United States Patent	12386288
Kind Code	B2
Date of Patent	August 12, 2025
Inventor(s)	Izumichi; Sachio et al.

Image forming apparatus capable of stabilizing electrical connection between movable unit and support unit included in fixing device

Abstract

An image forming apparatus includes a movable unit, a support unit, a protruding portion, a guide portion, and a pressing portion. The movable unit includes a fixing member and a pressure member, and swings along a width direction of a sheet. The support unit supports the movable unit. The protruding portion is electrically conductive and is provided to protrude from a first unit of one of the movable unit and the support unit toward a second unit of the other. The guide portion is electrically conductive and is formed in the second unit so that the protruding portion can be inserted therein, and guides the protruding portion along the width direction. The pressing portion presses the movable unit in a pressing direction perpendicular to the width direction and along a horizontal plane.

Inventors: **Izumichi; Sachio (Osaka, JP), Sato; Takehiro (Osaka, JP), Ishida; Keiju (Osaka, JP)**

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

Family ID: **1000008748480**

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

Appl. No.: **18/638387**

Filed: **April 17, 2024**

Prior Publication Data

Document Identifier	Publication Date
US 20240353779 A1	Oct. 24, 2024

Foreign Application Priority Data

JP	2023-068390	Apr. 19, 2023

Publication Classification

Int. Cl.: **G03G15/20** (20060101)

U.S. Cl.:

CPC **G03G15/2017** (20130101); **G03G15/2064** (20130101);

Field of Classification Search

USPC: None

References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
5323216	12/1993	Mahoney	399/68	G03G 15/2064
5579098	12/1995	Noguchi	399/122	G03G 15/2064
2004/0190939	12/2003	Yamanaka	399/122	G03G 15/2032
2005/0271432	12/2004	Chiba	399/328	G03G 15/2064
2011/0013936	12/2010	Fujii	399/328	G03G 15/2032
2011/0020033	12/2010	Nagase	399/122	G03G 15/2064
2012/0237259	12/2011	Tanda	N/A	N/A
2014/0064755	12/2013	Mogi	399/329	G03G 21/1685
2014/0064787	12/2013	Mogi	399/329	G03G 15/2053
2014/0064788	12/2013	Mogi	399/329	G03G 15/2053
2015/0370201	12/2014	Watatani	399/328	G03G 15/2017
2023/0127764	12/2022	Yamauchi	399/330	G03G 15/80
2023/0375965	12/2022	Fujiwara	N/A	G03G 15/2064

FOREIGN PATENT DOCUMENTS

Patent No.	Application Date	Country	CPC
2006072246	12/2005	JP	N/A
2012194331	12/2011	JP	N/A
2021015159	12/2020	JP	G03G 15/2039

Primary Examiner: Aydin; Sevan A

Attorney, Agent or Firm: Alleman Hall & Tuttle LLP

Background/Summary

INCORPORATION BY REFERENCE

(1) This application is based upon and claims the benefit of priority from the corresponding Japanese Patent Application No. 2023-068390 filed on Apr. 19, 2023, the entire contents of which are incorporated herein by reference.

BACKGROUND

(2) The present disclosure relates to an electrophotographic image forming apparatus.

(3) An electrophotographic image forming apparatus transfers a toner image from an image-carrying member to a sheet, and fixes the toner image to the sheet using a fixing device. The fixing device includes a fixing member that forms a fixing nip portion for fixing the toner image to the sheet, and a pressure roller.

SUMMARY

(4) The image forming apparatus according to the present disclosure includes a movable unit, a support unit, a protruding portion, a guide portion, and a pressing portion. The movable unit includes a fixing member and a pressure member that form a fixing nip portion for fixing a toner image to the sheet, and is swinged along a width direction of the sheet. The support unit supports the movable unit below the movable unit. The protruding portion is electrically conductive and is provided to protrude from a first unit of one of the movable unit and the support unit toward a second unit of the other. The guide portion is electrically conductive and is formed in the second unit so that the protruding portion can be inserted therein, and guides the protruding portion along the width direction with the protruding portion swinging relative to the second unit. The pressing portion presses the movable unit in a pressing direction perpendicular to the width direction and along a horizontal plane.

(5) This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description with reference where appropriate to the accompanying drawings. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter. Furthermore, the claimed subject matter is not limited to implementations that solve any or all disadvantages noted in any part of this disclosure.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) FIG. **1** is a configuration diagram of an image forming apparatus according to an embodiment.

(2) FIG. **2** is a diagram showing a configuration of main parts of a fixing device in the image forming apparatus according to the embodiment.

(3) FIG. **3** is a perspective view of a main body frame of the image forming apparatus according to the embodiment.

(4) FIG. **4** is a perspective view of a fixing unit in the image forming apparatus according to the embodiment.

(5) FIG. **5** is a perspective view of a support unit and a movable unit in the image forming apparatus according to the embodiment.

(6) FIG. **6** is a plan view of a drive mechanism and a reciprocating mechanism in the image forming apparatus according to the embodiment.

