US 20190332046A1

(19) **United States**

(12) **Patent Application Publication**

SHIBAHARA

(10) **Pub. No.: US 2019/0332046 A1**

(43) **Pub. Date: Oct. 31, 2019**

(54) **FIXING DEVICE AND IMAGE FORMING APPARATUS**

(71) Applicant: **KYOCERA Document Solutions Inc.**, Osaka (JP)

(72) Inventor: **Masami SHIBAHARA**, Osaka (JP)

(73) Assignee: **KYOCERA Document Solutions Inc.**, Osaka (JP)

(21) Appl. No.: **16/391,828**

(22) Filed: **Apr. 23, 2019**

(30) **Foreign Application Priority Data**

Apr. 26, 2018 (JP) 2018-085648

Publication Classification

(51) **Int. Cl.**

G03G 15/20 (2006.01)

G03G 15/00 (2006.01)

(52) **U.S. Cl.**

CPC . ***G03G 15/2064*** (2013.01); *G03G 2215/2035* (2013.01); ***G03G 15/80*** (2013.01); ***G03G 15/2053*** (2013.01)

(57) **ABSTRACT**

In a fixing device, a pressure roller is in contact with a fixing belt to form a fixing nip part with the fixing belt, a heating member heats the fixing belt when electrodes are energized, and a holding member holds the heating member. A connector in the fixing device includes a contact terminal that is in contact with the electrode, and by being mounted at a predetermined position of the holding member, the electrode and the contact terminal are in contact with each other. The holding member includes: a guide part having an inclined surface which is inclined with respect to a predetermined direction; and a positioning part that sets the position of the connector, inserted while being in contact with the inclined surface, in a rotatable state toward the predetermined position. The contact terminal is in contact with the electrode over a period before and after rotation of the connector.

