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SHEET CONVEYING APPARATUS AND IMAGE FORMING APPARATUS

Abstract

A sheet conveying apparatus includes a first roller, a second roller, a bush member, an urging member, and a conveyance guide member. The urging member urges the bush member in such a direction that the second roller approaches the first roller. The conveyance guide member is fitted to the rotation shaft of the second roller to be movable between a guiding position in which the conveyance guide member guides the sheet, and a retracted position in which the conveyance guide member is retracted from the guiding position, and it contacts, in the retracted position, a body frame to move the bush member against the urging force of the urging member in such a direction that the second roller separates from the first roller.

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Background/Summary

INCORPORATION BY REFERENCE

[0001] This application is based on and claims the benefit of priority from Japanese Patent Application No. 2024-018718 filed on Feb. 9, 2024, the contents of which are hereby incorporated by reference.

BACKGROUND

[0002] The present disclosure relates to a sheet conveying apparatus and an image forming apparatus.

[0003] Image forming apparatuses such as copiers and printers include a sheet conveying apparatus. The sheet conveying apparatus includes a pair of conveying rollers that conveys a sheet. The sheet conveying apparatus conveys one sheet after another from a sheet feeding portion, which stores a stack of sheets as a recording medium used for printing (recording) an image, to an image forming portion (transferring portion), a fixing portion, and a sheet ejection portion.

SUMMARY

[0004] According to one aspect of the present disclosure, a sheet conveying apparatus includes a first roller, a second roller, a bush member, an urging member, and a conveyance guide member. The first roller is rotatably supported on a body frame of an apparatus body. The second roller is disposed so as to face the first roller to constitute a pair of conveying rollers. The bush member is supported on the body frame so as to be movable along the radial direction of the first roller, and rotatably supports the second roller. The urging member urges the bush member in such a direction that the second roller approaches the first roller. The conveyance guide member guides a sheet that is conveyed to a nip portion in the pair of the conveying rollers. The conveyance guide member is fitted to the rotation shaft of the second roller so as to be movable between a guiding position in which the conveyance guide member guides the sheet and a retracted position in which the conveyance guide member is retracted from the guiding position. In the retracted position, the conveyance guide member contacts the body frame so as to move the bush member against the urging force of the urging member in such a direction that the second roller separates from the first roller.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. 1 is a schematic sectional front view of an image forming apparatus according to one embodiment of the present disclosure.

[0006] FIG. 2 is a perspective view of a sheet conveying apparatus in the image forming apparatus in FIG. 1.

[0007] FIG. 3 is a perspective part view around a pair of registration rollers in the sheet conveying apparatus in FIG. 2.

[0008] FIG. 4 is a sectional front view around the pair of registration rollers in FIG. 3 with a conveyance guide member in a guiding position.

[0009] FIG. 5 is a sectional front view around the pair of registration rollers in FIG. 3 with the conveyance guide member in a retracted position.

[0010] FIG. 6 is a perspective view of an openable/closable portion of the sheet conveying apparatus in the image forming apparatus in FIG. 1.

[0011] FIG. 7 is an enlarged perspective part view of the openable/closable portion in FIG. 6.

DETAILED DESCRIPTION

[0012] Now, an embodiment of the present disclosure will be described with reference to the drawings. Note that the description below is not meant to limit the scope of the present disclosure.

[0013] FIG. 1 is a schematic sectional front view of an image forming apparatus 1 according to the embodiment. One example of the image forming apparatus 1 according to the embodiment is a tandem color printer that transfers a toner image to a sheet S using an intermediate transfer belt 71. The image forming apparatus 1 can be what is called a multifunction peripheral having functions of, for example, printing, scanning (image reading), facsimile transmission, and the like.

[0014] As shown in FIG. 1, the image forming apparatus 1 includes, inside its apparatus body 2, a sheet feeding portion 3, a sheet conveying apparatus 4, an exposure portion 5, an image forming portion 6, a transferring portion 7, a fixing portion 8, a sheet ejection portion 9, and a control portion 10.

