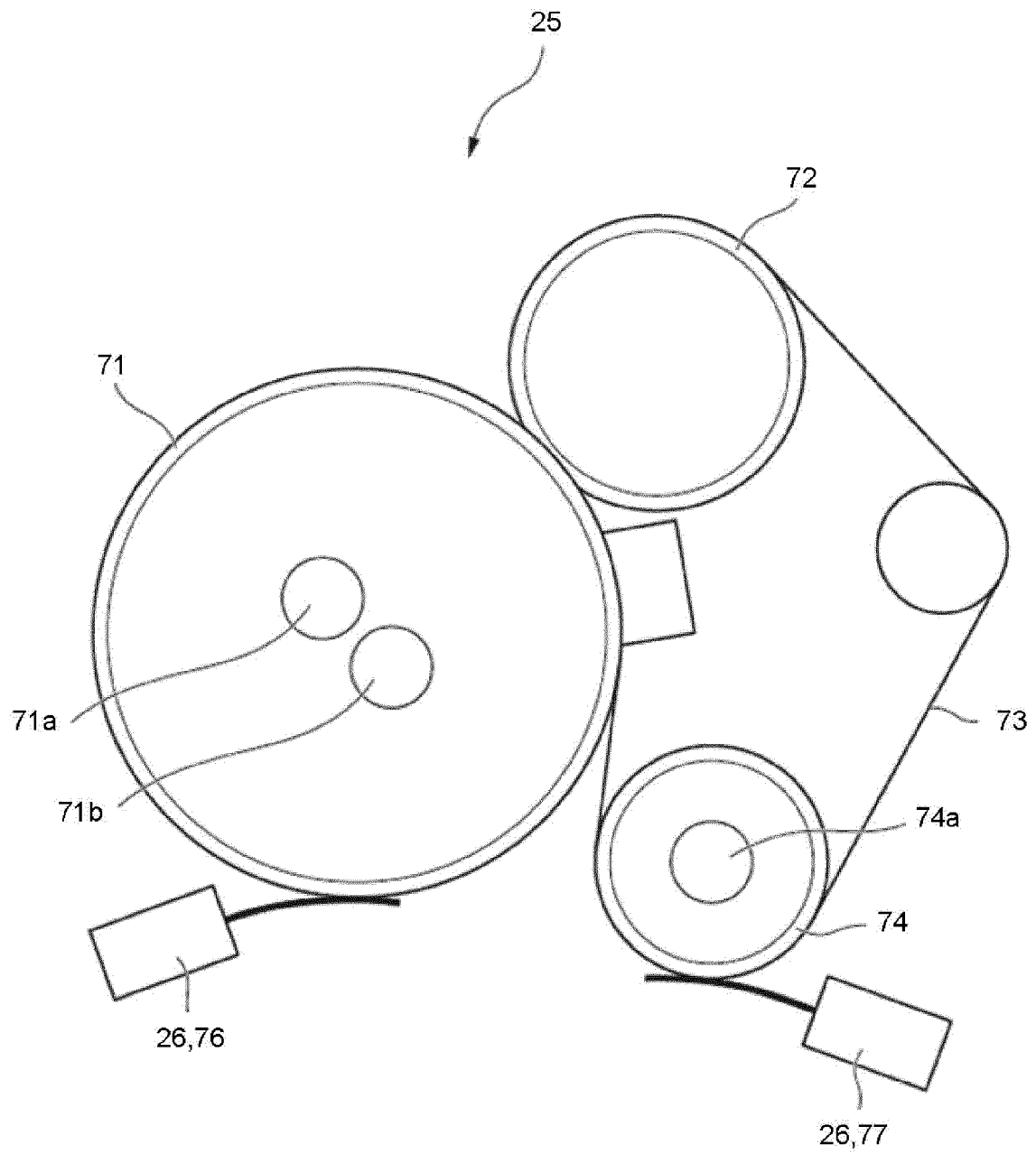
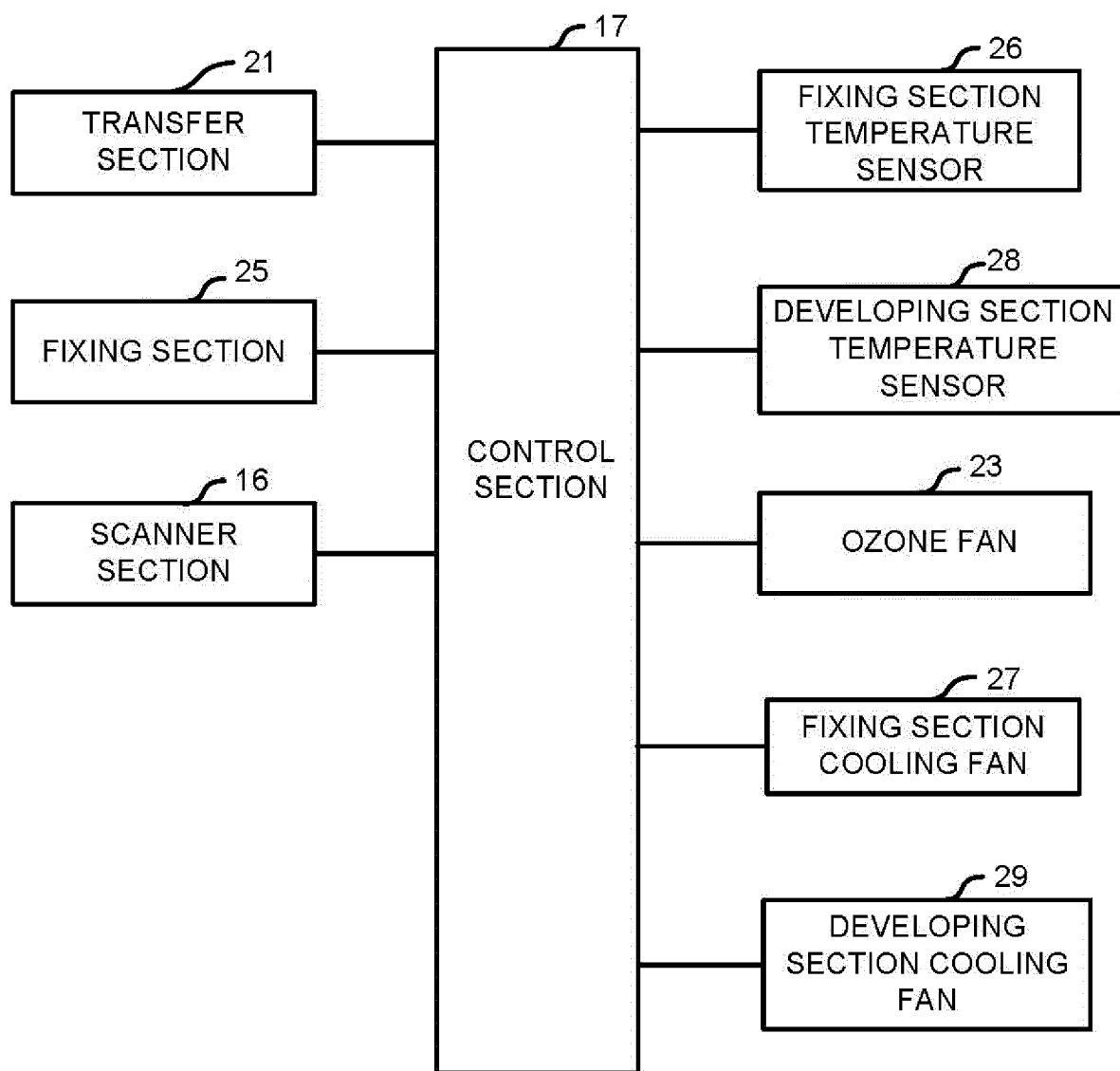