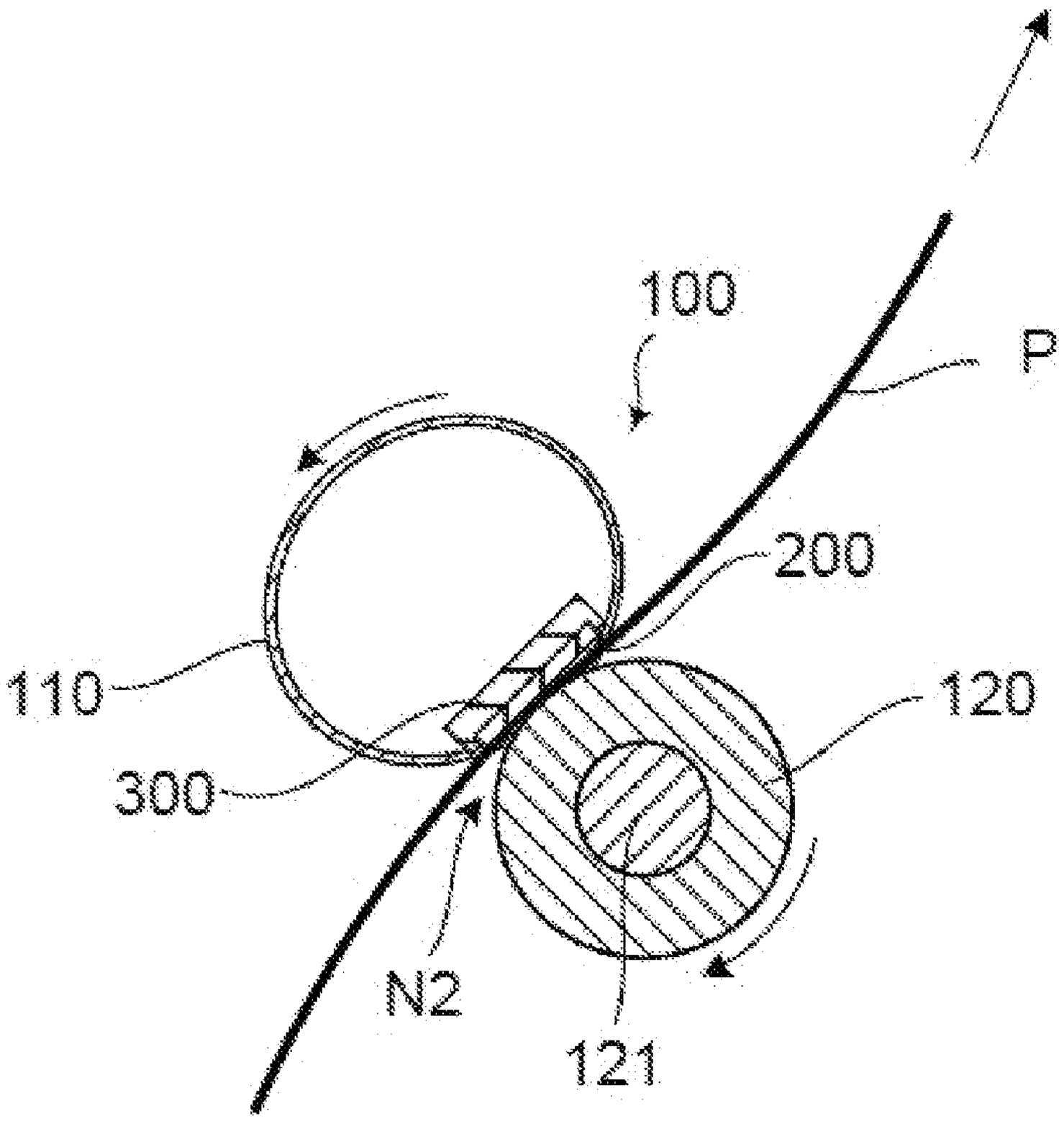


FIG. 1

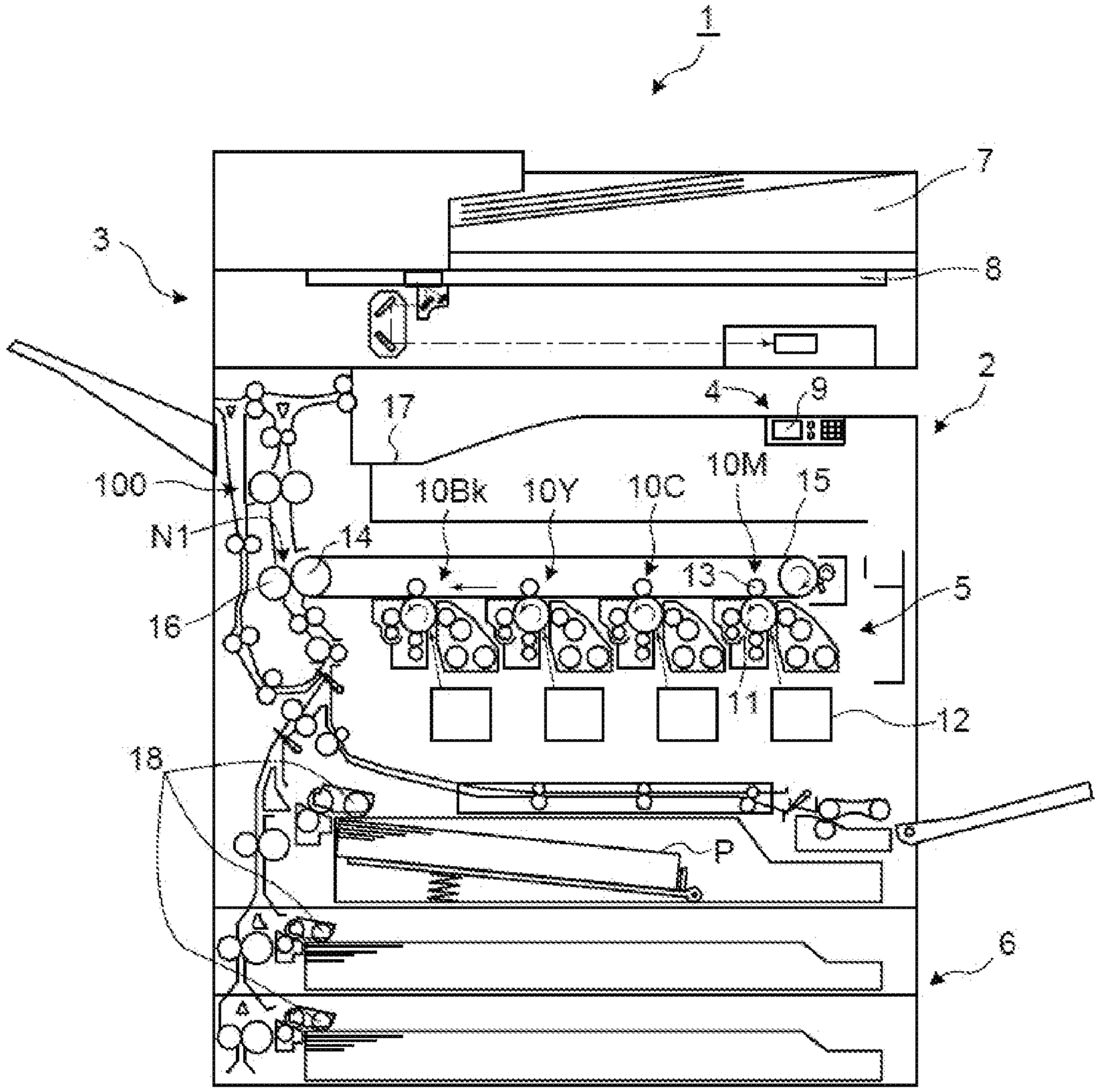


FIG. 2

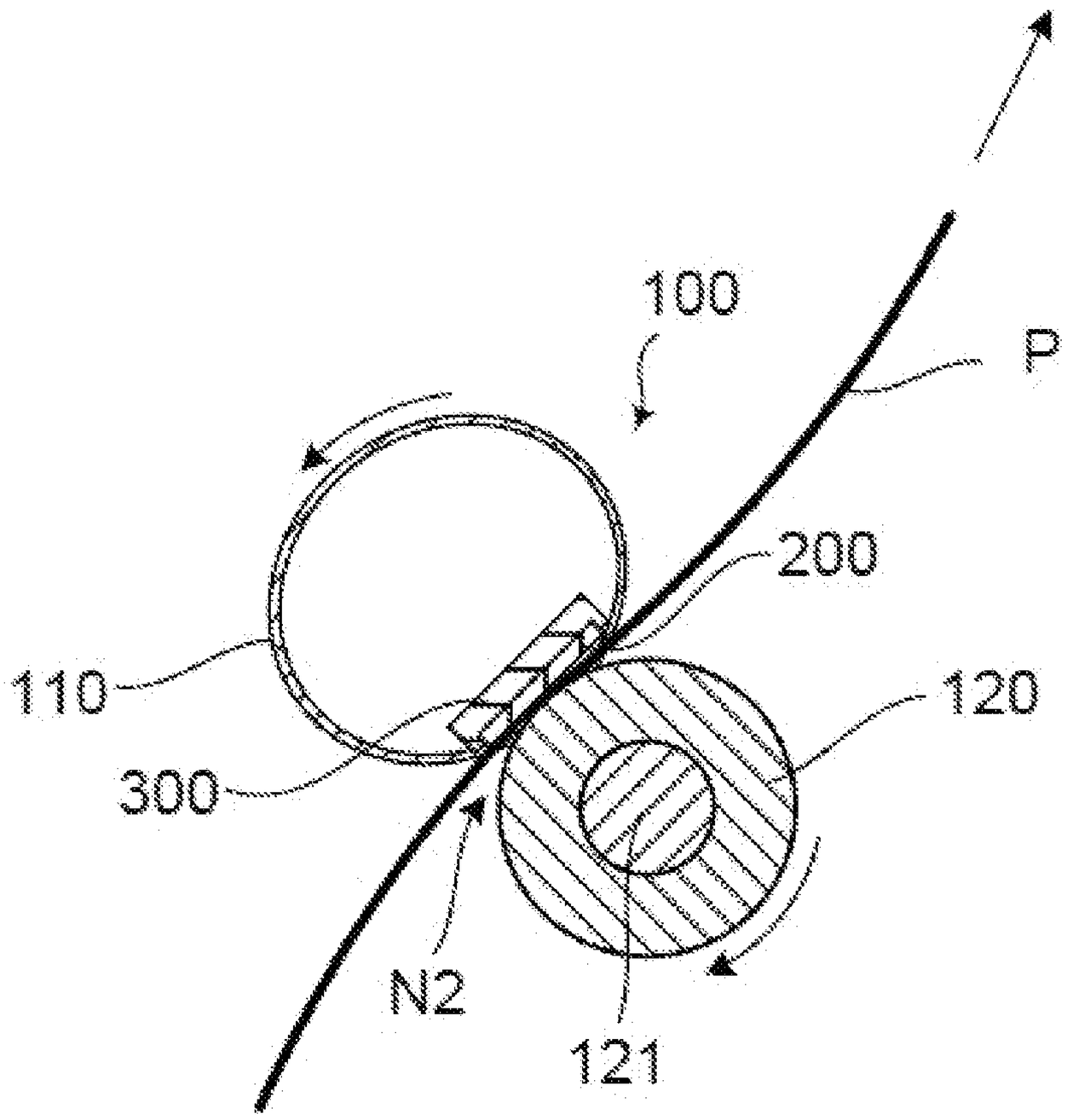


FIG. 3A

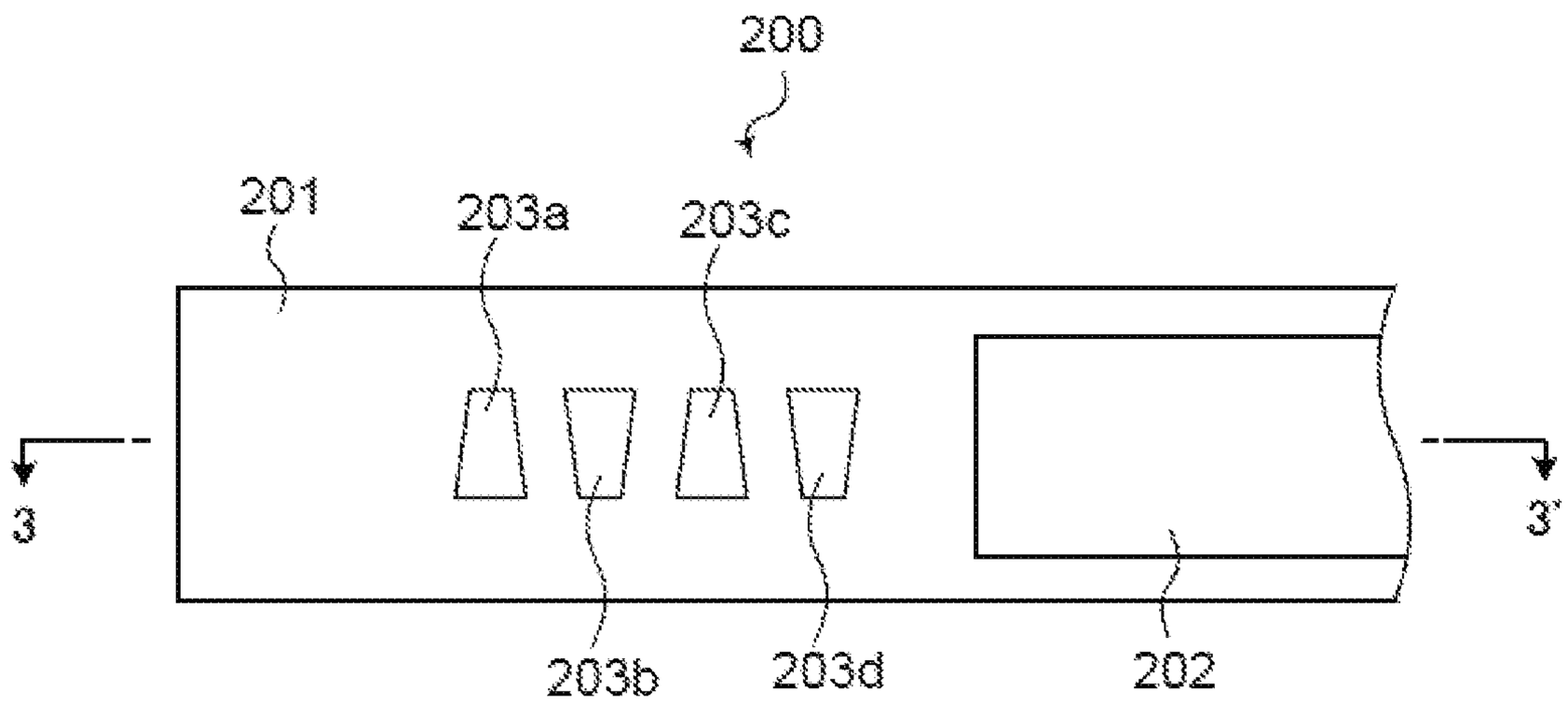

200
201
203a
203c
3
3'
203b
203d
202

FIG. 3B

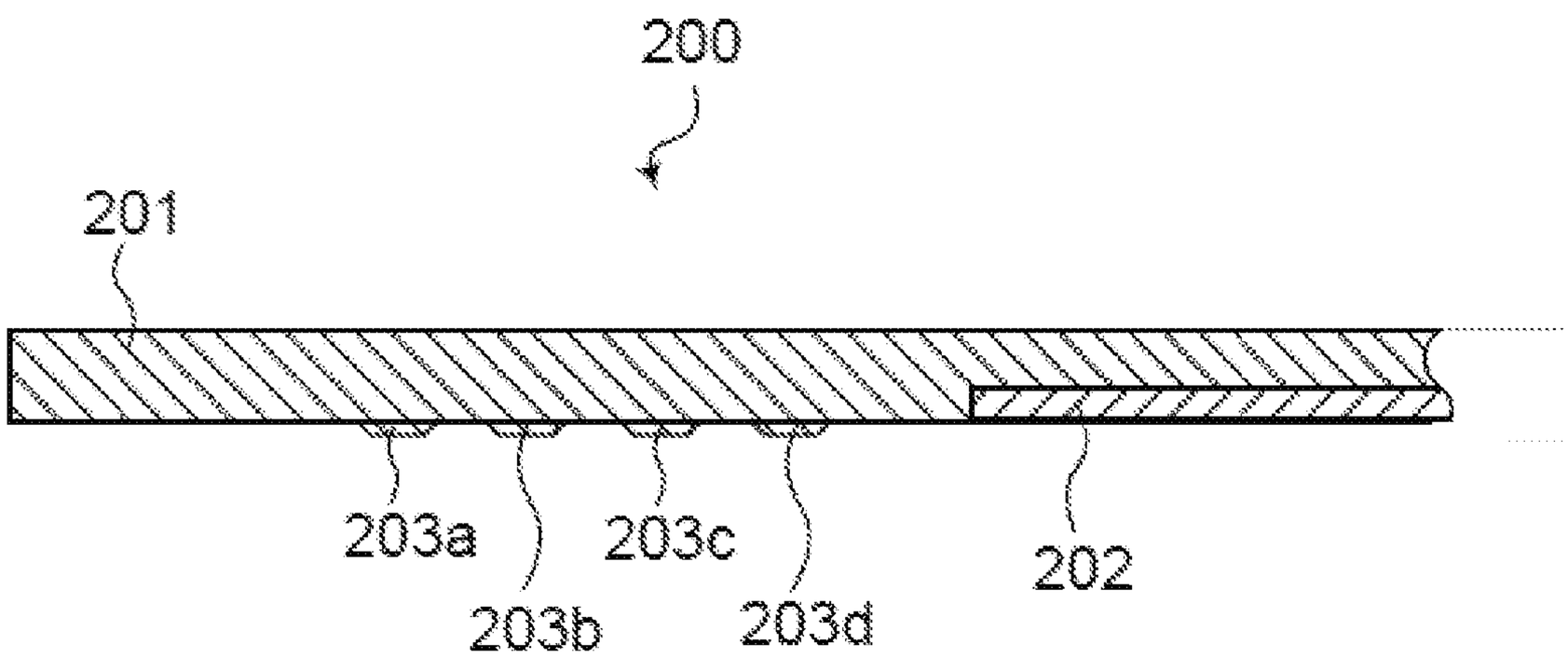