(7) FIG. **7** is a front view of the fixing device and an interlocking mechanism in a biased state in the image forming apparatus according to the embodiment.

(8) FIG. **8** is a front view of the fixing device and the interlocking mechanism in a retreat state in the image forming apparatus according to the embodiment.

(9) FIG. **9** is a plan view of the fixing device and the interlocking mechanism in the biased state in the image forming apparatus according to the embodiment.

(10) FIG. **10** is a plan view of the fixing device and the interlocking mechanism in the retreat state in the image forming apparatus according to the embodiment.

(11) FIG. **11** is a perspective view of the surrounding area of the fixing unit and a cover member in the image forming apparatus according to the embodiment.

(12) FIG. **12** is a perspective view of a protruding portion and a guide portion in the image forming apparatus according to the embodiment.

DETAILED DESCRIPTION

(13) Embodiments according to the present disclosure will be described below with reference to the drawings. Note that the following embodiments are examples of embodying a technique according to the present disclosure, and do not limit the technical scope of the present disclosure.

(14) [Configuration of Image Forming Apparatus **10**]

(15) An image forming apparatus **10** according to an embodiment executes a print process using an electrophotographic method. The printing process is a process of forming an image on a sheet **9**.

(16) As shown in FIG. **1**, the image forming apparatus **10** includes a sheet storing portion **2**, a sheet conveying device **3**, and a printing device **4**. The sheet conveying device **3** and the printing device **4** are housed in a main portion **1** (see FIG. **1**), which is a housing.

(17) The sheet storing portion **2** is able to store a plurality of sheets **9**. The sheet conveying device **3** includes a sheet feeding device **30** and a plurality of conveying roller pairs **31**.

(18) The sheet feeding device **30** feeds out the sheets **9** in the sheet storing portion **2** one by one to a conveying path **300**. The conveying path **300** is a path for the sheet **9**.

(19) The plurality of conveying roller pairs **31** convey the sheet **9** along the conveying path **300**. One set of the plurality of conveying roller pairs **31** discharges the sheet **9** on which an image is formed from the conveying path **300** onto a discharge tray **1***a* (see FIG. **1**).

(20) The printing device **4** executes the printing process on the sheet **9** conveyed along the conveying path **300**. The image formed on the sheet **9** is a toner image.

(21) The printing device **4** includes an optical scanning unit **40**, one or more image forming portions **4***x*, a transfer device **45**, and a fixing device **5**. The image forming portion **4***x* includes a photoconductor **41**, a charging device **42**, a developing device **43**, and a drum cleaning device **44**.

(22) The charging device **42** charges a surface of the photoconductor **41**. The optical scanning unit **40** scans the surface of the charged photoconductor **41** with a beam of light. Thus, the optical scanning unit **40** forms an electrostatic latent image on the surface of the photoconductor **41**.

(23) The developing device **43** supplies toner to the surface of the photoconductor **41** to develop the electrostatic latent image into a toner image. The transfer device **45** transfers the toner image formed on the surface of the photoconductor **41** to the sheet **9**.

(24) The transfer device **45** transfers the toner image to the sheet **9** at a transfer position P**1** on the conveying path **300**.

(25) In the present embodiment, the printing device **4** is a tandem color printing device including a plurality of image forming portions **4***x*. In addition, the transfer device **45** includes an intermediate transfer belt **450**, a plurality of primary transfer devices **451**, a secondary transfer device **452**, and a belt cleaning device **453**.

(26) In the example shown in FIG. **1**, the printing device **4** includes four image forming portions **4***x* corresponding to four colors of toner: yellow, magenta, cyan, and black. The transfer device **45** includes four primary transfer devices **451** corresponding to the four image forming portions **4***x*.

(27) The intermediate transfer belt **450** is rotatably supported by a plurality of support rollers **454**. One of the plurality of support rollers **454** is rotated by being driven by a belt drive device (not shown). Thus, the intermediate transfer belt **450** rotates.

(28) Each of the primary transfer devices **451** transfers the toner image formed on the surface of the photoconductor **41** in each of the image forming portions **4***x* to the surface of the intermediate transfer belt **450**. Thus, a composite toner image in which the four color toner images are combined is formed on the surface of the intermediate transfer belt **450**.

(29) The intermediate transfer belt **450** rotates while carrying the composite toner image. The secondary transfer device **452**, at the transfer position P**1**, transfers the composite toner image formed on the surface of the intermediate transfer belt **450** to the sheet **9**.

(30) The drum cleaning device **44** removes primary waste toner from the surface of the photoconductor **41**. The primary waste toner is toner that remains at a portion on the surface of the photoconductor **41** that has passed through the primary transfer device **451**.

