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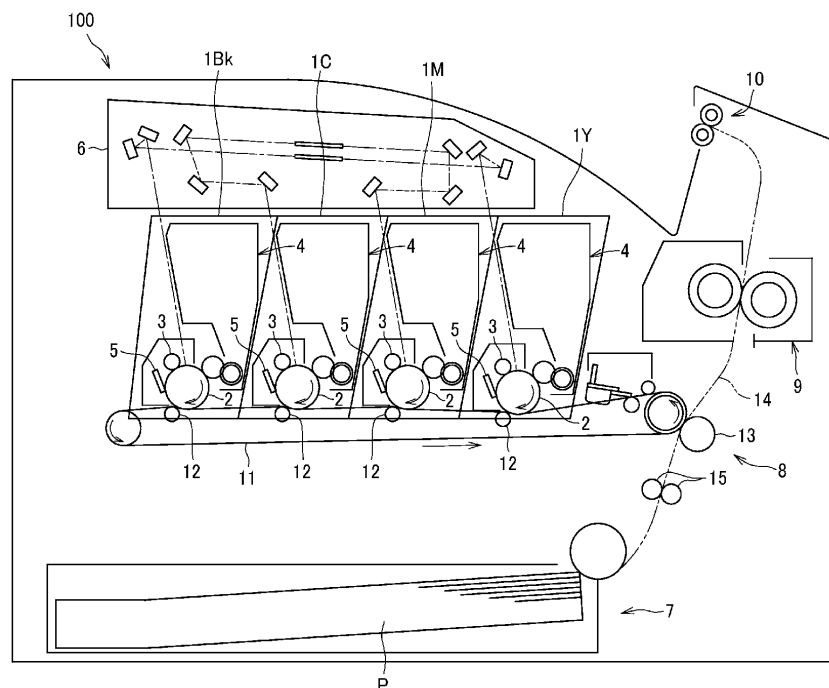
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(54) **NIP FORMING UNIT, HEATING DEVICE, FIXING DEVICE, AND IMAGE FORMING APPARATUS**

(57) A nip forming unit includes a rotating member (20), a pressure member (21), and a separating member (40). The pressure member (21) contacts the rotating member (20) to form a nip portion between the rotating member (20) and the pressure member (21). The separating member (40) separates a sheet from the rotating member (20). The separating member (40) is disposed downstream from the nip portion in a rotating direction

of the rotating member (20). The separating member (40) includes a contact part (40c) to contact the rotating member (20) and a separator part (40b) to contact the sheet to separate the sheet from the rotating member (20). The nip portion, the separator part, and the contact part are arranged in an order of the nip portion, the separator part, and the contact part from upstream to downstream in the rotating direction of the rotating member (20).

FIG. 1



Description

Technical Field

[0001] Embodiments of the present disclosure relate to a nip forming unit, a heating device, a fixing device, and an image forming apparatus.

Related Art

[0002] A fixing device as a nip forming unit including a fixing belt as a rotating member brings a paper sheet as the sheet that has passed through a fixing nip into contact with the separator part of a separating member, to separate the paper sheet from the fixing belt, and convey the paper sheet to the downstream side.

[0003] When the distance from the separator part of the separating member to the fixing belt is long, the paper sheet having passed through the fixing nip does not come into contact with the separating member, and the separating member cannot separate the paper sheet from the fixing belt. When the separating member is disposed too close to the fixing belt, on the other hand, the separator part comes into contact with the fixing belt due to component tolerance or the like, and damages the fixing belt, resulting in an abnormal image.

[0004] For example, a separating plate that is disposed in a fixing device disclosed in Japanese Unexamined Patent Application Publication No. 2013-186394 has contact portions that come into contact with the circumferential surface of a fixing belt, separately from a tip portion that separates a paper sheet from the fixing belt. The contact portions are both end portions of the separating plate outside the sheet passing region, and come into contact with the fixing belt at a point closer to the fixing nip than the tip portion. As the contact portions are brought into contact with the fixing belt, the gap between the fixing belt and the separating plate can be kept constant.

[0005] In the configuration disclosed in Japanese Unexamined Patent Application Publication No. 2013-186394, if the contact portions are not disposed outside the sheet passing region, the paper sheet comes into contact with the contact portions, and is caught or deformed by the contact portions. Therefore, it is necessary to dispose the contact portions outside the sheet passing region. As a result, the length of the separating member in the longitudinal direction becomes longer, which is a disadvantage.

SUMMARY

[0006] An object of the present disclosure is to maintain an appropriate distance between the separator part of a separating member and a rotating member, and obtain a nip forming unit that is smaller in size.

[0007] According to an embodiment of the present disclosure, a nip forming unit includes a rotating member; a pressure member, and a separating member. The pres-

sure member contacts the rotating member to form a nip portion between the rotating member and the pressure member. The separating member separates a sheet from the rotating member. The separating member is disposed downstream from the nip portion in a rotating direction of the rotating member. The separating member includes a contact part to contact the rotating member and a separator part to contact the sheet to separate the sheet from the rotating member. The nip portion, the separator part, and the contact part are arranged in an order of the nip portion, the separator part, and the contact part from upstream to downstream in the rotating direction of the rotating member.

[0008] According to another embodiment of the present disclosure, a nip forming unit includes a rotating member, a pressure member, and a separating member. The pressure member contacts the rotating member to form a nip portion between the rotating member and the pressure member. The separating member separates a sheet from the rotating member. The separating member is disposed downstream from the nip portion in a rotating direction of the rotating member. The separating member includes a contact part having a contact surface to contact the rotating member and a body part having a separation surface to contact the sheet to separate the sheet from the rotating member. The contact surface and the separation surface are formed on a surface of the separating member on the same side of the separating member. The contact part is formed with a bent portion that is bent downstream in the rotating direction of the rotating member with respect to the body part.

[0009] According to still another embodiment of the present disclosure, a heating device includes the nip forming unit according to any one of the above-described embodiments.

[0010] According to still yet another embodiment of the present disclosure, a fixing device includes the heating device to fix toner on the sheet by heat.

[0011] According to still yet another embodiment of the present disclosure, an image forming apparatus includes the fixing device.

[0012] According to an embodiment of the present disclosure, it is possible to maintain an appropriate distance between the separator part of a separating member and a rotating member, and obtain a nip forming unit that is smaller in size.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] A more complete appreciation of embodiments of the present disclosure and many of the attendant advantages and features thereof can be readily obtained and understood from the following detailed description with reference to the accompanying drawings, wherein:

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

FIG. 2 is a schematic configuration diagram of a fixing device according to an embodiment of the present disclosure;

FIG. 3 is a perspective view of a heater, a heater holder, and a guide portion according to an embodiment of the present disclosure;

FIG. 4 is a plan view of the heater illustrated in FIG. 3;

FIG. 5 is a diagram illustrating a power supply circuit for the heater illustrated in FIG. 3, according to an embodiment of the present disclosure;

FIG. 6 is a flowchart illustrating a control operation to be performed on the heater illustrated in FIG. 3, according to an embodiment of the present disclosure;

FIG. 7 is a side cross-sectional view of a fixing device having a separating plate according to an embodiment of the present disclosure;

FIG. 8 is a front view of the fixing device in FIG. 7, illustrating the separating plate, a fixing belt, and flanges;

FIG. 9 is a plan view of the fixing device in FIG. 8, illustrating a state in which the flanges are pulled;

FIG. 10 is a plan view of a fixing device according to an embodiment of the present disclosure, illustrating a separating plate, a fixing belt, and flanges, with a heater longer than the fixing belt;

FIG. 11 is a front view of a fixing belt in an inclined state;

FIG. 12 is a plan view of a fixing device, illustrating buckling due to biasing of the fixing belt;

FIG. 13 is a perspective view of a separating plate according to an embodiment of the present disclosure;

FIG. 14 is a side cross-sectional view of the separating plate illustrated in FIG. 13;

FIG. 15 is a view illustrating a separating plate in which the angle between the separating plate and contact parts is different from the angle in the separating plate in FIG. 13;

FIG. 16 is a view illustrating a separating plate in which the angle between the separating plate and contact parts is different from the angle in the separating plate in FIG. 13;

FIG. 17 is a view illustrating a separating plate in which the angle between the separating plate and contact parts is different from the angle in the separating plate in FIG. 13;

FIG. 18 is a view illustrating a separating plate in which the angle between the separating plate and contact parts is different from the angle in the separating plate in FIG. 13;

FIG. 19 is a diagram illustrating the relationship between the lengths of a separating plate and a fixing belt in the longitudinal direction according to an embodiment of the present disclosure;

FIG. 20 is a side view of a fixing device according to an embodiment of the present disclosure, illustrating a separating plate and a side plate;

FIG. 21 is a side view of the fixing device illustrated in FIG. 20, illustrating the separating plate, the side plate, and a tension spring;

FIG. 22 is a perspective exploded view of the separating plate, the side plate, and the tension spring illustrated in FIG. 20;

FIG. 23 is a side view of the fixing device illustrated in FIG. 20, illustrating the separating plate, the side plate, and a fixing belt;

FIG. 24 is a side view of the fixing device illustrated in FIG. 23, illustrating a state in which a paper sheet is wound around the fixing belt;

FIG. 25 is a side view of the fixing device illustrated in FIG. 23, illustrating a state in which a paper sheet is being pulled out;

FIG. 26 is a side view of the fixing device illustrated in FIG. 23, illustrating a state in which the fixing belt is being depressurized;

FIG. 27 is a plan view of the fixing device illustrated in FIG. 23, for explaining the amount of depressurization of the fixing belt;

FIG. 28 is a side cross-sectional view of a fixing device according to an embodiment of the present disclosure;

FIG. 29 is a side cross-sectional view of a fixing device according to an embodiment of the present disclosure;

FIG. 30 is a side cross-sectional view of a fixing device according to an embodiment of the present disclosure;

FIG. 31 is a side cross-sectional view of a fixing device according to an embodiment of the present disclosure, the fixing device including a halogen heater; and

FIG. 32 is a schematic view of a fixing device according to an embodiment of the present disclosure, the fixing device including a fixing roller.

[0014] The accompanying drawings are intended to depict embodiments of the present disclosure and should not be interpreted to limit the scope thereof. The accompanying drawings are not to be considered as drawn to scale unless explicitly noted. Also, identical or similar reference numerals designate identical or similar components throughout the several views.

DETAILED DESCRIPTION

[0015] In describing embodiments illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the disclosure of this 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 have a similar function, operate in a similar manner, and achieve a similar result.

[0016] Referring now to the drawings, embodiments of the present disclosure are described below. As used

herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

[0017] Referring to the drawings, embodiments of the present invention are described below. Identical or equivalent components are denoted by identical reference signs, and explanation of those components is simplified or is not made below. In the description below, a fixing device that is disposed in an image forming apparatus will be described as a nip forming unit according to an embodiment of the present invention. The nip forming unit includes a heating device having a heating member. The fixing device of the present embodiment is an aspect of the heating device. The fixing device that is disposed in the image forming apparatus according to the present embodiment conveys a paper sheet as a sheet. The sheet includes a recording medium on which an image is to be formed. The sheet of the present embodiment is an aspect of the recording medium.

[0018] FIG. 1 is a schematic configuration diagram of an image forming apparatus according to an embodiment of the present invention. An image forming apparatus 100 illustrated in FIG. 1 includes four image formation units 1Y, 1M, 1C, and 1Bk detachably attached to the image forming apparatus body.

[0019] The image formation units 1Y, 1M, 1C, and 1Bk have the same configurations, except that the image formation units 1Y, 1M, 1C, and 1Bk contain developers in different colors, which are yellow, magenta, cyan, and black corresponding to the color-separation components of a color image. Specifically, each of the image formation units 1Y, 1M, 1C, and 1Bk includes a photoconductor 2 that has a drum-like shape and serves as an image bearer, a charging device 3 that electrically charges a surface of the photoconductor 2, a developing device 4 that supplies toner as the developer to the surface of the photoconductor 2 to form a toner image, and a cleaning device 5 that cleans the surface of the photoconductor 2.

[0020] The image forming apparatus 100 also includes an exposure device 6 that exposes the surface of each of the photoconductors 2 to form an electrostatic latent image, a sheet feeding device 7 that supplies a paper sheet P as a conveyed object or a recording medium, a transfer device 8 that transfers the toner image formed on each of the photoconductors 2 onto the paper sheet P, a fixing device 9 as a nip forming unit that fixes the toner images transferred onto the paper sheet P, and a sheet ejection device 10 that ejects the paper sheet P to the outside of the apparatus. The paper sheet P serving as a recording medium may be thick paper, a postcard, an envelope, plain paper, thin paper, coated paper, art paper, tracing paper, an overhead projector (OHP) sheet, plastic film, prepreg, copper foil, or the like.

[0021] The transfer device 8 includes an intermediate transfer belt 11, four primary transfer rollers 12, and a secondary transfer roller 13. The intermediate transfer belt 11 is an endless belt serving as an intermediate transfer member stretched across a plurality of rollers.

The four primary transfer rollers 12 serve as primary transfer members that transfer the toner images formed on the photoconductors 2 onto the intermediate transfer belt 11. The secondary transfer roller 13 serves as a secondary transfer member that transfers the toner images, which have been transferred onto the intermediate transfer belt 11, further onto the paper sheet P. The plurality of primary transfer rollers 12 is in contact with the respective photoconductors 2 via the intermediate transfer belt 11.

[0022] Thus, the intermediate transfer belt 11 and each photoconductor 2 are in contact with each other, and a primary transfer nip is formed between them. Meanwhile, the secondary transfer roller 13 is in contact with one of the rollers across which the intermediate transfer belt 11 is stretched, via the intermediate transfer belt 11. Thus, a secondary transfer nip is formed between the secondary transfer roller 13 and the intermediate transfer belt 11.

[0023] The image forming apparatus 100 includes a sheet conveyance passage 14 in which the paper sheet P sent out from the sheet feeding device 7 is conveyed. A timing roller pair 15 is disposed between the sheet feeding device 7 and the secondary transfer nip (the secondary transfer roller 13) in the sheet conveyance passage 14.

[0024] Next, a printing operation to be performed by the image forming apparatus is described with reference to FIG. 1.

[0025] When an instruction to start a printing operation is issued, the photoconductor 2 is rotationally driven clockwise in FIG. 1 in each of the image formation units 1Y, 1M, 1C, and 1Bk. The charging device 3 charges the surfaces of the photoconductors 2 uniformly at a high electric potential. Subsequently, the exposure device 6 exposes the surface of each photoconductor 2, based on image information about an original document read by a document reading device or information about printing for which a print instruction has been issued from a terminal. Thus, the electric potential of the exposed portions is lowered, and an electrostatic latent image is formed. The developing device 4 then supplies toner to the electrostatic latent image, to form a toner image on each photoconductor 2.

[0026] The toner images formed on the respective photoconductors 2 reach the primary transfer nips (at the positions of the primary transfer rollers 12) with the rotation of the respective photoconductors 2, and are successively transferred onto the intermediate transfer belt 11 being driven and rotated counterclockwise in FIG. 1, so that the toner images are superimposed on the intermediate transfer belt 11. After that, the toner images transferred onto the intermediate transfer belt 11 are conveyed to the secondary transfer nip (at the position of the secondary transfer roller 13) by the rotation of the intermediate transfer belt 11, and are transferred onto the paper sheet P conveyed to the secondary transfer nip.

[0027] The paper sheet P is supplied from the sheet feeding device 7. The timing roller pair 15 temporarily

halts the paper sheet P supplied from the sheet feeding device 7. After that, the timing roller pair 15 conveys the paper sheet P to the secondary transfer nip in time with the arrival of the toner images on the intermediate transfer belt 11 at the secondary transfer nip. Thus, a full-color toner image is borne on the paper sheet P. After the toner image transfer, the cleaning device 5 removes residual toner remained on the respective photoconductors 2.

[0028] The paper sheet P having the toner image transferred thereon is conveyed to the fixing device 9 that fixes the toner image to the paper sheet P. After that, the sheet ejection device 10 ejects the paper sheet P to the outside of the apparatus, so that the series of printing processes is completed.

[0029] Next, an embodiment of a fixing device as a nip forming unit is described with reference to FIG. 2. FIG. 2 excludes the separating plate to be described later.

[0030] As illustrated in FIG. 2, the fixing device 9 according to the present embodiment includes a fixing belt 20, a pressure roller 21, a heater 22, a heater holder 23, a stay 24, and a thermistor 25. The fixing belt 20 is an endless belt. The pressure roller 21 is a pressure member that comes into contact with the outer circumferential surface of the fixing belt 20 to form a fixing nip N as a nip portion. The heater 22 is a nip forming member that is pressed against the pressure roller 21 via the fixing belt 20 and forms the fixing nip N as the nip portion between the heater 22 and the pressure roller 21. In the present embodiment, the heater 22 is also a heating member that heats the fixing belt 20. The heater holder 23 is a holding member that holds the heater 22. The stay 24 is a supporting member that supports the heater holder 23. The thermistor 25 is a temperature detector that detects the temperature of the fixing belt 20. The fixing belt 20, the pressure roller 21, the heater 22, the heater holder 23, the stay 24, the separating plate, and the like extend in the longitudinal direction X (see FIG. 8), which is a direction orthogonal to the paper surface of FIG. 2. This longitudinal direction is also the belt width direction, the axial direction of the pressure roller 21, the width direction of the paper sheet as the sheet being conveyed, or the nip width direction of the fixing nip N. The horizontal direction Y in FIG. 2 is the pressing direction of the pressure roller 21 with respect to the fixing belt 20, or the thickness direction of the paper sheet being conveyed through the fixing nip N. The vertical direction Z in FIG. 2 is the sheet conveying direction and the direction opposite thereto, or the lateral direction of the heater 22, the separating plate, or the like.

[0031] The fixing belt 20 includes a tubular base that is formed with polyimide (PI) and has an outer diameter of 25 mm and a thickness of 40 to 120 μm , for example. The fixing belt 20 also includes a release layer serving as the outermost surface layer. The release layer has a thickness of 5 to 50 μm , and is formed with a fluororesin, such as tetrafluoroethylene-perfluoroalkylvinylether copolymer (PFA) or polytetrafluoroethylene (PTFE), to enhance durability and ensure releasability. As a rotating

member of the present embodiment, an endless belt can be used. As one aspect of this belt, the fixing device 9 of the present embodiment includes the fixing belt 20.