200
201
203a
203b
203c
203d
202

FIG. 4A

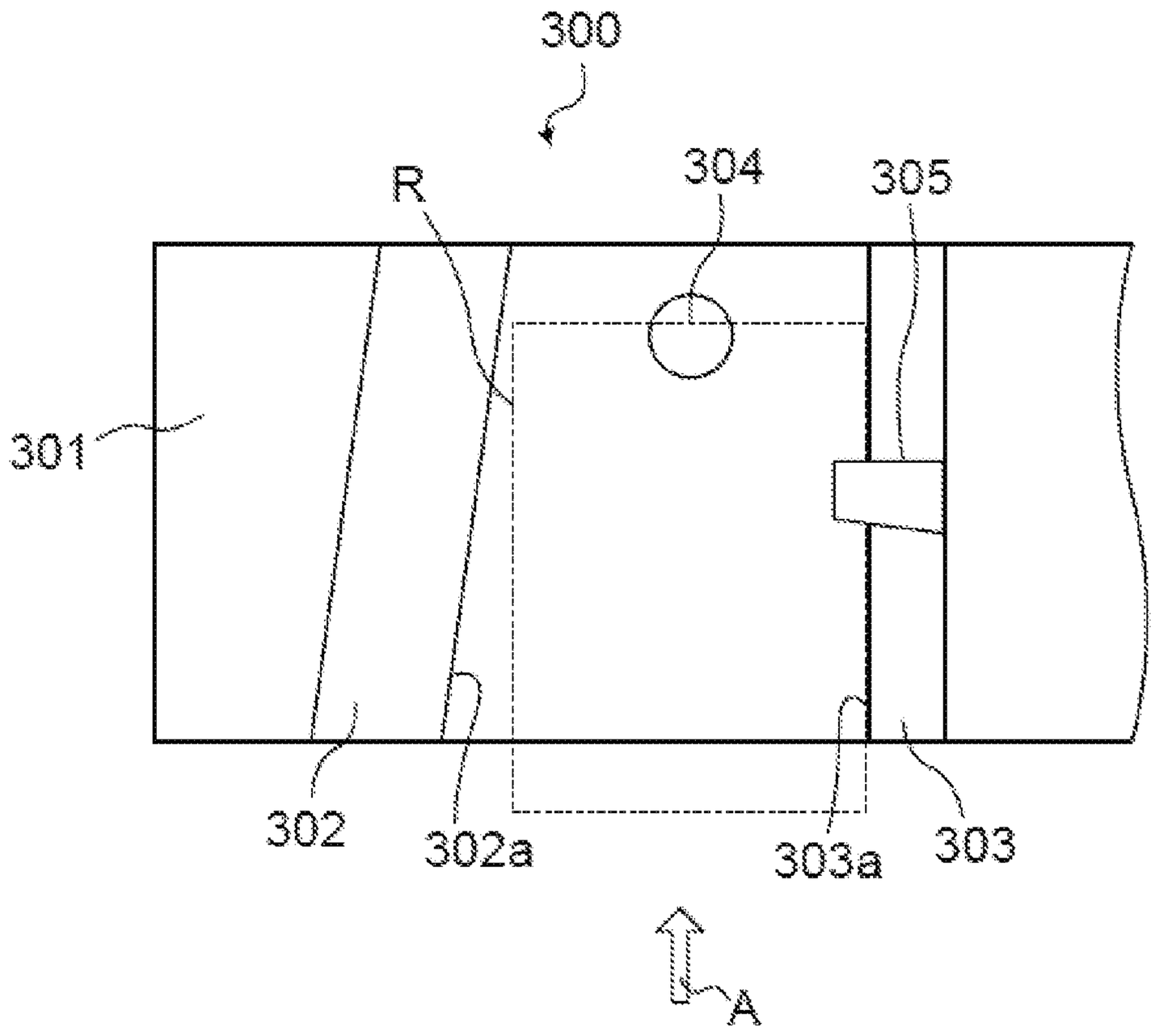

300
R
304
305
301
302
302a
303a
303
A

FIG. 4B

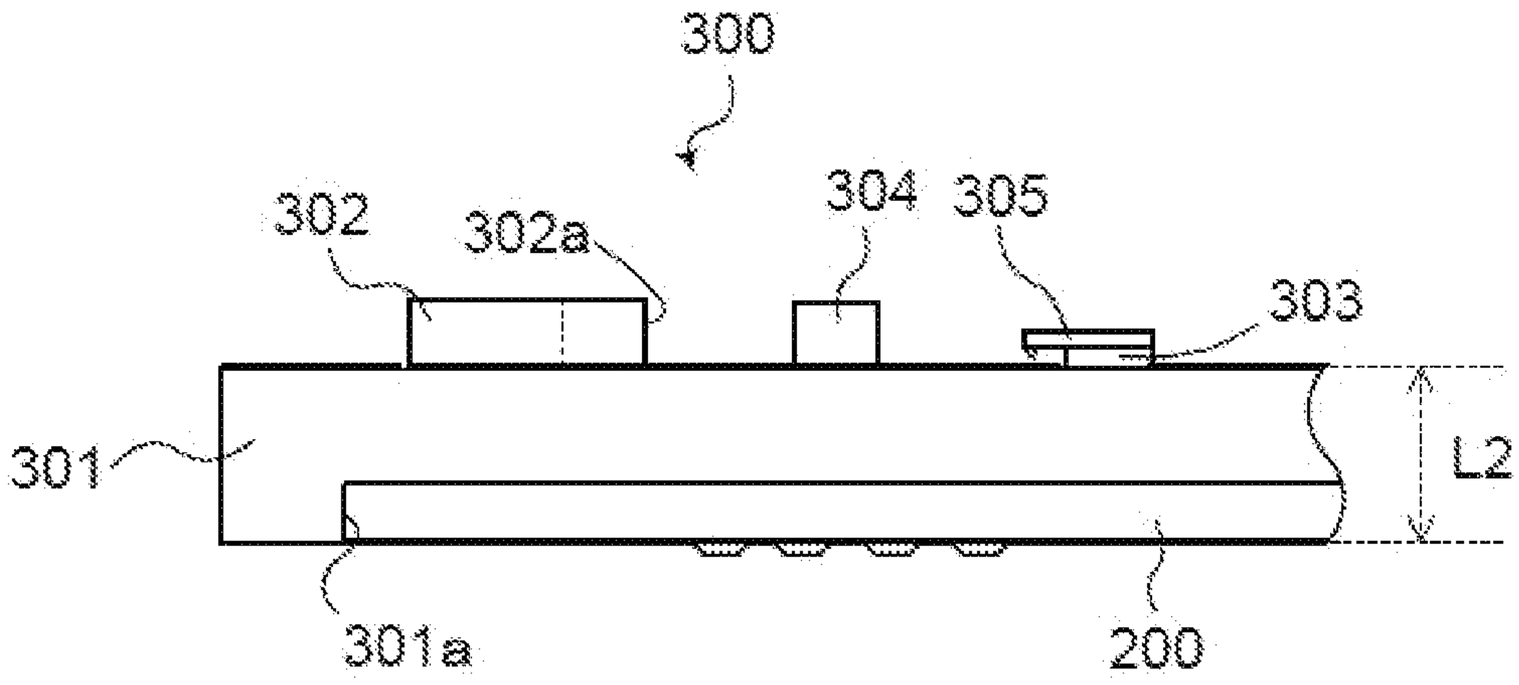

300
302
302a
304
305
303
301
L2
301a
200

FIG. 5A

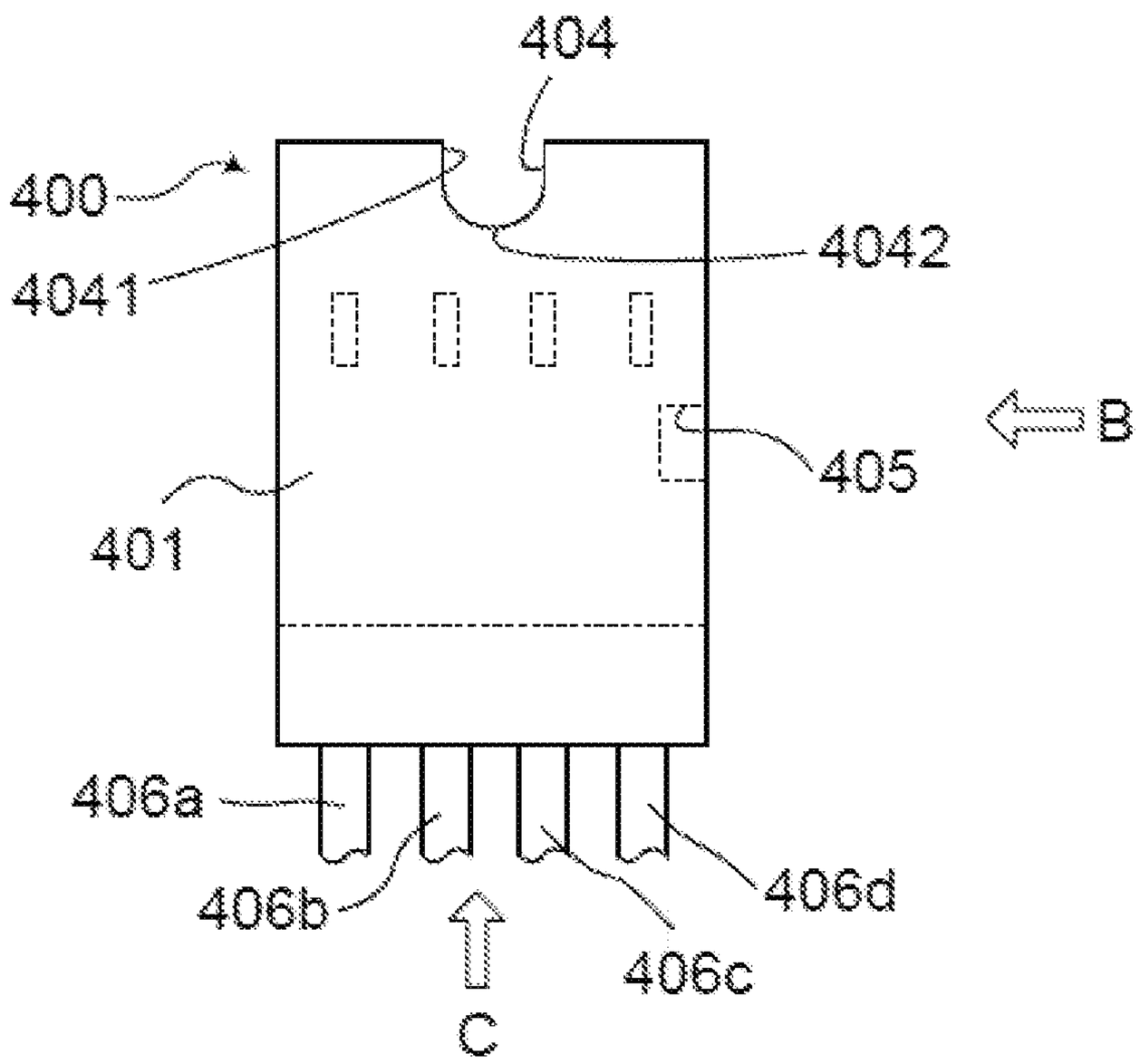