[0015] The sheet feeding portion 3 is disposed in a bottom part of the apparatus body 2. The sheet feeding portion 3 stores a plurality of unprinted sheets S and separates and feeds out one sheet S after another for printing. The sheet conveying apparatus 4 extends in the top-bottom direction along a side wall of the apparatus body 2. The sheet conveying apparatus 4 conveys the sheet S fed from the sheet feeding portion 3 to a secondary transfer portion 73 and the fixing portion 8, and ejects the sheet S after fixing through a sheet ejection port 4a to the sheet ejection portion 9. The exposure portion 5 is disposed above the sheet feeding portion 3. The exposure portion 5 exposes the image forming portion 6 to laser light controlled based on image data.

[0016] The image forming portion 6 is disposed above the exposure portion 5, below the intermediate transfer belt 71. The image forming portion 6 includes an image forming portion 6Y for yellow, an image forming portion 6C for cyan, an image forming portion 6M for magenta, an image forming portion 6B for black. These four image forming portions 6 have basically the same configuration. Thus, in the following description, except when distinction is needed, the suffixes distinguishing the colors, “Y,” “C,” “M,” and “B,” are sometimes omitted.

[0017] The image forming portion 6 includes a photosensitive drum that is supported so as to be rotatable in a predetermined direction (clockwise in FIG. 1). The image forming portion 6 further includes a charging portion, a development portion, and a drum cleaning portion that are disposed around the photosensitive drum along its rotational direction. Note that a primary transfer portion 72 is disposed between the development portion and the drum cleaning portion.

[0018] The photosensitive drum has a photosensitive layer formed on its outer circumferential surface. The charging portion electrostatically charges the outer circumferential surface of the photosensitive drum to a predetermined surface potential. The exposure portion 5 exposes the outer circumferential surface of the photosensitive drum charged by the charging portion to light to form, by attenuating the charge on the outer circumferential surface of the photosensitive drum, an electrostatic latent image based on a document image. The development portion supplies toner to and thereby develops the electrostatic latent image on the outer circumferential surface of the photosensitive drum to form a toner image. The four image forming portions 6 form toner images of mutually different colors. The drum cleaning portion performs cleaning by removing the residual toner and the like left on the outer circumferential surface of the photosensitive drum after primary transfer of the toner images to the outer circumferential surface of the intermediate transfer belt 71. In this way, the image forming portion 6 forms the image (toner image) that will be subsequently transferred to the sheet S.

[0019] The transferring portion 7 includes the intermediate transfer belt 71, the primary transfer portions 72Y, 72C, 72M, and 72B, the secondary transfer portion 73, and a belt cleaning portion 74. The intermediate transfer belt 71 is disposed above the four image forming portions 6. The intermediate transfer belt 71 is supported so as to be rotatable in a predetermined direction (counterclockwise in FIG. 1). The intermediate transfer belt 71 is an endless intermediate transfer

member to which the toner images formed at the four image forming portions **6** are primarily transferred sequentially so as to be overlayed on each other. The four image forming portions **6** are disposed in what is called a tandem arrangement, in which they are arrayed in a row from upstream to downstream in the rotational direction of the intermediate transfer belt **71**.

[0020] The primary transfer portions **72Y**, **72C**, **72M**, and **72B** are disposed, across the intermediate transfer belt **71**, above the image forming portions **6Y**, **6C**, **6M**, and **6B** of the corresponding colors. The secondary transfer portion **73** is disposed upstream of the fixing portion **8** with respect to the sheet conveyance direction of the sheet conveying apparatus **4**, downstream of the four image forming portions **6Y**, **6C**, **6M**, and **6B** with respect to the rotational direction of the intermediate transfer belt **71**. The belt cleaning portion **74** is disposed downstream of the secondary transfer portion **73** with respect to the rotational direction of the intermediate transfer belt **71**.

[0021] The primary transfer portion **72** transfers the toner image formed on the outer circumferential surface of the photosensitive drum to the intermediate transfer belt **71**. In other words, the toner image is primarily transferred to the outer circumferential surface of the intermediate transfer belt **71** at the primary transfer portions **72Y**, **72C**, **72M**, and **72B** of the corresponding colors. Then as the intermediate transfer belt **71** rotates, with predetermined timing, the toner images of the four image forming portions **6** are transferred to the intermediate transfer belt **71** sequentially so as to be overlayed on each other to form a color toner image having the toner images of four colors, namely yellow, cyan, magenta, and black, overlayed on each other on the outer circumferential surface of the intermediate transfer belt **71**.