FIG.5



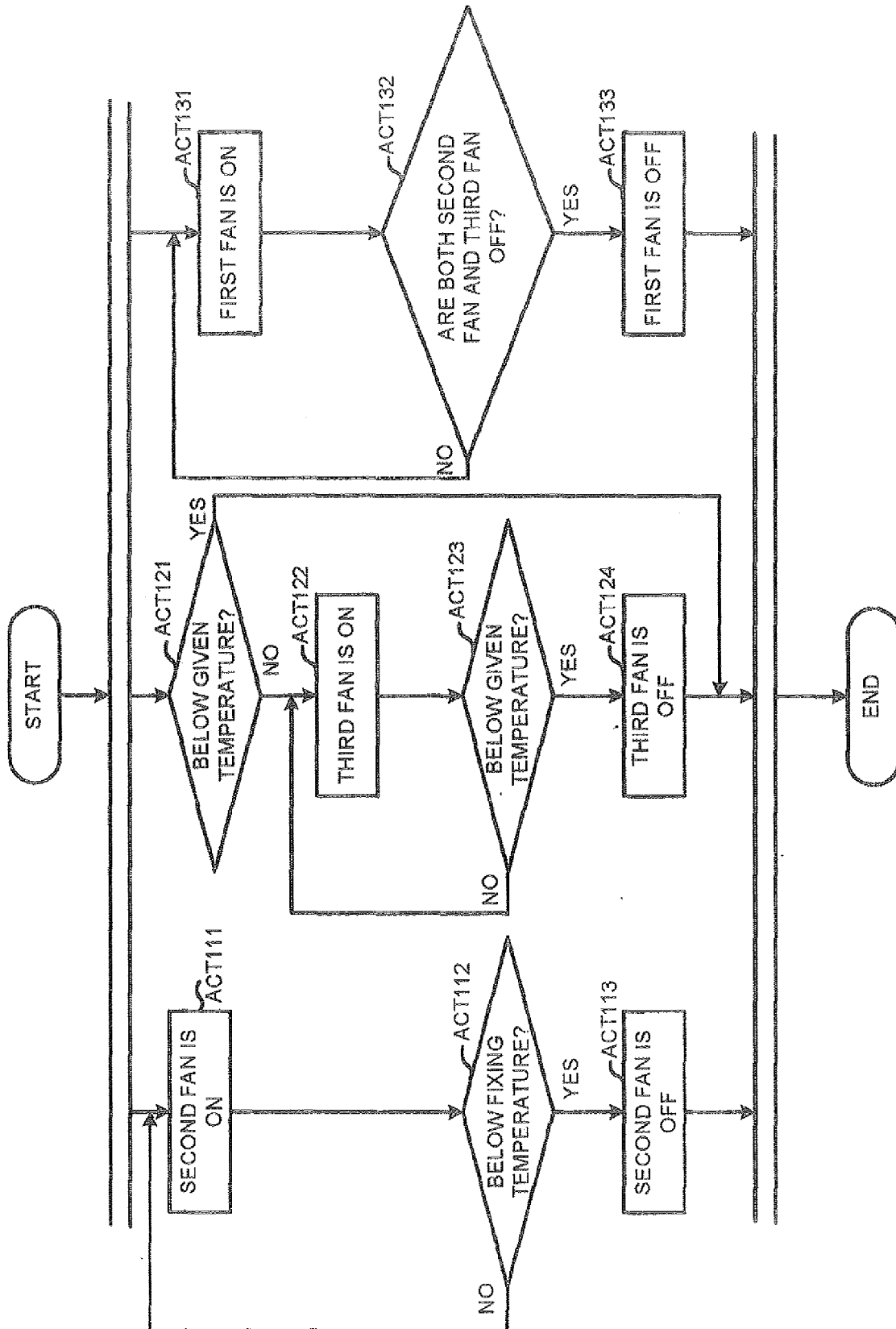


FIG.6

