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Transfer belt unit and image forming apparatus

Abstract

A transfer belt unit mountable to and demountable from an apparatus main body of an image forming apparatus, the transfer belt unit including: a transfer belt being in contact with a photosensitive drum of a drum cartridge of the image forming apparatus in a state where the transfer belt unit is mounted to the apparatus main body, the transfer belt being configured to transfer a toner image on the photosensitive drum to a sheet conveyed between the photosensitive drum and the transfer belt and to convey the sheet conveyed between the photosensitive drum and the transfer belt toward a fixing unit of the image forming apparatus in the state where the transfer belt unit is mounted to the apparatus main body, and a belt memory in which information about the transfer belt unit is stored.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) This application is a continuation of U.S. patent application Ser. No. 17/391,102, filed Aug. 2, 2021, now U.S. Pat. No. 11,829,097, which is a continuation of U.S. patent application Ser. No. 16/584,254, filed Sep. 26, 2019, now U.S. Pat. No. 11,079,715, which is based upon and claims the benefit of priority from prior Japanese patent application No. 2018-184031, filed on Sep. 28, 2018, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD
(1) The present disclosure relates to a transfer belt unit and an image forming apparatus including the transfer belt unit.
BACKGROUND ART

(2) In the related art, an image forming apparatus including a detachable transfer belt unit has been known. The transfer belt unit is configured to transfer a toner image on a photosensitive drum to a sheet and to convey the sheet between the transfer belt unit and the photosensitive drum.
(3) In order to perform an optimal image processing in correspondence to an exchanged transfer belt unit, it is needed to obtain information about the transfer belt unit.

SUMMARY

(4) An aspect of the present disclosure provides a transfer belt unit storing information about a detachable transfer belt unit.
(5) Another aspect of the present disclosure provides an image forming apparatus including a transfer belt unit storing information about a detachable transfer belt unit.
(6) According to an aspect of the present disclosure, there is provided a transfer belt unit mountable to and demountable from an apparatus main body of an image forming apparatus, the transfer belt unit including: a transfer belt being in contact with a photosensitive drum of a drum cartridge of the image forming apparatus in a state where the transfer belt unit is mounted to the apparatus main body, the transfer belt being configured to transfer a toner image on the photosensitive drum to a sheet conveyed between the photosensitive drum and the transfer belt and to convey the sheet conveyed between the photosensitive drum and the transfer belt toward a fixing unit of the image forming apparatus in the state where the transfer belt unit is mounted to the apparatus main body, and a belt memory in which information about the transfer belt unit is stored.

Description

BRIEF DESCRIPTION OF DRAWINGS

(1) FIG. **1** depicts a schematic configuration of an image forming apparatus in accordance with an exemplary embodiment of the present disclosure;
(2) FIG. **2** is a plan view of a transfer belt unit;
(3) FIG. **3**A is a side view depicting a simplified relation between the transfer belt unit located at a contact position and a pressing member;
(4) FIG. **3**B is a sectional view depicting a relation between a bearing part and a restraint part;
(5) FIG. **4** is a view depicting a state where the transfer belt unit of FIG. **3**A is located at a spaced position;
(6) FIG. **5** depicts the transfer belt unit, as seen from below;
(7) FIG. **6** is a sectional view of a holder and a contact holder;
(8) FIG. **7** depicts the transfer belt unit located at the contact position, as seen from a user side;
(9) FIG. **8** depicts the contact holder, as seen from above; and
(10) FIG. **9** depicts the transfer belt unit located at the spaced position, as seen from the user side.

DESCRIPTION OF EMBODIMENTS

(11) Hereinafter, an exemplary embodiment of the present disclosure will be described in detail with reference to the drawings. Meanwhile, in the following descriptions, an axial direction of a photosensitive drum **41** is referred to as ‘first direction’. Also, a direction in which a plurality of photosensitive drums **41** is aligned is referred to as ‘second direction’. The second direction intersects with the first direction. Preferably, the second direction is perpendicular to the first direction. Also, a direction in which a discharge tray **12**, an image forming part **3** and a sheet tray **21** are aligned is referred to as ‘third direction’. The third direction intersects with the first direction and the second direction. Preferably, the third direction is perpendicular to the first direction and the second direction. In the exemplary embodiment, the third direction is a vertical direction.
(12) As shown in FIG. **1**, an image forming apparatus **1** is a color laser printer, for example. The image forming apparatus **1** includes an apparatus main body **10**, a feeder unit **2** configured to feed a sheet S, an image forming part **3** configured to form an image on the fed sheet S, and a discharge