[0032] An elastic layer that is formed with rubber and has a thickness of 50 to 500 μm may be provided between the base and the release layer. The base of the fixing belt 20 is not necessarily formed with polyimide, but may be formed with a heat resistant resin such as polyetheretherketone (PEEK), or a metal such as nickel (Ni) or steel use stainless (SUS). The inner circumferential surface of the fixing belt 20 may be coated with polyimide or PTFE serving as a slide layer.

[0033] The pressure roller 21, which has an outer diameter of 25 mm, for example, includes a solid iron cored bar 21a, an elastic layer 21b formed on the surface of the cored bar 21a, and a release layer 21c formed on the outer side of the elastic layer 21b. The elastic layer 21b is formed with silicone rubber, and has a thickness of 3.5 mm, for example. Preferably, the release layer 21c is formed with a fluororesin layer having a thickness of approximately 40 μm , for example, on the surface of the elastic layer 21b to improve releasability.

[0034] The pressure roller 21 is biased toward the fixing belt 20 by a biasing means, and is pressed against the heater 22 via the fixing belt 20. Thus, the fixing nip N is formed between the fixing belt 20 and the pressure roller 21. A driving means drives and rotates the pressure roller 21 in a direction indicated by an arrow in FIG. 2, and the rotation of the pressure roller 21 rotates the fixing belt 20.

[0035] The heater 22 is a planar heating member disposed longitudinally in the width direction of the fixing belt 20, and includes a plate-like base 30, resistive heat generators 31 disposed on the base 30, and an insulating layer 32 covering the resistive heat generators 31. The insulating layer 32 of the heater 22 is in contact with the inner circumferential surface of the fixing belt 20, and heat generated from the resistive heat generators 31 is transmitted to the fixing belt 20 through the insulating layer 32.

[0036] Although the resistive heat generators 31 and the insulating layer 32 are disposed on the side of the base 30 facing the fixing belt 20 (which is the side facing the fixing nip N) in the present embodiment, the resistive heat generators 31 and the insulating layer 32 may be disposed on the opposite side of the base 30, which is the side facing the heater holder 23. In that case, heat from the resistive heat generators 31 is transmitted to the fixing belt 20 through the base 30, and therefore, it is preferable that the base 30 be formed with a material with a high thermal conductivity, such as aluminum nitride. Further, as the base 30 is formed with a material having a high thermal conductivity, the fixing belt 20 can be sufficiently heated even if the resistive heat generators 31 are disposed on the opposite side of the base 30 from the side facing the fixing belt 20.

[0037] The heater holder 23 and the stay 24 are disposed inside a loop of the fixing belt 20. The stay 24 is

formed with a channeled metallic member, and both side plates of the fixing device 9 support both end portions of the stay 24. As the heater holder 23 and the heater 22 held by the heater holder 23 are supported by the stay 24, the heater 22 reliably receives the pressing force of the pressure roller 21 and stably forms the fixing nip N, with the pressure roller 21 being pressed against the fixing belt 20.

[0038] Since the heater holder 23 is easily heated to a high temperature by heat from the heater 22, the heater holder 23 is preferably formed with a heat resistant material. For example, in a case where the heater holder 23 is formed with a heat resistant resin having a low thermal conductivity, such as a liquid crystal polymer (LCP), heat transfer from the heater 22 to the heater holder 23 is reduced, and the fixing belt 20 can be efficiently heated.

[0039] To reduce the contact area of the heater holder 23 with respect to the heater 22, and reduce the amount of heat to be transferred from the heater 22 to the heater holder 23, the heater holder 23 is in contact with the base 30 of the heater 22 via protrusions 23a. Further, as in the present embodiment, the protrusions 23a of the heater holder 23 are brought into contact with the base 30 excluding the back sides of the portions at which the resistive heat generators 31 of the base 30 are disposed, which are the portions at which the temperature of the base 30 tends to be high. Thus, the amount of heat to be transferred to the heater holder 23 can be further reduced, and the fixing belt 20 can be efficiently heated.

[0040] Further, the heater holder 23 includes guide portions 26 to guide the fixing belt 20. The guide portions 26 are disposed on both the upstream side (the lower side of the heater 22 in FIG. 2) and the downstream side (the upper side of the heater 22 in FIG. 2) in the belt rotating direction A of the heater 22.

[0041] As illustrated in FIG. 3, a plurality of upstream-side and downstream-side guide portions 26 is disposed at intervals in the longitudinal direction (belt width direction) of heater 22. Each guide portion 26 is formed in a fan-like shape, and has a belt facing surface 260 that has an arc shape or is a convexly curved surface extending in the belt circumferential direction so as to face the inner circumferential surface of the fixing belt 20 (see FIG. 2).

[0042] When a printing operation is started in the fixing device 9 according to the present embodiment, the pressure roller 21 is driven to rotate, and the fixing belt 20 then starts rotating accordingly. At this point of time, the inner circumferential surface of the fixing belt 20 is brought into contact with the belt facing surfaces 260 of the guide portions 26, so that the fixing belt 20 stably and smoothly rotates.

[0043] As power is supplied to the resistive heat generators 31 of the heater 22, the fixing belt 20 is heated. With the temperature of the fixing belt 20 having reached a predetermined target temperature (the fixing temperature), the paper sheet P bearing an unfixed toner image is conveyed between the fixing belt 20 and the pressure roller 21 (the fixing nip N) as illustrated in FIG. 2. Thus,

the unfixed toner image is heated and pressurized, and is fixed to the paper sheet P.

[0044] FIG. 4 is a plan view of the heater according to the present embodiment. As illustrated in FIG. 4, the heater 22 according to the present embodiment includes a plurality of resistive heat generators 31 arranged at intervals in the longitudinal direction (the belt width direction). In other words, the plurality of resistive heat generators 31 constitutes a heat generating unit 35 divided into a plurality of heat generators in the belt width direction. The heat generating unit 35 can be divided into at least the three heaters of end heaters that heat both end portions and a central heater that heats the central portion, or four or more such heaters.

[0045] Each resistive heat generator 31 is electrically coupled in parallel to a pair of electrode portions 34 disposed at both end portions in the longitudinal direction of the base 30 via power supply lines 33. The power supply lines 33 are formed with a conductor having a smaller resistance value than the resistive heat generators 31.

[0046] A gap between adjacent resistive heat generators 31 is preferably 0.2 mm or wider, or more preferably 0.4 mm or wider, to maintain the insulation between the adjacent resistive heat generators 31. If the gap between adjacent resistive heat generators 31 is too wide, the temperature tends to decrease at the portion of the gap. Therefore, to avoid temperature unevenness in the longitudinal direction, the gap is preferably 5 mm or narrower, or more preferably 1 mm or narrower.

[0047] The resistive heat generators 31 are formed with a material having a positive temperature coefficient (PTC) of resistance, and has a feature that the resistance value increases (the heater output drops) as the temperature rises. Because of this feature, in a case where a paper sheet having a smaller width than the entire width of the heat generating unit 35 is provided, for example, the fixing belt 20 is not deprived of heat by the paper sheet in any region outside the sheet width. Accordingly, the temperature of the resistive heat generator 31 corresponding to that portion rises.

[0048] Since a constant voltage is applied to the resistive heat generators 31, the increase in resistance values of the resistive heat generators 31 caused by the temperature rise in the regions outside the sheet width relatively reduces outputs (heat generation amounts) of the resistive heat generators 31, and thus, reduces the temperature rise at the end portions. Electrically coupling the plurality of resistive heat generators 31 in parallel can also reduce the temperature rise in the non-sheet passing regions while maintaining the print speed.

[0049] The heat generators that constitute the heat generating unit 35 may not be resistive heat generators having the PTC characteristics. The heat generators may be arranged in a plurality of rows in the lateral direction of the heater 22.

[0050] The resistive heat generators 31 can be formed in the following manner. A paste prepared with silver pal-

ladium (AgPd), glass powder, or the like is applied to the base 30 by screen printing or the like, for example, and the base 30 is then fired. In the present embodiment, the resistive heat generators 31 each have a resistance value of 80 Ω at room temperature.

[0051] The material of the resistive heat generators 31 may contain a resistant material, such as silver alloy (AgPt) or ruthenium oxide (RuO_2), other than the above material. The material of the power supply lines 33 and the electrode portions 34 can be formed with silver (Ag) or silver palladium (AgPd) by screen printing or the like.

[0052] As for the material of the base 30, ceramics such as alumina and aluminum nitride, which excel in heat resistance and insulating properties, and nonmetallic materials such as glass and mica are preferable. An alumina base having a lateral width of 8 mm, a longitudinal width of 270 mm, and a thickness of 1.0 mm is used in the present embodiment.

[0053] The base 30 may be formed by stacking an insulating material on a conductive material such as a metal. The metal material is preferably aluminum, stainless steel, or the like, which is low in cost. To increase thermal uniformity of the heater 22 and improve image quality, the base 30 may be formed with a material having a high thermal conductivity, such as copper, graphite, or graphene.

[0054] The insulating layer 32 may be formed with heat resistant glass having a thickness of 75 μm , for example. The insulating layer 32 covers the resistive heat generators 31 and the power supply lines 33 to insulate and protect the resistive heat generators 31 and the power supply lines 33, and maintains sliding performance with the fixing belt 20.

[0055] FIG. 5 is a schematic diagram illustrating a power supply circuit for the heater according to the present embodiment.

[0056] As illustrated in FIG. 5, in the present embodiment, the power supply circuit for supplying power to each resistive heat generator 31 is formed by electrically coupling an alternating-current power supply 200 and the electrode portions 34 of the heater 22. The power supply circuit includes a triac 210 that controls the amount of power supplied.

[0057] The amount of power to be supplied to each resistive heat generator 31 is controlled by a controller 220 via the triac 210, based on the temperature detected by the thermistor 25 as a temperature detector. The controller 220 is formed with a microcomputer that includes a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), and an input and output (I/O) interface.

[0058] In the present embodiment, one thermistor 25 is disposed in the central region of the heater 22 in the longitudinal direction that is the region inside the sheet conveyance span for the smallest sheets, and the other thermistor 25 is disposed in one end portion of the heater 22 in the longitudinal direction. Further, a thermostat 27 as a power cut-off device is disposed at the one end

portion of the heater 22 in the longitudinal direction, and cuts off power supply to the resistive heat generators 31 when the temperature of the resistive heat generators 31 is a predetermined temperature or higher. The thermistors 25 and the thermostat 27 are in contact with the back surface of the base 30 (the side opposite to the side on which the resistive heat generators 31 are disposed), to detect the temperature of the resistive heat generators 31.

[0059] Next, a control operation to be performed on the heater according to the present embodiment is described with reference to the flowchart in FIG. 6. First, when a printing operation is started in the image forming apparatus (S1 in FIG. 6), the controller 220 starts supplying power from the alternating-current power supply 200 to each resistive heat generator 31 of the heater 22 (S2 in FIG. 6).

[0060] As a result, each resistive heat generator 31 starts to generate heat, and the fixing belt 20 is heated. At this point of time, the thermistor (central thermistor) 25 disposed in the central region of the heater 22 in the longitudinal direction detects a temperature T4 of the resistive heat generator 31 located in the central region of the heater 22 (S3 in FIG. 6). Based on the temperature T4 obtained from the central thermistor 25, the controller 220 then controls, with the triac 210, the amount of power to be supplied to each resistive heat generator 31, so that each resistive heat generator 31 has a predetermined temperature (S4 in FIG. 6).

[0061] At the same time, a temperature T8 of the resistive heat generator 31 is also detected by the thermistor (end thermistor) 25 disposed on an end side in the longitudinal direction of the heater 22 (S5 in FIG. 6). A check is then made to determine whether the temperature T8 detected by the end thermistor 25 is equal to or higher than a predetermined temperature T_N ($T8 \geq T_N$) (S6 in FIG. 6). If the temperature T8 is lower than the predetermined temperature T_N , it is determined that an abnormally low temperature has occurred (disconnection has occurred). Accordingly, power supply to the heater 22 is cut off (S7 in FIG. 6), and an error indicator is displayed on the operation panel of the image forming apparatus (S8 in FIG. 6). If the detected temperature T8 is equal to or higher than the predetermined temperature T_N , on the other hand, the printing operation is started on the assumption that any abnormally low temperature has not occurred (S9 in FIG. 6).

[0062] Further, if the temperature control based on detection performed by the central thermistor 25 is not possible due to breakage, disconnection, or the like of a resistive heat generator 31, there is a possibility that the other resistive heat generators 31 including the resistive heat generator 31 at the end in the longitudinal direction will have an abnormally high temperature. In that case, when the temperature of the resistive heat generators 31 becomes equal to or higher than the predetermined temperature, the thermostat 27 operates to cut off the power supply to the resistive heat generators 31, to prevent the

resistive heat generators 31 from having an abnormally high temperature.

[0063] Next, a detailed configuration of the separating plate disposed in the fixing device of the present embodiment is described with reference to FIG. 7. FIG. 7 is a view illustrating a configuration of a separating plate 40 that is a separating member according to the present embodiment. The separating plate 40 is disposed on the downstream side of the fixing nip N, and separates a paper sheet from the fixing belt 20.

[0064] As illustrated in FIG. 7, the separating plate 40 as a separating member includes a body part 40a, a separator part 40b, and contact parts 40c. The separator part 40b is a portion that comes into contact with a paper sheet P that has passed through the fixing nip N and separates the paper sheet P from the fixing belt 20. In the present embodiment, in particular, the separator part 40b is one end portion in the lateral direction including one end of the body part 40a on the side of the fixing belt 20 in the lateral direction. The contact parts 40c are portions that come into contact with the outer circumferential surface of the fixing belt 20, and appropriately maintain a gap between the contact parts 40c and the fixing belt 20.

[0065] As illustrated in FIG. 8, the separating plate 40 extends in a longitudinal direction X. The contact parts 40c are disposed on both ends of the separating plate 40 in the longitudinal direction, and come into contact with the fixing belt 20 outside the sheet non-passing regions on both ends in the longitudinal direction. The separator part 40b is disposed on the center side in the longitudinal direction between the contact parts 40c on both ends.

[0066] Flanges 29 as holding members that hold the fixing belt 20 are fitted and inserted into both ends of the fixing belt 20 in the longitudinal direction. The flanges 29 slide with the rotating fixing belt 20, and guides the rotation of the fixing belt 20.

[0067] The separating plate 40 is biased in the direction of an arrow B in FIG. 7 by a spring. Because of this, the contact parts 40c comes into contact with the outer circumferential surface of the fixing belt 20.

[0068] To bring the separator part 40b into contact with the paper sheet P and appropriately separate the paper sheet P from the fixing belt 20, an appropriate distance is kept between the separator part 40b and the fixing belt 20. That is, if the separator part 40b is disposed too far from the outer circumferential surface of the fixing belt 20, the paper sheet P passes between the separator part 40b and the fixing belt 20, and the separator part 40b cannot separate the paper sheet P from the fixing belt 20. If the separator part 40b is too close to the fixing belt 20, on the other hand, the separator part 40b might come into contact with the fixing belt 20 due to component tolerance or the like, and the surface of the fixing belt 20 might be damaged, resulting in an abnormal image.

[0069] Further, as a method for improving the separability of the paper sheet P from the fixing belt 20, there is a method for increasing the curvature of the fixing belt

20 by pulling the flanges 29 on both ends in a direction away from the fixing nip N (the upward direction in FIG. 9, and the leftward direction of FIG. 7), as illustrated in FIG. 9. In the fixing device 9 of the present embodiment, however, the length of the heater 22 in the longitudinal direction is greater than the length of the fixing belt 20, and the heater 22 partially protrudes from the fixing belt 20 in the longitudinal direction, as illustrated in FIG. 10. When the flanges 29 are strongly pulled in a direction away from the fixing nip N as illustrated in FIG. 9 in such a configuration, a great tension is applied to the fixing belt 20. This results in a disadvantage that the inner surface of the fixing belt 20 becomes worn, or the sliding load of the fixing belt 20 increases and causes slippage, which leads to a sheet conveyance failure. Therefore, a gap C illustrated in FIG. 7 is formed between the flanges 29 and the fixing belt 20, to allow the fixing belt 20 a backlash, and reduce the tension to be applied to the fixing belt 20. Because of this, there is a limit on the increase in the curvature of the fixing belt 20 on the exit side of the fixing nip N.

[0070] In the configuration in which the fixing belt 20 is allowed to have a backlash as described above, when the parallelism between the fixing belt 20 and the pressure roller shifts, the fixing belt 20 may be inclined with respect to the flanges 29, following the pressure roller as illustrated in FIG. 11.

[0071] As described above, there is a goal to maintain an appropriate distance between the contact parts 40c and the fixing belt 20, and there is a disadvantage that the fixing belt 20 is inclined due to the backlash. In the present embodiment, on the other hand, the contact parts 40c are brought into contact with the fixing belt 20, so that an appropriate gap can be formed between the separator part 40b and the fixing belt 20, as illustrated in FIG. 7. With this arrangement, the separator part 40b can appropriately separate the paper sheet P from the fixing belt 20, and the separator part 40b can be prevented from coming into contact with the outer circumferential surface of the fixing belt 20. Further, as the contact parts 40c come into contact with both ends of the fixing belt 20 in the longitudinal direction, the inclination of the fixing belt 20 can be reduced.

[0072] In the present embodiment, in particular, the fixing nip N, the separator part 40b, and the contact parts 40c are arranged in this order in the rotating direction A of the fixing belt 20. That is, the separator part 40b is disposed on the upstream side of the contact parts 40c in the rotating direction of the fixing belt 20. Here, the rotating direction A of the fixing belt 20 is a rotating direction extending along the surface of the fixing belt 20 in the plane of FIG. 7, which is a plane perpendicular to the longitudinal direction of the fixing belt 20. In other words, the rotating direction A is a direction perpendicular to each radial direction of the fixing belt 20 from a virtual center point on the inner side of the fixing belt 20 in this plane.