(31) The belt cleaning device **453** removes secondary waste toner from the surface of the intermediate transfer belt **450**. The secondary waste toner is toner that remains at a portion on the surface of the intermediate transfer belt **450** that has passed through the secondary transfer device **452**.
(32) The fixing device **5** heats and presses the composite toner image on the sheet **9** at a fixing position P**2** on the conveying path **300**. Thus, the fixing device **5** fixes the composite toner image to the sheet **9**. The fixing position P**2** is a position on the downstream side in the sheet conveying direction with respect to the transfer position P**1**.
(33) As shown in FIG. **2**, the fixing device **5** includes a heater **51**, a fixing belt **52**, a fixing roller **520**, a pressure roller **53**, and a sheet separating member **5200**.
(34) The fixing belt **52** is a flexible cylindrical member that includes the fixing roller **520** therein. The fixing belt **52** is heated by the heater **51**.
(35) The fixing roller **520** is a cylindrical member that supports the fixing belt **52** on the inner side of the fixing belt **52**. The fixing roller **520** includes a cylindrical metal core portion **521** and an elastic portion **522** formed around the outer periphery of the metal core portion **521**.
(36) The fixing roller **520** is rotatably supported. The fixing belt **52** is rotatable together with the fixing roller **520**.
(37) The fixing belt **52** includes a conductive base material, an elastic layer formed around the outer periphery of the base material, and a release layer formed around the outer periphery of the elastic layer.
(38) The heater **51** is arranged to face the outer peripheral surface of the fixing belt **52**. In this embodiment, the heater **51** is an electromagnetic induction type heating device. The heater **51** mainly heats the base material of the fixing belt **52** by electromagnetic induction.
(39) The pressure roller **53** is rotatably supported. Similar to the fixing roller **520**, the pressure roller **53** also includes a cylindrical metal core portion **531** and an elastic portion **532** formed around the outer periphery of the metal core portion **531**.
(40) The pressure roller **53** is driven and rotated by a drive device (not shown). The fixing belt **52** and the fixing roller **520** rotate in conjunction with the pressure roller **53**.
(41) The fixing belt **52** heats the toner image formed on the sheet **9**. The pressure roller **53** presses the toner image toward the sheet **9**.
(42) The fixing belt **52** and the pressure roller **53** convey the sheet **9** onto which the toner image has been transferred, and form a fixing nip portion for fixing the toner image to the sheet **9**. The fixing position P**2** is a position where the fixing nip portion is formed. The fixing belt **52** and the pressure roller **53** are arranged side by side along a horizontal plane (see FIG. **1**). The heater **51** heats the fixing belt **52** on the opposite side of the fixing belt **52** from the pressure roller **53**. The fixing belt **52** is an example of a fixing member according to the present disclosure. The pressure roller **53** is an example of a pressure member according to the present disclosure.
(43) The sheet separating member **5200** separates the sheet **9** from the fixing belt **52** when the sheet **9** is attached to the fixing belt **52**.
(44) In the present embodiment, the fixing device **5** is divided into a heating unit **5***a* and a fixing unit **5***b* (see FIGS. **7** and **8**). The heating unit **5***a* includes the heater **51**. The fixing unit **5***b* includes the fixing belt **52**, the fixing roller **520**, and the pressure roller **53**.
(45) By moving the heating unit **5***a* to a position separated away from the fixing unit **5***b*, it is possible to pull out the fixing unit **5***b* from the main portion **1** in a removal direction D**11** along a first direction D**1** (see FIGS. **8** and **10**). The first direction D**1** is a direction along a center line of rotation of the fixing belt **52** and the pressure roller **53**. In the present embodiment, the first direction D**1** is the depth direction of the image forming apparatus **10**.
(46) [Configuration of Heating Unit **5***a* and Fixing Unit **5***b]*
(47) The heating unit **5***a* includes the heater **51** and a support body **54** (see FIGS. **7** and **8**). The support body **54** is a member that supports the heater **51**.