unit **4** configured to discharge the sheet S having the image formed thereon.
(13) The feeder unit **2** is located at a lower part in the apparatus main body **10**, and includes a feeding tray **21** configured to accommodate therein sheets S, and a feeding mechanism **22** configured to feed the sheet S from the feeding tray **21** to the image forming part **3**. The sheets S in the feeding tray **21** are separated one by one by the feeding mechanism **22**, which is then fed to the image forming part **3**.
(14) The image forming part **3** includes an exposure unit **30**, an image forming unit **40**, a transfer belt unit **50**, a belt cleaner **60**, and a fixing unit **70**.
(15) The exposure unit **30** is located at an upper part in the apparatus main body **10**, and includes a laser light-emitting part, a polygon mirror, a lens and a reflector, which are not shown.
(16) The image forming unit **40** includes a drum cartridge **40**A mountable to and demountable from the apparatus main body **10** and four developing cartridges **41** mountable to and demountable from the drum cartridge **40**A. In a state where the drum cartridge **40**A is mounted to the apparatus main body **10**, the drum cartridge **40**A is located between the feeder unit **2** and the exposure unit **30**. The drum cartridge **40**A is movable between a mounting position (refer to FIG. **1**) inside the apparatus main body **10** and a separation position outside the apparatus main body **10**.
(17) The drum cartridge **40**A includes four photosensitive drums **43** and four chargers **44**. The developing cartridge **41** includes a developing roller **46**. The developing cartridge **41** also includes a supply roller, a layer thickness regulation blade, and a toner accommodation part whose reference numerals are omitted.
(18) The transfer belt unit **50** is mountable to and demountable from the apparatus main body **10**. In a state where the transfer belt unit **50** is mounted to the apparatus main body **10**, the transfer belt unit **50** is arranged between the feeder unit **2** and the image forming unit **40**. The transfer belt unit **50** includes a drive roller **51**, a driven roller **52**, a transfer belt **53**, four transfer rollers **54**, four belt electrodes **57**, and a backup roller **56**.
(19) The drive roller **51** is a roller configured to drive the transfer belt **53**. The drive roller **51** is in contact with an inner surface of the transfer belt **53**. A drive force that is generated from a motor M of the image forming apparatus **1** is transmitted to the drive roller **51**, so that the transfer belt **53** is rotated in an arrow direction (counterclockwise direction) in FIG. **1**.
(20) The driven roller **52** is a roller configured to rotate in association with driving of the transfer belt **53**. The driven roller **52** is in contact with the inner surface of the transfer belt **53**.
(21) The transfer belt **53** (including upper surface **53**A) is in contact with the photosensitive drums **43** in the state where the transfer belt unit **50** is mounted to the apparatus main body **10**. The transfer belt **53** is configured to transfer toner images on the photosensitive drums **43** to the sheet S conveyed between the photosensitive drums **43** and the transfer belt **53**, and to convey the sheet S conveyed between the photosensitive drums **43** and the transfer belt **53** toward the fixing unit **70**. The transfer belt **53** is an endless belt.
(22) The transfer roller **54** is in contact with the inner surface of the transfer belt **53**. The transfer roller **54** is a roller configured to sandwich the transfer belt **53** between the transfer roller **54** and each photosensitive drum **43**. The belt electrode **57** is located at an end portion of the transfer roller **54** at another end-side in the first direction. The belt electrode **57** is an electrode electrically connected to the transfer belt **53** via the transfer roller **54**. The belt electrode **57** is configured to apply a transfer bias to the transfer roller **54** so as to transfer the toner image on the photosensitive drum **43** to the sheet S in the state where the sheet S is conveyed between the photosensitive drum **43** and the transfer belt **53**.
(23) The belt cleaner **60** is located below the transfer belt unit **50**. The belt cleaner **60** includes a cleaning roller **61** and a collection box **62**. The cleaning roller **61** is in contact with a lower surface **53**B of the transfer belt **53**. The cleaning roller **61** is configured to collect toner on the transfer belt **53** and to accommodate the same in the collection box **62**. The cleaning roller **61** is configured to sandwich the transfer belt **53** between the cleaning roller **61** and the backup roller **56**.