FIG. 5B

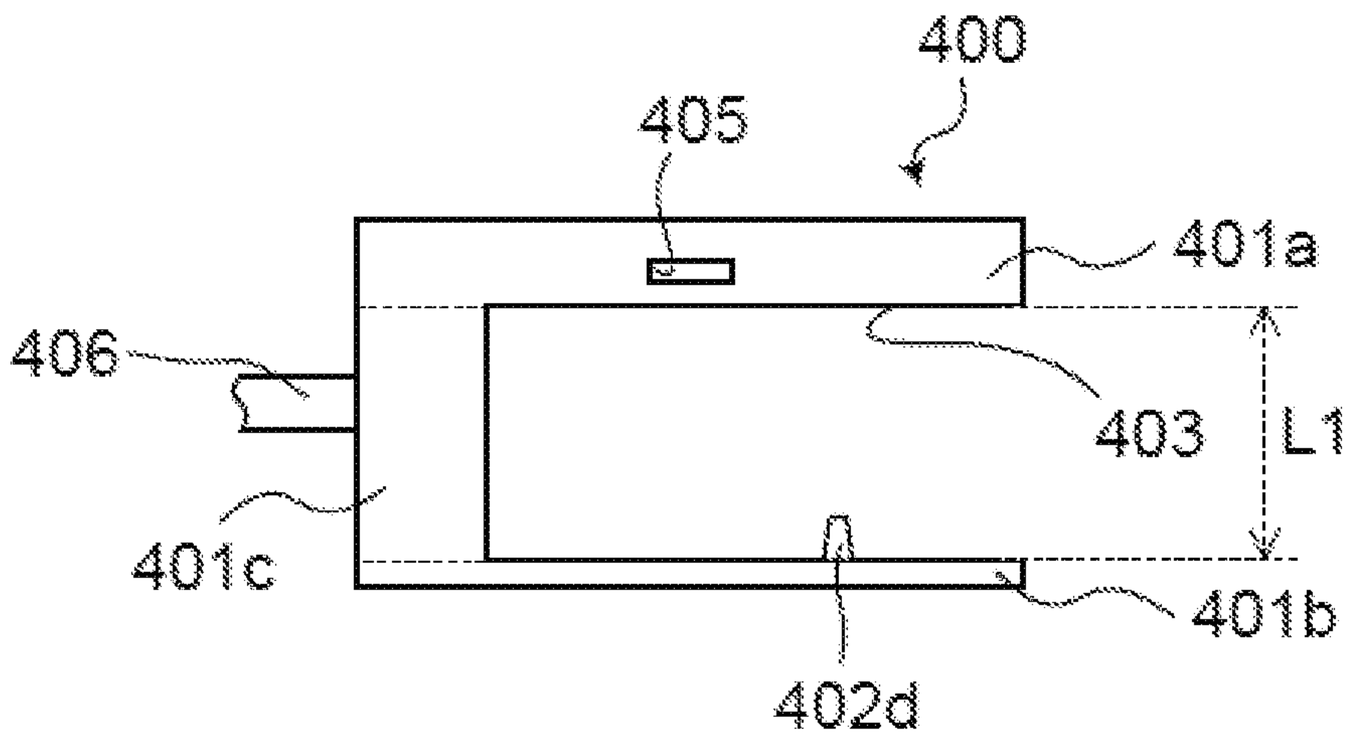

400
405
401a
406
403
L1
401c
401b
402d

FIG. 5C

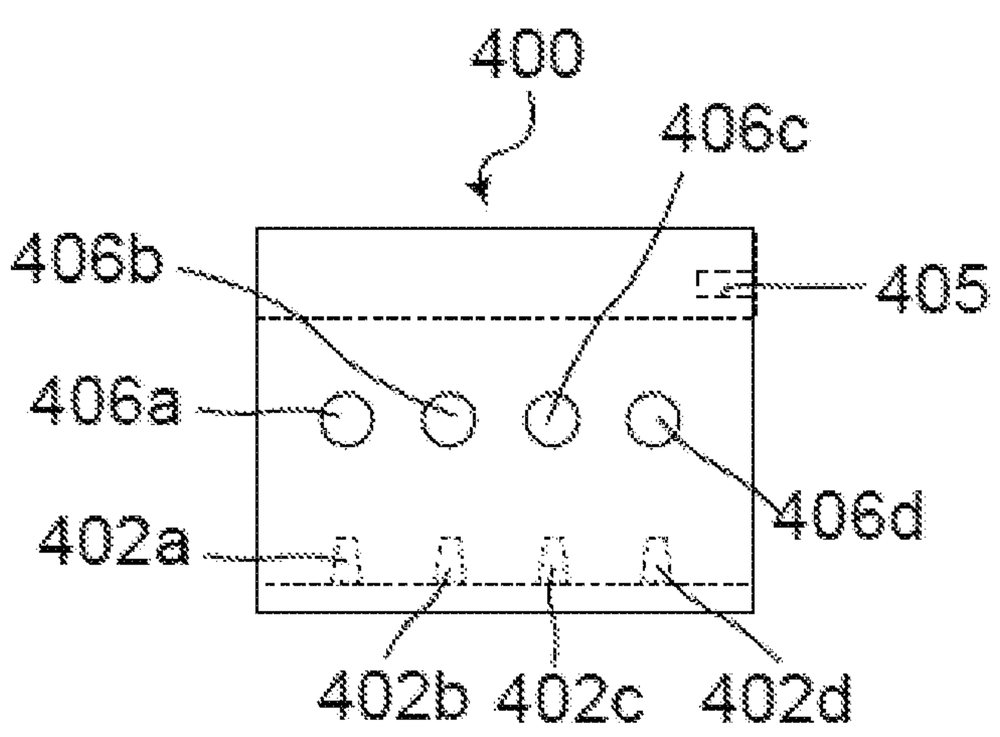

400
406c
406b
405
406a
406d
402a
402b
402c
402d

FIG. 6A

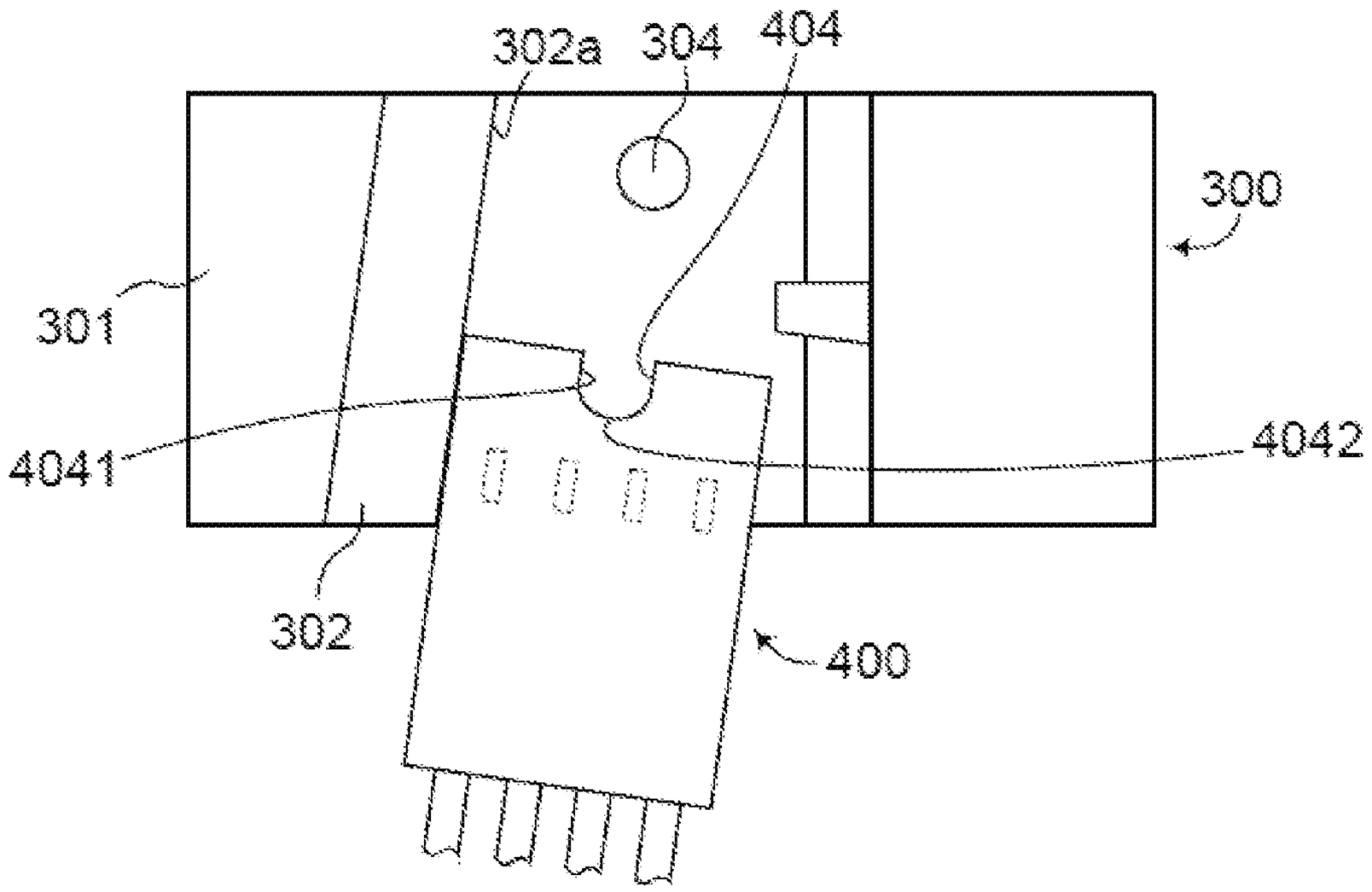


FIG. 6B