(48) The fixing unit **5***b* includes a support unit **55** and a movable unit **56** (see FIGS. **4** and **5**). The movable unit **56** includes the fixing belt **52**, the fixing roller **520**, and the pressure roller **53**.
(49) The support unit **55** supports the movable unit **56** below the movable unit **56**.
(50) As shown in FIGS. **4** and **5**, the support unit **55** includes a support surface portion **551**, an opening portion **552**, protruding portions **553**, a beam contact portion **554**, and a side wall portion **555**.
(51) The support surface portion **551** forms a support surface that supports the movable unit **56**. The support surface portion **551** is formed in a flat plate shape orthogonal to a vertical direction D**3**. The vertical direction D**3** is an up-down direction. Note that the first direction D**1** is also a direction orthogonal to the vertical direction D**3**. The support surface portion **551** is formed to be elongated in the first direction D**1**. FIG. **5** shows a state in which the movable unit **56** is lifted from the support surface portion **551**.
(52) The opening portion **552** is provided in the support surface portion **551**. The sheet **9** conveyed to the fixing position P**2** passes through the inside of the opening portion **552**.
(53) The protruding portions **553** are provided to protrude from the support surface of the support surface portion **551** toward the movable unit **56**. More specifically, the protruding portions **553** protrude upward from the support surface portion **551**. The protruding portions **553** are formed in a columnar shape. Note that the protruding portions **553** may be formed in a prismatic shape. As shown in FIG. **5**, the support unit **55** includes two protruding portions **553** spaced apart in the first direction D**1**.
(54) The beam contact portion **554** is provided to protrude downward from a bottom surface of the support surface portion **551** (see FIG. **4**).
(55) The side wall portion **555** is erected upright along one end of the support surface portion **551** in the first direction D**1**. More specifically, the side wall portion **555** is erected along an end on the upstream side of the support surface portion **551** in the removal direction D**11**.
(56) The movable unit **56** rotatably supports the fixing roller **520** and the pressure roller **53**. The fixing roller **520** supports fixing belt **52**. That is, the fixing belt **52** is supported by the movable unit **56** via the fixing roller **520**.
(57) As shown in FIGS. **4** and **5**, the movable unit **56** includes a bottom surface portion **561** and guide portions **562**.
(58) The bottom surface portion **561** forms a bottom surface of the movable unit **56**. The bottom surface portion **561** is formed in a flat plate shape orthogonal to the vertical direction D**3** (see FIG. **12**). The bottom surface portion **561** is formed to be elongated in the first direction D**1**. The bottom surface portion **561** is placed on the support surface portion **551** of the support unit **55**. An opening portion **565** (see FIG. **12**) is formed in the bottom surface portion **561** for passing the sheet **9** to the fixing position P**2**. The fixing belt **52**, the fixing roller **520**, and the pressure roller **53** are provided above the bottom surface portion **561**.
(59) The guide portions **562** are provided on the bottom surface portion **561**. Each guide portion **562** is formed so that a protruding portion **553** of the support unit **55** can be inserted therein (see FIG. **12**). More specifically, the guide portions **562** are holes formed in the bottom surface portion **561**. The guide portions **562** are formed to be elongated in the first direction D**1**. The guide portions **562** are provided corresponding to the two protruding portions **553** provided on the support unit **55**. That is, the movable unit **56** includes two guide portions **562** spaced apart from each other in the first direction D**1**. When the movable unit **56** is attached to the support unit **55**, the two protruding portions **553** are inserted into the two guide portions **562** (see FIG. **12**).
(60) The support unit **55** and the movable unit **56** are provided so as to be integrally insertable into and removable from the main portion **1**, which is the housing of the image forming apparatus **10**, along the first direction D**1**.
(61) The portions of the fixing belt **52** that rub against edges on both side of the sheet **9** are more likely to wear than other portions of the fixing belt **52**.

(62) In contrast, in the image forming apparatus **10**, the movable unit **56** is swinged along the width direction of the sheet **9**. The width direction of the sheet **9** is the same direction as the first direction D**1**.
(63) The fixing unit **5***b* further includes a reciprocating mechanism **57** that causes the movable unit **56** to reciprocate along the first direction D**1** (see FIG. **6**).
(64) The image forming apparatus **10** further includes a drive mechanism **7** arranged within the main portion **1** (see FIG. **6**). The drive mechanism **7** is fixed to the main body frame **1***x*.
(65) The drive mechanism **7** includes a reduction gear mechanism **71** including an output gear **711** and an output engagement portion **72**. The output engagement portion **72** is formed integrally with the output gear **711**. The output engagement portion **72** rotates at the same speed as the output gear **711**.
(66) The reduction gear mechanism **71** transmits the rotational force of a motor (not shown) to the output gear **711** while decelerating the rotational force. The output engagement portion **72** is a rotating body that transmits rotational force to the movable unit **56** of the fixing unit **5***b*.
(67) The reciprocating mechanism **57** includes an input engagement portion **571** and a cylindrical cam **572**. The input engagement portion **571** is provided so as to protrude from the side wall portion **555** of the support unit **55** in the mounting direction D**12**. The mounting direction D**12** is the opposite direction to the removal direction D**11**. The input engagement portion **571** engages with output engagement portion **72**. The input engagement portion **571** transmits the rotational force of the output engagement portion **72** to the cylindrical cam **572**. The input engagement portion **571** and the cylindrical cam **572** are provided at both ends of a shaft member extending in the first direction D**1**. The shaft member is rotatably supported by the side wall portion **555**.
(68) The movable unit **56** of the fixing unit **5***b* has a cam engagement portion **563** that engages with a cylindrical cam **572**. As the cylindrical cam **572** rotates, the cam engagement portion **563** reciprocates along the first direction D**1**.
(69) By reciprocating the cam engagement portion **563** along the first direction D**1**, the entire movable unit **56** reciprocates along the first direction D**1**. That is, the reciprocating mechanism **57** converts the rotational movement of the output engagement portion **72** into the reciprocating movement of the movable unit **56**.
(70) The reciprocating mechanism **57** reciprocates the movable unit **56** once every time a plurality of sheets **9** pass between the fixing belt **52** and the pressure roller **53**.
(71) For example, the movement range of the movable unit **56** in the first direction D**1** is approximately 3 mm to 10 mm.
(72) For example, the reciprocating mechanism **57** moves the movable unit **56** by about 0.02 mm to 0.08 mm each time one sheet **9** passes through the fixing device **5**.
(73) The guide portions **562** of the movable unit **56** guide the protruding portions **553** of the support unit **55**, which swings relative to the movable unit **56**, along the first direction D**1**. The guide portions **562**, which are swinged by the reciprocating mechanism **57**, are restricted by the protruding portions **553** from moving in the second direction D**2** orthogonal to the first direction D**1**. That is, the protruding portions **553** restrict movement of the movable unit **56**, which is swinged by the reciprocating mechanism **57**, in the second direction D**2**. The second direction D**2** is the lateral direction of the image forming apparatus **10**. In addition, the second direction D**2** is also a direction orthogonal to the vertical direction D**3**.
(74) Here, a case where the fixing unit **5***b* is divided into the movable unit **56** and the support unit **55**, it is necessary to provide a contact point between the movable unit **56** and the support unit **55** to release static electricity generated by friction between the fixing belt **52** and the sheet **9**. The contact point is required to prevent the electrical connection between the movable unit **56** and the support unit **55** from becoming unstable due to the swinging of the movable unit **56** relative to the support unit **55**.
(75) In contrast, as will be described below, in the image forming apparatus **10** of an embodiment