(24) The fixing unit **70** is located downstream of the image forming unit **40** and the transfer belt unit **50** with respect to a conveying direction. The fixing unit **70** includes a heating roller **71** and a pressing roller **72** arranged to face the heating roller **71**. The pressing roller **72** is configured to press the heating roller **71**.
(25) In the image forming part **3**, surfaces of the photosensitive drums **43** are uniformly charged by the chargers **44**. Thereafter, laser light (dashed-dotted line) from the exposure unit **30** is irradiated to the surfaces of the photosensitive drums **43**. As a result, electrostatic latent images are formed on the photosensitive drums **43**. Also, the toner in the toner accommodation part is supplied to the developing rollers **46** through the supply rollers. Then, the toner is carried on the developing rollers **46**.
(26) The toner carried on the developing rollers **46** is supplied from the developing rollers **46** to the electrostatic latent images on the photosensitive drums **43**. As a result, toner images are formed on the photosensitive drums **43**. Thereafter, the sheet S fed onto the transfer belt **53** is conveyed between the photosensitive drums **43** and the transfer rollers **54**. As a result, the toner images formed on the respective photosensitive drums **43** are transferred to the sheet S. Then, the sheet S is conveyed between the heating roller **71** and the pressing roller **72**. As a result, the transferred toner images are heat-fixed on the sheet S.
(27) The discharge unit **4** has a discharge path **81** formed to extend upward from an exit of the fixing unit **70** and to change a direction thereof toward the front, and a plurality of conveyor rollers **82** configured to convey the sheet S. The sheet S having the toner images heat-fixed thereon is enabled to pass the discharge path **81** by the conveyor rollers **82**. Thereafter, the sheet S is discharged onto a discharge tray **12** located at an upper part of the apparatus main body **10**,
(28) The apparatus main body **10** has an openable and closable front cover **11**. The front cover **11** is a front sidewall of the apparatus main body **10**. A user can open the front cover **11** and pull out the drum cartridges **41** to an outside of the apparatus main body **10**. That is, the drum cartridge **40**A is detachably mounted to the apparatus main body **10**. Also, the user can pull out the transfer belt unit **50** to the outside of the apparatus main body **10** by demounting the drum cartridge **40**A from the apparatus main body **10**.
(29) Subsequently, a detailed structure around the transfer belt unit **50** is described.
(30) As shown in FIG. **2**, the transfer belt unit **50** has a belt frame **55**. The belt frame **55** rotatably supports the drive roller **51** and the driven roller **52**.
(31) The drive roller **51** is rotatable about a first axis X**1** extending in the first direction. The driven roller **52** is rotatable about a second axis X**2** extending in the first direction. The driven roller **52** is located with being spaced from the drive roller **51** in the second direction intersecting with the first direction. In the exemplary embodiment, the second direction is a direction in which the first axis X**1** and the second axis X**2** are aligned, and intersects with the first direction.
(32) The belt frame **55** has a first frame **55**A, a second frame **55**B, a third frame **55**C, and a handle C**1**. The first frame **55**A is located at an end portion of the transfer belt **53** at one end-side in the first direction. The second frame **55**B is located at an end portion of the transfer belt **53** at the other end-side in the first direction. The third frame **55**C is located at an end portion of the transfer belt **53** at one end-side in the second direction. The third frame **55**C couples an end portion of the first frame **55**A at the one end-side in the second direction and an end portion of the second frame **55**B at the one end-side in the second direction.
(33) The handle C**1** is located on the third frame **55**C. The handle C**1** is located at an end portion of the belt frame **55** at the one end-side in the second direction. The user can mount and demount the transfer belt unit **50** by gripping the handle C**1**.
(34) The first frame **55**A has a main body part A**1**, a bearing part A**2**, an engaging part A**3**, and a supported part A**4**. The main body part A**1** extends in the second direction. The bearing part A**2**, the engaging part A**3** and the supported part A**4** protrude from a side surface of the main body part A**1** toward the one end-side in the first direction. The bearing part A**2**, the engaging part A**3** and the