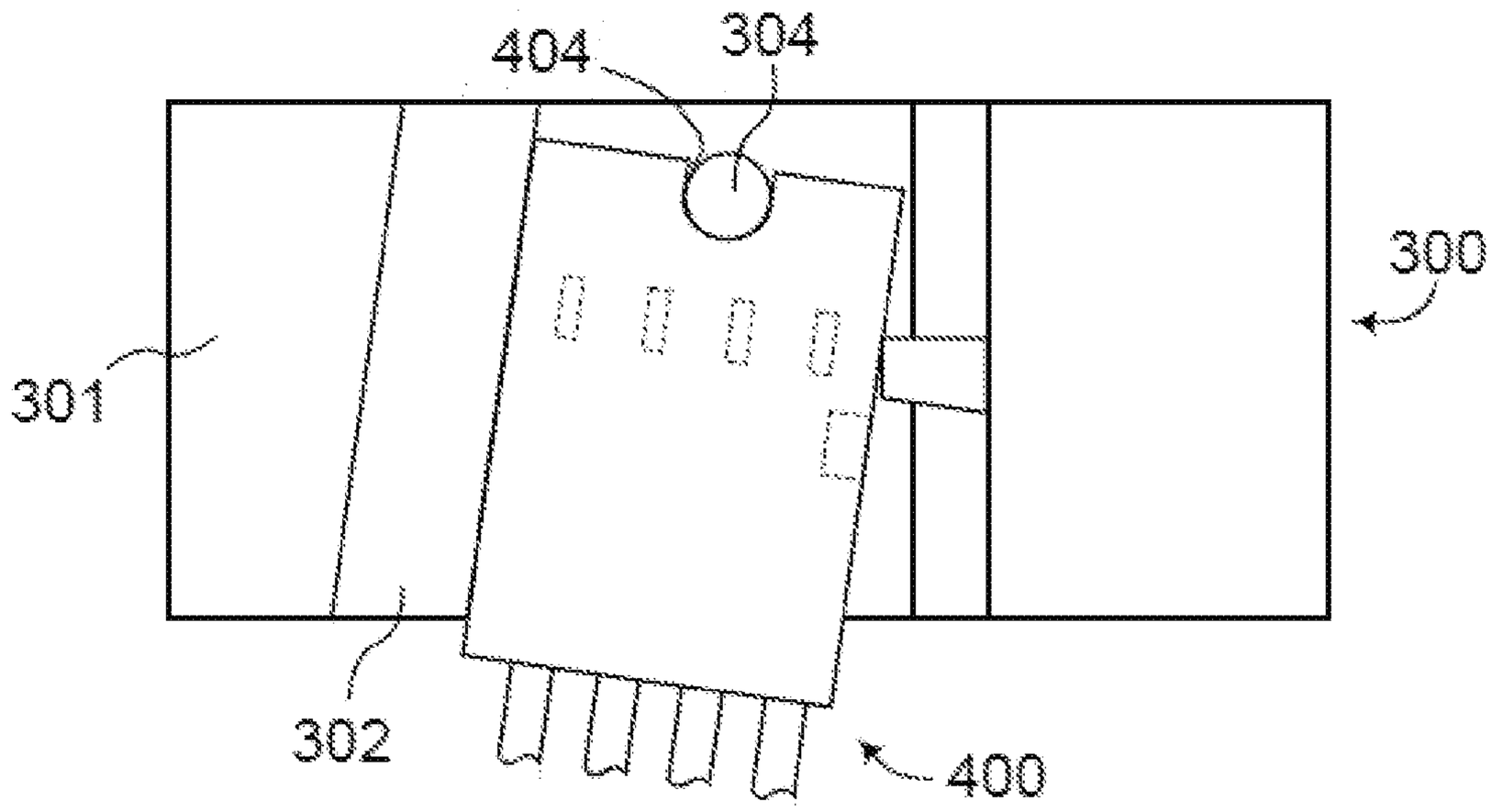


FIG. 6C

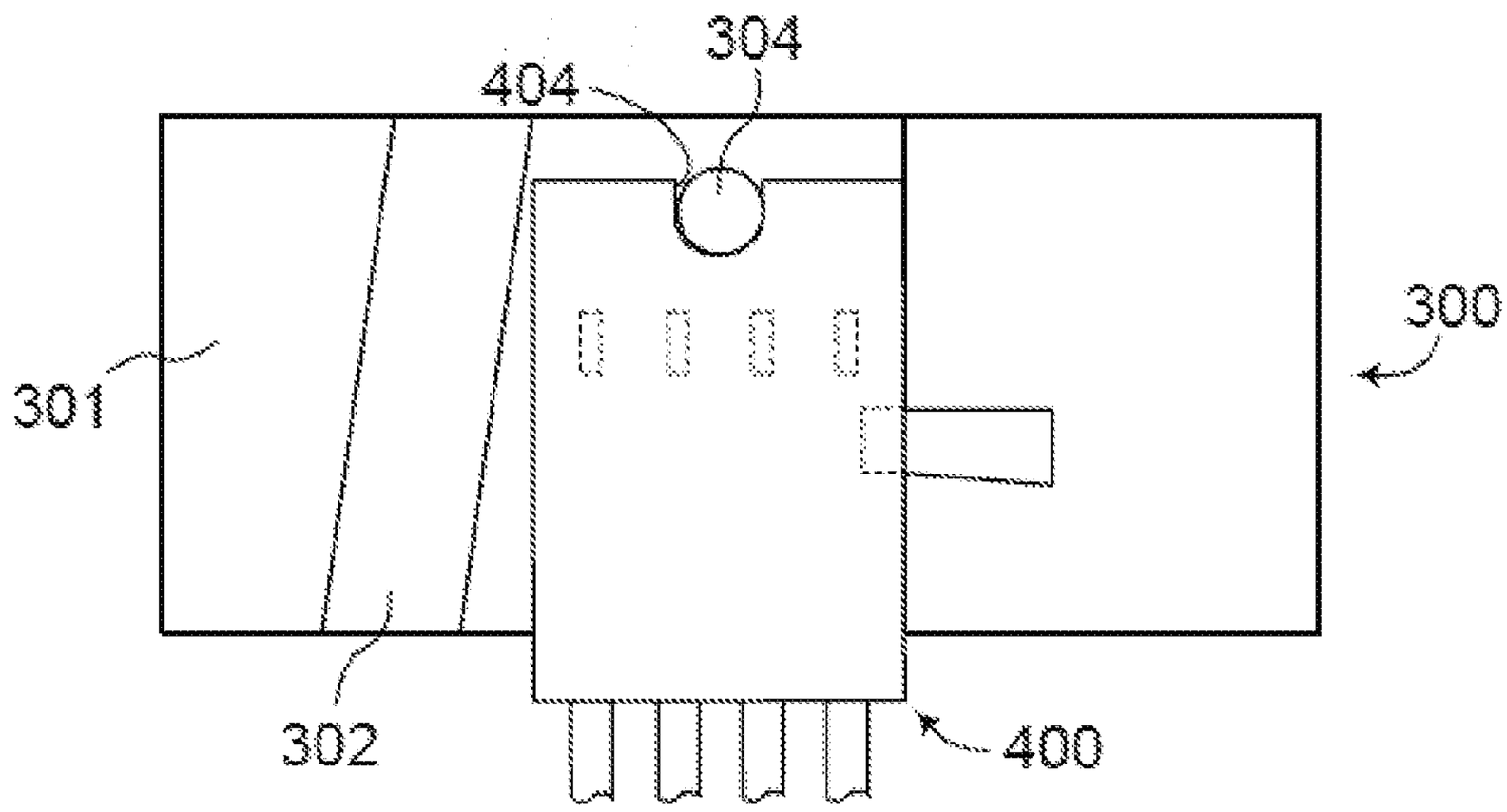


FIG. 7

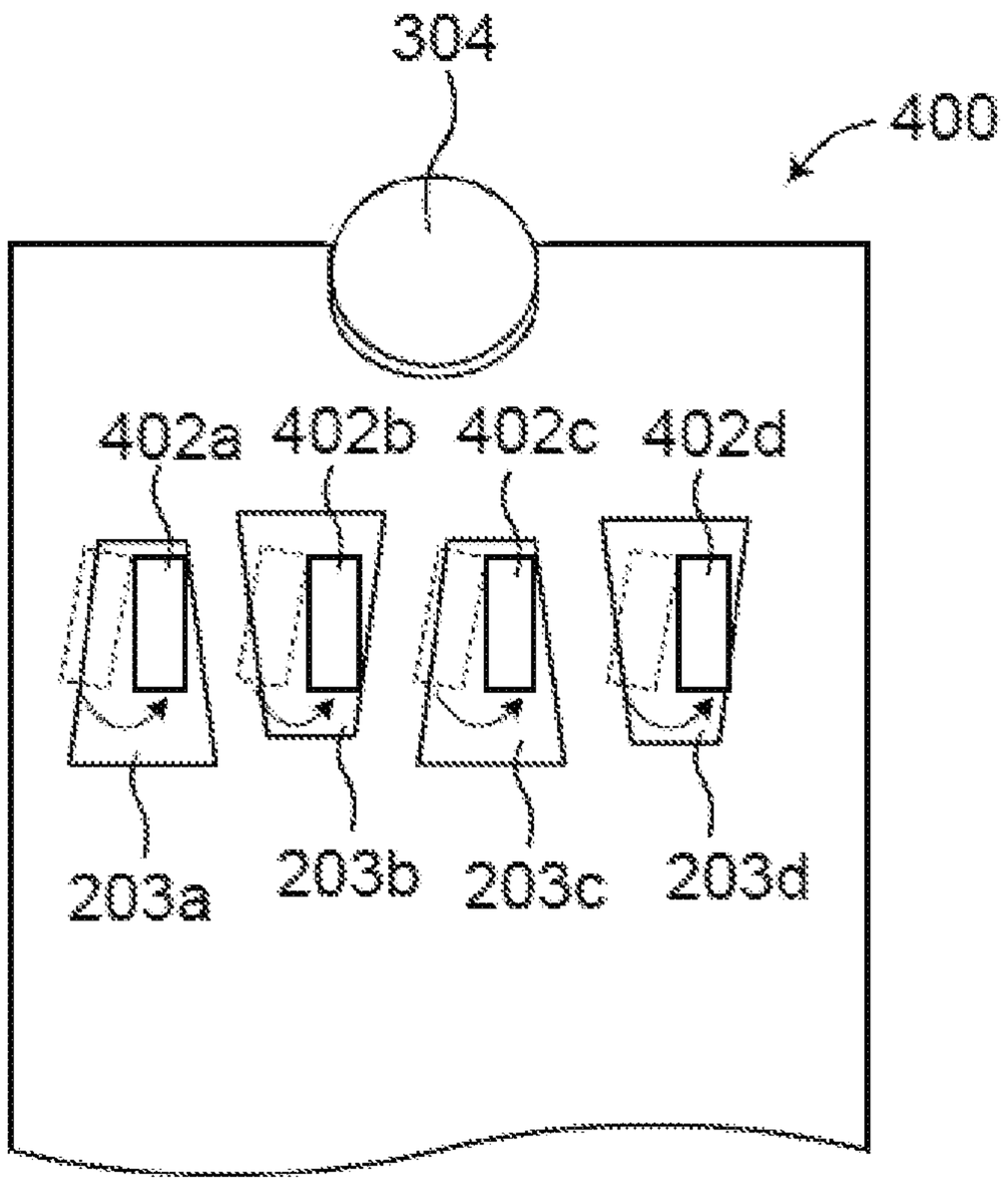


FIG. 8

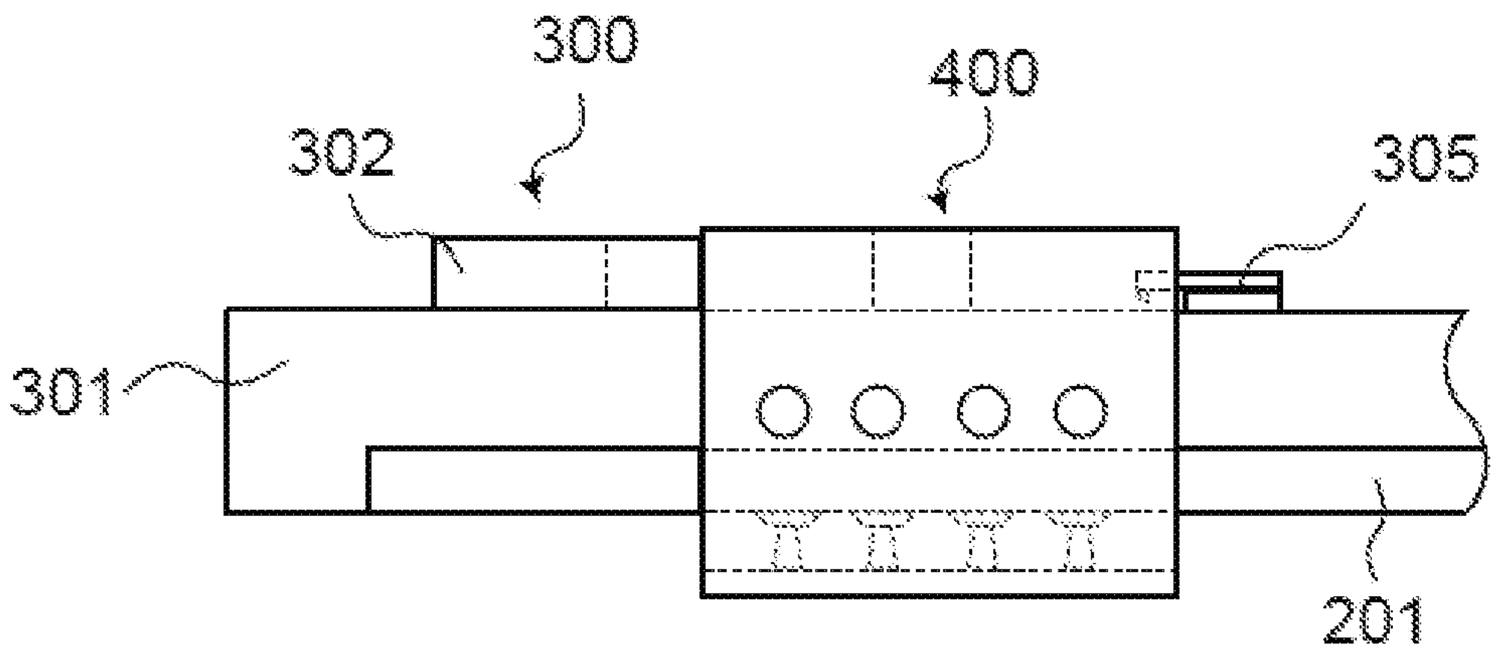


FIG. 9

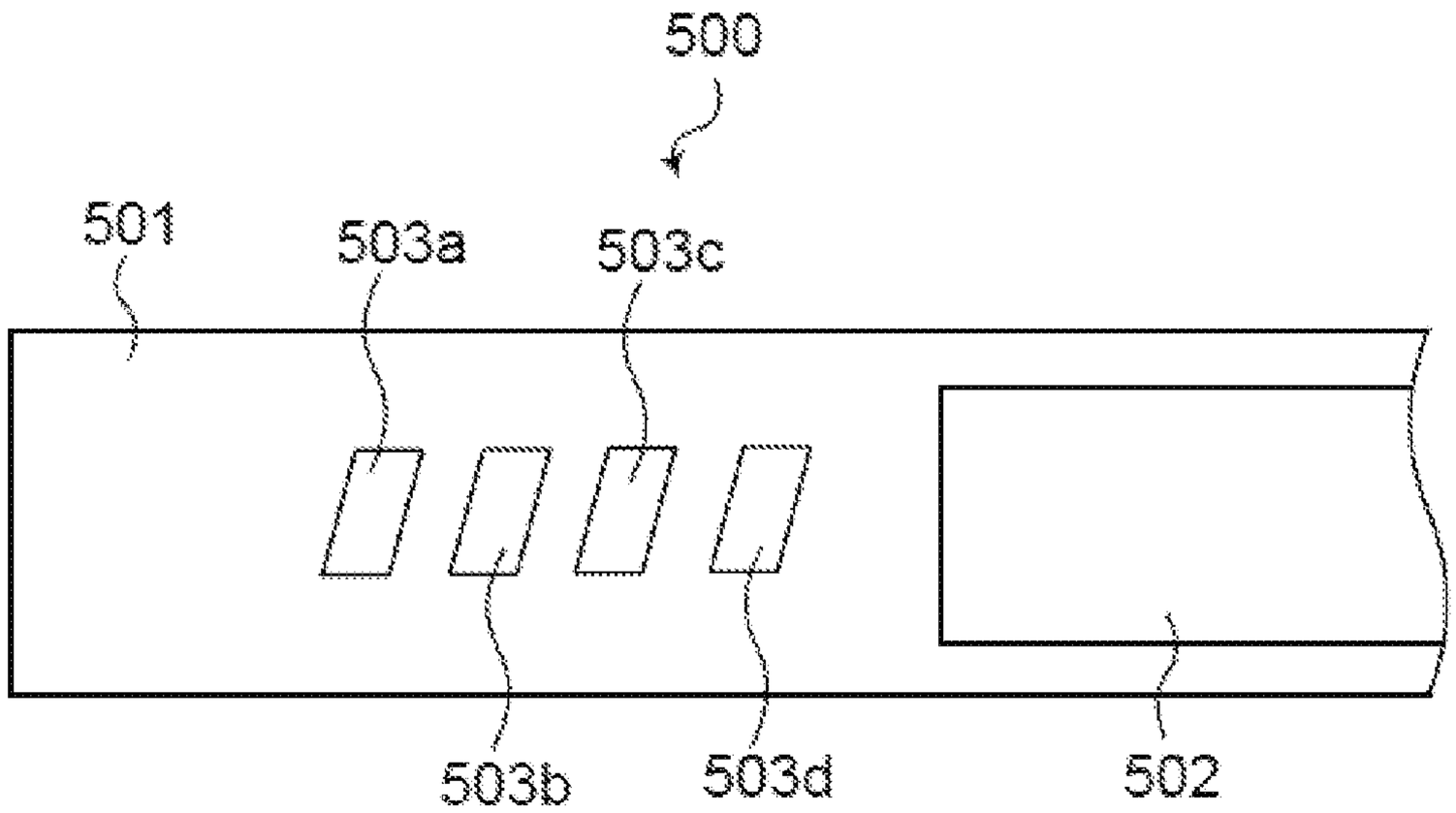
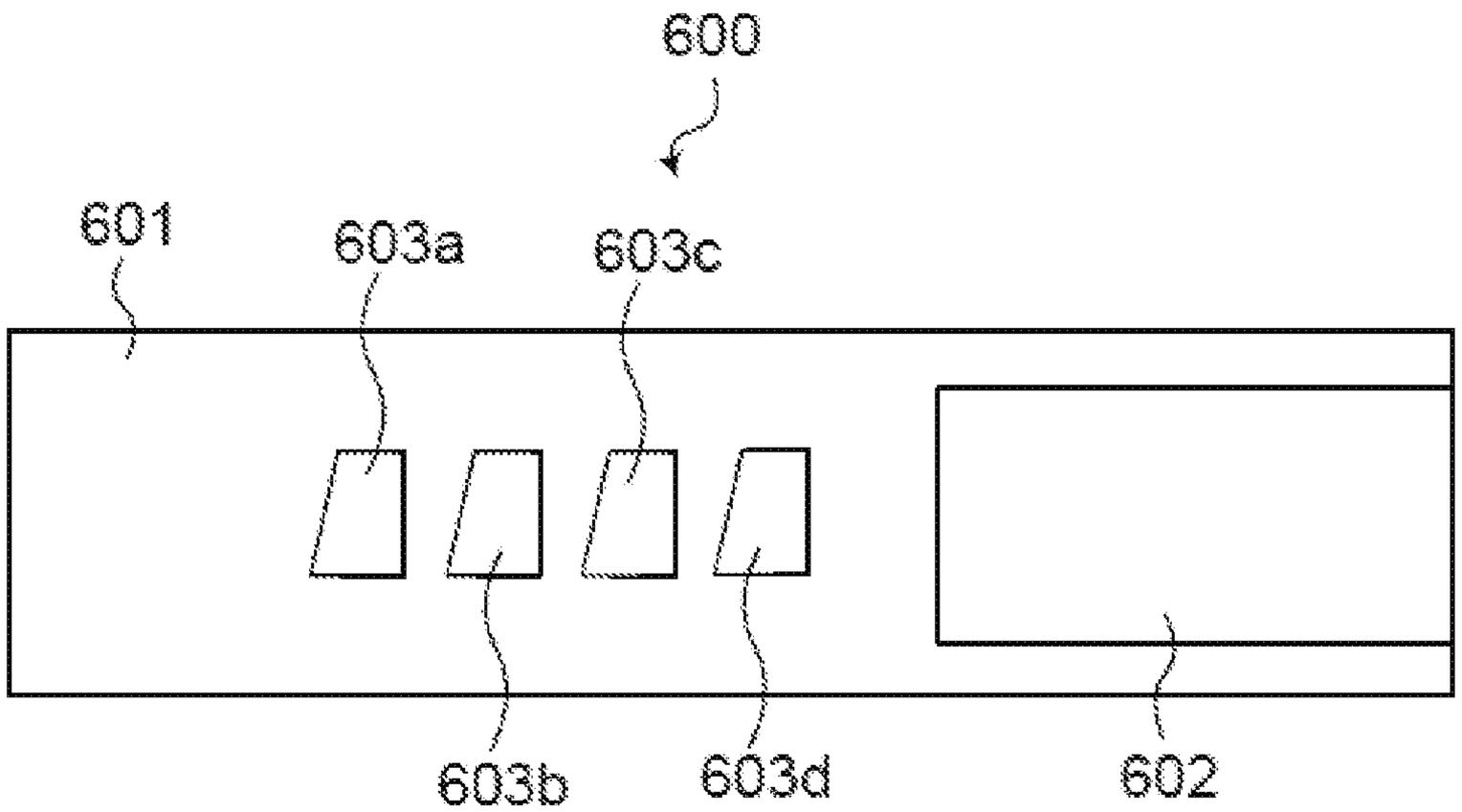