[0022] The color toner image on the outer circumferential surface of the intermediate transfer belt **71** is transferred to the sheet **S** synchronously fed by the sheet conveying apparatus **4** at a secondary transfer nip portion formed in the secondary transfer portion **73**. The belt cleaning portion **74** performs cleaning by removing foreign matter such as residual toner left on the outer circumferential surface of the intermediate transfer belt **71** after secondary transfer. In this way, the transferring portion **7** transfers (records) the toner image formed on the outer circumferential surface of the photosensitive drum to the sheet **S**.

[0023] The fixing portion **8** is disposed above the secondary transfer portion **73**. The fixing portion **8** heats and presses the sheet **S** having the toner image transferred to it to fix the toner image to the sheet **S**.

[0024] The sheet ejection portion **9** is disposed above the transferring portion **7**. The sheet **S** having the toner image fixed to it and having undergone printing is conveyed to the sheet ejection portion **9**. In the sheet ejection portion **9**, the printed sheet (printed matter) can be retrieved upward.

[0025] The control portion **10** includes a CPU, an image processing portion, a memory, and other electronic circuits and components (none of which is shown). The CPU controls the operation of different components in the image forming apparatus **1** based on programs and data for control stored in the memory to perform processes related to the functions of the image forming apparatus **1**. The sheet feeding portion **3**, the sheet conveying apparatus **4**, the exposure portion **5**, the image forming portion **6**, the transferring portion **7**, and the fixing portion **8** individually receive instructions from the control portion **10** and operate together to perform printing on the sheet **S**. The memory is configured with a combination of a non-volatile memory device (not shown) such as a program ROM (read only memory) or a data ROM and a volatile memory device (not shown) such as a RAM (random access memory).

[0026] Now, the configuration of the sheet conveying apparatus **4** will be described with reference to FIG. 1 and FIG. 2. FIG. 2 is a perspective view of the sheet conveying apparatus **4** in the image forming apparatus **1** in FIG. 1. Note that, FIG. 2 does not show components that are not relevant to the following detailed description. The sheet conveying apparatus **4** includes a sheet conveyance passage **41**, an openable/closable portion **42** (see FIG. 6), and a pair of registration rollers **43**.

[0027] The sheet conveyance passage **41** extends substantially along the top-bottom direction from downstream of the sheet feeding portion **3** in the sheet conveyance direction via the secondary

transfer portion **73** and the fixing portion **8** to upstream of the sheet ejection portion **9** in the sheet conveyance direction. The sheet conveyance passage **41** includes a plurality of pairs of conveying rollers including a pair of registration rollers **43**. With the plurality of pairs of conveying rollers, the sheet conveyance passage **41** conveys the sheet **S** fed out from the sheet feeding portion **3** to the secondary transfer portion **73** and the fixing portion **8**, and then ejects the sheet **S** after fixing through the sheet ejection port **4a** to the sheet ejection portion **9**.

[0028] The openable/closable portion **42** extends along a side wall of the apparatus body **2**, along the top-bottom direction. The openable/closable portion **42** is supported on the apparatus body **2** so as to be swingable, with an upper end part of the openable/closable portion **42** as a free end, about a rotation axis disposed in a lower end part of the openable/closable portion **42** and extending along the front-rear direction of the apparatus body **2** (depth direction of the plane of FIG. **1**). When the upper end part of the openable/closable portion **42** is leaned sideward away from the apparatus body **2**, the sheet conveyance passage **41** including the vicinity of the pair of registration rollers **43** is exposed. In other words, the openable/closable portion **42** is fitted to the apparatus body **2** so as to be openable and closable relative to it.

[0029] The pair of registration rollers **43** is disposed upstream of the secondary transfer portion **73** in the sheet conveyance direction. The sheet **S** fed out from the sheet feeding portion **3** reaches the pair of registration rollers **43** through the sheet conveyance passage **41**. The control portion **10** feeds out the sheet **S** toward a secondary transfer nip portion in the secondary transfer portion **73**, while correcting a skew in the sheet **S** and adjusting timing with toner image formation in the image forming portion **6** and primary transfer in the transferring portion **7**.