[0073] Contrary to the present embodiment, in the case

of a configuration in which the contact parts 40c are disposed on the upstream side of the separator part 40b in the rotating direction of the fixing belt 20, the paper sheet P passes through the positions of the contact parts 40c in the rotating direction, before coming into contact with the separator part 40b. Therefore, it is necessary to dispose the contact parts 40c at a certain distance in the longitudinal direction from the sheet passing region so that the contact parts 40c do not come into contact with the paper sheet P being conveyed even if the positions of the contact parts 40c are displaced due to component tolerance or the like. For this reason, there is a disadvantage that the separating plate 40 and the fixing belt 20 are long in the longitudinal direction, and the fixing device is large in size. Further, when a contact part 40c comes into contact with an end portion of the paper sheet P in the width direction, the contact part 40c catches the paper sheet P, and edge folding of the paper sheet P occurs.

[0074] In the present embodiment, on the other hand, the separator part 40b is disposed on the upstream side of the contact parts 40c in the rotating direction of the fixing belt 20. With this arrangement, even if the contact parts 40c are disposed in the sheet passing region, the paper sheet P comes into contact with the separator part 40b and is separated from the fixing belt 20 before coming into contact with the contact parts 40c. Thus, edge folding of the paper sheet P as described above does not occur. Thus, the contact parts 40c can be disposed on the further inner side in the longitudinal direction, and the fixing device can be made smaller in size.

[0075] As described above, in the present embodiment, the contact parts 40c are provided, and an appropriate gap is formed between the separator part 40b and the outer circumferential surface of the fixing belt 20. Thus, the separator part 40b can appropriately separate the paper sheet P from the fixing belt 20. Furthermore, the contact parts 40c can be disposed on the further inner side in the longitudinal direction, so that the width of the fixing belt 20 in the longitudinal direction can be reduced, and the fixing device 9 can be made smaller in size accordingly.

[0076] Further, as the width of the fixing belt 20 in the longitudinal direction is reduced as described above, it is possible to reduce the rotating torque for rotating the pressure roller 21. That is, as the width of the fixing belt 20 in the longitudinal direction becomes greater, the width of the pressure roller 21 and the width of the fixing nip N also becomes greater, and the rotating torque increases accordingly. However, the rotating torque can be reduced with the above configuration. Thus, the drive mechanism such as a gear and a motor can be made smaller in size, and an increase in cost can be prevented. As illustrated in FIG. 12, it is also possible to prevent an increase in the rotating torque by increasing the length of the fixing belt 20 in the longitudinal direction without changing the length of the elastic layer 21b of the pressure roller 21. In this case, however, the fixing belt 20 is buckled unevenly to one side in the longitudinal direction,

and is damaged. For example, the fixing belt 20 is biased and buckled on the left side in FIG. 12. In particular, this occurs when the rigidity of the fixing belt 20 is low, and such a disadvantage of buckling is conspicuous in the case of a fixing belt 20 formed with polyimide or a fixing belt 20 not having any elastic layer, or particularly, in the case of a fixing belt 20 formed with polyimide without any elastic layer. This buckling is likely to occur particularly when the interval J5 between the flanges 29 in the longitudinal direction is longer than the width J3 of the elastic layer 21b in the longitudinal direction. Conversely, adopting the above configuration according to the present embodiment can shorten the length of the fixing belt 20 in the longitudinal direction, and thus, the buckling as described above does not occur even in a fixing belt 20 having a low rigidity. Accordingly, the fixing belt 20 that is low in cost and rigidity can be adopted.

[0077] As illustrated in FIG. 13, the separating plate 40 of the present embodiment is formed by bending a metal plate. The separator part 40b is one end portion of the body part 40a. As described above, in the present embodiment, the contact parts 40c and the separator part 40b are formed with the same plate material. That is, the contact parts 40c and the separator part 40b are formed with the same component. Although one side in the longitudinal direction of separating plate 40 is illustrated in FIG. 13, the other side has the same configuration.

[0078] The contact parts 40c are formed with bent portions that are bent with respect to the body part 40a. A contact surface 40c1 of a contact part 40c in contact with the fixing belt 20 is a surface on the same side as a surface 40a1 of the body part 40a on the side by which a separated paper sheet passes. In other words, the surface 40a1 is the surface of the body part 40a on the side opposite to the side of the fixing belt 20 (see FIG. 7), and a portion of the surface 40a1 on the side of the fixing nip N forms a portion of the separator part 40b that separates the paper sheet. That is, the surface 40a1 is also a separation surface that separates the paper sheet. The fact that the separation surface 40a1 and the contact surface 40c 1 are surfaces on the same side of the separating plate 40 means that, in a plate-like member as in the present embodiment, the separation surface and the contact surface are surfaces on the same side in a plate-like state before bending. Further, a notch 40d is formed between the body part 40a (the separator part 40b) and the contact parts 40c in the longitudinal direction of the separating plate 40.

[0079] The separating plate 40 has a support part 40e at one end portion thereof in the longitudinal direction. A support shaft disposed in the housing of the fixing device is fitted into a shaft hole formed in the support part 40e. As a result, the separating plate 40 is supported rotatably with respect to the housing of the fixing device. The support part 40e is a bent portion that is bent in a direction different from the contact parts 40c, with respect to the body part 40a.

[0080] The contact parts 40c of the present embodi-

ment are formed with bent portions that are bent toward the downstream side in the rotating direction of the fixing belt 20, with respect to the body part 40a. With this arrangement, the contact parts 40c can be disposed on the downstream side of the separator part 40b formed on one end side of the body part 40a in the rotating direction of the fixing belt 20, as illustrated in FIG. 7. Accordingly, the fixing nip N, the separator part 40b, and the contact parts 40c can be disposed in this order from the upstream side toward the downstream side in the rotating direction of the fixing belt 20. Thus, a separation gap to be described later can be appropriately formed, and the fixing device can be made smaller in size. At this point of time, the separation surface 40a1 and the contact surfaces 40c1 are formed in a plane on the same side of the separating plate 40. Accordingly, there is no misalignment between the separation surface 40a1 and the contact surfaces 40c1 due to variation in plate thickness, and the positional accuracy between the separation surface 40a1 and the contact surfaces 40c1 can be increased. Thus, the positional accuracy between the separation surface 40a1 and the outer circumferential surface of the fixing belt 20 can be enhanced.

[0081] As the notch 40d is further formed between the body part 40a (the separator part 40b) and the contact part 40c in the longitudinal direction of separating plate 40, the body part 40a and the contact part 40c can be located apart from each other. With this arrangement, the presence of the notch 40d can prevent deformation of the separator part 40b at the time of bending to form the contact part 40c. Thus, the positional accuracy between the separation surface 40a1 and the outer circumferential surface of the fixing belt 20 can be enhanced.

[0082] FIG. 14 is a cross-sectional view taken in a direction orthogonal to the longitudinal direction, and is a view illustrating a state in which the contact parts 40c of the separating plate 40 are in contact with the fixing belt 20, and the separator part 40b separates the paper sheet P from the fixing belt 20.

[0083] As illustrated in FIG. 14, a separation gap D is formed between the outer circumferential surface of the fixing belt 20 and the separator part 40b. As the separation gap D is smaller, the paper sheet P is less likely to enter between the separator part 40b and the fixing belt 20, and the releasability of the paper sheet P to be separated from the fixing belt 20 by the separating plate 40 is higher. The separation gap D is a distance from the outer circumferential surface of the fixing belt 20 to the surface of one end of the separating plate 40 on the side of the separator part 40b opposite to the side of the fixing belt 20.

[0084] The separating plate 40 of the present embodiment is formed with a metal plate. Accordingly, separation performance of the separating plate 40 can be enhanced. That is, compared with a resin or the like, for example, a metal is less likely to be warped due to molding or heat, and thus, the separation gap can be made narrower with the separating plate 40 formed with a metal

material. Further, compared with a resin material, a metal plate can reduce the thickness of the plate material, which is the thickness of the plate material. In this regard, a metal material can also narrow the separation gap, compared with a resin material. As a method for forming a thin separator part 40b, rolling a metal plate may be adopted to form the separator part 40b.

[0085] The contact surfaces 40c1 of the contact parts 40c are brought into surface contact with the fixing belt 20. With this arrangement, it is possible to prevent damage and breakage of the fixing belt 20.

[0086] The contact parts 40c are formed by bending the plate material. That is, the contact parts 40c are formed with portions that are bent with respect to the body part 40a. Thus, the contact parts 40c can be accurately molded with respect to the body part 40a. In particular, in the present embodiment, the contact parts 40c are formed with portions that are bent only once with respect to the body part 40a. With this arrangement, in particular, the contact parts 40c can be accurately molded with respect to the body part 40a, which is preferable.

[0087] An angle α of the contact parts 40c with respect to the body part 40a is set to an acute angle. In a configuration in which the contact parts 40c are formed by bending, and the contact surfaces 40c1, which are the outer surfaces of bent portions, are brought into contact with the fixing belt 20 as in the present embodiment, the angle α is preferably set to an acute angle. In this configuration, as the separating plate 40 is rotated in the direction of an arrow B by a biasing force, the contact parts 40c are biased in the direction in which the contact surfaces 40c1 are brought into contact with the outer circumferential surface of the fixing belt 20. Accordingly, the contact surfaces 40c1 can be accurately brought into contact with the outer circumferential surface of the fixing belt 20, and an appropriate separation gap can be formed between the separator part 40b and the outer circumferential surface of the fixing belt 20. The angle α herein is the angle obtained by subtracting the bending angle of the contact parts 40c with respect to the body part 40a from 180 degrees in a plane orthogonal to the longitudinal direction of the separating plate 40.

[0088] Further, as the angle α is set to an acute angle, the extending direction of the surface 40a1 continuing to the separator part 40b can be positioned in a direction close to the tangential direction of the outer circumferential surface of the fixing belt 20, and the contact pressure of the top of the paper sheet P on the separator part 40b and the surface 40a1 can be lowered. On the other hand, in a separating plate 40' in FIG. 15 different from the present embodiment, the angle α of the contact parts 40c with respect to the body part 40a is set to 90 degrees. In this case, even if the separating plate 40 is biased in a rotating direction B by the biasing force of a spring, the biasing force does not act in the direction in which the contact surfaces 40c1 are brought into contact with the fixing belt 20, and the contact surfaces 40c1 cannot be correctly brought into contact with the fixing belt 20. Also,

as illustrated in FIG. 16, the position of the separating plate 40 is changed, so that the contact surfaces 40c1 can be biased in the direction of contact with the fixing belt 20, though the angle α is set to 90 degrees. In this case, however, the angle of the separator part 40b with respect to the outer circumferential surface of the fixing belt 20 is close to 90 degrees. Therefore, the paper sheet P strongly comes into contact with the contact parts 40c, and the top of the paper sheet P is folded as illustrated in FIG. 16. Further, the direction of separation of the paper sheet P is limited to the direction on the side of the pressure roller 21 as indicated by an arrow E. Furthermore, as illustrated in FIG. 17, moving the separating plate 40 away from the fixing nip N increases the degree of freedom in the ejecting direction of the separated paper sheet. However, the distance H in the circumferential direction of the fixing belt 20 from the fixing nip N to the separator part 40b is long. This causes another disadvantage that excessive heat is supplied from the fixing belt 20 to the paper sheet P, and an abnormal image with a hot offset or the like is generated. There also is a disadvantage that edge folding occurs at the top of the paper sheet P.

[0089] Conversely, if the angle α is too small, the separation gap D is wide as illustrated in FIG. 18. As a result, the separating plate 40 cannot separate the paper sheet P from the fixing belt 20, the central portion of the paper sheet P in the width direction comes into contact with the separating plate 40, and the edge folding occurs at the central portion of the paper sheet P in the width direction. The thickness of the separator part 40b can be reduced to narrow the separation gap D, but there is a limit to the thickness reduction in view of strength and the like. Therefore, the angle α is preferably equal to or larger than a certain value. For example, if the angle α is set to 0 degrees, the separation gap D becomes wider than twice the thickness of the separating plate 40.

[0090] With the above aspects taken into consideration, an experiment was conducted to determine whether edge folding of a paper sheet would occur due to changes in the angle α or the like. In this experiment, a solid image was passed on the fixing belt 20 at a temperature of 150°C and a linear velocity of 200 mm/s, and the conditions of the angle α and sheet types (such as thin paper and plain paper) were changed. The presence or absence of edge folding at the central portion in the width direction and the end portions in the width direction at the top of a paper sheet under each condition was visually checked. The separating plate 40 was disposed near the fixing nip N as illustrated in FIG. 14 (specifically, in this experiment, one end of the body part 40a was disposed at a position of 10 mm from the exit end of the fixing nip N along the surface of the fixing belt 20), and the angle α was changed.

[0091] The experiment results were evaluated on the basis of the three criteria of "good", "fair", and "not good" as follows. Good: no edge folding occurred in both thin paper and plain paper. Fair: edge folding occurred in thin

paper. Not good: edge folding occurred in both thin paper and plain paper.

[0092] The above experiment results are illustrated in Table 1.

[Table 1]

Angle	Central portion	End portion
25	Not good	Good
30	Fair	Good
35	Fair	Good
40	Fair	Good
45	Good	Good
50	Good	Good
55	Good	Good
60	Good	Good
65	Good	Good
70	Good	Good
75	Good	Fair
80	Good	Fair
85	Good	Fair
90	Good	Not good

[0093] As illustrated in Table 1, when the angle α was too small, the separation gap on the sheet end sides was wide, resulting in edge folding at the central portion in the sheet width direction. Specifically, edge folding of thin paper occurred at the central portion in the width direction at 40 degrees or lower, and edge folding of plain paper also occurred at 25 degrees. When the angle α was too large, the contact pressure of the top of the paper sheet on the separator part was high, resulting in edge folding at the end portions in the sheet width direction. Specifically, edge folding of thin paper occurred in the width direction at 75 degrees or higher, and edge folding of plain paper also occurred at 90 degrees.

[0094] From the above results, the angle α is preferably in the range of 30 to 85 degrees, and more preferably in the range of 45 to 70 degrees, to prevent edge folding at the time of separation of the paper sheet. In the present embodiment, the angle α is set to 60 degrees.

[0095] As described above, according to the configuration of the present embodiment, the contact parts 40c of the separating plate 40 can be disposed on the further inner side in the longitudinal direction. In other words, the distance J1 in the longitudinal direction between the contact parts 40c illustrated in FIG. 8 can be shortened. Specifically, in the present embodiment, the distance J1 in the longitudinal direction between the contact parts 40c is shorter than the region width J2 of the heat generating unit of the heater 22 in the longitudinal direction,

as illustrated in FIG. 19. The distance J1 is also shorter than the length of the elastic layer 21b of the pressure roller 21 in the longitudinal direction. This heat generating unit is the principal heat generating region of the heater 22, which is a heating member. The region in the longitudinal direction of the heat generating unit of the heater 22 of the present embodiment is the region in which the resistive heat generators 31 in the longitudinal direction are disposed, and is a region including the spaces between the resistive heat generators 31. In other words, the region width J2 of the heat generating unit is the width of the region from one longitudinal end of the resistive heat generator 31 disposed closest to one side in the longitudinal direction to the other longitudinal end of the resistive heat generator 31 disposed closest to the other side in the longitudinal direction. In the present embodiment, the resistive heat generators 31 are disposed outside the range of the distance J1 on both the one side and the other side in the longitudinal direction.

[0096] Further, the distance J1 in the longitudinal direction between the contact parts 40c is longer than the maximum image width J4 that can be formed on the paper sheet P. In other words, each contact part 40c is located outside the image formation region. With such arrangement, the separator part on the inner side of the contact parts 40c can be disposed so as to cover the image width J4. Accordingly, the contact parts 40c can function like a toner image adhesive in the regions in which the separator part is not disposed in the longitudinal direction, and prevent hindering separation of the paper sheet from the fixing belt 20. This image width J4 can be determined by printing a solid image having the maximum width and measuring the image width with a scale or the like, for example.

[0097] In the present embodiment, the length of the heater 22 in the longitudinal direction is longer than the fixing belt 20. As described above, in such a configuration, a certain backlash is preferably allowed between the flanges and the fixing belt 20, to reduce the sliding load of the fixing belt 20.

[0098] Next, a biasing mechanism for biasing the separating plate 40 toward the fixing belt 20 is described. In the description below, the separating plate 40 having a configuration partially different in shape and the like from the above embodiment is used.

[0099] FIG. 20 illustrates a specific embodiment of the separating plate 40. In this embodiment, the separating plate 40 is disposed so as to be rotatable about a support shaft 41a as a rotation shaft. That is, as illustrated in FIG. 23, the separating plate 40 is disposed so as to be rotatable in the direction in which the separator part 40b of the separating plate 40 approaches the fixing belt 20 and the direction in which the separator part 40b moves away from the fixing belt 20.

[0100] As illustrated in FIG. 22, the support shaft 41a is disposed to protrude from the inner surface of a side plate 41. The support shaft 41a is rotatably fitted into shaft holes of the support part 40e formed at both ends

of the separating plate 40. Although only one side plate 41 is illustrated in FIG. 22, side plates 41 are disposed on both ends in the longitudinal direction.

[0101] The side plates 41 each have a U-shaped notch 41b for rotatably supporting both end shaft portions of the pressure roller 21. A rotation restricting hole 41c as a fan-shaped movement restricting hole centered around the support shaft 41a is formed at an adjacent position above the notch 41b of each side plate 41. This rotation restricting hole 41c restricts the rotation range (moving positions) of the separating plate 40.

[0102] As illustrated in FIG. 22, the separating plate 40 has rotation-restricted pieces 40g as movement-restricted pieces protruding in the longitudinal direction at both longitudinal ends, and the rotation-restricted pieces 40g are inserted into the rotation restricting holes 41c. The rotation-restricted pieces 40g and the rotation restricting holes 41c constitute a movement restricting unit or a rotation restricting unit of the separating plate 40.

[0103] That is, one end portion (the left end portion in FIG. 22) of each rotation restricting hole 41c forms a first restricting portion that defines the moving position or the rotating position of the separating plate 40 in the direction in which the separator part 40b approaches the fixing belt 20. The other end portion (the right end portion in FIG. 22) of the rotation restricting hole 41c forms a second restricting portion that defines the moving position or the rotating position of separating plate 40 in the direction in which the separator part 40b moves away from the fixing belt 20.

[0104] When the separator part 40b rotates in the direction in which the separator part 40b approaches the fixing belt 20, a desirable distance between the separator part 40b and the fixing belt 20 is 0.6 to 1.2 mm, or 0.6 to 1.3 mm. If the distance between the fixing belt 20 and the separating plate 40 is too short, the separating plate 40 comes into contact with the fixing belt 20, and the belt is easily damaged, which causes an abnormal image. With a distance of 0.6 mm as described above, it is possible to prevent the fixing belt 20 from being scratched.