according to the present disclosure, it is possible to stabilize the electrical connection between the movable unit **56** and the support unit **55** included in the fixing device **5**.
(76) More specifically, the guide portions **562** of the movable unit **56** have conductivity. For example, the bottom surface portion **561** including the guide portions **562** is manufactured by processing a metal plate. In addition, the guide portions **562** are electrically connected to a static eliminating member that neutralizes the surface of the fixing belt **52**. The movable unit **56** is an example of the second unit according to the present disclosure.
(77) Moreover, the protruding portions **553** of the support unit **55** that are inserted through the guide portions **562** have electrical conductivity. For example, the protruding portions **553** are made of metal. Furthermore, the protruding portions **553** are electrically connected to ground of the image forming apparatus **10**. The support unit **55** is an example of the first unit according to the present disclosure.
(78) That is, the guide portions **562** and the protruding portions **553** function as the contact points for dissipating static electricity generated by friction between the fixing belt **52** and the sheet **9**.
(79) Note that the guide portions **562** may be provided in the support unit **55**. In that case, the protruding portions **553** may be provided on the movable unit **56**.
(80) In addition, in the image forming apparatus **10**, the movable unit **56** is pressed in the pressing direction D**21** (see FIG. **12**) by the heating unit **5***a*, as will be described below. The pressing direction D**21** is a direction perpendicular to the first direction D**1** and along a horizontal plane. More specifically, the pressing direction D**21** is a direction along the second direction D**2**. The heating unit **5***a* is an example of a pressing portion according to the present disclosure.
(81) [Mechanism for Pressing the Movable Unit **56**]
(82) The main portion **1** of the image forming apparatus **10** includes a main body frame **1***x* and an exterior member **100** that covers the main body frame **1***x* (see FIGS. **3** and **11**).
(83) The main body frame **1***x* is configured as a combination of a plurality of metal pipes (see FIG. **3**). The heating unit **5***a* and the fixing unit **5***b* are supported by the main body frame **1***x*. The fixing unit **5***b* is arranged next to the heating unit **5***a*.
(84) The exterior member **100** is attached to the main body frame **1***x* (see FIG. **11**). The exterior member **100** forms the exterior of the image forming apparatus **10**.
(85) The plurality of metal pipes of the main body frame **1***x* have two support column portions **11** and two beam portions **12** (see FIG. **3**).
(86) The two support column portions **11** are formed to extend in the vertical direction D**3**, and are arranged at intervals in the first direction D**1** (see FIG. **3**).
(87) The two support column portions **11** are formed to extend in the vertical direction D**3** next to the fixing unit **5***b* (see FIG. **7**).
(88) The exterior member **100** has an opening portion **101** and a cover member **102** (see FIG. **11**). The opening portion **101** is a portion in which an opening is formed that opens one end of the fixing unit **5***b* in the first direction D**1**.
(89) The cover member **102** is supported by a first support shaft **102***x* (see FIGS. **9** and **10**). Thus, the cover member **102** is rotatable about a first support shaft **102***x*. The cover member **102** is rotatable between a closed position where the opening portion **101** is closed and an open position where the opening portion **101** is opened.
(90) FIGS. **7** and **9** show the fixing device **5** when the cover member **102** is in the closed position. FIGS. **8** and **10** show the fixing device **5** when the cover member **102** is in the open position.
(91) When the cover member **102** is in the closed position, the cover member **102** is held in the closed position by a locking mechanism (not shown). When the lock by the locking mechanism is released, the cover member **102** can be rotated from the closed position to the open position.
(92) The two support column portions **11** include a first support column portion **11***a* arranged on a front side of the image forming apparatus **10** and a second support column portion **11***b* arranged on a rear side of the image forming apparatus **10** (see FIG. **3**).