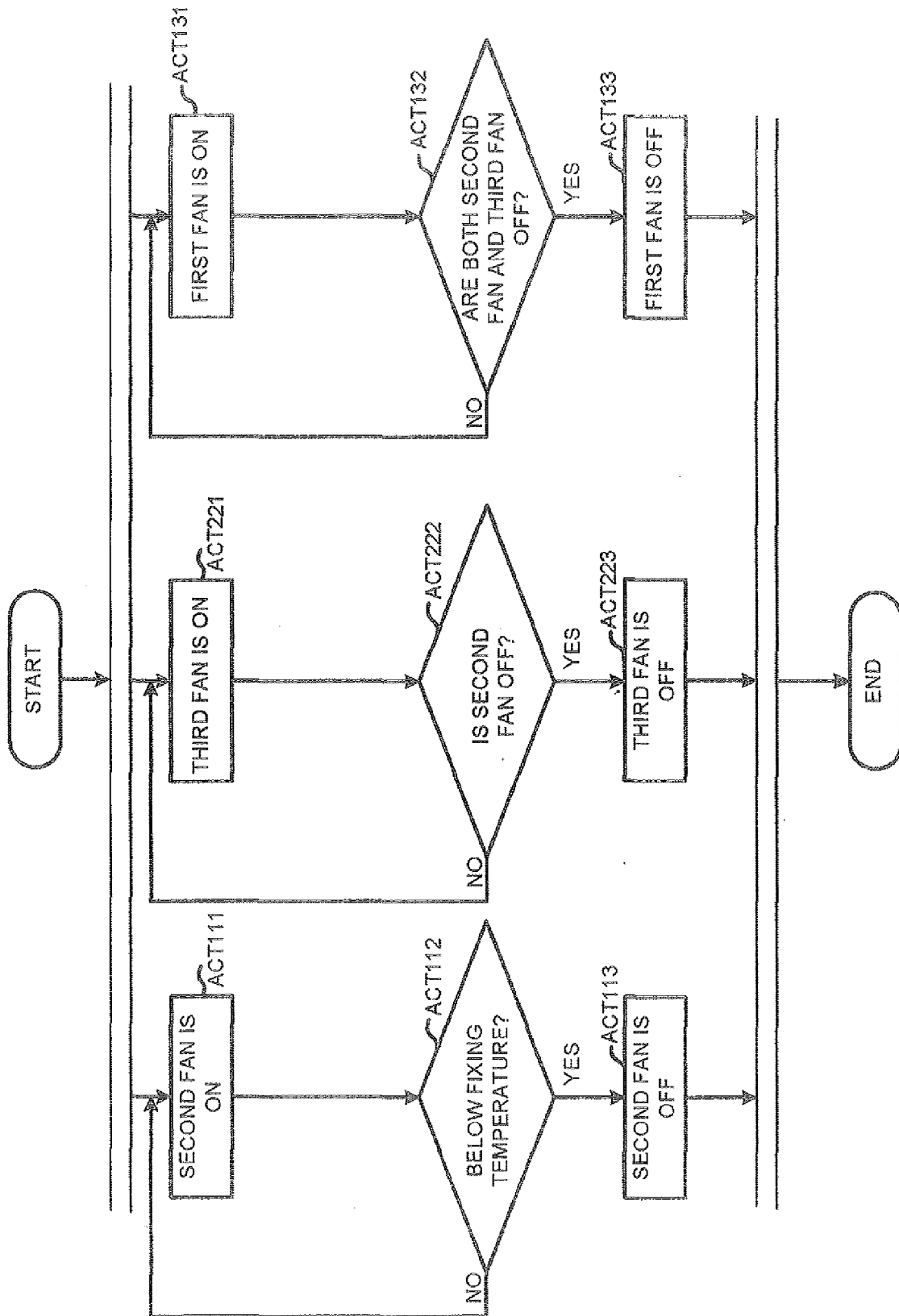


FIG. 7



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Application Number
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