[0105] If the distance between the fixing belt 20 and the separating plate 40 is too long, the paper sheet passes through this wide gap, and is wound around the fixing belt 20, which often results in a paper jam. With a distance of 1.2 mm or a distance of 1.3 mm or shorter as described above, it is possible to prevent the paper sheet from being wound around the fixing belt 20 and causing a paper jam. The relationship between the rotation-restricted pieces 40g and the rotation restricting holes 41c can be reversed. Rotation-restricted holes can be formed in the separating plate 40, and rotation restricting pieces can be formed on the side plates 41.

[0106] Tension springs 42 as biasing members are stretched between spring engaging portions 40h at both ends of the separating plate 40 and spring engaging portions 41d at the end portions of the side plates. The tension springs 42 bias the separating plate 40 clockwise about the support shaft 41a in FIGS. 21 and 22.

[0107] The rotation generating direction is the direction in which the separator part 40b approaches the fixing belt 20. Since the separating plate 40 is easily deformed as described above, the tension springs 42 are preferably attached to both ends of the separating plate 40, to ensure generation of rotation of the separating plate 40.

[0108] As illustrated in FIG. 23, the separator part 40b can be brought into contact with the outer circumferential surface of the fixing belt 20 by the biasing force of the tension springs 42. In this state, each rotation-restricted piece 40g comes into contact with one side end portion (the left side end portion) of each corresponding rotation restricting hole 41c. Thus, the separating plate 40 cannot further rotate clockwise from the state illustrated in FIG. 23.

[0109] In a fixing device including the separating plate 40 having such a configuration, the fixing nip N, the separator part 40b, and the contact parts 40c are also arranged in this order in the rotating direction of the fixing belt 20, as illustrated in FIG. 7 of the above-described embodiment. Accordingly, the separation gap between the separator part 40b and the fixing belt 20 can be appropriately formed, and the fixing device can be made smaller in size.

[0110] As illustrated in FIG. 24, when a paper jam occurs, and the paper sheet P is wound around the fixing belt 20, the separating plate 40 rotates counterclockwise so as to move away from the paper sheet P. Thus, a collision with the paper sheet P can be avoided. This can prevent the paper sheet P from being damaged. Further, when the paper sheet P wound around the fixing belt 20 is pulled downward from the fixing nip as illustrated in FIG. 25, the separating plate 40 rotates counterclockwise so as to move away from the paper sheet P. Thus, the paper sheet P can be pulled out without being damaged.

[0111] Even if the sheet separability is enhanced by the action of the separating plate 40, when an attempt is made to fix an image on which the toner is applied up to the top of the paper sheet P while the print setting or the like is wrong, the paper sheet P might enter between the separating plate 40 and the fixing belt 20, and be wound around the fixing belt 20. If the paper sheet P is wound around the fixing belt 20 to form a plurality of layers on the fixing belt 20, or a large wrinkle appears in the paper sheet P, the paper sheet P come into strong contact with the separating plate 40 when the paper sheet P is pulled out. As a result, the separating plate 40 might be deformed, or the fixing belt 20 might be damaged.

[0112] Therefore, in the present embodiment, the separating plate 40 is pushed by the tension springs 42. In this configuration, the separating plate 40 is opened against the tension springs 42 when the paper sheet P is pulled out. Thus, deformation and scratching of the separating plate 40 can be reduced. Furthermore, the force to be used for pulling out the paper sheet P can also be reduced. Thus, operability is enhanced.

[0113] To reduce the force to be used for pulling out a paper sheet, it is effective to make the amount of opening

of the separating plate 40, which is the clearance between the rotation-restricted pieces 40g of the separating plate 40 and the rotation restricting holes 41c of the side plates 41, larger than the amount of depressurization at the time of depressurization of the fixing nip. The amount of depressurization at the time of depressurization of the fixing nip can be obtained by measuring and subtracting a distance Y1 between the cored bar 21a of the pressure roller 21 and the heater 22 with a caliper or the like as illustrated in FIG. 27 in a pressurized state and a depressurized state.

[0114] However, if the amount of opening of the rotation restricting holes 41c is made too large, the separator part 40b might come into contact with the pressure roller 21, and the pressure roller 21 might be damaged by the contact. Therefore, the size of the rotation restricting holes 41c is preferably set so that the separating plate 40 stops rotating at a position before the separator part 40b comes into contact with the pressure roller 21. That is, when the separating plate 40 rotates in the direction of widening the distance between the separator part 40b and the fixing belt 20, the rotation is restricted at the other end (the right end portion in FIG. 22) as the second restricting portion of the rotation restricting hole 41c before the separating plate 40 comes into contact with the pressure roller 21.

[0115] As another method for preventing contact with the pressure roller 21, a layout in which the position of the support shaft 41a of the separating plate 40 is devised not to come into contact with the pressure roller 21 may be adopted. For this purpose, it is also effective to make the diameter of the pressure roller 21 smaller than the diameter of the fixing belt 20, or shift the center of the pressure roller 21 in a direction (a downward direction in FIG. 26) away from the separating plate 40 with respect to the center of the fixing belt 20.

[0116] As a pressing configuration of the fixing nip, the two pressing configurations of a first pressing configuration and a second pressing configuration are conceivable. The first pressing configuration is a configuration in which the fixing belt 20 (the heater holder 23) is secured, and the pressure roller 21 can come into and out of contact with the fixing belt 20, and is biased toward the fixing belt 20. The second pressing configuration is a configuration in which the pressure roller 21 (the cored bar of the pressure roller 21) is secured, and the fixing belt 20 can come into and out of contact with the pressure roller 21, and is biased toward the pressure roller 21.

[0117] The latter second pressing configuration can further reduce the force to be used for pulling out the paper sheet P at the time of handling a paper jam, and therefore, is more preferable. That is, in the second pressing configuration, when depressurization is performed, the fixing belt 20 and the pressure roller 21 are separated, and the fixing belt 20 and the separating plate 40 are also separated. Accordingly, displacement of the tension springs 42 is reduced, and the force to be used for pulling out the paper sheet P can be further reduced.

[0118] Further, in the case of a configuration in which the contact parts 40c are formed in the separating plate 40 as in the present embodiment, the positional accuracy of the separator part 40b with respect to the fixing belt 20 can be increased, though the fixing belt 20 comes into and out of contact with the pressure roller 21 in the configuration. Accordingly, edge folding of paper sheets and image defects as described above can be reduced.

[0119] In addition to the above, the clearance in the biasing direction in the rotation restricting holes 41c is made smaller than the amount of depressurization, so that the rotation of the separating plate 40 in the clockwise direction in FIG. 24 is restricted at the time of depressurization. As a result, the distance between the fixing belt 20 and the separator part 40b is widened, and the paper sheet P can be more easily pulled out.

[0120] In the case of a paper jam, it is difficult for the user to pull out the paper sheet P, unless the paper is clearly seen through the fixing nip. If the distance between the fixing belt 20 and the separator part 40b can be widened, the pressure roller 21 and the fixing belt 20 can be easily rotated in the reverse direction, and the paper sheet P can be pulled out toward the upstream side of the fixing nip (downward in FIG. 24) with a sufficient length.

[0121] On the other hand, in forward rotation and reverse rotation of the fixing belt 20 at the time of handling a paper jam, the trajectory of the fixing belt 20 changes. Therefore, the second pressing configuration in which the fixing belt 20 and the separator part 40b do not come into contact with each other even if the trajectory of the fixing belt 20 changes is preferable.

[0122] The embodiment of the present invention can also be applied to fixing devices as illustrated in FIGS. 28 and 29, other than the fixing device described above. The configurations of the respective fixing devices illustrated in FIGS. 28 and 29 are briefly described below.

[0123] First, the fixing device 9 illustrated in FIG. 28 includes a pressing roller 84 disposed on the opposite side of the fixing belt 20 from the pressure roller 21. The pressing roller 84 is an opposed rotating member that rotates, facing the fixing belt 20 as a rotating member. The fixing belt 20 is sandwiched between the pressing roller 84 and the heater 22, and is heated. On the side of the pressure roller 21, on the other hand, a nip forming member 45 is disposed inside the loop formed by the fixing belt 20. The nip forming member 45 is supported by the stay 24. The nip forming member 45 and the pressure roller 21 sandwich the fixing belt 20, and form the fixing nip N.

[0124] Next, the fixing device 9 illustrated in FIG. 29 does not include the pressing roller 84 described above. To ensure a contact length between the fixing belt 20 and the heater 22 in the circumferential direction, the heater 22 is curved into an arc that matches the curvature of the fixing belt 20. The other aspects of the fixing device 9 are the same as the fixing device 9 illustrated in FIG. 28.

[0125] The embodiment of the present invention can

also be applied to a fixing device as illustrated in FIG. 30, other than the fixing devices described above. In the description below, the fixing device 9 illustrated in FIG. 30 is explained.

[0126] As illustrated in FIG. 30, the fixing device 9 includes a heating assembly 92, a fixing roller 93 as a rotating member, and a pressure assembly 94 as a pressure member. The heating assembly 92 includes the heater 22 described in the foregoing embodiment, a first high thermal conductive member 28, the heater holder 23, the stay 24, and a heating belt 120 as a rotating member. The fixing roller 93 is a pressure member that presses the heating belt 120 and forms a heating nip N3 between the fixing roller 93 and the heating belt 120. The fixing roller 93 includes a cored bar 93a, an elastic layer 93b, and a surface layer 93c. The pressure assembly 94 is disposed on the opposite side of the fixing roller 93 from the heating assembly 92. The pressure assembly 94 includes a nip forming member 95 and a stay 96, and also includes a pressure belt 97 that is rotatably disposed to enclose the nip forming member 95 and the stay 96 inside its loop. A paper sheet P passes through a fixing nip N2 between the pressure belt 97 and the fixing roller 93, and an image on the paper sheet P is heated, pressed, and fixed.

[0127] In the fixing devices in FIGS. 28, 29, and 30, the separating plate 40 described in the above embodiment can also be disposed. Specifically, in the embodiments in FIGS. 28 and 29, the separating plate 40 is disposed on the downstream side of the fixing nip N. In the embodiment in FIG. 30, the separating plate 40 is disposed on the downstream side of the fixing nip N2. As illustrated in FIG. 7, the fixing nip N, the separator part 40b, and the contact parts 40c can be arranged in this order in the rotating direction of the fixing belt 20 (the fixing roller 93 in FIG. 30). Accordingly, the separation gap between the separator part 40b and the fixing belt 20 can be appropriately formed, and the fixing device can be made smaller in size. In the embodiment in FIG. 30, the separating plate 40 can prevent the paper sheet P from being wound around the pressure belt 97.

[0128] Although embodiments of the present invention have been described so far, embodiments of the present invention are not limited to the above-described embodiments, and various modifications can be made to them without departing from the scope of the present invention.

[0129] An image forming apparatus according to an embodiment of the present invention is not necessarily the color image forming apparatus illustrated in FIG. 1, but may be a monochrome image forming apparatus, a copier, a printer, a facsimile machine, or a multifunction peripheral including any combination of them.

[0130] In addition to the paper sheet P (plain paper), examples of sheets include cardboard, a postcard, an envelope, thin paper, coated paper (including art paper and the like), tracing paper, an OHP sheet, a plastic film, a prepreg, and copper foil.

[0131] As an example of a heating device according

to an embodiment of the present invention, a fixing device has been described in the above embodiment, but the heating device is not limited to this. That is, the heating device may be a drying device that dries ink applied to a paper sheet, or a heating device such as a laminator that bonds a film as a covering member to a surface of a sheet such as a paper sheet by thermocompression, or a thermocompression bonding device such as a heat sealer that seals a sealing portion of a packaging material by thermocompression. As a separating member according to an embodiment of the present invention is applied also to such a heating device, a separation gap between the separating member and the rotating member can be appropriately formed, and the heating device can be made smaller in size. Further, the separating member according to an embodiment of the present invention may be applied to a nip forming unit that is not a heating device. The separating member is not necessarily a plate-like member, and may have any appropriate shape.

[0132] In the cases described above, the heater 22 that has a planar shape is disposed as the heating member. However, the heating member may be an induction heating (IH) heater, a halogen heater, a carbon heater, or the like. For example, the fixing device 9 illustrated in FIG. 31 includes the fixing belt 20, the pressure roller 21, the stay 24, a halogen heater 46 as a heating member, a reflective member 47, and a nip forming member 48. In such a fixing device 9, the separating member illustrated in FIG. 7 and others is used, so that a separation gap between the separating member and the rotating member can be appropriately formed, and the fixing device can be made smaller in size. The heating member and the nip forming member may be separate members as in the present embodiment, or may be formed as the same member as in the embodiment in FIG. 2. The heat generating unit in a halogen heater is a densely wound portion in which a filament held in a glass tube is densely wound, for example.

[0133] Further, embodiments of the present invention are not limited to the configuration of the fixing device 9 that forms the fixing nip N between the fixing belt 20 and the pressure roller 21 as illustrated in FIG. 2. For example, as illustrated in FIG. 32, the fixing device 9 may form the fixing nip N between the fixing roller 93 as the rotating member and the pressure roller 21 as the pressure member. In such a fixing device 9, the separating member illustrated in FIG. 7 and others is used, so that a separation gap between the separating member and the rotating member can be appropriately formed, and the fixing device can be made smaller in size.

[0134] Aspects of the present invention includes the followings, for example.

First Aspect

[0135] According to first aspect, a nip forming unit includes: a rotating member; a pressure member to contact the rotating member to form a nip portion between the

rotating member and the pressure member; and a separating member that separates a sheet from the rotating member. The separating member is disposed downstream from the nip portion in a rotating direction of the rotating member. The separating member includes: a contact part to contact the rotating member; and a separator part to contact the sheet to separate the sheet from the rotating member. The nip portion, the separator part, and the contact part are arranged in an order of the nip portion, the separator part, and the contact part from upstream to downstream in the rotating direction of the rotating member.

Second Aspect

[0136] In the nip forming unit according to the first aspect, the contact part and the separator part are formed with one component.

Third Aspect

[0137] In the nip forming unit according to the first or second aspect, a thickness of the separator part is smaller than a thickness of the contact part.

Fourth Aspect

[0138] In the nip forming unit according to any one of the first to third aspects, the separating member is formed with a plate material, and the contact part is formed with a bent portion that is bent with respect to a body part of the plate material.

Fifth Aspect

[0139] In the nip forming unit according to the fourth aspect, an angle of the contact part with respect to the body part is an acute angle.

Sixth Aspect

[0140] In the nip forming unit according to the fifth aspect, the separating member is disposed to be rotatable about a rotation shaft, and includes a biasing member that biases the separating member in a direction in which a contact surface on the contact part comes into contact with the rotating member.

Seventh Aspect

[0141] In the nip forming unit according to the sixth aspect, the rotating member is disposed to come into and out of contact with the pressure member.

Eighth Aspect

[0142] In the nip forming unit according to any one of the fifth to seventh aspects, an angle of the contact part

with respect to the body part is 30 to 85 degrees.

Ninth Aspect

[0143] In the nip forming unit according to any one of the fifth to seventh aspects, an angle of the contact part with respect to the body part is 45 to 70 degrees.

Tenth Aspect

[0144] In the nip forming unit according to any one of the first to ninth aspects, the pressure member includes an elastic layer, the contact part and another contact part are disposed on both ends of the rotating member in a longitudinal direction of the rotating member, and a distance between the contact part and the other contact part in the longitudinal direction is shorter than a length of the elastic layer in the longitudinal direction.

Eleventh Aspect

[0145] In the nip forming unit according to any one of the first to tenth aspects, the rotating member is an endless belt that rotates. The nip forming unit further includes a nip forming member that is disposed inside a loop of the belt to form the nip portion between the pressure member and the nip forming member via the belt. The belt slides on the nip forming member.

Twelfth Aspect

[0146] In the nip forming unit according to the eleventh aspect, the belt does not include an elastic layer.

Thirteenth Aspect

[0147] The nip forming unit according to the eleventh or twelfth aspect further includes holding members that hold the belt at both ends in a longitudinal direction of the belt. The pressure member includes an elastic layer. A distance between the holding members in the longitudinal direction is longer than a length of the elastic layer in the longitudinal direction.

Fourteenth Aspect

[0148] In the nip forming unit according to any one of the eleventh to thirteenth aspects, a length of the nip forming member in a longitudinal direction of the rotating member is longer than a length of the rotating member in the longitudinal direction.

Fifteenth Aspect

[0149] A nip forming unit includes: a rotating member; a pressure member to contact the rotating member to form a nip portion between the rotating member and the pressure member; and a separating member to separate

a sheet from the rotating member. The separating member is disposed downstream from the nip portion in a rotating direction of the rotating member. The separating member includes: a contact part having a contact surface to contact the rotating member; and a body part having a separation surface to contact the sheet to separate the sheet from the rotating member. The contact surface and the separation surface are formed on a surface of the separating member on the same side of the separating member, and the contact part is formed with a bent portion that is bent downstream in the rotating direction of the rotating member with respect to the body part.

Sixteenth Aspect

[0150] The nip forming unit according to the fifteenth aspect includes a notch between the body part and the separator part.

Seventeenth Aspect

[0151] A heating device includes the nip forming unit according to any one of the first to sixteenth aspects.

Eighteenth Aspect

[0152] The heating device according to the seventeenth aspect includes a heating member having a heat generating unit. The contact part and another contact part are disposed on both ends of the rotating member in a longitudinal direction of the rotating member. A distance between the contact part and the other contact part in the longitudinal direction is shorter than a length of the heat generating unit in the longitudinal direction.

Nineteenth Aspect

[0153] A fixing device includes the heating device according to the seventeenth or eighteenth aspect, and fixes toner on the sheet by heat.

Twentieth Aspect

[0154] In the fixing device of the nineteenth aspect, the contact part and another contact part are disposed on both ends in the longitudinal direction of the rotating member. A distance between the contact part and the other contact part is longer in the longitudinal direction of the rotating member than an image formation region in which an image is to be formed on the sheet.

Twenty-first Aspect

[0155] An image forming apparatus includes the fixing device according to the nineteenth or twentieth aspect.