supported part A**4** protrude from the main body part A**1** so as to be distant from the second frame **55**B in the first direction.
(35) The second frame **55**B has a main body part B**1**, a bearing part B**2**, an engaging part B**3**, and a supported part B**4**. The main body part B**1** extends in the second direction. The bearing part B**2**, the engaging part B**3** and the supported part B**4** protrude from a side surface of the main body part B**1** toward the other end-side in the first direction. The bearing part B**2**, the engaging part B**3** and the supported part B**4** protrude from the main body part B**1** so as to be distant from the first frame **55**A in the first direction.
(36) The bearing part A**2** rotatably supports an end portion of a shaft **51**S of the drive roller **51** at the one end-side in the first direction. The bearing part B**2** rotatably supports an end portion of the shaft **51**S of the drive roller **51** at the other end-side in the first direction. The bearing parts A**2**, B**2** are cylindrical members. The bearing part A**2** is located at an end portion of the first frame **55**A at the other end-side in the second direction. The bearing part B**2** is located at an end portion of the second frame **55**B at the other end-side in the second direction. The drive roller **51** has a drive gear **58**. The drive gear **58** is configured to transmit the drive force from the motor M of the image forming apparatus **1** to the drive roller **51**. The drive gear **58** is located on the first frame **55**A.
(37) As shown in FIG. **3**A, the bearing parts A**2**; B**2** are supported by a restraint part **14** of the apparatus main body **10** in the state where the belt unit **50** is mounted to the apparatus main body **10**. The restraint part **14** is a member configured to restrain a position of the drive roller **51** in the third direction intersecting with the first direction and the second direction via the bearing parts A**2**, B**2**. In the exemplary embodiment, the third direction is perpendicular to the first direction and the second direction.
(38) As shown in FIG. **3**B, the restraint part **14** has a bottom part **14**A extending in the third direction, an upper part **14**B extending from one end of the bottom part **14**A in the third direction toward the one end-side in the second direction, and a lower part **14**C extending from another end of the bottom part **14**A in the third direction toward the one end-side in the second direction. The restraint part **14** has an opening at an end portion of the restraint part **14** at the one end-side in the second direction. The restraint part **14** has a U-shape. A length of the lower part **14**C in the second direction is greater than a length of the upper part **14**B in the second direction.
(39) An interval between the upper part **14**B and the lower part **14**C is greater than an outer diameter of the bearing parts A**2**, B**2**. For this reason, in the state where the belt unit **50** is mounted to the apparatus main body **10**, the bearing parts A**2**, B**2** are inserted in the restraint part **14**. Thereby, movement of the bearing parts A**2**, B**2** in the third direction is restrained by the upper part **14**B and the lower part **14**C.
(40) The bottom part **14**A is configured to restrain a position of the drive roller **51** in the second direction. The bottom part **14**A is in contact with the bearing parts A**2**, B**2** in the state where the belt unit **50** is mounted to the apparatus main body **10**. On the other hand, the bottom part **14**A may be located while being spaced from the bearing part sA**2**, B**2** in the second direction in the state where the belt unit **50** is mounted to the apparatus main body **10**.
(41) Also, the transfer belt unit **50** is rotatable about an axis of the drive roller **51** upon mounting to and demounting from the apparatus main body **10**. Specifically, the transfer belt unit **50** is rotatable about the axis of the drive roller **51** between a contact position shown in FIG. **3**A and a spaced position shown in FIG. **4**.
(42) As shown in FIG. **3**A, the engaging parts A**3**, B**3** are members engaged to a pressing member **110** of the apparatus main body **10**. The engaging parts A**3**, B**3** have a tapered shape. A distance between the engaging parts A**3**, B**3** and the drive roller **51** in the second direction is a first distance L**1**. A distance between the engaging parts A**3**, B**3** and the handle C**1** in the second direction is a second distance L**2** greater than the first distance L**1**. More specifically, a distance from the axis of the drive roller **51** to a contact points of the engaging parts A**3**, B**3** and the pressing member **110** is the first distance L**1**. Also, a distance from the contact points of the engaging parts A**3**, B**3** and the

pressing member **110** to the other end of the handle C**1** in the second direction is the second distance L**2**.
(43) The pressing member **110** is a member configured to press the engaging part A**3**; B**3** toward a positioning part **15** of the apparatus main body **10** in the second direction. The pressing member **110** is rotatable between an initial position shown in FIG. **4** and a pressing position shown in FIG. **3**A. In the meantime, the positioning parts **15** are located at both sides of the transfer belt unit **50** in the first direction.
(44) The pressing member **110** has a rotating shaft **111** rotatably supported by the apparatus main body **10**, a first arm part **112** extending from the rotating shaft **111** toward one end-side in the third direction and configured to sandwich the engaging parts A**3**, B**3** between the first arm part **112** and the positioning part **15**, a guide part **113** protruding from an end portion of the first arm part **112** at one end-side in the third direction toward the other end-side in the second direction, and a second arm part **114** extending from the rotating shaft **111** toward the one end-side in the second direction. An end portion of the first arm part **112** at the one end-side in the third direction has a tapered shape.
(45) The apparatus main body **10** has a tensile coil spring **120**, a spring engaging part **16**, and a support part **17**.
(46) One end portion of the tensile coil spring **120** is engaged to a tip end portion of the second arm part **114** of the pressing member **110**. The other end portion of the tensile coil spring **120** is engaged to the spring engaging part **16**. Thereby, the pressing member **110** is always pressed from the pressing position toward the initial position by the tensile coil spring **120**. Also, the pressing member **110** pressed by the tensile coil spring **120** presses the engaging parts A**3**, B**3** toward the positioning part **15** in the second direction. As a result, the transfer belt unit **50** is positioned in the second direction with respect to the apparatus main body **10**. Here, when the engaging parts A**3**, B**3** deviate from between the pressing member **110** and the positioning part **15**, the pressing member **110** comes in contact with the positioning part **15**. As a result, the pressing member **110** is kept at the initial position.
(47) Also, the first frame **55**A has the supported part A**4**, a bearing part **52**A, a guide hole **52**B, and a compression coil spring **52**C. The second frame **55**B has the supported part B**4**.
(48) The supported parts A**4**, B**4** are supported by the support part **17** in the state where the belt unit **50** is mounted to the apparatus main body **10**. The supported part A**4** is located between the engaging part A**3** and the handle C**1**. The supported part B**4** is located between the engaging part B**3** and the handle C**1**. The bearing **52**A rotatably supports the driven roller **52**. The bearing **52**A is located at an end portion of the first frame **55**A at the one end-side in the second direction. The guide hole **52**B is formed to movably support the bearing **52**A in the second direction. The compression coil spring **52**C is configured to urge the bearing **52**A toward the one end-side in the second direction.
(49) The transfer belt unit **50** includes a belt memory **200**. The belt memory **200** is located on the belt frame **55**. The belt memory **200** includes a memory element **201**, and a first electrical contact surface **202**. The first electrical contact surface **202** is electrically connected to the memory element **201**. In the exemplary embodiment, the memory element **201** and the first electrical contact surface **202** are adjacent to each other. However, the memory element **201** and the first electrical contact surface **202** may be spaced apart.
(50) In the belt memory **200**, information about the transfer belt unit **50** is stored. Specifically, in the belt memory **200**, a conveying speed of the transfer belt **53** measured in advance is stored. Also, in the belt memory **200**, a thickness of the transfer belt **53**, an outer diameter of the drive roller **51**, and an outer diameter of the driven roller **52**, which have been measured in advance, may be stored as examples of component information influencing the conveying speed of the belt.
(51) As shown in FIG. **5**, the first electrical contact surface **202** is located on an outer surface of the belt frame **55**. The first electrical contact surface **202** is located at the end portion of the belt frame