[0030] Now, the configuration around the pair of registration rollers **43** will be described in detail with reference to FIGS. **3** to **6**. FIG. **3** is a perspective part view around the pair of registration rollers **43** in the sheet conveying apparatus **4** in FIG. **2**. FIGS. **4** and **5** are sectional front views around the pair of registration rollers **43** in FIG. **3** with a conveyance guide member in a guiding position and in a retracted position respectively. Note that FIG. **3** illustrates a region around one end part of the pair of registration rollers **43** along the sheet width direction perpendicular to the sheet conveyance direction. On the other hand, FIGS. **4** and **5** are sectional front views at a place closer, than the region shown in FIG. **3**, to the middle along the sheet width direction.

[0031] The pair of registration rollers **43** has a first roller **43A** and a second roller **43B** that constitute a pair of conveying rollers. The first and second rollers **43A** and **43B** are disposed so as to face each other. The first roller **43A** is rotatably supported on a body frame **2F** of the apparatus body **2**. Specifically, the rotation shaft **43Ax** of the first roller **43A** is rotatably supported via a bearing (not shown) fitted to the body frame **2F**. Around the pair of registration rollers **43**, a bush member **44**, an urging member **45**, and a conveyance guide member **46** are disposed.

[0032] The bush member **44** is disposed at each end of the pair of registration rollers **43** along the sheet width direction. The bush member **44** is formed substantially in the shape of a rectangular parallelepiped extending along the direction in which the first and second rollers **43A** and **43B** face each other, and is supported on the body frame **2F** so as to be movable along the radial direction of the first roller **43A**. The bush member **44** has a hole **44a** and a bearing **44b**.

[0033] The hole **44a** is disposed at the position where the rotation shaft **43Ax** of the first roller **43A** is located, and penetrates the bush member **44** along the axial direction of the rotation shaft **43Ax** (sheet width direction). The hole **44a** is formed substantially in a cylindrical shape and is penetrated by the rotation shaft **43Ax**. Within the movement range of the bush member **44**, which is movable along the radial direction of the first roller **43A**, the rotation shaft **43Ax** does not contact an inner circumferential part of the hole **44a**.

[0034] The bearing **44b** is disposed at the position where the rotation shaft **43Bx** of the second roller **43B** is located. The bearing **44b** is fixed to the bush member **44** and rotatably supports the rotation shaft **43Bx**. In other words, the bush member **44** rotatably supports the second roller **43B**. Accordingly, the second roller **43B** is supported on the apparatus body **2** via the bush member **44**.

In addition, with the movement of the bush member **44**, which moves along the radial direction of the first roller **43A**, the second roller **43B** moves along the radial direction of the first roller **43A**. [0035] The urging member **45** is disposed adjacent to the bush member **44**, opposite the second roller **43B** across the first roller **43A**. The urging member **45** is configured with a compression coil spring disposed so that it expands and contracts along the radial direction of the first roller **43A**. One end of the urging member **45** along its expansion-contraction direction is supported on the body frame **2F**, and the other end is supported on the bush member **44**.

[0036] The urging member **45** urges, relative to the body frame **2F**, the bush member **44**, which is movable along the radial direction of the first roller **43A**. Specifically, the urging member **45** urges the bush member **44** in such a direction that the second roller **43B** approaches the first roller **43A**, i.e., leftward in FIG. 3.

[0037] The conveyance guide member **46** is fitted to the rotation shaft **43Bx** of the second roller **43B**. The conveyance guide member **46** has a guide portion **46a** and a pair of bearing portions **46b**.

[0038] The guide portion **46a** extends over the entire region of the pair of registration rollers **43** along the sheet width direction. In addition, a part of the guide portion **46a** upstream of a nip portion **N** in the pair of registration rollers **43** in the sheet conveyance direction extends toward the nip portion **N** in the sheet conveyance direction. The guide portion **46a** guides the sheet **S** that is conveyed to the nip portion **N** in the pair of registration rollers **43**.