Claims**1.** A nip forming unit comprising:

a rotating member (20);
 a pressure member (21) to contact the rotating member (20) to form a nip portion between the rotating member (20) and the pressure member (21); and
 a separating member (40) to separate a sheet from the rotating member (20), the separating member (40) being disposed downstream from the nip portion in a rotating direction of the rotating member (20),
 wherein the separating member (40) includes:

a contact part (40c) to contact the rotating member (20); and
 a separator part (40b) to contact the sheet to separate the sheet from the rotating member (20), and
 the nip portion, the separator part, and the contact part are arranged in an order of the nip portion, the separator part, and the contact part from upstream to downstream in the rotating direction of the rotating member (20).

2. The nip forming unit according to claim 1, wherein the contact part and the separator part are formed with one component.

3. The nip forming unit according to claim 1 or 2, wherein a thickness of the separator part is smaller than a thickness of the contact part.

4. The nip forming unit according to any one of claims 1 to 3,

wherein the separating member (40) is formed with a plate material, and
 the contact part is formed with a bent portion that is bent with respect to a body part of the plate material.

5. The nip forming unit according to claim 4, wherein an angle of the contact part with respect to the body part is an acute angle.

6. The nip forming unit according to claim 5, wherein the separating member (40) is disposed to be rotatable about a rotation shaft (41a), and includes a biasing member that biases the separating member (40) in a direction in which a contact surface on the contact part comes into contact with the rotating member (20).

7. The nip forming unit according to claim 6,

wherein the rotating member (20) is disposed to come into and out of contact with the pressure member (21).

8. The nip forming unit according to any one of claims 5 to 7, wherein an angle of the contact part with respect to the body part is 30 to 85 degrees.

9. The nip forming unit according to any one of claims 5 to 7, wherein an angle of the contact part with respect to the body part is 45 to 70 degrees.

10. The nip forming unit according to any one of claims 1 to 9,

wherein the pressure member (21) includes an elastic layer,
 the contact part and another contact part are disposed on both ends of the rotating member (20) in a longitudinal direction of the rotating member (20), and
 a distance between the contact part and said another end in the longitudinal direction is shorter than a length of the elastic layer in the longitudinal direction.

11. The nip forming unit according to any one of claims 1 to 10,

wherein the rotating member (20) is an endless belt that rotates,
 the nip forming unit further includes a nip forming member (45, 48) that is disposed inside a loop of the belt to form the nip portion between the pressure member (21) and the nip forming member (45, 48) via the belt, and
 the belt slides on the nip forming member (45, 48).

12. The nip forming unit according to claim 11, wherein the belt does not include an elastic layer.

13. The nip forming unit according to claim 11 or 12, further comprising holding members (29) that hold the belt at both ends in a longitudinal direction of the belt,

wherein the pressure member (21) includes an elastic layer, and
 a distance between the holding members (29) in the longitudinal direction is longer than a length of the elastic layer in the longitudinal direction.

14. The nip forming unit according to any one of claims 11 to 13,

wherein a length of the nip forming member (45, 48) in a longitudinal direction of the rotating member (20) is longer than a length of the rotating member in the longitudinal direction.

15. A nip forming unit comprising:

a rotating member (20);
 a pressure member (21) to contact the rotating member (20) to form a nip portion between the rotating member (20) and the pressure member (21); and
 a separating member (40) to separate a sheet from the rotating member (20), the separating member (40) being disposed downstream from the nip portion in a rotating direction of the rotating member (20),
 wherein the separating member (40) includes:

a contact part having a contact surface to contact the rotating member (20); and
 a body part having a separation surface to contact the sheet to separate the sheet from the rotating member (20),
 the contact surface and the separation surface are formed on a surface of the separating member (40) on the same side of the separating member (40), and
 the contact part (40c) is formed with a bent portion that is bent downstream in the rotating direction of the rotating member (20) with respect to the body part (40a).

16. The nip forming unit according to claim 15, further comprising a notch (40d) between the body part (40a) and the contact part (40c).

17. A heating device comprising the nip forming unit according to any one of claims 1 to 16.

18. The heating device according to claim 17, further comprising

a heating member (22) having a heat generating unit,
 wherein the contact part and another contact part are disposed on both ends of the rotating member (20) in a longitudinal direction of the rotating member (20), and
 a distance between the contact part and said another contact part in the longitudinal direction is shorter than a length of the heat generating unit in the longitudinal direction.

19. A fixing device comprising the heating device according to claim 17, wherein the heating device fixes toner on the sheet by heat.

20. The fixing device according to claim 19,

wherein the contact part and another contact part are disposed on both ends of the rotating member (20) in a longitudinal direction of the rotating member (20), and
 a distance between the contact part and said another contact part is longer in the longitudinal direction of the rotating member (20) than an image formation region in which an image is to be formed on the sheet.