55 at the one end-side in the first direction. Also, the first electrical contact surface **202** is aligned with the handle C**1** in the first direction, when viewed by a user from the third direction. The first electrical contact surface **202** is located at an end portion of the belt frame **55** at the one end-side in the second direction. The first electrical contact surface **202** is located at an opposite side to the drive roller **51** with respect to the driven roller **52** in the second direction. That is, the driven roller **52** is located between the first electrical contact surface **202** and the drive roller **51** in the second direction. The first electrical contact surface **202** is perpendicular to the third direction.

(52) The belt frame **55** has a protrusion **55**T, a holder **210**, positioning parts **212**, a spring holding part **213**, and a spring **214**.

(53) As shown in FIG. **3**A, the belt frame **55** has the protrusion **55**T extending away from the transfer belt **53**. The protrusion **55**T extends in the third direction. The first electrical contact surface **202** is closer to the transfer belt **53** than to a tip end **55**S of the protrusion **55**T in the third direction.

(54) As shown in FIG. **6**, the holder **210** is supported by the spring holding part **213** so as to be slidable in the third direction. Specifically, the third frame **55**C of the belt frame **55** has the holder **210** configured to hold the first electrical contact surface **202**. The first electrical contact surface **202** of the belt memory **200** is held by the holder **210**.

(55) The holder **210** has a concave part **211**A configured to hold the belt memory **200** and a protrusion **211**B extending toward the one end-side in the third direction.

(56) The spring holding part **213** has a hole **213**A extending in the third direction. The spring **214** is located in the hole **213**A. The spring **214** is a compression spring. One end of the spring **214** is in contact with a bottom of the hole **213**A, and the other end of the spring **214** is engaged with the protrusion **211**B of the holder **210**. Thereby, the spring **214** always presses the first electrical contact surface **202** in the third direction.

(57) The positioning parts **212** are located at both sides of the spring holding part **213** in the first direction.

(58) The positioning part **212** is supported by the spring holding part **213** so as to be slidable in the third direction. The positioning part **212** has a positioning protrusion **212**A protruding toward the other end-side in the third direction and an inclined surface **212**B. The positioning protrusion **212**A is located at an end portion of the spring holding part **213** in the first direction. The inclined surface **212**B is located at a position more distant from the spring holding part **211** than the positioning protrusion **212**A in the first direction. The inclined surface **212**B is inclined so as to be more distant from the positioning protrusion **212**A in the third direction as it is more spaced from the first electrical contact surface **202** in the first direction.

(59) The positioning parts **212** are located at both sides of the spring holding part **213** when the transfer belt unit **50** is located at the contact position shown in FIG. **7**. On the other hand, when the transfer belt unit **50** is located at the spaced position shown in FIG. **9**, the positioning parts **212** are slid by an urging member (not shown) or an own weight thereof, and is moved toward the other end-side in the third direction with respect to the spring holding part **213**.

(60) The image forming apparatus **1** includes a first electric contact **300**, a contact holder **310**, and a separation preventing member **320**. As shown in FIG. **7**, the first electric contact **300** is located at an end portion of the apparatus main body **10** at the one end-side in the first direction (refer to FIG. **9**, too). The first electric contact **300** comes into electrical contact with the first electrical contact surface **202** in the state where the transfer belt unit **50** is mounted to the apparatus main body **10**. The first electric contact **300** is held by the contact holder **310**.