FIG. 10



FIXING DEVICE AND IMAGE FORMING APPARATUS

INCORPORATION BY REFERENCE

[0001] This application claims priority to Japanese Patent Application No. 2018-085648 filed on Apr. 26, 2018, the entire contents of which are incorporated by reference herein.

BACKGROUND

[0002] The present disclosure relates to a fixing device and an image forming apparatus, and more particularly, to a technique for energizing a heating member using a connector having a contact terminal.

[0003] In recent years, there has been a known fixing device of a type in which a fixing belt is heated by a heating member in which a planar heat generating body and an electrode are provided on a ceramic substrate. In such a fixing device, there is a known technique in which the heat generating body is energized by using a connector having the contact terminal that is in contact with the electrode.

[0004] For example, a fixing device is disclosed which includes a U-shaped connector having a plurality of current-carrying terminals in contact with a plurality of electrodes provided at the end of a ceramic heater. In such a fixing device, a lock member for fixing the connector is provided in the connector. In addition, a fixing device is disclosed which includes a contact terminal having a U-shaped cross-section having a pair of spring contact parts that are in contact with electrode parts provided on both the front and back sides of a planar heater.

SUMMARY

[0005] A technique improved over the aforementioned techniques is proposed as one aspect of the present disclosure.

[0006] A fixing device according to one aspect of the present disclosure includes a fixing belt, a pressure roller, a heating member, a holding member, and a connector. The fixing belt is endless. The pressure roller is in contact with the fixing belt to form a fixing nip part with the fixing belt. The heating member includes an electrode and heats the fixing belt when the electrode is energized. The holding member holds the heating member. The connector includes a contact terminal in contact with the electrode and is mounted at a predetermined position of the holding member so that the electrode and the contact terminal are in contact with each other. The holding member includes: a guide part having an inclined surface that is inclined with respect to a predetermined direction; and a positioning part that sets the position of the connector, inserted while being in contact with the inclined surface, in a rotatable state toward the predetermined position. The electrode is configured such that the contact terminal is in contact with the electrode over a period before and after the rotation of the connector.

[0007] An image forming apparatus according to one aspect of the present disclosure includes the above described fixing device and an image forming unit. The image forming unit forms a toner image on a recording sheet. At the fixing nip part, the fixing device fixes the toner image formed by the image forming unit to the recording sheet.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is a front cross-sectional view showing a configuration of an image forming apparatus provided with a fixing device according to an embodiment of the present disclosure.

[0009] FIG. **2** is a cross-sectional view showing a configuration of the fixing device.

[0010] FIG. **3**A and FIG. **3**B are diagrams each showing a configuration of one end part of a heating member in a longer direction.

[0011] FIG. **4**A and FIG. **4**B are diagrams each showing a configuration of one end part of a holding member in the longer direction.

[0012] FIGS. **5**A, **5**B, and **5**C are diagrams each showing a configuration of a connector.

[0013] FIGS. **6**A, **6**B and **6**C are diagrams each for explaining a method of mounting the connector.

[0014] FIG. **7** is a view for explaining positional relationship between an electrode and a contact terminal when the connector is rotated.

[0015] FIG. **8** is a side view showing a state in which the connector is attached.

[0016] FIG. **9** is a bottom view showing a configuration of one end part of the heating member in the longer direction according to a first modification.

[0017] FIG. **10** is a bottom view showing a configuration of one end part of the heating member in the longer direction according to a second modification.

DETAILED DESCRIPTION

[0018] A fixing device and an image forming apparatus according to an embodiment as one aspect of the present disclosure are described below with reference to the drawings. FIG. **1** is a front sectional view showing a configuration of an image forming apparatus **1** provided with a fixing device **100** according to an embodiment of the present disclosure.

[0019] The image forming apparatus **1** is a multifunction peripheral having a plurality of functions such as a facsimile function, a copy function, a printer function, and a scanner function. The image forming apparatus **1** includes an apparatus main body **2** and an image reading device **3**. The apparatus main body **2** includes an operating unit **4**, an image forming unit **5**, a fixing device **100**, a sheet feeding unit **6**, and the like.

[0020] The image reading device **3** includes a document conveyance unit **7** that conveys a document, and a scanner that optically reads a document conveyed by the document conveyance unit **7** or a document placed on a contact glass **8**. The image reading device **3** includes, for example, an ADF (Auto Document Feeder). The image reading device **3** irradiates a document by using a light irradiator and receives the reflected light by using a CCD (Charge-Coupled Device) sensor, thereby reading an image from the document and acquiring image data. The image data acquired by the image reading device **3** is stored in a built-in HDD (not shown) or a personal computer connected via a network.

[0021] The operating unit **4** is provided near the image reading device **3** and on the front side of the image forming apparatus **1**. The user inputs instructions, and the like, for various functions executable by the image forming apparatus **1** via the operating unit **4**. The operating unit **4** includes a touch-panel type display unit **9**. The display unit **9** displays

various screens regarding various functions executable by the image forming apparatus **1**.

[0022] The image forming unit **5** forms a toner image on recording paper P supplied from the sheet feeding unit **6** based on the image data acquired by the image reading device **3** or the image data sent from a personal computer connected via a network, other facsimile machines, or the like.

[0023] The image forming unit **5** includes image forming units **10**M, **10**C, **10**Y, and **10**Bk (hereinafter, there is a case of simply referred to as "image forming unit **10**"). The image forming unit **10** includes: a photosensitive drum **11**; a toner cartridge that stores toner; a charging device that uniformly charges the surface of the photosensitive drum **11**; an exposure device **12** that exposes the surface of the photosensitive drum **11** to form an electrostatic latent image; a developing device that supplies toner to the photosensitive drum **11** to develop an electrostatic latent image into a toner image; and a primary transfer roller **13**.

[0024] When color printing is performed, each of the image forming unit **10**M for magenta, the image forming unit **10**C for cyan, the image forming unit **10**Y for yellow, and the image forming unit **10**Bk for black in the image forming unit **5** forms a toner image on the photosensitive drum **11** by conducting charging, exposing, and developing based on image data composed of each of the color components that constitute image data, and transfers the toner image onto an intermediate transfer belt **15** extending between a drive roller **14** and a driven roller by the primary transfer roller **13**.

[0025] The intermediate transfer belt **15** has an image bearing surface on the outer circumferential surface to which a toner image is transferred. The intermediate transfer belt **15** is driven to rotate by the drive roller **14** in a state of being in contact with the circumferential surface of each of the photosensitive drums **11**. The intermediate transfer belt **15** endlessly travels between the drive roller **14** and the driven roller in synchronization with the rotation of each of the photosensitive drums **11**.

[0026] The toner images of the respective colors transferred onto the intermediate transfer belt **15** are superimposed on the intermediate transfer belt **15** by adjusting the transfer timing to form a color toner image.

[0027] The secondary transfer roller **16** transfers, to the recording paper P conveyed from the sheet feeding unit **6**, the color toner image formed on the surface of the intermediate transfer belt **15** at a transfer nip part N**1** formed between the secondary transfer roller **16** and the drive roller **14** with the intermediate transfer belt **15** interposed therebetween.

[0028] The fixing device **100** fixes the color toner image on the recording paper P to the recording paper P. The recording paper P on which the fixing process has been completed and the color image has been formed is discharged into a discharge tray **17**.

[0029] The sheet feeding unit **6** includes a plurality of sheet feeding cassettes. When the size of the recording paper P is input by the user via the operating unit **4**, a pickup roller **18** of the sheet feeding cassette storing the recording paper P with the input size is rotationally driven, and the recording paper P is transported to the conveyance path.

[The Fixing Device **100**]

[0030] FIG. **2** is a cross-sectional view showing the configuration of the fixing device **100**. With reference to FIG. **2**, the fixing device **100** includes: an endless fixing belt **110**; a pressure roller **120** that forms a fixing nip part N**2** with the fixing belt **110** in contact with the fixing belt **110**; a heating member **200** that heats the fixing belt **110**; a holding member **300** that holds the heating member **200**; and a connector **400** (not shown in FIG. **2**) mounted at a predetermined position of the holding member **300**.

[0031] The fixing belt **110** is configured by laminating an elastic layer formed of silicone rubber, or the like, and a release layer formed of a fluorine-based resin such as PFA or PTFE on the surface of a hollow cylindrical base layer formed of a metal or synthetic resin. The fixing belt **110** is configured to be rotatable.

[0032] The pressure roller **120** is a cylindrical member configured by laminating an elastic layer formed of silicone rubber, or the like, and a release layer formed of a fluorine-based resin such as PFA or PTFE on the surface of a cylindrical core formed of a metal. The axial direction of the pressure roller **120** and the axial direction of the fixing belt **110** are parallel.

[0033] A shaft **121** extending in the axial direction of the pressure roller **120** is provided at the radial center of the pressure roller **120** as viewed in the axial direction of the pressure roller **120**. Both ends of the shaft **121** are rotatably supported by bearings (not shown).