21. An image forming apparatus comprising the fixing device (9) according to claim 19 or 20.

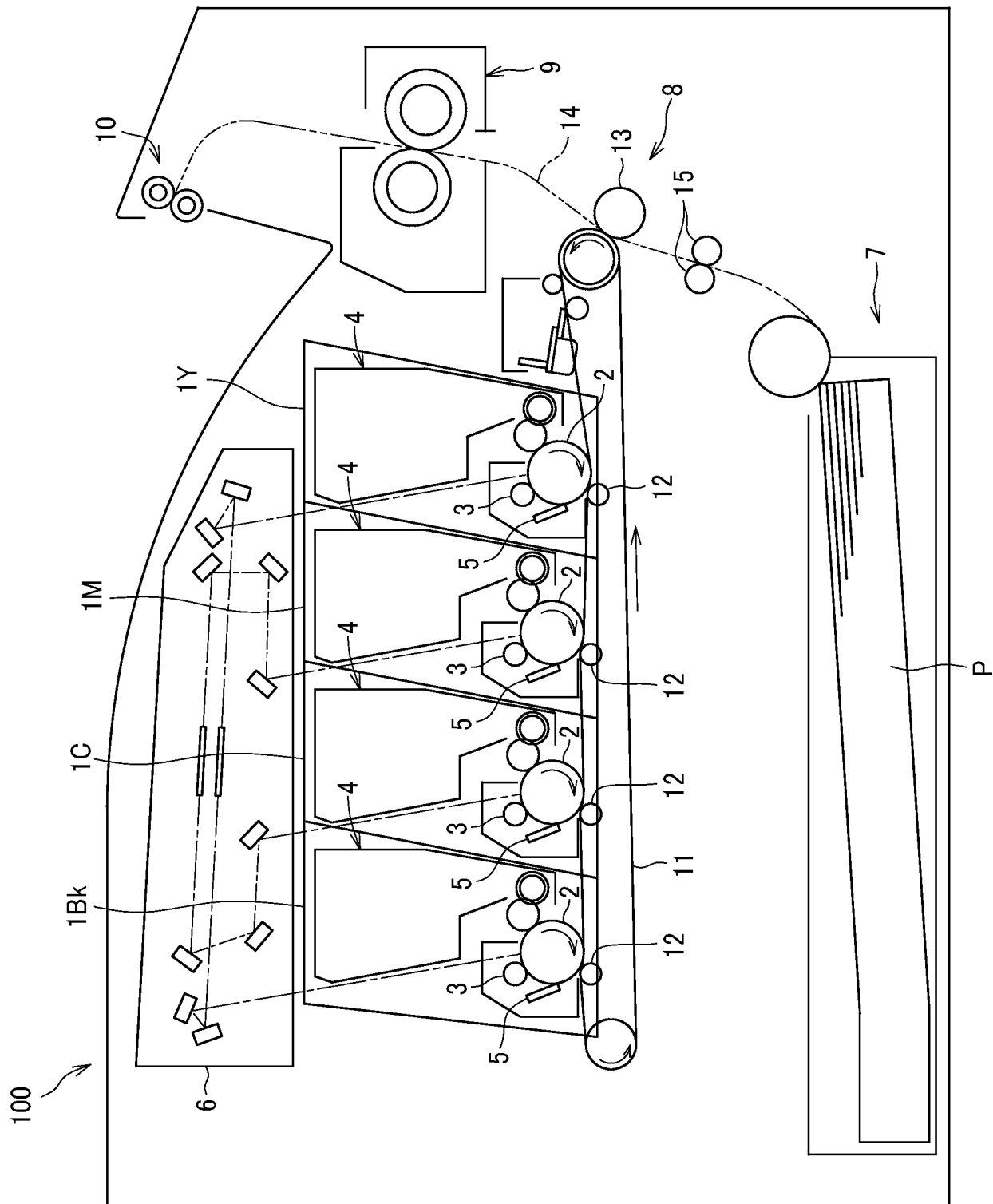


FIG. 1

FIG. 2

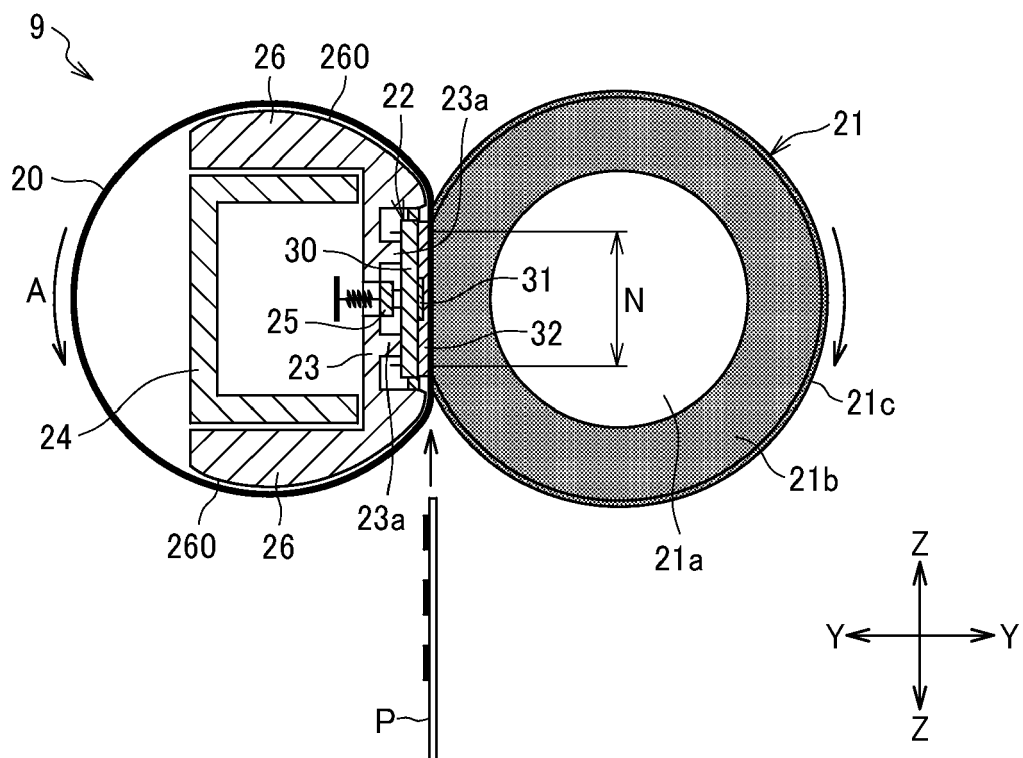


FIG. 3

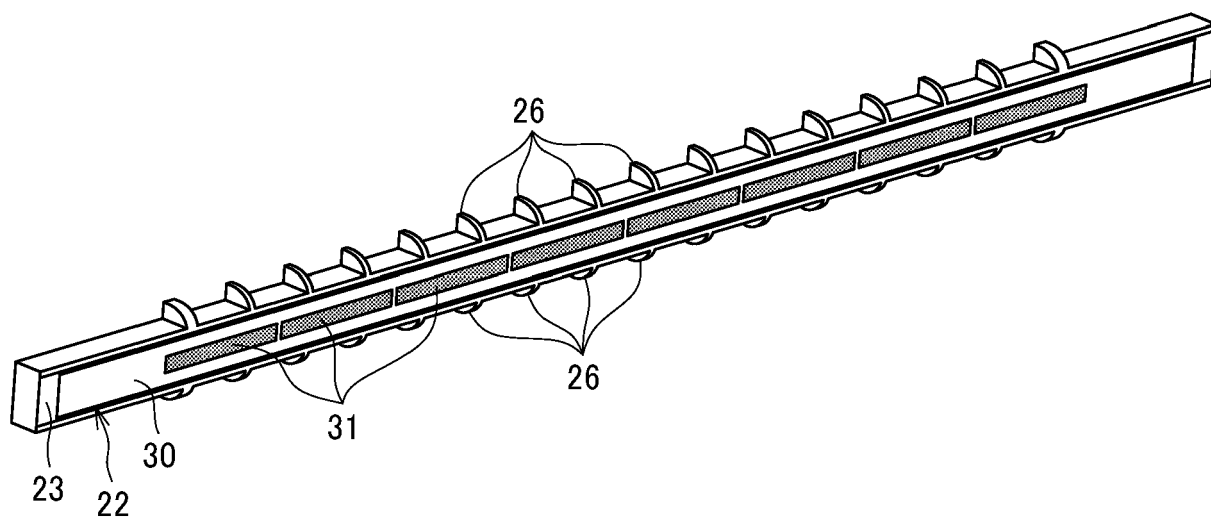


FIG. 4

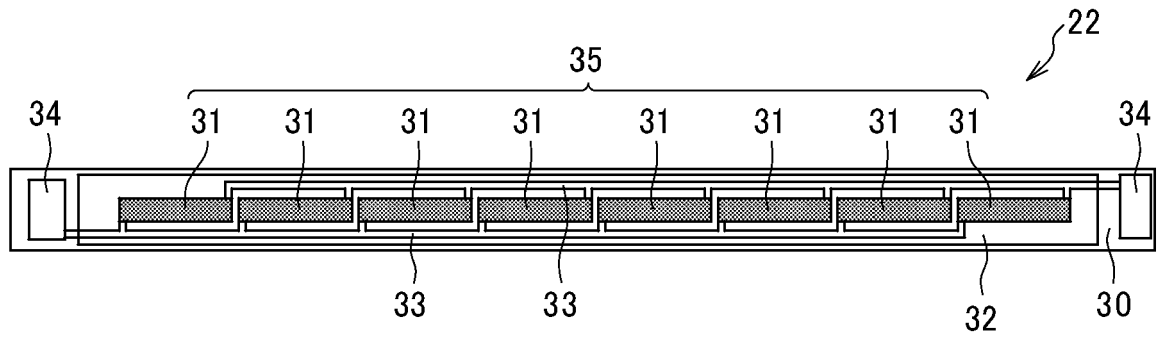


FIG. 5

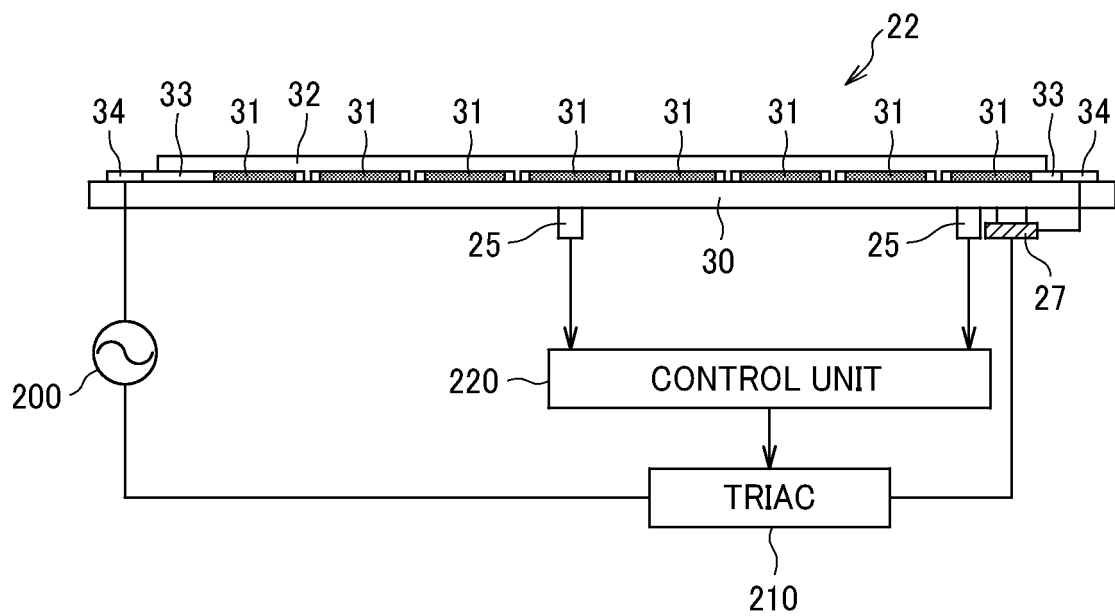


FIG. 6

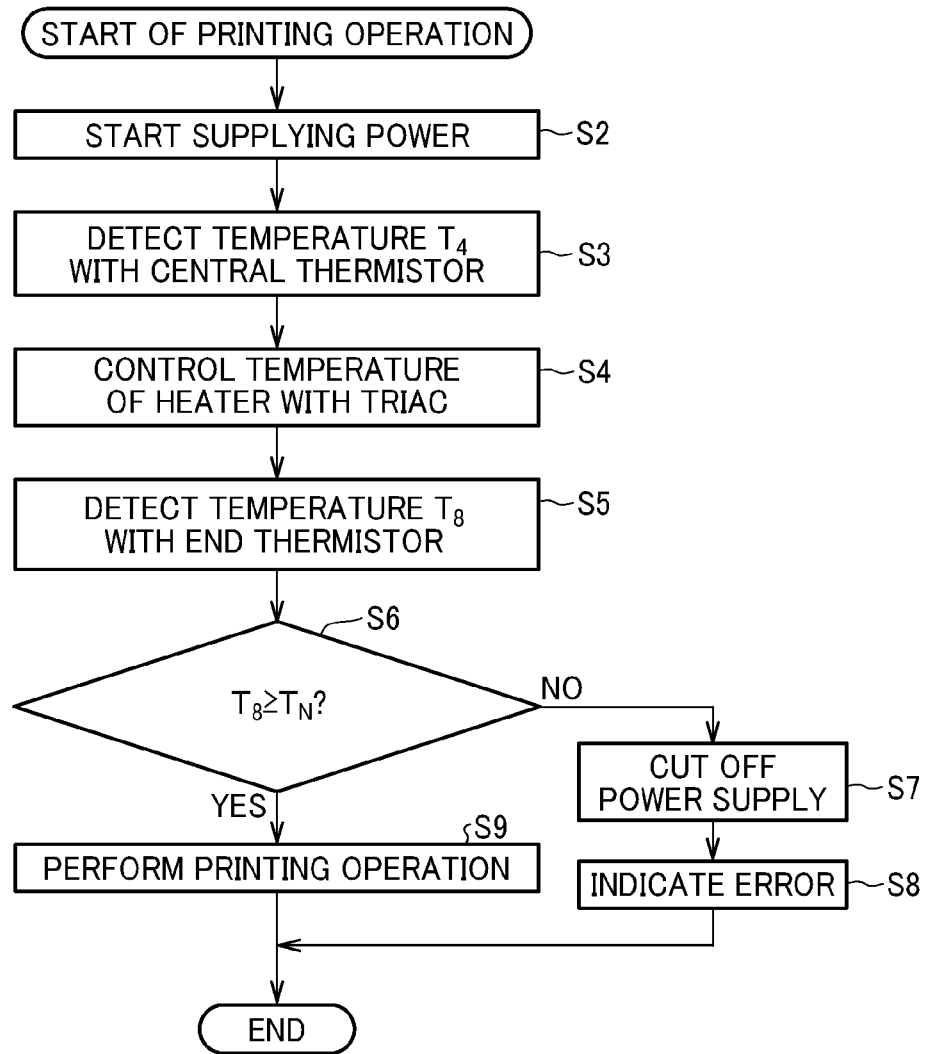


FIG. 7

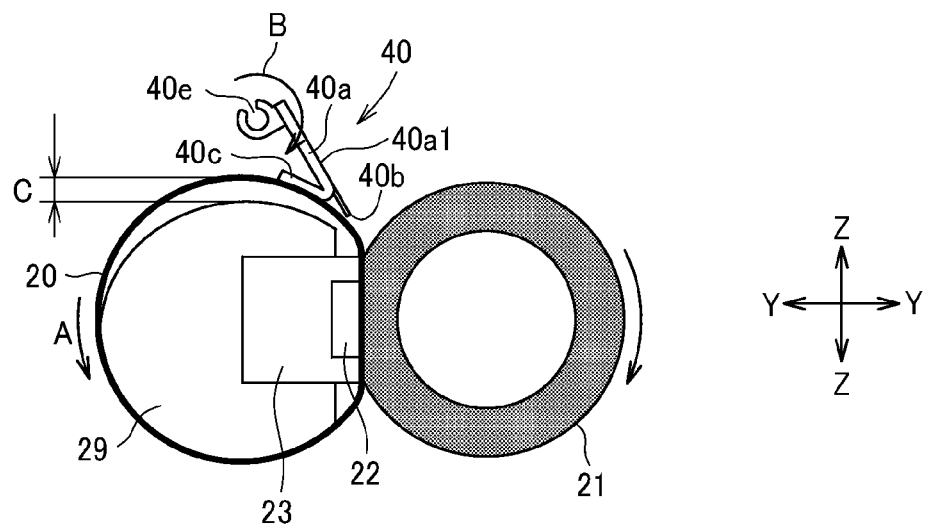


FIG. 8

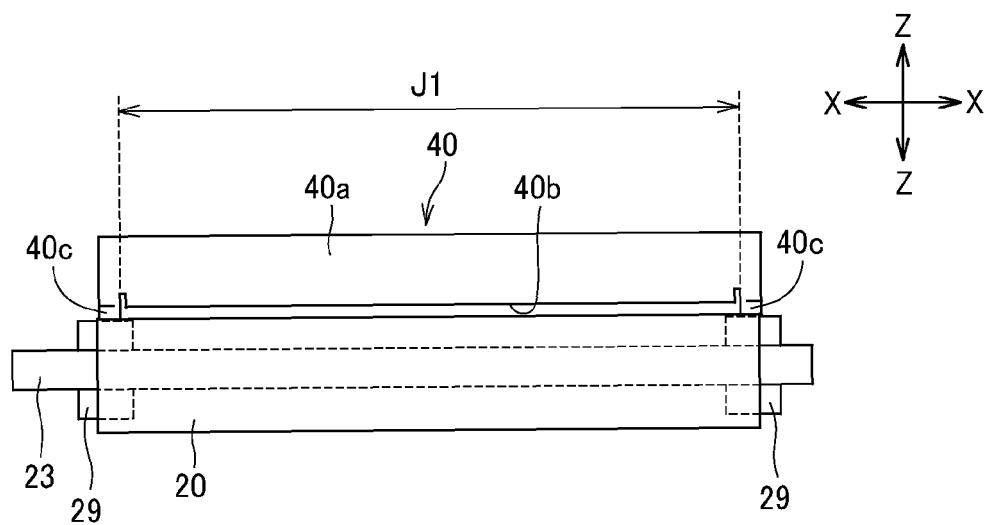


FIG. 9

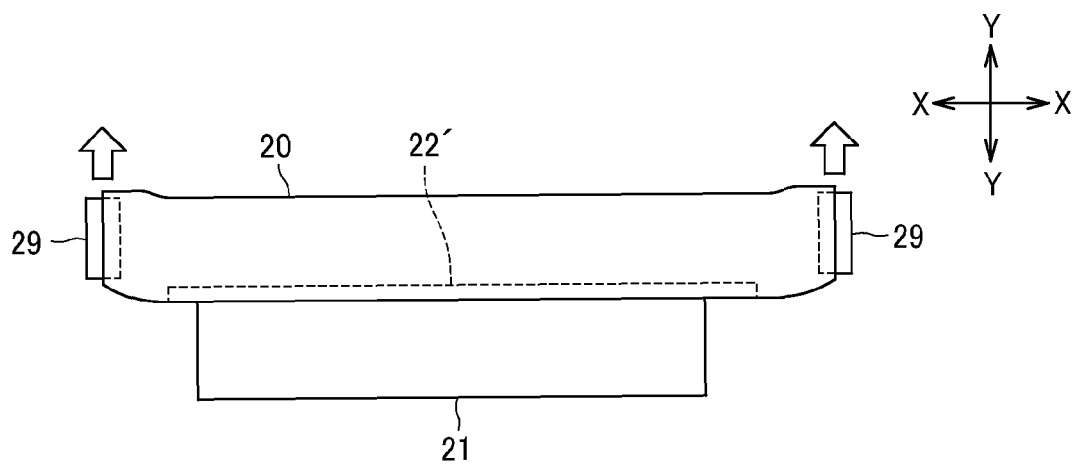


FIG. 10

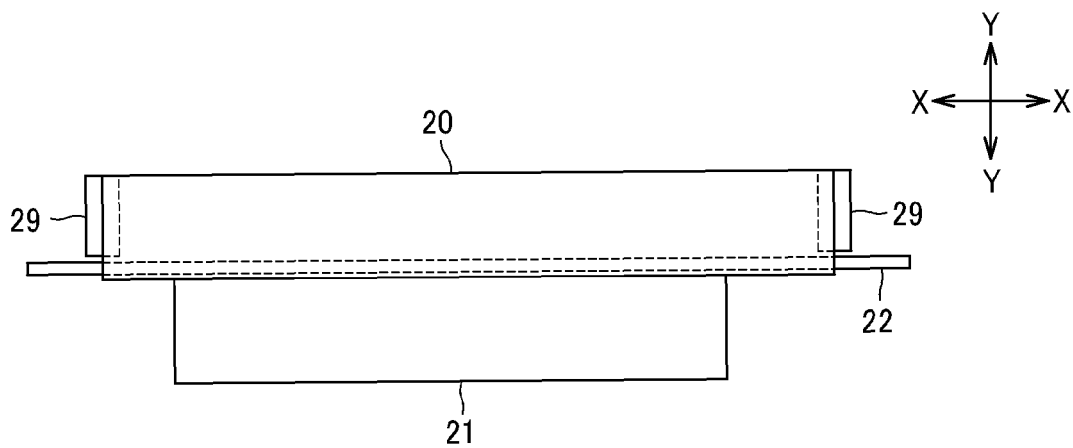