(93) The two beam portions **12** are formed to extend in the second direction D**2** below the heating unit **5***a* and the fixing unit **5***b*, and are spaced apart in the first direction D**1** (see FIGS. **3** and **9**).
(94) The two beam portions **12** are connected to the two support column portions **11** (see FIG. **3**). For example, the two beam portions **12** are connected to the two support column portions **11** by welding.
(95) The two beam portions **12** include a first beam portion **12***a* arranged on the front side of the image forming apparatus **10** and a second beam portion **12***b* arranged on the rear side of the image forming apparatus **10** (see FIG. **3**).
(96) The fixing unit **5***b* is arranged between the heating unit **5***a* and the two support column portions **11** (see FIG. **7**).
(97) The support body **54** of the heating unit **5***a* is placed on the two beam portions **12** in a state of spanning between the two beam portions **12**. Similarly, the support unit **55** of the fixing unit **5***b* is placed on the two beam portions **12** in a state of spanning between the two beam portions **12**.
(98) That is, neither the heating unit **5***a* nor the fixing unit **5***b* is fixed to the main body frame **1***x* with fixtures such as screws.
(99) The heating unit **5***a* and the fixing unit **5***b* are placed on the two beam portions **12** with the longitudinal direction of each oriented in the first direction D**1** (see FIGS. **9** and **10**).
(100) The heating unit **5***a* and the fixing unit **5***b* are arranged side by side in the second direction D**2**. That is, the second direction D**2** is the direction in which the heating unit **5***a* and the fixing unit **5***b* are arranged.
(101) The image forming apparatus **10** further includes a first spring **60** and an interlocking mechanism **6** (see FIGS. **7** to **10**). For example, the first spring **60** is supported by a protruding portion **544** of the support body **54**.
(102) The first spring **60** biases the support body **54** toward the movable unit **56** by an elastic force (see FIG. **7**). The support body **54** is biased by the first spring **60** and comes into contact with the movable unit **56**. Thus, the movable unit **56** is pressed in the pressing direction D**21** (see FIG. **12**) by the heating unit **5***a*.
(103) The biasing force F**1** of the first spring **60** against the support body **54** is larger than a static frictional force of the heating unit **5***a* with respect to the two beam portions **12**. Therefore, the heating unit **51***a* that has received the biasing force F**1** moves in the pressing direction D**21**. In addition, the biasing force F**1** is smaller than the sum of the static frictional force of the heating unit **5***a* with respect to the two beam portions **12** and the static frictional force of the support unit **55** with respect to the two beam portions **12**. The movable unit **56** is restricted from moving in the pressing direction D**21** by the protruding portions **553** of the support unit **55** inserted into the guide portions **562** (see FIG. **12**). Therefore, the movement in the pressing direction D**21** of the heating unit **51***a* that has received the biasing force F**1** is stopped by the movable unit **56** whose movement in the pressing direction D**21** is restricted by the support unit **55**. The heating unit **51***a* is positioned by being pressed in the pressing direction D**21** and coming into contact with the movable unit **56**.
(104) Here, when the heating unit **51***a* moves in the pressing direction D**21** due to the biasing force F**1** received from the first spring **60** and comes into contact with the movable unit **56**, the protruding portions **553** of the support unit **55** are pressed in the pressing direction D**21** from the guide portions **562** of the movable unit **56** (See FIG. **12**). Thus, the stability of the electrical connection between the guide portions **562** and the protruding portions **553** is ensured.
(105) The support body **54** has a plurality of ribs **541** that come in contact with the upper surfaces of the two beam portions **12**. The ribs **541** of the support body **54** are provided to reduce static frictional force.
(106) The bottom surface of the support surface portion **551** of the support unit **55** is placed on top surfaces of the two beam portions **12**. The two beam portions **12** support the support unit **55** on the lower side of the support unit **55**, and restrict movement of the support unit **55** in the pressing direction D**21** by frictional force generated at the contact portion with the support unit **55**. In other

words, the two beam portions **12** function as restricting portions according to the present disclosure. Note that the bottom surface of the support surface portion **551** of the support unit **55** may be processed to increase static frictional force. In addition, a member for increasing the static frictional force may be provided on the bottom surface of the support surface portion **551** of the support unit **55**.

(107) Note that the two support column portions **11** may come in contact with the support unit **55** inserted into the main portion **1**, and may restrict the movement of the support unit **55** in the pressing direction D**21**. In other words, the two support column portions **11** may function as a restricting portion according to the present disclosure.

(108) The support body **54** has a plurality of recessed first fitting portions **542** that open in a lateral direction (see FIGS. **7** and **8**). The support body **54** has four first fitting portions **542** formed at intervals in the first direction D**1** and the vertical direction D**3**.

(109) The movable unit **56** has a plurality of protruding second fitting portions **564** that can be fitted into the plurality of first fitting portions **542**. The movable unit **56** has four second fitting portions **564** corresponding to the four first fitting portions **542**.

(110) When the first spring **60** biases the support body **54**, the inner surfaces of the recessed portions of the four first fitting portions **542** come into contact with the four second fitting portions **564** (see FIG. **7**).