[0039] The pair of bearing portions **46b** are disposed one at each end of the guide portion **46a** along the sheet width direction. The pair of bearing portions **46b** is rotatably fitted one to each end of the rotation shaft **43Bx** of the second roller **43B**. Accordingly, the conveyance guide member **46** rotates about the axis of the rotation shaft **43Bx**. The conveyance guide member **46** rotates about the axis of the rotation shaft **43Bx** so as to be movable between the guiding position (see FIG. 4), in which the conveyance guide member **46** guides the sheet **S** along the sheet conveyance passage **41**, and the retracted position (see FIG. 5), in which the conveyance guide member **46** is retracted from the guiding position.

[0040] The body frame **2F** includes a contacted portion **2Fc**, which contacts and separates from each of a pair of bearing portions **46b**. The contacted portion **2Fc** is disposed outward of the second roller **43B** along the radial direction so as to face the bearing portions **46b** along the radial direction.

[0041] When the conveyance guide member **46** is arranged in the guiding position as shown in FIG. 4, the pair of bearing portions **46b** are each away from the contacted portion **2Fc** of the body frame **2F**. In this state, the second roller **43B** is pressed onto the first roller **43A** by the urging force of the urging member **45** to form the nip portion **N** for conveying the sheet **S**.

[0042] When the conveyance guide member **46** is arranged in the retracted position as shown in FIG. 5, the pair of bearing portions **46b** are each in contact with the contacted portion **2Fc** of the body frame **2F**. Accordingly, the bearing portions **46b** of the conveyance guide member **46** move the bush member **44** against the urging force of the urging member **45** in such a direction that the second roller **43B** separates from the first roller **43A**.

[0043] With the configuration described above, the first and second rollers **43A** and **43B** of the pair of registration rollers **43** are both supported on the apparatus body **2**, and this allows the accurate positioning and stable pressing. Moreover, the pair of registration rollers **43** can, by moving the conveyance guide member **46**, easily make the first and second rollers **43A** and **43B** contact and separate from each other. Thus, the sheet conveying apparatus **4** allows easy removal of a jammed sheet **S**.

[0044] Specifically, the pair of bearing portions **46b** are each shaped as an eccentric cam having in an outer circumferential part of it a small diameter portion **46c** and a large diameter portion **46d**.

[0045] The distance from the central axis of the rotation shaft **43Bx** of the second roller **43B** to the outer edge of the small diameter portion **46c** along the radial direction is smaller than the radius of the second roller **43B**. When the conveyance guide member **46** is arranged in the guiding position,

the small diameter portion **46c** is located opposite the contacted portion **2Fc** of the body frame **2F** along the radial direction of the second roller **43B**. In other words, with the conveyance guide member **46** in the guiding position, the small diameter portion **46c** comes close to the body frame **2F** such that the bearing portion **46b** makes the second roller **43B** contact the first roller **43A** under the urging force of the urging member **45**.

[0046] The distance from the central axis of the rotation shaft **43Bx** of the second roller **43B** to the outer edge of the large diameter portion **46d** along the radial direction is larger than the radius of the second roller **43B**. When the conveyance guide member **46** is arranged in the retracted position, the large diameter portion **46d** is located opposite the contacted portion **2Fc** of the body frame **2F** along the radial direction of the second roller **43B**. In other words, with the conveyance guide member **46** in the retracted position, the large diameter portion **46d** contacts the body frame **2F** such that the bearing portion **46b** makes the second roller **43B** separate from the first roller **43A** against the urging force of the urging member **45**.

[0047] With the configuration described above, simply rotating the conveyance guide member **46** about the axis of the second roller **43B** permits easy contact and separation between the first and second rollers **43A** and **43B**. Thus, the sheet conveying apparatus **4** allows easy removal of a jammed sheet **S**.

[0048] With the sheet **S** nipped in the nip portion **N** in the pair of registration rollers **43**, holding the sheet **S** from upstream of the nip portion **N** in the sheet conveyance direction and lifting it up permits the conveyance guide member **46** to move from the guiding position to the retracted position. Specifically, the conveyance guide member **46** rotates counterclockwise from the guiding position shown in FIG. **4** to the retracted position shown in FIG. **5**. This separates the second roller **43B** from the first roller **43A**.

[0049] With this configuration, in coping with a jam at the nip portion **N** in the pair of registration rollers **43**, simply by removing the sheet **S**, it is possible to easily separate the first and second rollers **43A** and **43B**. This makes it easier for a user to cope with a jam at the nip portion **N** in the pair of registration rollers **43**.