(61) As shown in FIG. **8**, the contact holder **310** is held by the apparatus main body **10** and the separation preventing member **320**. The apparatus main body **10** and the separation preventing member **320** hold the contact holder **310** so as to be slidable in the first direction and in the second direction. Specifically, the separation preventing member **320** holds the contact holder **310** so as to be slidable within a range of a region R**1**. The apparatus main body **10** and the separation

preventing member **320** hold the contact holder **310** so as to be slidable within a range of a region R**2**. The separation preventing member **320** restrains the contact holder **310** from moving in the third direction. The contact holder **310** is capable of sliding in the first direction and the second direction.

(62) The contact holder **310** has a holding member **311**, holes **312**, guides **313**, a concave part **314**, and an extension part **315**. The holding member **311** is a member holding the first electric contact **300**. The hole **312** is a hole that the positioning protrusion **212**A of the holder **210** is to enter. The guide **313** has an inclined part **313**A. The inclined part **313**A is configured to come into contact with the inclined surface **212**B of the holder **210**, thereby guiding the holder **210**. The concave part **314** supports the holding member **311**. The extension part **315** extends toward the one end-side in the second direction. The extension part **315** is configured to enter between the apparatus main body **10** and the separation preventing member **320**. Thereby, the contact holder **310** is restrained from moving in the third direction.

(63) As shown in FIG. **7**, the apparatus main body **10** has a lever **350**. The lever **350** is rotatable about a rotary axis X**3** extending in the second direction between a first position shown in FIG. **7** and a second position shown in FIG. **9**. When the lever **350** is located at the first position, the first electrical contact surface **202** is in contact with the first electric contact **300**. On the other hand, when the lever **350** is located at the second position, the first electrical contact surface **202** is spaced from the first electric contact **300**.

(64) The lever **350** has a rotating shaft **351**, a first arm **352**, a second arm **353**, and a third arm **354**.

(65) The rotating shaft **351** is rotatable about the rotary axis X**3**. The first arm **352** extends from an outer peripheral surface of the rotating shaft **351**. A tip end portion of the first arm **352** is aligned with the handle C**1** in the first direction. The user can touch the tip end portion of the first arm **352**.

(66) The second arm **353** extends from the outer peripheral surface of the rotating shaft **351** in a direction different from the first arm **352**. The second arm **353** is located while being spaced from the first arm **352** in a rotating direction of the lever **350**. When the lever **350** is located at the first position, a tip end of the second arm **353** comes into contact with the handle C**1**.

(67) The third arm **354** extends from the outer peripheral surface of the rotating shaft **351** in a direction different from the first arm **352** and the second arm **353**. The third arm **354** can be elastically deformed. When the lever is located at the second position, a tip end of the third arm **354** is engaged with the apparatus main body **10**. For this reason, when the lever is located at the second position, the third arm **354** always urges the lever **350** to return from the second position toward the first position.

(68) In a state where the lever **350** is located at the first position, when the user presses the first arm **352** so that the lever **350** rotates from the first position to the second position, the second arm **353** pushes up the transfer belt unit **50** to the spaced position. Thereby, the first electrical contact surface **202** is spaced from the first electric contact **300**. In other words, when the lever **350** is located at the first position, the first electrical contact surface **202** comes into contact with the first electric contact **300**. When the lever **350** is located at the second position, the first electrical contact surface **202** is spaced from the first electric contact **300**.

(69) The apparatus main body **10** has a main body substrate **360** electrically connected to the first electric contact **300**. The main body substrate **360** is located at the end portion of the apparatus main body **10** at the one end-side in the first direction. That is, both the first electric contact **300** and the main body substrate **360** are located at the end portion of the apparatus main body **10** at the one end-side in the first direction. The main body substrate **360** is a substrate including a CPU, a RAM, a ROM and an input/output circuit, for example.

(70) As shown in FIG. **7**, the drum cartridge **41** includes a drum memory **41**M having a second electrical contact surface **41**T (refer to FIG. **1**, too). The apparatus main body **10** has a second electric contact **300**T that is in contact with the second electrical contact surface **41**T in the state where the drum cartridge **41** is mounted to the apparatus main body **10**. The second electric contact