[0034] The pressure roller **120** is in contact with the outer peripheral surface of the fixing belt **110** in a biased state. Thus, the fixing nip part N**2** is formed between the pressure roller **120** and the fixing belt **110**. The pressure roller **120** is rotated by being driven by a drive source (not shown) via a drive mechanism (not shown). When the pressure roller **120** is rotated, the fixing belt **110** is rotated in accordance with the rotation of the pressure roller **120** while being in contact with the pressure roller **120**.

[The Heating Member **200**]

[0035] FIG. **3**A is a bottom view showing the configuration of one end part of the heating member **200** in the longer direction. FIG. **3**B is a cross-sectional view showing the configuration of one end part of the heating member **200** in the longer direction and is a cross-sectional view taken along the line **3-3'** shown in FIG. **3**A. The configuration of the other end part of the heating member **200** in the longer direction is the same as the configuration of one end part of the heating member **200** in the longer direction.

[0036] With reference to FIGS. **3**A and **3**B, the heating member **200** includes a substrate **201**, a heat generating body **202**, and electrodes **203***a*, **203***b*, **203***c*, and **203***d* (hereinafter, there is a case of simply referred to as "electrode **203**").

[0037] The substrate **201** is a substantially cuboidal member. The substrate **201** is formed of a ceramic-based material such as Al_2O_3 (alumina), which has electrical insulation.

[0038] The heat generating body **202** is a pattern layer formed by atmospheric baking on an electric resistance material such as AgPd (silver-palladium alloy) coated by screen printing, or the like. The heat generating body **202** is formed at the central part of the substrate **201** in the longer direction along the longer direction of the substrate **201**. The heat generating body **202** generates heat when it is energized through the electrode **203** and heats the fixing belt **110**.

[0039] The electrode **203** is a pattern layer formed by atmospheric baking on a conductive metal material such as Ag (silver) and Cu (copper) coated by screen printing, or the like. The electrodes **203***a*, **203***b*, **203***c*, and **203***d* are formed in line in the longer direction of the substrate **201** at both ends of the substrate **201** in the longer direction. The electrode **203** is electrically connected to the heat generating body **202** through a wire (not shown).

[0040] The heat generating body **202** and the electrodes **203** are formed on the same surface of the substrate **201**. Hereinafter, in the substrate **201**, the surface on which the heat generating body **202** and the electrodes **203** are formed is referred to as a first surface of the substrate **201**. In the substrate **201**, the surface opposite to the first surface is referred to as a second surface of the substrate **201**. Further, a direction perpendicular to the longer direction of the substrate **201** is referred to as a shorter direction of the substrate **201**. A direction perpendicular to a plane including the longer direction and the shorter direction of the substrate **201** is referred to as a thickness direction of the substrate **201**.

[0041] As shown in FIG. **3**A, the electrodes **203***a*, **203***b*, **203***c*, and **203***d* are formed in an isosceles trapezoid. The electrodes **203***a*, **203***b*, **203***c*, and **203***d* have the same shape. The electrodes **203***a* and **203***c* are formed such that the short side of the trapezoid is located on one end side in the shorter direction of the substrate **201**. The electrodes **203***b* and **203***d* are formed such that the short side of the trapezoid is located on the other end side in the shorter direction of the substrate **201**.

[0042] A protective layer (not shown) is formed on the first surface of the substrate **201** so as to cover the heat generating body **202** in a state where the electrode **203** is exposed. The above-described protective layer is formed of an insulating material such as glass.

[0043] A temperature detecting element (not shown) such as a thermistor is provided on the second surface of the substrate **201** at the central part of the substrate **201** in the longer direction. The above-described temperature detecting element detects the temperature of the heating member **200** and inputs the detected information to a control unit (not shown). The control unit controls the supplied power to the electrode **203** based on the input information so that the temperature of the heating member **200** is maintained at a predetermined temperature.

[The Holding Member **300**]

[0044] FIG. **4**A is a top view showing the configuration of one end part of the holding member **300** in the longer direction. FIG. **4**B is a side view showing the configuration of one end part of the holding member **300** in the longer direction and is a diagram viewed in the direction of the arrow A shown in FIG. **4**A. The configuration of the other end part of the holding member **300** in the longer direction is the same as the configuration of one end part of the holding member **300** in the longer direction.

[0045] With reference to FIGS. **4**A and **4**B, the holding member **300** includes a holding part **301**, a first guide part **302**, a second guide part **303**, a positioning part **304**, and a hook part **305**. A connector **400** is mounted at a predetermined position R. The predetermined position R is an area corresponding to the part where the electrode **203** of the heating member **200** is exposed from the fixing belt **110**.

[0046] The holding part **301** is a substantially cuboidal member. The holding part **301** is formed of a heat-resistant synthetic resin or the like. In the holding part **301**, a groove **301***a* is provided for fitting and holding the heating member **200** along the longer direction of the holding part **301**. The heating member **200** is fitted into the groove **301***a* such that the longer direction of the substrate **201** is parallel to the longer direction of the holding part **301**. The holding part **301** is located inward of the fixing belt **110** in the radial direction as viewed in the axial direction of the fixing belt **110** and is disposed to penetrate the fixing belt **110** in the axial direction of the fixing belt **110** so that the electrodes **203** of the heating member **200** held by the holding part **301** are exposed from the fixing belt **110**.

[0047] The holding part **301** is biased toward the pressure roller **120** with the fixing belt **110** interposed between the holding part **301** and the pressure roller **120** while holding the heating member **200**. Thus, when the pressure roller **120** rotates, the fixing belt **110** slides and rotates in contact with the heating member **200**.

[0048] Hereinafter, in the holding part **301**, the surface on which the groove **301***a* is formed is referred to as a first surface of the holding part **301**. In the holding part **301**, the surface opposite to the first surface is referred to as a second surface of the holding part **301**. Further, the direction perpendicular to the longer direction of the holding part **301** is referred to as the shorter direction of the holding part **301**. The direction perpendicular to a plane including the longer direction and the shorter direction of the holding part **301** is referred to as the thickness direction of the holding part **301**.

[0049] The first guide part **302** is a substantially cuboidal member. The first guide part **302** is formed of a heat-resistant synthetic resin or the like. The first guide part **302** is arranged on the second surface of the holding part **301** such that it is provided with an inclined surface **302***a* which is inclined with respect to the shorter direction of the substrate **201** when viewed in the thickness direction of the substrate **201** of the heating member **200** held by the holding part **301**. When the connector **400** is mounted, the first guide part **302** guides the connector **400** so that the connector **400** moves while being in contact with the inclined surface **302***a*.

[0050] The second guide part **303** is a cuboidal member. The second guide part **303** is formed of a heat-resistant synthetic resin, or the like. The second guide part **303** is arranged on the second surface of the holding part **301** such that it is provided with a parallel surface **303***a* that is parallel to the shorter direction of the substrate **201** as viewed in the thickness direction of the substrate **201** of the heating member **200** held by the holding part **301**. The connector **400** abuts the parallel surface **303***a* when mounted at the predetermined position R.

[0051] The positioning part **304** is a cylindrical member. The positioning part **304** is formed of a heat-resistant synthetic resin, or the like. The positioning part **304** is provided on the second surface of the holding part **301** at a position corresponding to the connector **400** mounted at the predetermined position R. The positioning part **304** sets the position of the connector **400** inserted while being in contact with the inclined surface **302***a* so as to be rotatable toward the predetermined position R.

[0052] The hook part **305** is a hook-like member having a claw. The hook part **305** is formed of a heat-resistant synthetic resin, or the like. The hook part **305** is disposed at

the position corresponding to the connector **400** mounted at the predetermined position R in the second guide part **303**.

[The Connector **400**]

[0053] FIG. **5**A is a top view showing the configuration of the connector **400**. FIG. **5**B is a side view showing the configuration of the connector **400** and is a diagram viewed in the direction of the arrow B shown in FIG. **5**A. FIG. **5**C is a side view showing the configuration of the connector **400** and is a diagram viewed in the direction of the arrow C shown in FIG. **5**A. Although the connector **400** mounted on one end part of the holding member **300** in the longer direction is explained below, the connector **400** is similarly mounted on the other end part of the holding member **300** in the longer direction. With reference to FIGS. **5**A to **5**C, the connector **400** includes a housing **401** and contact terminals **402***a*, **402***b*, **402***c*, and **402***d* (hereinafter, there is a case of simply referred to as "contact terminals **402**").

[0054] The housing **401** is formed of an insulating synthetic resin, or the like. The housing **401** includes a first part **401***a*, a second part **401***b*, and a third part **401***c*, each formed in a substantially cuboid.

[0055] The first part **401***a* and the second part **401***b* are arranged such that opposing surfaces are parallel with a predetermined gap interposed therebetween. The third part **401***c* is arranged to connect one end parts, in the longer direction, of the first part **401***a* and the second part **401***b*. The housing **401** is integrally formed into a substantially U shape in which a groove **403** having a predetermined interval L**1** is formed as a whole by the first part **401***a*, the second part **401***b*, and the third part **401***c*. The predetermined interval L**1** in the groove **403** is set to be larger than a thickness L**2** of the holding part **301** shown in FIG. **4**B.

[0056] The connector **400** is detachably attached to the holding member **300** by inserting the holding part **301** in a state of holding the heating member **200** into the groove **403** at the predetermined position R of the holding member **300**.

[0057] At the other end part of the first part **401***a* in the longer direction and at the position corresponding to the positioning part **304** of the holding member **300**, a groove part **404** is formed, which has a size so as to have the positioning part **304** fitted thereinto. The positioning part **304** is configured to fit into the groove part **404** in a state where the connector **400** is rotatable around the positioning part **304**. The groove part **404** of the connector **400** includes a receiving part **4041** and a restricting part **4042**. The receiving part **4041** linearly extends in a receiving direction so as to receive the fitted positioning part **304**. The restricting part **4042** is formed in a shape that conforms to the arc formed by the outer shape of the cylindrical positioning part **304** at the end of the receiving part **4041**. The restricting part **4042** restricts the movement of the positioning part **304** when the positioning part **304** moves along the linear shape of the receiving part **4041** in the receiving part **4041**.

[0058] Hereinafter, the direction perpendicular to the longer direction of the first part **401***a* is referred to as the shorter direction of the first part **401***a*. The direction perpendicular to the longer direction of the second part **401***b* is referred to as the shorter direction of the second part **401***b*.

[0059] An opening **405** configured to be engaged with the claw of the hook part **305** is provided on the side surface on one end side in the shorter direction of the first part **401***a* and at the position corresponding to the hook part **305** of the holding member **300**. Accordingly, when the connector **400** is mounted at the predetermined position R of the holding member **300**, the claw of the hook part **305** is engaged with the opening **405**.

[0060] The contact terminal **402** is a substantially cylindrical terminal formed of a conductive metal such as stainless steel or titanium alloy. The contact terminals **402***a*, **402***b*, **402***c*, **402***d* are provided at the positions corresponding to the electrodes **203***a*, **203***b*, **203***c*, **203***d* of the heating member **200** on the surface of the second part **401***b* opposing to the first part **401***a* and are arranged in line along the shorter direction of the second part **401***b*.

[0061] In the space provided inside the housing **401**, the contact terminals **402** are electrically connected to four wires **406***a*, **406***b*, **406***c*, **406***d* (hereinafter, there is a case of simply referred to as "wire **406**") provided in accordance with the number of the contact terminals **402**.

[0062] The contact terminal **402** is brought into contact with the electrode **203** of the heating member **200** when the connector **400** is mounted at the predetermined position R of the holding member **300**. When the power is supplied from the power supply (not shown) via the wire **406** to the contact terminal **402**, the contact terminal **402** applies the electricity to the electrode **203** of the heating member **200**.

[Technique of Mounting the Connector **400**]

[0063] Hereinafter, the technique of mounting the connector **400** is described in order. FIGS. **6**A to **6**C are diagrams that explain the technique of mounting the connector **400**.

[0064] With reference to FIG. **6**A, the user first inserts the connector **400** along the inclined surface **302***a* of the first guide part **302** in a direction inclined with respect to the shorter direction of the substrate **201** when viewed in the thickness direction of the substrate **201** of the heating member **200**. The user moves the connector **400** forward while bringing the connector **400** into contact with the inclined surface **302***a* until the positioning part **304** is fitted into the groove part **404**.