FIG. 11

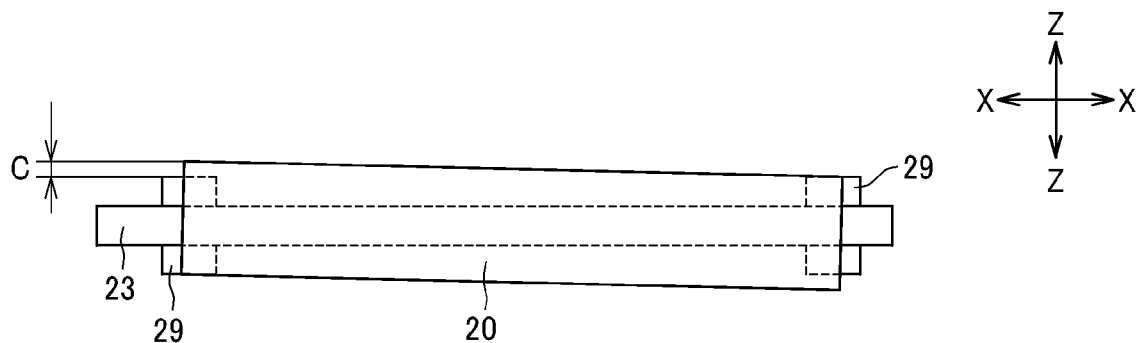


FIG. 12

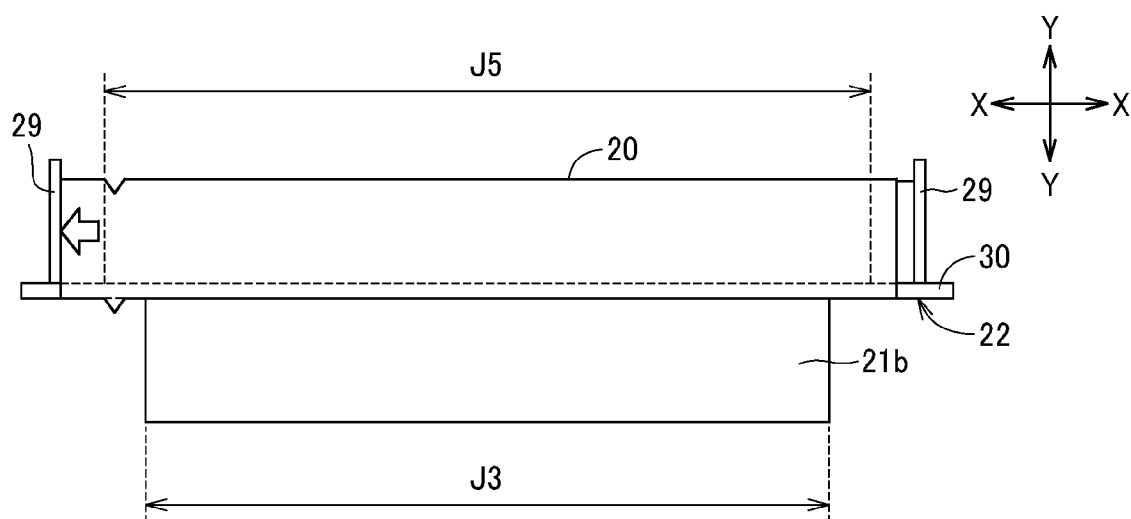


FIG. 13

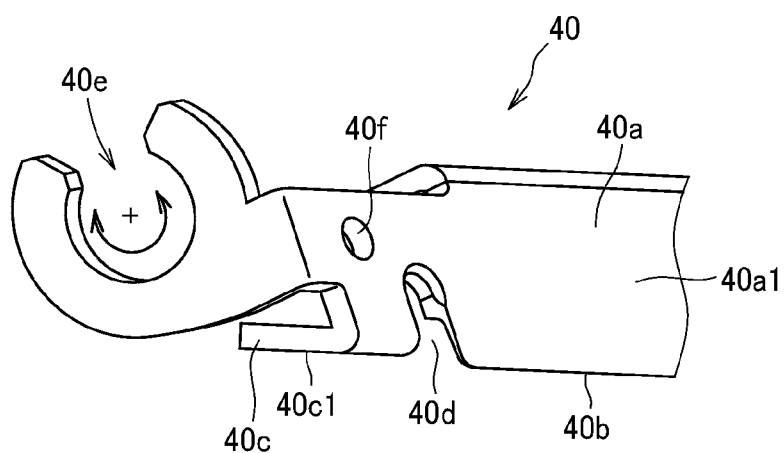


FIG. 14

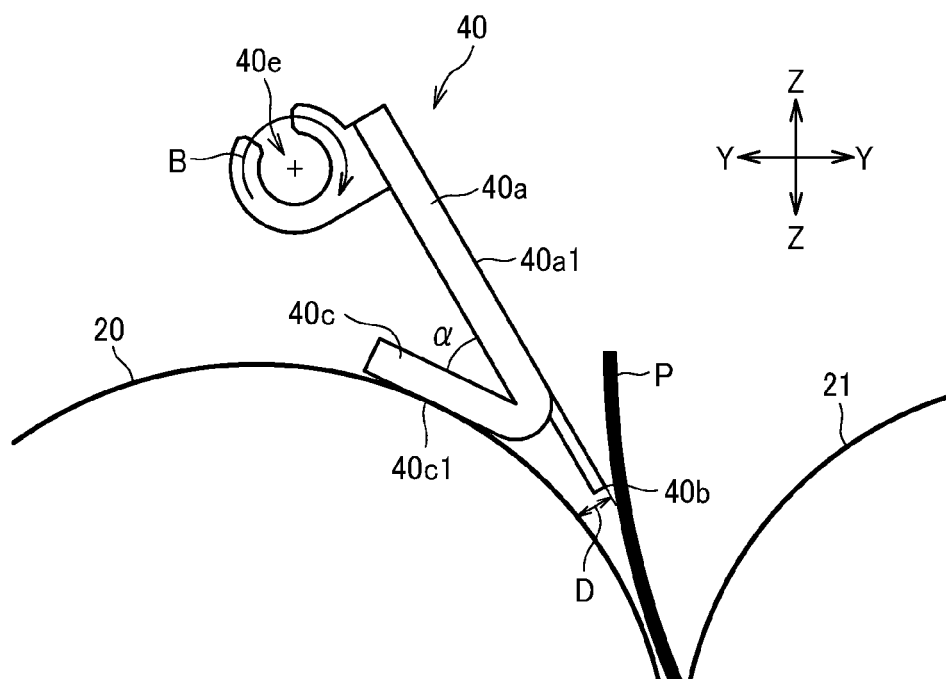


FIG. 15

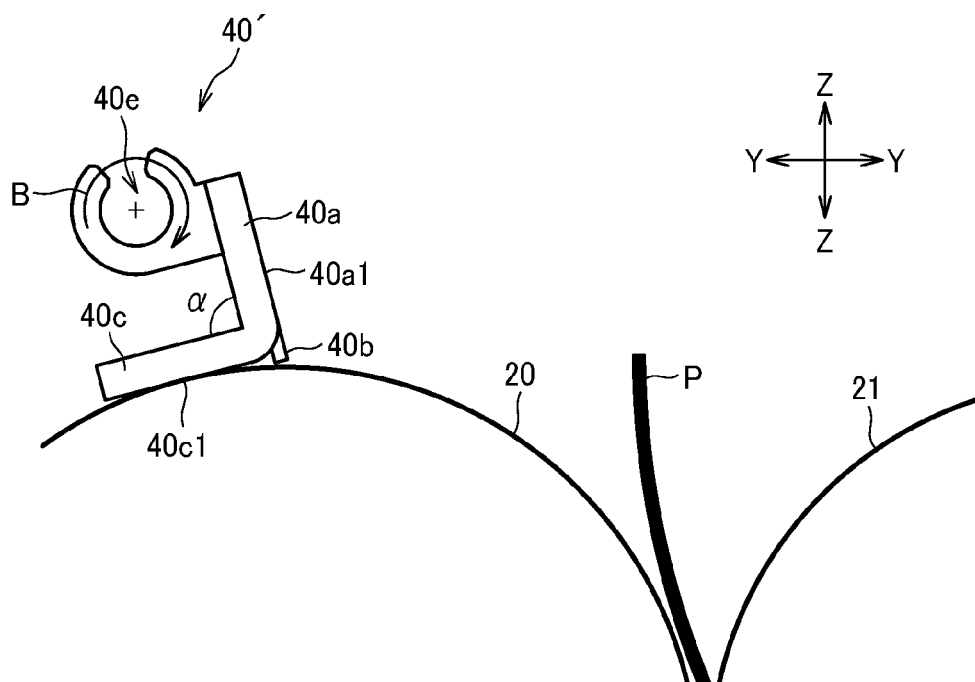


FIG. 16

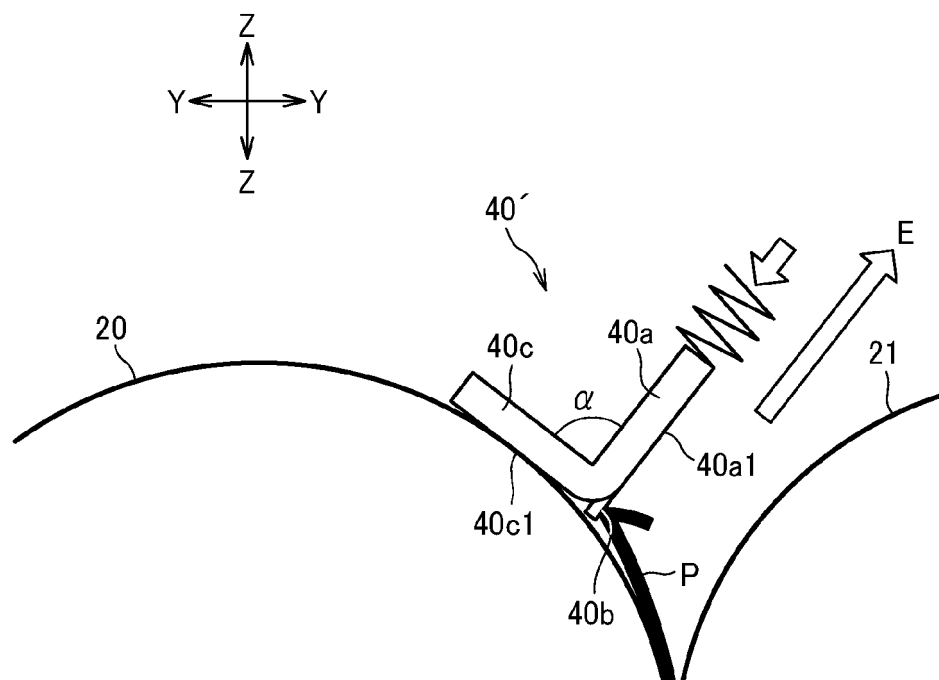


FIG. 17

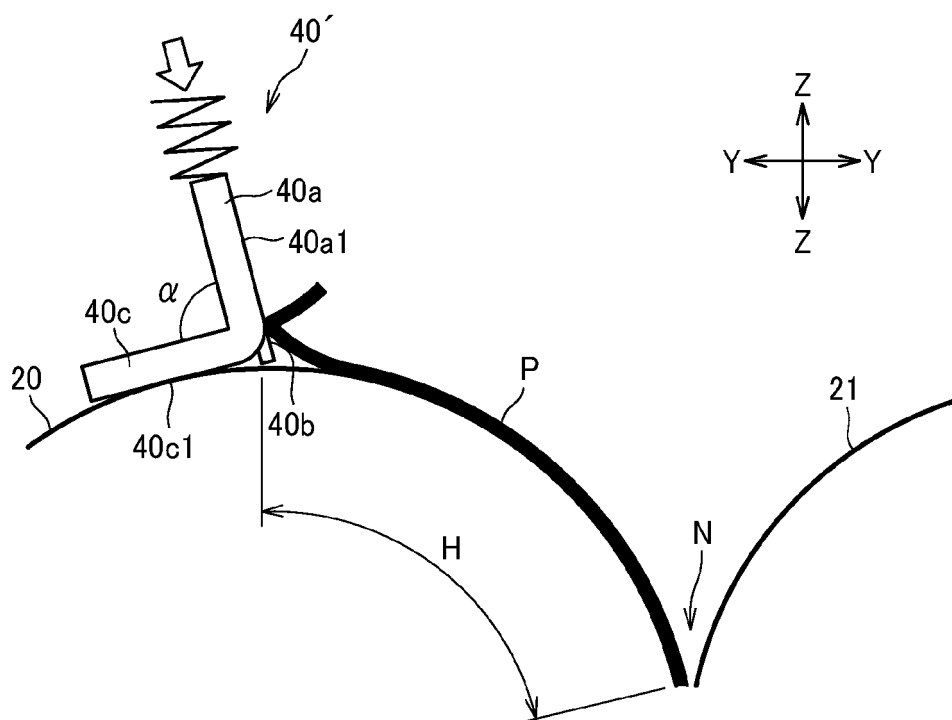


FIG. 18

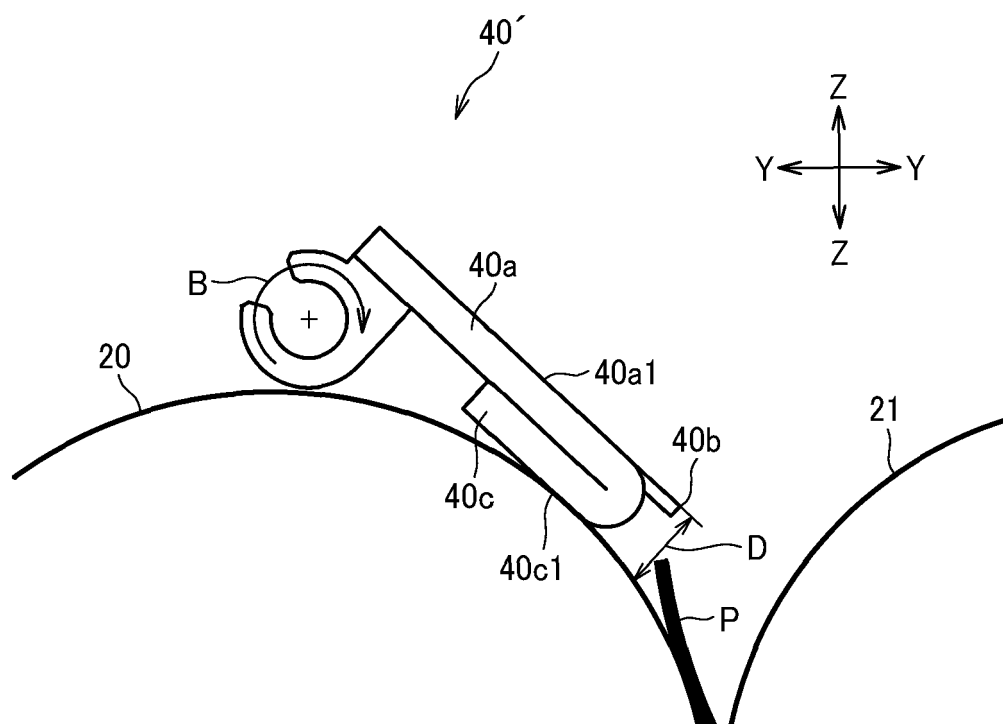


FIG. 19

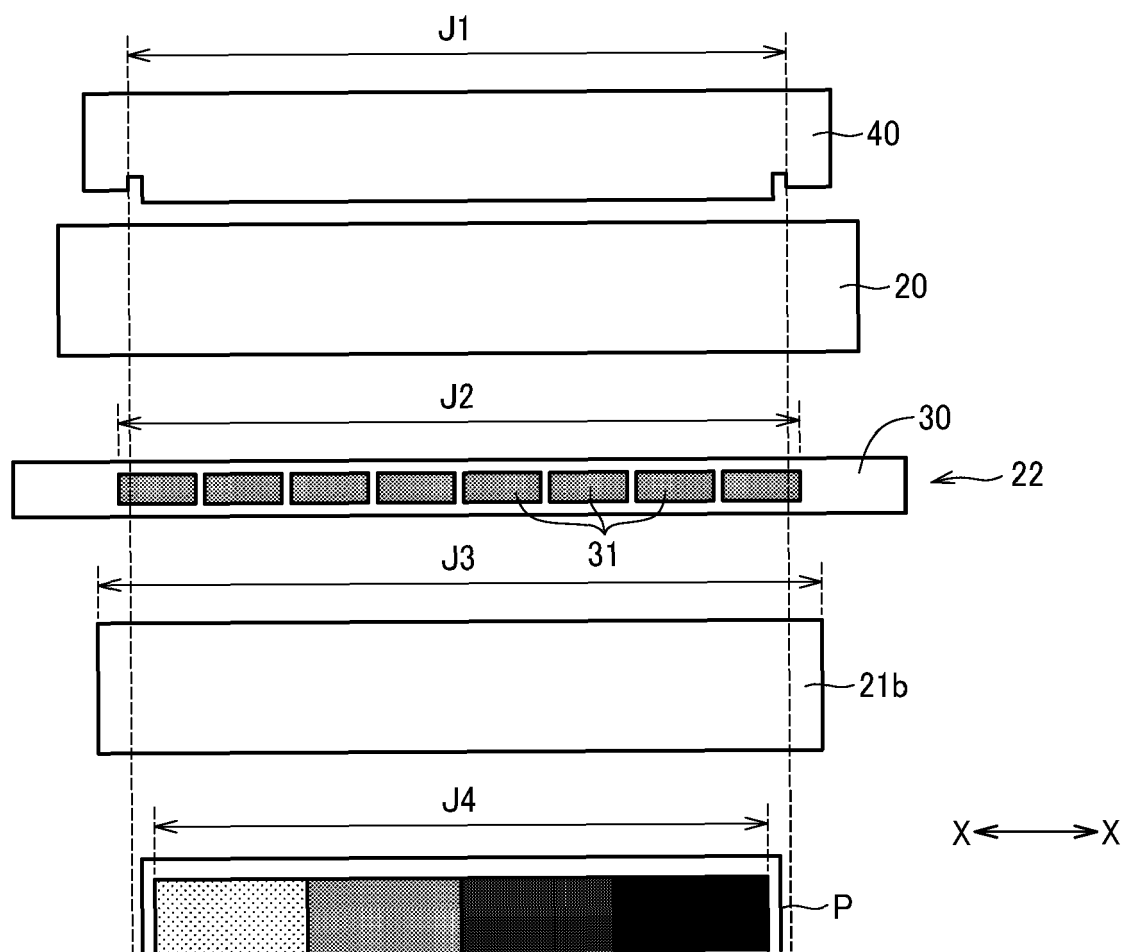


FIG. 20

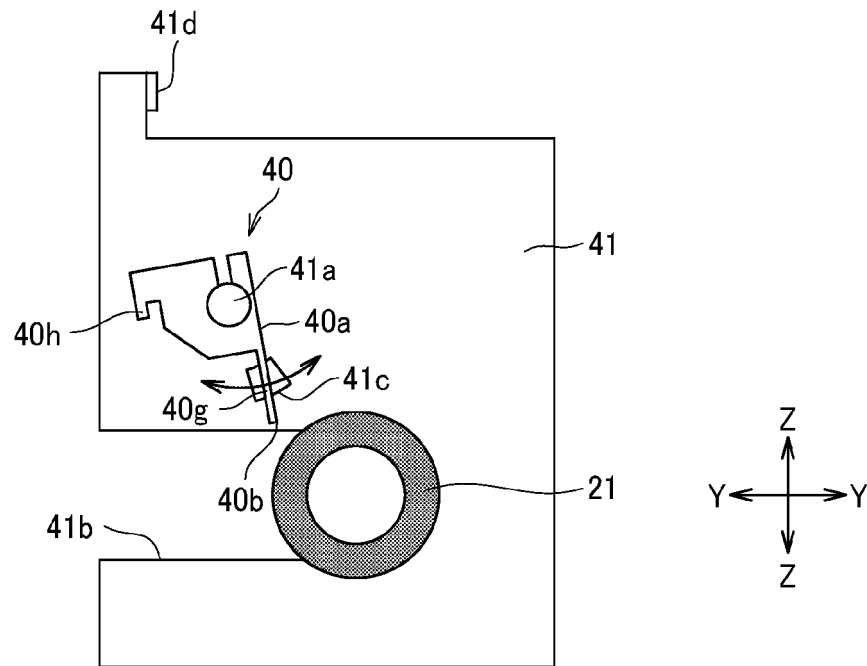


FIG. 21

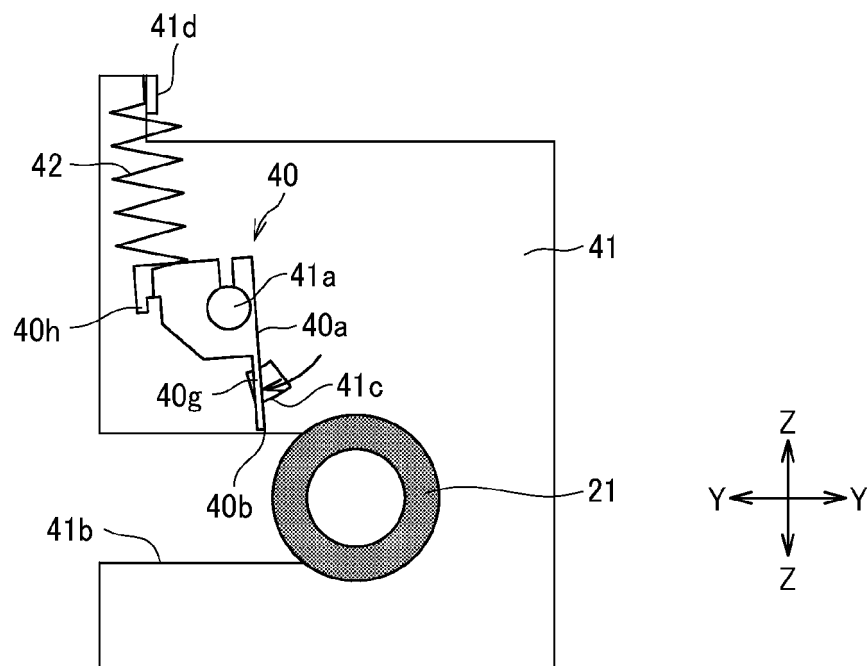


FIG. 22

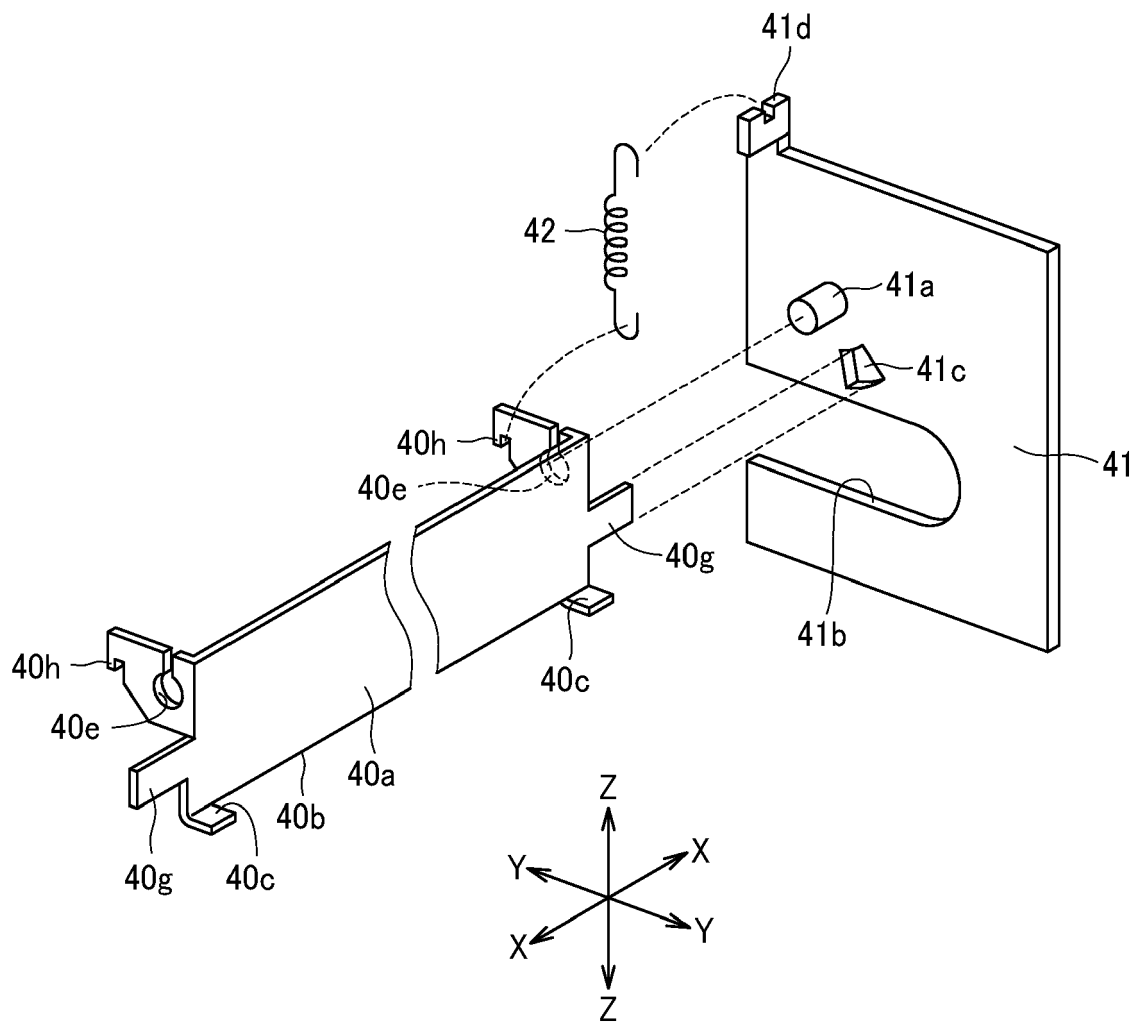