(111) In addition, by fitting the second fitting portions **564** into the first fitting portions **542**, relative movement of the support body **54** and the movable unit **56** in the vertical direction D**3** is restricted.

(112) Note that the movable unit **56** may include the first fitting portions **542** and the support body **54** may include the second fitting portions **564**.

(113) The interlocking mechanism **6** moves the heating unit **5***a* along the second direction D**2** in conjunction with the movement of the cover member **102**.

(114) When the cover member **102** moves from the closed position to the open position, the interlocking mechanism **6** moves the support body **54** of the heating unit **5***a* from the reference position to the retreat position (see FIGS. **7** and **8**).

(115) The reference position is the position of the support body **54** when the support body **54** is in contact with the movable unit **56**. The retreat position is a position of the support body **54** when the support body **54** is separated from the movable unit **56**.

(116) When the support body **54** moves from the reference position to the retreat position, the four second fitting portions **564** are separated from the four first fitting portions **542** (see FIG. **8**).

(117) Note that positioning the support body **54** at the reference position has the same meaning as positioning the heating unit **5***a* at the reference position. In addition, the fact that the support body **54** is positioned at the retreat position is synonymous with the fact that the heating unit **5***a* is positioned at the retreat position.

(118) When the support body **54** is located at the retreat position, the fixing unit **5***b* can be pulled out from the main body frame **1***x* in the removal direction D**11** along the first direction D**1** (see FIG. **10**).

(119) When the fixing unit **5***b* is pulled out from the main body frame **1***x*, the fixing unit **5***b* can pass through the opening portion **101** of the exterior member **100**.

(120) On the other hand, when the cover member **102** moves from the open position to the closed position, the interlocking mechanism **6** moves the support body **54** from the retreat position to the reference position (see FIGS. **7** and **8**).

(121) When the support body **54** moves from the retreat position to the reference position, the four second fitting portions **564** fit into the four first fitting portions **542** (see FIG. **7**).

(122) The cover member **102** also serves as an operation portion that can be moved between a first position and a second position by being operated. The closed position of the cover member **102** is the first position of the operation portion. The open position of the cover member **102** is the second

position of the operation portion.
(123) For example, the interlocking mechanism **6** includes an action member **61**, two first link members **62**, a second link member **63**, and a third link member **64** (see FIGS. **9** and **10**).
(124) The action member **61** is arranged so as to be movable along the second direction D**2**. The two first link members **62** are connected to the action member **61** by two first connecting shafts **611**. The second link member **63** is connected to the two first link members **62** by two second connecting shafts **621**.
(125) The third link member **64** is supported by a second support shaft **640**. The third link member **64** is rotatable about the second support shaft **640**. The third link member **64** is connected to the second link member **63** by a third connecting shaft **631**. The cover member **102** is connected to the third link member **64** by a fourth connecting shaft **641**.
(126) The interlocking mechanism **6** shown in FIGS. **9** and **10** is a link mechanism that converts the rotation of the cover member **102** into the movement of the action member **61** along the second direction D**2**.
(127) When the cover member **102** rotates, the second link member **63** moves along the first direction D**1** by the action of the third link member **64**.
(128) When the second link member **63** moves along the first direction D**1**, the action member **61** moves along the second direction D**2** due to the action of the first link member **62**.
(129) When the cover member **102** moves from the closed position to the open position, the interlocking mechanism **6** moves the action member **61** in a direction away from the fixing unit **5***b*. When the cover member **102** moves from the open position to the closed position, the interlocking mechanism **6** moves the action member **61** in a direction toward the fixing unit **5***b*.
(130) The first spring **60** is arranged between the action member **61** and the support body **54** of the heating unit **5***a* (see FIGS. **7** and **8**). The action member **61** pushes the first spring **60** toward the support body **54** when approaching the support **54** along the second direction D**2** (see FIG. **7**).
(131) When the action member **61** pushes the first spring **60** toward the support body **54**, the first spring **60** biases the support body **54** toward the reference position.
(132) The action member **61** has an engaging portion **612** that can engage with an engaged portion **543** of the support body **54** (see FIG. **7**). When the action member **61** moves along the second direction D**2** in the direction away from the support body **54**, the engaging portion **612** engages with the engaged portion **543**.
(133) When the action member **61** moves along the second direction D**2** in the direction away from the support body **54**, the support body **54** receives a force from the action member **61** through the engaging portion **612**, and moves from the reference position to the retreat position (See FIG. **8**).
(134) On the other hand, when the action member **61** moves along the second direction D**2** in the direction approaching the support body **54**, the support body **54** receives a force from the action member **61** through the first spring **60**, and moves from the retreat position to the reference position (See FIG. **7**).
(135) Note that the interlocking mechanism **6** may include a gear mechanism such as a rack and pinion mechanism. In that case as well, the interlocking mechanism **6** converts the rotation of the cover member **102** into the movement of the action member **61** along the second direction D**2**.
(136) The heating unit **5***a* and the fixing unit **5***b* are positioned in the vertical direction D**3** by being placed on the two beam portions **12**. The loads of the heating unit **5***a* and the fixing unit **5***b* restrict upward movement of the heating unit **5***a* and the fixing unit **5***b*.
(137) In addition, the image forming apparatus **10** further includes a cover biasing mechanism **8** attached to an inner surface of the cover member **102** (see FIGS. **9** and **10**).
(138) The cover biasing mechanism **8** includes a second spring **80**, a spring case **81**, and a cap portion **82** (see FIG. **9**).
(139) The spring case **81** accommodates the second spring **80**. The cap portion **82** is movably attached to the spring case **81**.