[0050] FIG. **6** is a perspective view of the openable/closable portion **42** of the sheet conveying apparatus **4** in the image forming apparatus **1** in FIG. **1**. FIG. **7** is an enlarged perspective part view of the openable/closable portion **42** in FIG. **6**. The openable/closable portion **42** is disposed opposite the first roller **43A** across the second roller **42B** (see FIG. **1**).

[0051] The openable/closable portion **42** has a positioning portion **42a**. The positioning portion **42a** is disposed one to each side of the middle along the sheet width direction. With the openable/closable portion **42** closed, the positioning portion **42a** is located at a position adjacent to the pair of the registration rollers **43**. Specifically, with the openable/closable portion **42** closed, the positioning portion **42a** contacts the conveyance guide member **46** arranged in the guiding position and positions the conveyance guide member **46**.

[0052] Specifically, for example, the conveyance guide member **46**, which is arranged in the retracted position when the openable/closable portion **42** is open, is, as the openable/closable portion **42** is closed, contacted by the positioning portion **42a** of the openable/closable portion **42**. This rotates the conveyance guide member **46** clockwise from the retracted position shown in FIG. **5** to the guiding position shown in FIG. **4** so as to be positioned. Thus, the second roller **43B** contacts the first roller **43A**.

[0053] With this configuration, when the first and second rollers **43A** and **43B** are separated from each other, simply by closing the openable/closable portion **42**, it is possible to easily bring the first and second rollers **43A** and **43B** into contact so as to form the nip portion **N**. This makes it easier for a user to cope with a jam at the nip portion **N** in the pair of registration rollers **43**.

[0054] While an embodiment of the present disclosure is described herein, it is not meant to limit the scope of the present disclosure, which can thus be implemented with various modifications made without departing from the spirit of the present disclosure.

[0055] For example, in the above embodiment, the image forming apparatus **1** is a color-printing image forming apparatus of what is called a tandem type that forms images of multiple colors sequentially while overlaying them on each other. This, however, is not meant as any limitation to such models. The image forming apparatus can be a color-printing image forming apparatus of any type other than a tandem type, or a monochrome-printing image forming apparatus.

Claims

1. A sheet conveying apparatus comprising: a first roller that is rotatably supported on a body frame of an apparatus body; a second roller that is disposed so as to face the first roller to constitute a pair of conveying rollers; a bush member that is supported on the body frame so as to be movable along a radial direction of the first roller, the bush member rotatably supporting the second roller; an urging member that urges the bush member in such a direction that the second roller approaches the first roller; and a conveyance guide member that guides a sheet that is conveyed to a nip portion in the pair of the conveying rollers, wherein the conveyance guide member is fitted to a rotation shaft of the second roller, the conveyance guide member being movable between a guiding position in which the conveyance guide member guides the sheet, and a retracted position in which the conveyance guide member is retracted from the guiding position, the conveyance guide member contacting, in the retracted position, the body frame so as to move the bush member against an urging force of the urging member in such a direction that the second roller separates from the first roller.
 2. The sheet conveying apparatus according to claim 1, wherein the conveyance guide member has a pair of bearing portions that are rotatably fitted one to each end of the rotation shaft of the second roller, the bearing portions are shaped as an eccentric cam having in an outer circumferential part thereof a small diameter portion and a large diameter portion, and in the guiding position, the small diameter portion comes close to the body frame to make the second roller contact the first roller under the urging force of the urging member, and in the retracted position, the large diameter portion contacts the body frame to make the second roller separate from the first roller against the urging force of the urging member.
 3. The sheet conveying apparatus according to claim 1 further comprising: an openable/closable portion that is fitted opposite the first roller across the second roller, the openable/closable portion being openable and closable relative to the apparatus body, wherein the openable/closable portion has a positioning portion that, with the openable/closable portion closed, contacts the conveyance guide member arranged in the guiding position and positions the conveyance guide member.
 4. The sheet conveying apparatus according to claim 1, wherein lifting up the sheet nipped in the nip portion in the pair of the conveying rollers lets the conveyance guide member move from the guiding position to the retracted position so that the second roller separates from the first roller.
 5. An image forming apparatus comprising the sheet conveying apparatus according to claim 1.
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