FIG. 23

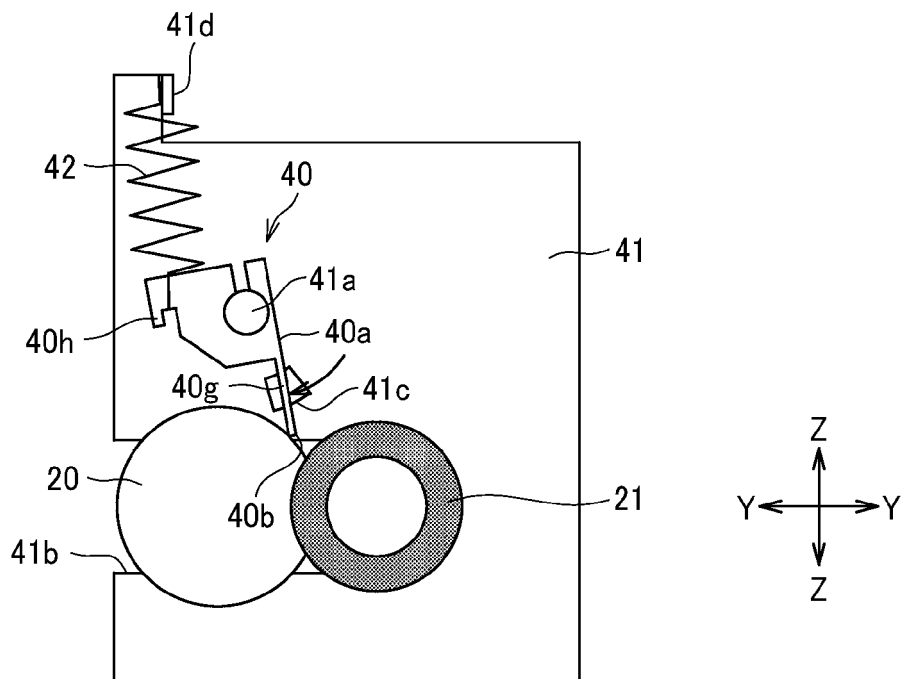


FIG. 24

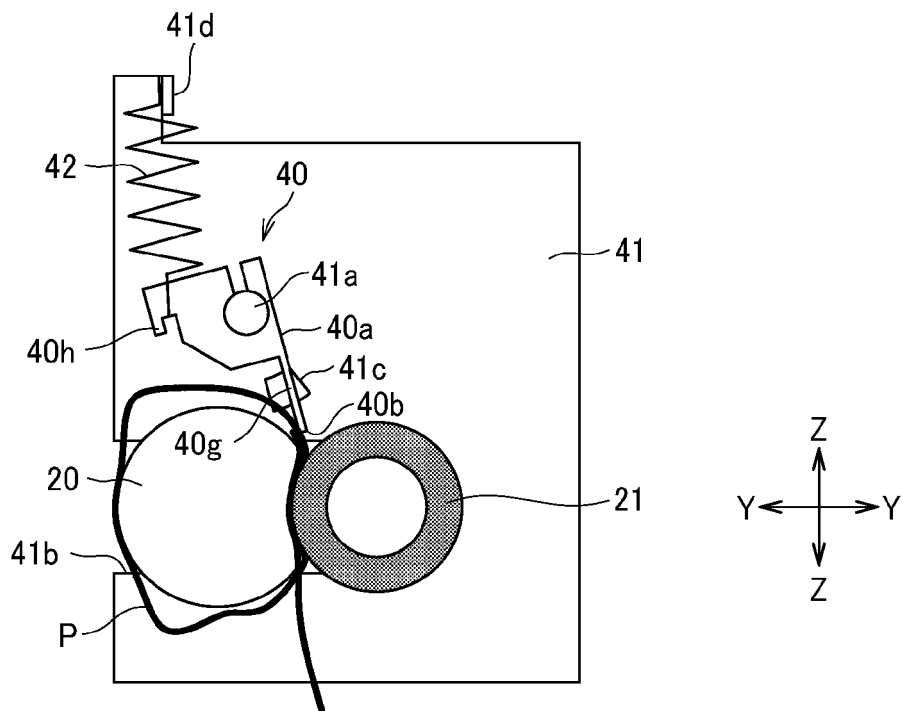


FIG. 25

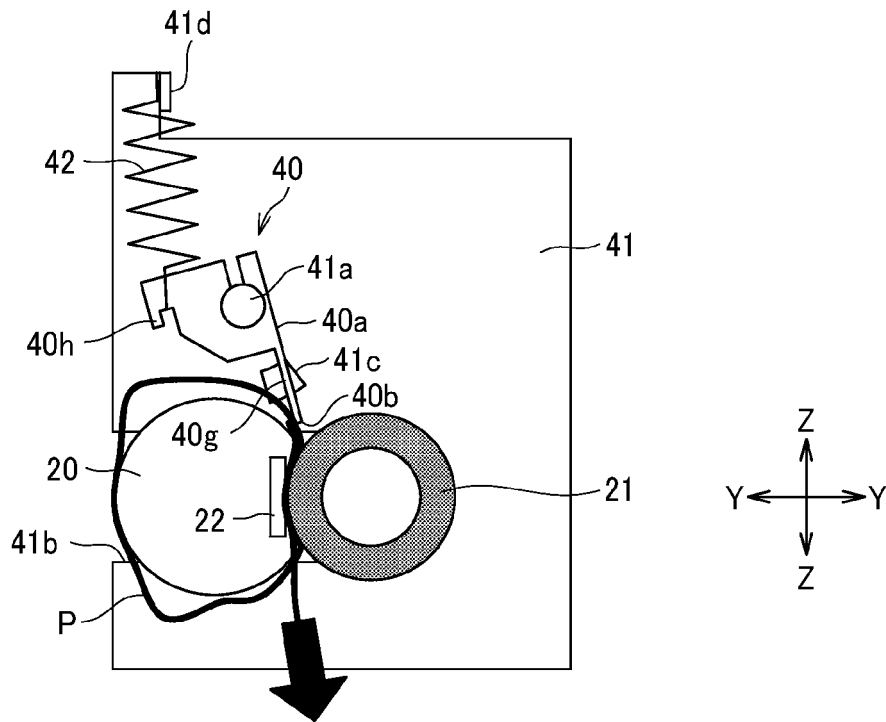


FIG. 26

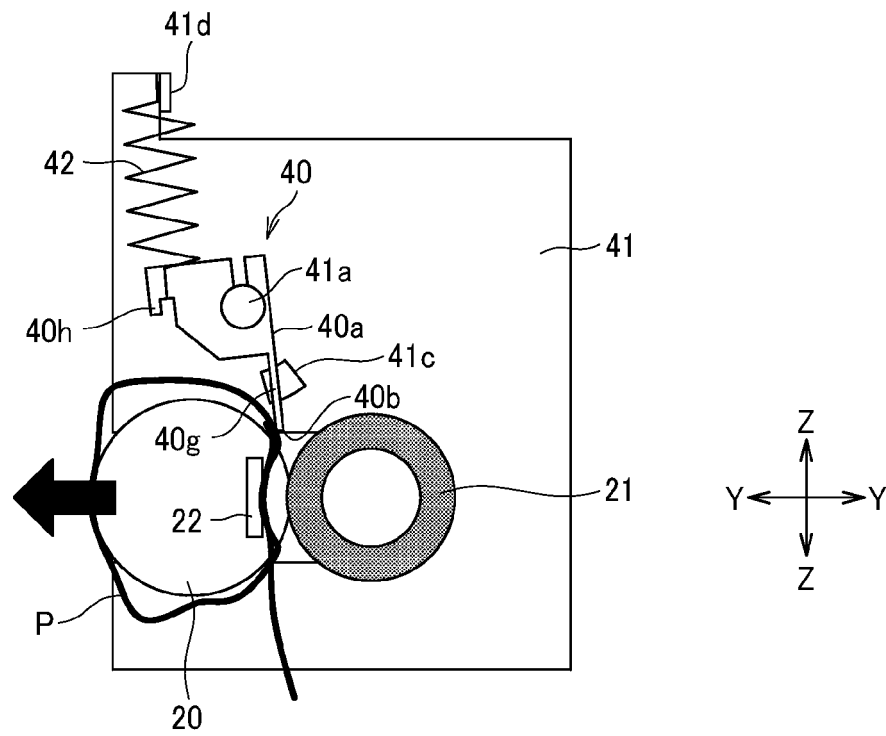


FIG. 27

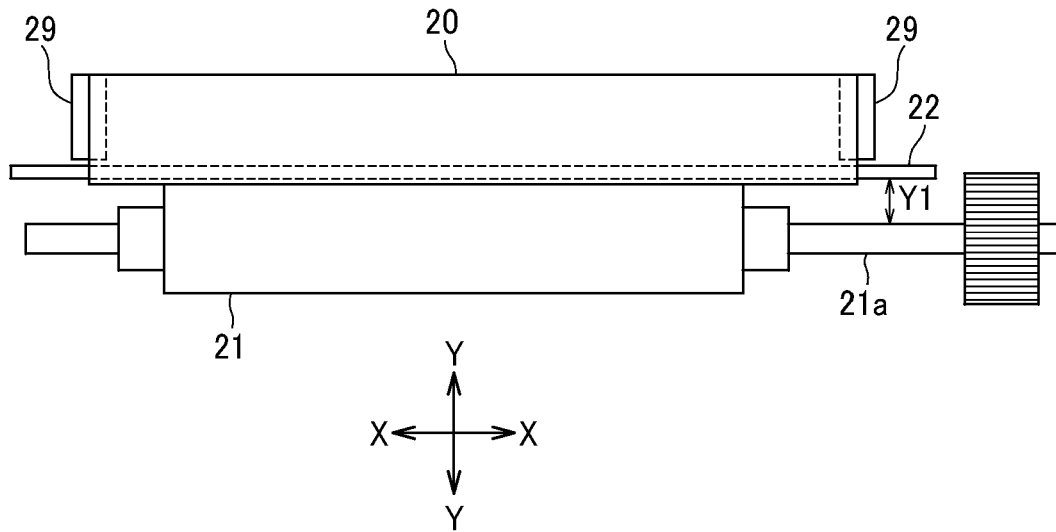


FIG. 28

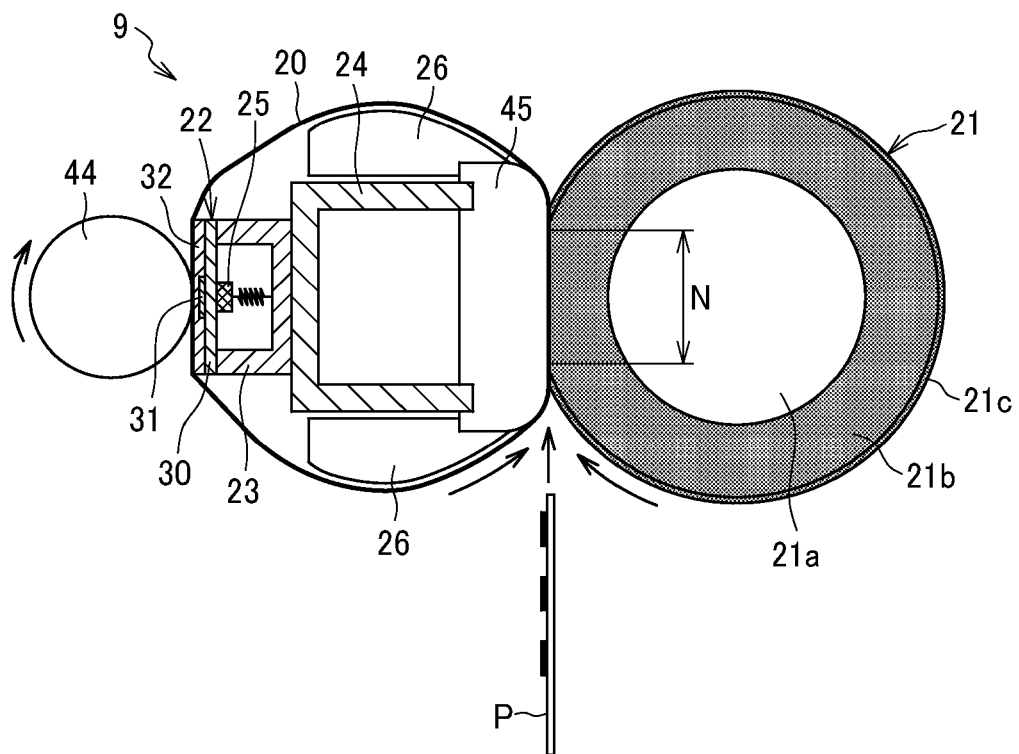


FIG. 29

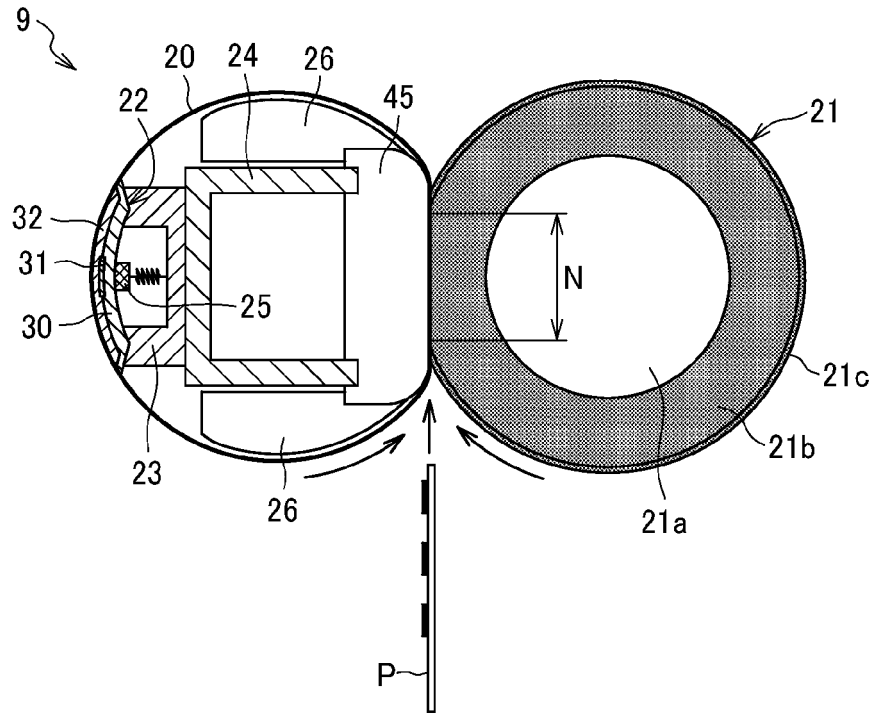


FIG. 30

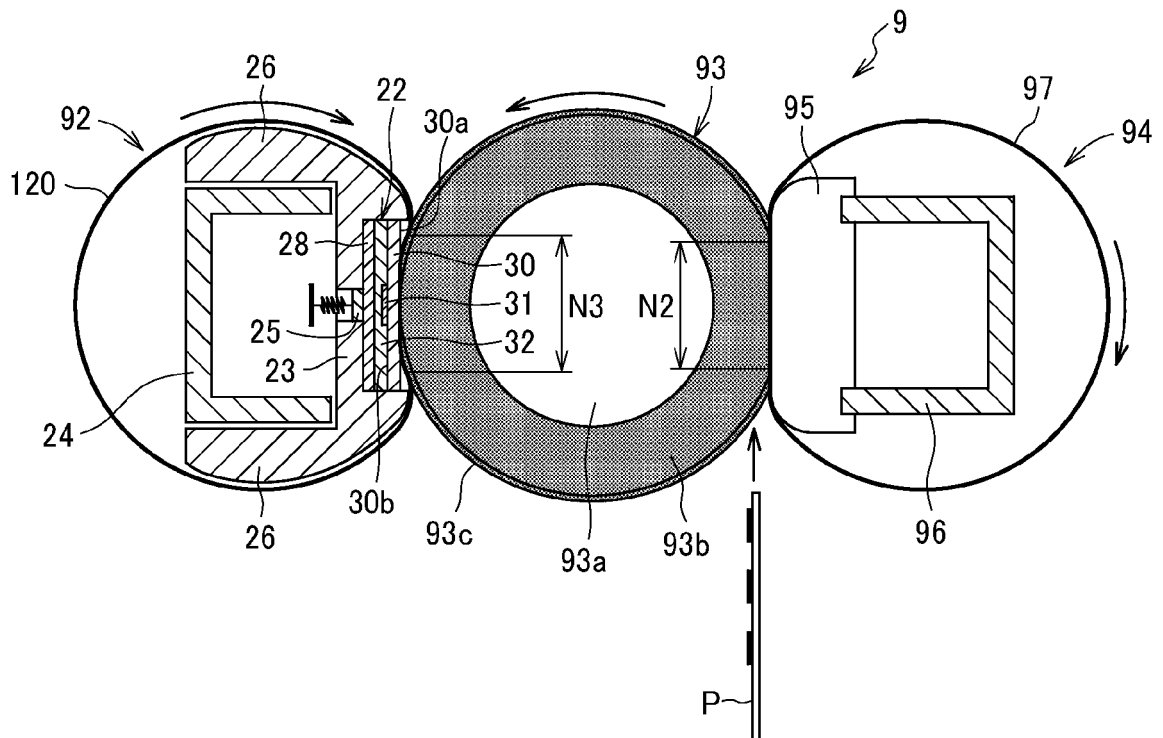


FIG. 31

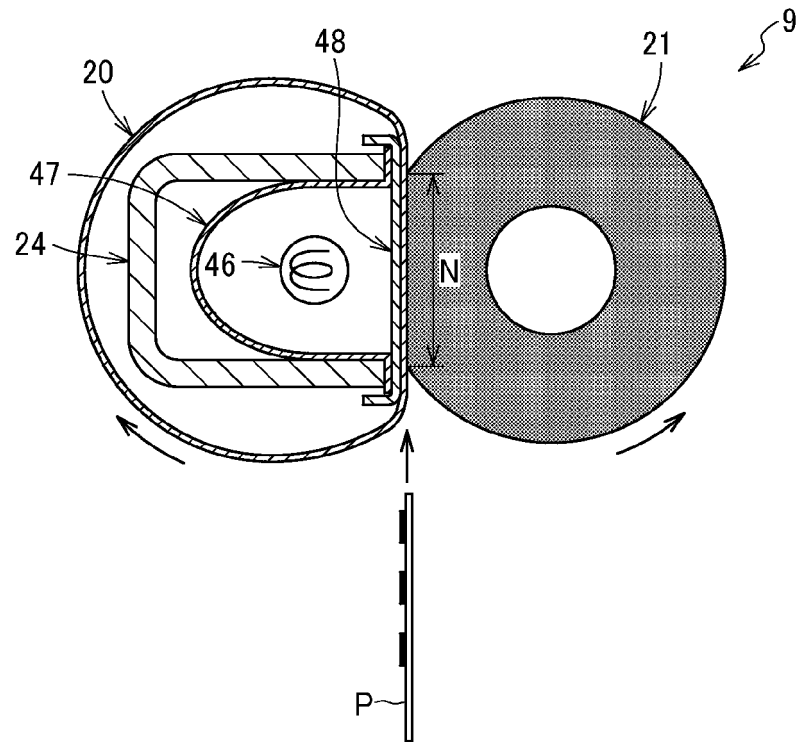
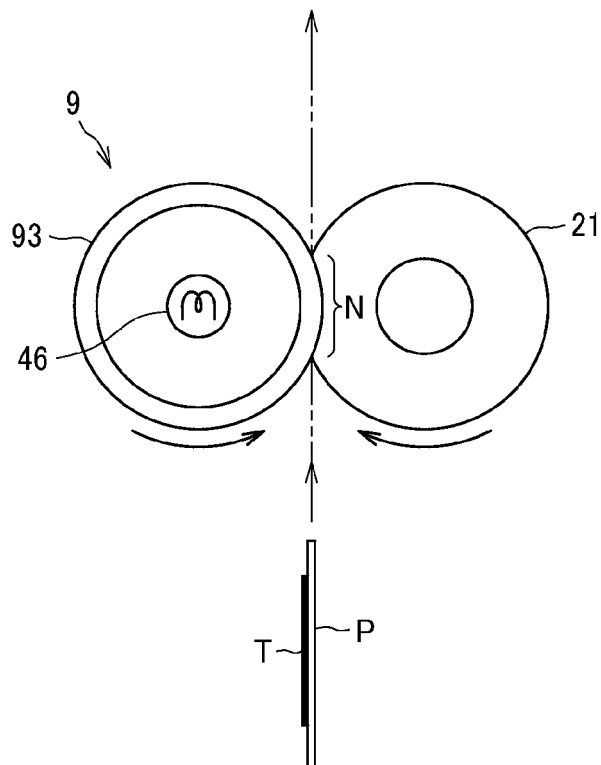


FIG. 32



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2013186394 A [0004] [0005]