(140) When the cover member **102** is positioned in the closed position, the second spring **80** is sandwiched between the cover member **102** and the support unit **55** of the fixing unit **5***b*. In the present embodiment, the second spring **80** and the cap portion **82** are sandwiched between the cover member **102** and the support unit **55**.
(141) The second spring **80** is sandwiched between the cover member **102** and the support unit **55**, and thereby biases the support unit **55** inserted into the main portion **1** in the mounting direction D**12** by elastic force (see FIG. **9**). The second spring **80** is an example of a biasing portion according to the present disclosure. Furthermore, the mounting direction D**12** is an example of an insertion direction according to the present disclosure.
(142) In addition, when the cover member **102** is positioned in the closed position, the force that the support unit **55** receives from the second spring **80** causes the beam contact portion **554** to come in contact with one side surface of the two beam portions **12**. In the present embodiment, the beam contact portion **554** comes in contact with the side surface of the second beam portion **12***b*. The second beam portion **12***b*, by coming in contact with the beam contact portion **554**, stops movement of the support unit **55** in the mounting direction D**12** farther on the downstream side in the mounting direction D**12** than the support unit **55** inserted into the main portion **1**. In addition, the second beam portion **12***b* restricts the movement of the support unit **55** in the pressing direction D**21** due to the frictional force generated at the contact portion with the beam contact portion **554** of the support unit **55**. In other words, the second beam portion **12***b* functions as a restricting portion according to the present disclosure.
(143) The fixing unit **5***b* is positioned in the first direction D**1** by the action of the second spring **80** and the beam contact portion **554**.
(144) Note that the cover biasing mechanism **8** may be attached to the support unit **55** of the fixing unit **5***b*.
(145) In this way, in the image forming apparatus **10**, the movable unit **56** of the fixing unit **5***b* is pressed in the pressing direction D**21** by the heating unit **5***a*. In addition, by the movable unit **56** being pressed in the pressing direction D**21**, the protruding portions **553** of the support unit **55** inserted into the guide portions **562** of the movable unit **56** are pressed in the pressing direction D**21** by the guide portions **562**. Moreover, the guide portions **562** and the protruding portions **553** function as contact points for dissipating static electricity generated due to friction between the fixing belt **52** and the sheet **9**. Thus, it is possible to stabilize the electrical connection between the movable unit **56** and the support unit **55**.
(146) It is to be understood that the embodiments herein are illustrative and not restrictive, since the scope of the disclosure is defined by the appended claims rather than by the description preceding them, and all changes that fall within metes and bounds of the claims, or equivalence of such metes and bounds thereof are therefore intended to be embraced by the claims.

Claims

1. An image forming apparatus, comprising: a movable unit configured to be able to swing along a width direction of a sheet, and including a fixing member and a pressure member that form a fixing nip portion for fixing a toner image to the sheet; a support unit configured to support the movable unit below the movable unit; a conductive protruding portion provided to protrude from a first unit of one of the movable unit and the support unit toward a second unit of the other; a conductive guide portion formed in the second unit so that the protruding portion is insertable therein, and configured to guide the protruding portion along the width direction with the protruding portion swinging relative to the second unit; and a pressing portion configured to press the movable unit in a pressing direction perpendicular to the width direction and along a horizontal plane.
2. The image forming apparatus according to claim 1, wherein the fixing member and the pressure member are arranged side by side along a horizontal plane; and the pressing portion includes a

heater configured to heat the fixing member on a side of the fixing member opposite to the pressing member, and is positioned by being pressed in the pressing direction and coming into contact with the movable unit.

3. The image forming apparatus according to claim 1, wherein the movable unit and the support unit are provided to be integrally insertable into and removable from a housing of the image forming apparatus along the width direction; and the image forming apparatus comprises a restricting portion configured to come into contact with the support unit inserted into the housing and restrict movement of the support unit in the pressing direction.

4. The image forming apparatus according to claim 3, wherein the restricting portion supports the support unit below the support unit, and restricts movement of the support unit in the pressing direction by a frictional force generated at a contact portion with the support unit.

5. The image forming apparatus according to claim 3, comprising a biasing portion configured to bias the support unit inserted into the housing in an insertion direction in which the movable unit and the support unit are inserted; wherein the restricting portion stops movement of the support unit in the insertion direction farther at a downstream side in the insertion direction than the support unit inserted into the housing, and restricts movement of the support unit in the pressing direction by a frictional force generated at a contact portion with the support unit.