[0065] With reference to **6**B, the user rotates the connector **400** around the positioning part **304** toward the predetermined position R of the holding member **300** in a state where the positioning part **304** is fitted in groove part **404**.

[0066] FIG. **7** is a diagram that explains the positional relationship between the electrode **203** and the contact terminal **402** when the connector **400** rotates. With reference to FIG. **7**, the electrode **203** is formed in the above-described isosceles trapezoid so that the contact terminal **402** is brought into contact with the electrode **203** over a period before and after the rotation of the connector **400**. Therefore, while the connector **400** is rotated, the contact terminals **402***a*, **402***b*, **402***c*, **402***d* are rotated in accordance with the rotation of the connector **400** while they are in contact with the electrodes **203***a*, **203***b*, **203***c*, **203***d*.

[0067] With reference to FIG. **6**C, when the connector **400** comes to the predetermined position R of the holding member **300**, the connector **400** abuts the parallel surface **303***a*, and the claw of the hook part **305** of the holding part **301** is engaged with the opening **405** of the connector **400**. That is, the connector **400** is rotated along the arc formed by the outer shape of the positioning part **304** in a state where the positioning part **304** of the holding member **300** is fitted into the receiving part **4041** of the groove part **404** and the positioning part **304** is in contact with the restricting part **4042**. Then, the hook part **305** engages with the opening **405**,

thereby the rotation of the connector **400** is stopped, and the connector **400** is fixed to the holding member **300**.

[0068] FIG. **8** is a side view showing a state in which the connector **400** is attached. With reference to FIG. **8**, the connector **400** is attached to the holding member **300** by inserting the holding part **301** in a state of holding the heating member **200** into the groove **403** at the predetermined position R of the holding member **300**.

[Operation of the Fixing Device **100**]

[0069] The operation of the fixing device **100** is described below. In the following description, the two connectors **400** are attached to both ends of the holding member **300** in the longer direction.

[0070] The pressure roller **120** is in contact with the outer peripheral surface of the fixing belt **110** in a pressurized state. When the pressure roller **120** is driven and rotated by a drive source (not shown) via a drive mechanism (not shown), the fixing belt **110** is driven to rotate in the opposite direction to the pressure roller **120**.

[0071] Electric power is supplied from the power supply (not shown) to the contact terminal **402** through the wire **406**, and when current is supplied from the contact terminal **402** to the electrode **203**, the heat generating body **202** generates heat.

[0072] The holding part **301** in a state of holding the heating member **200** is biased toward the pressure roller **120** with the fixing belt **110** interposed between the holding part **301** and the pressure roller **120**. As a result, the fixing belt **110** is rotatably slid and heated while being in contact with the heating member **200**.

[0073] In this state, when the recording paper P carrying the unfixed color toner image formed by the image forming unit **5** is conveyed to the fixing nip part N**2**, the recording paper P is heated and pressed in the fixing nip part N**2** so that the toner image is fixed to the recording paper P.

[0074] According to the above embodiment, in the fixing device **100**, the holding member **300** includes: the first guide part **302** having the inclined surface **302***a* inclined with respect to the predetermined direction; and the positioning part **304** that sets the position of the inserted connector **400** in a rotatable state to the predetermined position while being in contact with the inclined surface **302***a*. Further, the electrode **203** is configured such that the contact terminal **402** is brought into contact with the electrode **203** over a period before and after the rotation of the connector **400**.

[0075] Thus, the connector **400** is inserted in a direction inclined with respect to a predetermined direction while being in contact with the inclined surface **302***a*, and it is then rotated in a state where the contact terminal **402** is in contact with the electrode **203**, whereby it is mounted at the predetermined position. Therefore, as compared with the case where the connector **400** is directly inserted and mounted in the shorter direction of the heating member **200**, the distance at which the contact terminal **402** is in contact with the electrode **203** may be longer; thus, contact failures between the electrode **203** and the contact terminal **402** may be avoided without increasing the size of the connector **400**.

[0076] Further, according to the above-described embodiment, the holding member **300** includes the hook part **305** having the claw, and the connector **400** includes the opening **405** with which the claw of the hook part **305** is engaged when the connector **400** is mounted at the predetermined position R of the holding member **300**. Therefore, the connector **400** is fixed by the engagement of the claw of the hook part **305** with the opening **405**; thus, as compared with the case where a member such as a lock member for fixing the connector **400** is provided in the connector **400**, the size of the connector **400** may be reduced, and the cost needed to produce the connector **400** may be reduced as the connector **400** is formed with less resin material.

[0077] Further, according to the above embodiment, the connector **400** includes the groove part **404** configured to have the positioning part **304** fitted thereinto, and the positioning part **304** is configured to be fitted into the groove part **404** in such a state that the connector **400** is rotatable around the positioning part **304**. This allows efficient positioning and rotation of the connector **400** without increasing the number of members.

[0078] Further, according to the above embodiment, the heating member **200** includes the substrate **201** on which the electrode **203** is formed, and the predetermined direction is a direction inclined with respect to the shorter direction of the substrate **201** when viewed in the thickness direction of the substrate **201**. Thus, as compared with the case where the connector **400** is directly inserted and mounted in the shorter direction of the heating member **200**, it may be ensured that the distance at which the contact terminal **402** is in contact with the electrode **203** is longer.

[0079] Further, according to the above embodiment, as the image forming apparatus **1** includes the above-described fixing device **100**, contact failures between the electrode and the contact terminal may be avoided without increasing the size of the connector, and smooth image formation may be performed. According to the above embodiment, the electrode **203** is formed in the shape of an isosceles trapezoid; however, the shape of the electrode **203** is not particularly limited as long as it has a shape configured such that the contact terminal **402** is in contact with the electrode **203** over a period before and after the rotation of the connector **400**.

[0080] In typical connectors other than the connector **400** according to the present embodiment, in order to avoid contact failures between the electrode and the contact terminal, it is necessary to increase the contact distance between the electrode and the contact terminal when the connector is attached; thus, the connector tends to be large. In addition, when the connector is provided with a member such as a lock member, the size of the connector may be further larger. However, in the fixing device **100** according to the present embodiment, contact failures between the electrode and the contact terminal may be avoided without increasing the size of the connector **400**.

[0081] (First Modification)

[0082] FIG. **9** is a bottom view showing the configuration of one end part of the heating member **500** in the longer direction according to a first modification. With reference to FIG. **9**, a heating member **500** includes a substrate **501**, a heat generating body **502**, and electrodes **503***a*, **503***b*, **503***c*, **503***d* (hereinafter, there is a case of simply referred to as "electrode **503**"). According to the first modification, the heating member **500** has the same configuration as that of the heating member **200** in the above embodiment except that the shape of the electrode **503** is different. Hereinafter, only different configurations are described.

[0083] The electrodes **503***a*, **503***b*, **503***c*, **503***d* are formed in the shape of a parallelogram. The electrodes **503***a*, **503***b*, **503***c*, **503***d* have the same shape. The electrodes **503***a*, **503***b*, **503***c*, **503***d* are formed in line along the longer direction of

the substrate **501** such that the direction of the pair of opposite sides of the parallelogram is parallel to the inclination direction of the inclined surface **302***a*. Thus, while the connector **400** is rotated, the contact terminals **402***a*, **402***b*, **402***c*, **402***d* are rotated in accordance with the rotation of the connector **400** while they are in contact with the electrodes **503***a*, **503***b*, **503***c*, **503***d*, respectively.

[0084] (Second Modification)

[0085] FIG. **10** is a bottom view showing the configuration of one end part of the heating member **600** in the longer direction according to a second modification. With reference to FIG. **10**, a heating member **600** includes a substrate **601**, a heat generating body **602**, and electrodes **603***a*, **603***b*, **603***c*, **603***d* (hereinafter, there is a case of simply referred to as "electrode **603**"). According to the second modification, the heating member **600** has the same configuration as that of the heating member **200** in the above embodiment except that the shape of the electrode **603** is different. Hereinafter, only different configurations are described.

[0086] The electrodes **603***a*, **603***b*, **603***c*, **603***d* are formed in the shape of a trapezoidal. The electrodes **603***a*, **603***b*, **603***c*, **603***d* have the same shape. In the electrodes **603***a*, **603***b*, **603***c*, **603***d*, one of the two sides connecting the upper and lower bases of the trapezoid is formed to be perpendicular to the upper and lower bases. The other side is formed to be inclined with respect to the upper and lower bases. The electrodes **603***a*, **603***b*, **603***c*, **603***d* are formed in line along the longer direction of the substrate **601** such that the direction of the other side of the trapezoid is parallel to the inclination direction of the inclined surface **302***a*. Thus, while the connector **400** is rotated, the contact terminals **402***a*, **402***b*, **402***c*, **402***d* are rotated in accordance with the rotation of the connector **400** while they are in contact with the electrodes **603***a*, **603***b*, **603***c*, **603***d*.

[0087] (Other Modifications)

[0088] The present disclosure is not limited to the configuration according to the above embodiment, and various modifications are possible.

[0089] For example, although four electrodes are provided as the electrodes **203**, **503**, **603** according to the above embodiments, the present disclosure is not limited to the embodiments, and for example, the number of electrodes may be one or two.

[0090] Further, in the above embodiment, the configurations and processes shown in the above embodiment using FIGS. **1** to **10** are merely an embodiment of the present disclosure, and there is no intention to limit the present disclosure to the configurations and the processes.

[0091] Various modifications and changes to the present disclosure may be apparent to those skilled in the art without departing from the scope and spirit of the present disclosure. It should also be understood that the present disclosure is not limited to the exemplary embodiments described in this description.

What is claimed is;:

1. A fixing device comprising:

a fixing belt that is endless;

a pressure roller that is in contact with the fixing belt to form a fixing nip part with the fixing belt;

a heating member that includes an electrode and heats the fixing belt when the electrode is energized;

a holding member that holds the heating member; and

a connector that includes a contact terminal in contact with the electrode and is mounted at a predetermined position of the holding member so that the electrode and the contact terminal are in contact with each other, wherein

the holding member includes:

a guide part having an inclined surface that is inclined with respect to a predetermined direction; and

a positioning part that sets a position of the connector, inserted while being in contact with the inclined surface, in a rotatable state toward the predetermined position, and

the electrode is configured such that the contact terminal is in contact with the electrode over a period before and after rotation of the connector.

2. The fixing device according to claim **1**, wherein

the holding member further includes a hook part having a claw, and

on the connector, an opening, with which the claw of the hook part is engaged when the connector is mounted at the predetermined position, is further formed.

3. The fixing device according to claim **1**, wherein

the connector further includes a groove part configured to have the positioning part fitted thereto, and

the positioning part is configured to be fitted into the groove part in a state where the connector is rotatable around the positioning part.

4. The fixing device according to claim **3**, wherein

the holding member further includes a hook part having a claw,

on the connector, an opening, with which the claw of the hook part is engaged when the connector is mounted at the predetermined position, is further formed,

the positioning part of the holding member is a cylindrical member,

the groove part of the connector includes:

a receiving part that linearly extends in a receiving direction to receive the positioning part fitted into the groove; and

a restricting part that is formed at an end of the receiving part in a shape that conforms to an arc formed by an outer shape of the cylindrical positioning part and that restricts a movement of the positioning part within the receiving part, and

in a state where the positioning part of the holding member is fitted into the receiving part of the groove part and the positioning part abuts the restricting part, the connector is rotated along the arc formed by the outer shape of the positioning part and the hook part engages with the opening, thereby the rotation of the connector is stopped, and the connector is fixed to the holding member.

5. The fixing device according to claim **1**, wherein

the heating member includes a substrate on which the electrode is formed, and

the predetermined direction is a direction inclined with respect to a shorter direction of the substrate when viewed in a thickness direction of the substrate.

6. An image forming apparatus comprising:

the fixing device according to claim **1**; and

an image forming unit that forms a toner image on a recording sheet, wherein

the fixing device fixes the toner image formed by the image forming unit to the recording sheet at the fixing nip part.

* * * * *