300T is located at the end portion of the apparatus main body **10** at the one end-side in the first direction. That is, both the second electric contact and the main body substrate **360** are located at the end portion of the apparatus main body **10** at the one end-side in the first direction.
(71) Subsequently, operations that are performed when mounting and demounting the transfer belt unit **50** are described.
(72) As shown in FIG. **4**, when mounting the transfer belt unit **50** to the apparatus main body **10**, the user first inserts the transfer belt unit **50** into the apparatus main body **10** while gripping the handle C**1**. At this time, the user inserts the bearing parts A**2**, B**2** into the restraint parts **14**.
(73) Then, the user rotates the transfer belt unit **50** about the axis of the drive roller **51**. Thereby, the engaging parts A**3**, B**3** come into contact with the guide parts **113** of the pressing members **110**. When the user further rotates the transfer belt unit **50**, the engaging parts A**3**, B**3** press the guide parts **113** of the pressing members **110** against the urging forces of the tensile coil springs **120**. Thereby, the pressing members **110** are rotated from the initial position shown in FIG. **4** to the pressing position shown in FIG. **3**A. At this time, the engaging parts A**3**, B**3** enter between the pressing members **110** and the positioning parts **15**. As a result, the transfer belt unit **50** is positioned in the second direction with respect to the apparatus main body **10**. At this time, the first electrical contact surface **202** comes into contact with the first electric contact **300**. When the first electrical contact surface **202** comes into contact with the first electric contact **300**, the spring **214** presses the first electrical contact surface **202** in the third direction.
(74) When the first electrical contact surface **202** comes into contact with the first electric contact **300**, the positioning protrusions **212**A of the holder **210** enter the holes **312** of the contact holder **310**. As a result, the first electric contact **300** is positioned in the first direction and the second direction. In a case where the positioning protrusions **212**A deviate from the holes **312** of the contact holder **310**, the inclined parts **313**A of the contact holder **310** are guided to the inclined surfaces **212**B of the holder **210**. For this reason, the positioning protrusions **212**A are guided into the holes **312** of the contact holder **310**.
(75) When demounting the transfer belt unit **50** from the apparatus main body **10**, the user first pushes the tip end portion of the first arm **352** of the lever **350** toward the other end-side in the third direction (an arrow direction in FIG. **7**). Thereby, the tip end portion of the second arm **353** pushes up the handle C**1** toward the one end-side in the third direction. Then, the transfer belt unit **50** is moved from the contact position to the spaced position (refer to FIG. **9**). At this time, the user can grip the handle C**1** by pushing fingers from a gap between the handle C**1** and the apparatus main body **10**. The user rotates the transfer belt unit **50** about the axis of the drive roller **51** by raising an end portion of the transfer belt unit **50** by gripping the handle C**1**. Thereby, the engaging parts A**3**, B**3** depart from between the pressing members **110** and the positioning parts **15**. For this reason, as shown in FIG. **4**, the pressing members **110** are rotated in a clockwise direction by the urging forces of the tensile coil springs **120** and are thus returned from the pressing position to the initial position. Thereafter, the user separates the bearing parts A**2**, B**2** from the restraint parts **14** and takes out the transfer belt unit **50** to the outside of the apparatus main body **10**.
(76) According to the transfer belt unit **50** as described above, it is possible to store the information about the transfer belt unit **50**. Also, according to the image forming apparatus **1** including the transfer belt unit **50**, it is possible to store the information about the transfer belt unit **50**.
(77) Also, since the first electrical contact surface **202** of the belt memory **200** is located at the outer surface of the belt frame **55**, the information stored in the belt memory **200** can be easily read out from the first electrical contact surface **202**.
(78) Also, since the drive gear **58** and the first electrical contact surface **202** are arranged at the same side in the first direction, the positioning in the first direction can be performed easily.
(79) Also, since the first electrical contact surface **202** is arranged at an opposite side to the drive roller **51** with respect to the driven roller **52** in the second direction, the first electrical contact surface **202** is unlikely to be an obstacle.

(80) Also, since the first electrical contact surface **202** is aligned with the handle C**1** in the first direction, it is possible to suppress enlargement of the transfer belt unit **50**.
(81) Also, since the holder **210** configured to hold the first electrical contact surface **202** can be slid in the third direction, the first electrical contact surface **202** can stably come into contact with a member configured to read out the information.
(82) Also, since the first electrical contact surface **202** is urged in the third direction by the spring **214**, it is possible to suppress contact defects which are caused due to vibrations and the like.
(83) Also, the first electrical contact surface **202** is closer to the transfer belt **53** than to the tip end **55**S of the protrusion **55**T of the belt frame **55**. Therefore, even when the transfer belt unit **50** is placed on a table or the like, the tip end **55**S of the protrusion **55**T comes into contact with the table, so that the first electrical contact surface **202** does not contact the table. For this reason, it is possible to suppress the first electrical contact surface **202** from being damaged.
(84) Also, since the contact holder **310** can be slid in the first direction and the second direction, the first electrical contact surface **202** can stably contact the first electric contact **300**.
(85) The first electric contact **300**, the second electric contact and the main body substrate **360** are located at the end portion at the one end-side in the first direction. For this reason, it is possible to shorten a wiring that connects the first electric contact **300** and the second electric contact to the main body substrate **360**.
(86) Also, the first electrical contact surface **202** is in contact with the first electric contact **300** when the lever **350** is located at the first position, and the first electrical contact surface **202** is spaced from the first electric contact **300** when the lever **350** is located at the second position. Therefore, it is possible to easily demount the transfer belt unit **50** by locating the lever **350** at the second position.
(87) In the above configuration, the lever **350** can rotate about the rotary axis X**3** extending in the second direction intersecting with the first direction. For this reason, it is possible to compactly arrange the lever **350** in the second direction. As a result, the lever **350** is unlikely to be an obstacle.
(88) Also, the user can push up the transfer belt unit **50** by pushing the first arm **352** of the lever **350**. For this reason, the user can easily demount the transfer belt unit **50**.
(89) Although the exemplary embodiment of the present disclosure has been described, the present disclosure is not limited to the exemplary embodiment.
(90) In the exemplary embodiment, the transfer belt unit has the drive roller and one driven roller. However, the present disclosure is not limited thereto. For example, the transfer belt unit may have the drive roller and two or more driven rollers.
(91) In the exemplary embodiment, the image forming apparatus **1** is the color laser printer. However, the present disclosure is not limited thereto. For example, the present disclosure can be applied to other image forming apparatuses such as a copier, a complex machine, and the like.

Claims

1. A transfer belt unit comprising: a transfer roller rotatable about a first axis extending in a first direction; a transfer belt being in contact with a photosensitive drum in a state where the transfer belt unit is mounted to the apparatus main body, the transfer belt having a first end and a second end spaced apart from the first end in the first direction; and a belt memory including: a memory element in which information about the transfer belt unit is stored; and a first electrical contact surface electrically connected to the memory element, the first electrical contact surface being positioned between the first end of the transfer belt and the second end of the transfer belt in the first direction, wherein the transfer belt is an endless belt, the transfer roller is positioned inside of the transfer belt, and the first electrical contact surface is positioned outside of the transfer belt.
2. The transfer belt unit according to claim 1, further comprising: a holder holding the first electrical contact surface, the holder including a protrusion extending from an outer surface of the

holder in a second direction intersecting with the first direction.
3. The transfer belt unit according to claim 1, further comprising: a backup roller rotatable about a second axis extending in the first direction, the backup roller being in contact with an inner surface of the transfer belt.
4. The transfer belt unit according to claim 1, further comprising: a drive roller configured to drive the transfer belt, the drive roller being rotatable about a drive axis extending in the first direction, and the drive roller being in contact with an inner surface of the transfer belt; and a driven roller being rotatable in association with driving of the transfer belt, the driven roller being rotatable about a driven axis extending in the first direction, the driven roller being in contact with the inner surface of the transfer belt, and the driven roller being spaced from the drive roller in a third direction intersecting with the first direction.
5. The transfer belt unit according to claim 4, wherein the first electrical contact surface is positioned closer to the driven roller than to the drive roller in the third direction.
6. The transfer belt unit according to claim 4, wherein the driven roller is positioned between the first electrical contact surface and the drive roller in the third direction.
7. The transfer belt unit according to claim 4, wherein the drive roller includes a drive gear configured to transmit a drive force to the drive roller, and wherein the drive gear and the first electrical contact surface are positioned at one end of the transfer belt unit in the first direction.
8. The transfer belt unit according to claim 4, wherein the belt memory stores information about a thickness of the transfer belt, an outer diameter of the drive roller, and an outer diameter of the driven roller.
9. The transfer belt unit according to claim 1, wherein the belt memory stores information about a conveying speed of the transfer belt.
10. The transfer belt unit according to claim 1, further comprising: a belt electrode electrically connected to the transfer belt via the transfer roller.
11. The transfer belt unit according to claim 10, wherein the first electrical contact surface is positioned at one end of the transfer belt unit in the first direction, and wherein the belt electrode is positioned at the other end of the transfer belt unit in the first direction.
12. The transfer belt unit according to claim 1, further comprising: a belt frame including a frame protrusion protruding in a second direction intersecting with the first direction, wherein the first electrical contact surface is positioned between a tip end of the frame protrusion and the memory element in the second direction.
13. The transfer belt unit according to claim 12, wherein the belt frame includes a handle located at an end portion of the belt frame at one end side in the second direction, and wherein the first electrical contact surface is aligned with the handle in the first direction when viewed from a third direction intersecting the first direction and the second direction.
14. The transfer belt unit according to claim 12, wherein the belt frame includes a holder holding the first electrical contact surface, and wherein the holder is slidable in a third direction intersecting with the first direction and the second direction.
15. The transfer belt unit according to claim 14, wherein the belt frame further includes a spring configured to press the first electrical contact surface in the third direction.
16. The transfer belt unit according to claim 14, wherein the third direction is a direction perpendicular to the first electrical contact surface.