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(54) **MEDIUM CONVEYING DEVICE AND IMAGE FORMING APPARATUS**

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(57) **ABSTRACT**

A medium conveying device includes: a first roller that is rotatably supported; a second roller that conveys a recording medium while nipping the recording medium between the first roller and the second roller; a biasing member that biases the first roller toward the second roller; an attachment member to which the first roller, the second roller, and the biasing member are attached, the attachment member being mounted on and dismounted from a main body together with the first roller, the second roller, and the biasing member; and an adjustment member that changes a posture of the biasing member in conjunction with mounting of the attachment member on the main body to adjust a biasing force applied by the biasing member to the first roller.

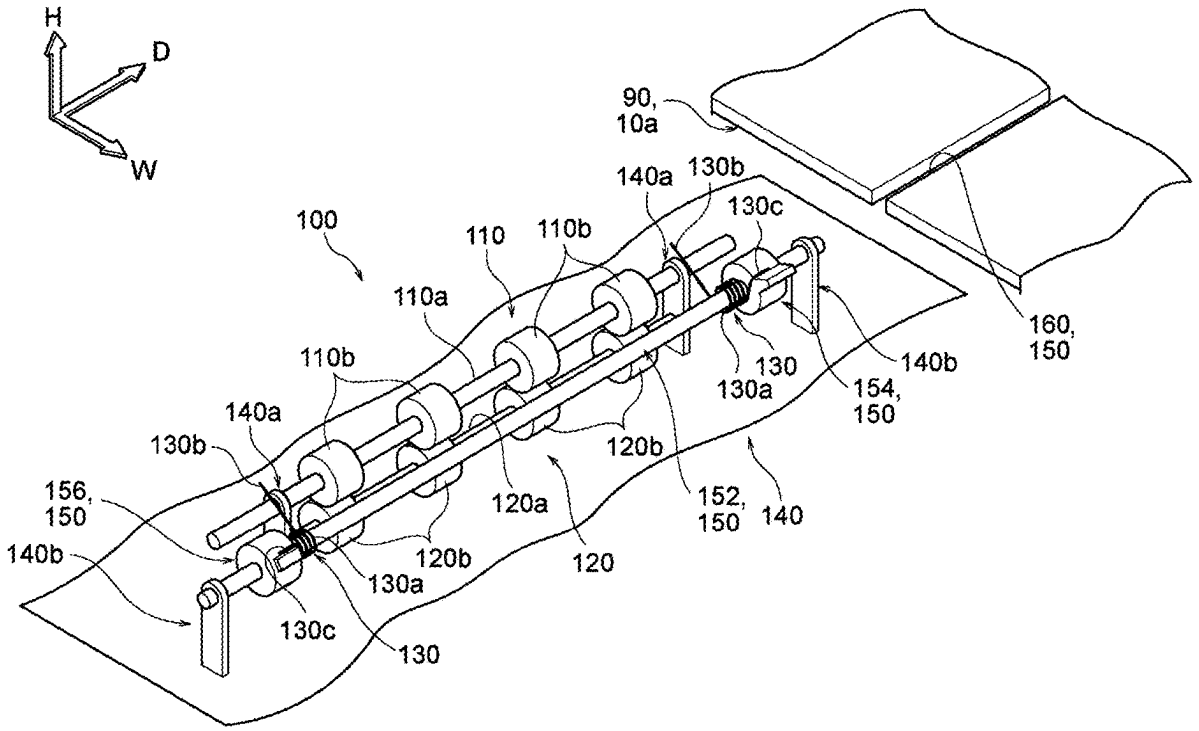
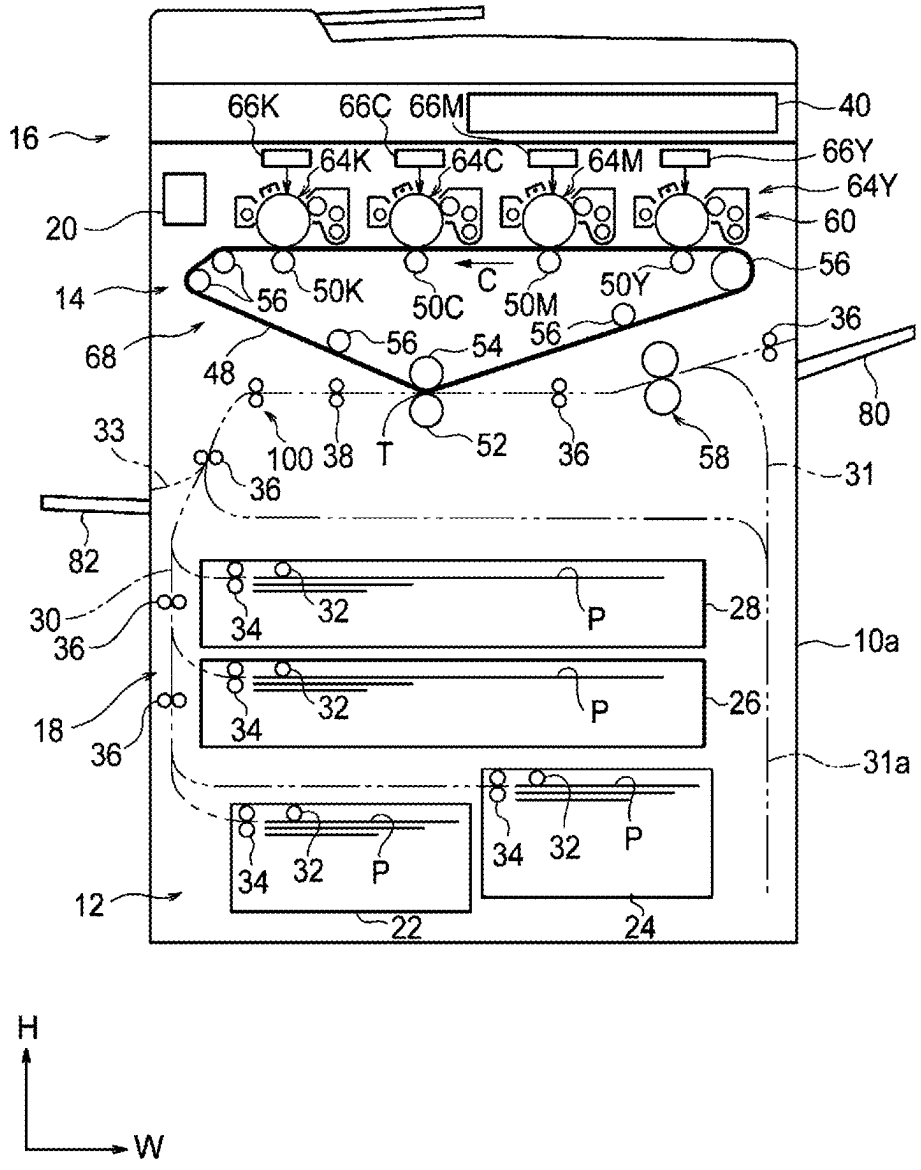


FIG. 1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66M
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64C
64M
66Y
64Y
20
60
14
56
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50C
C
50M
50Y
68
48
54
36
80
33
100
38
T
52
58
31
82
30
28
10a
18
26
31a
12
22
24
H
W

FIG. 2

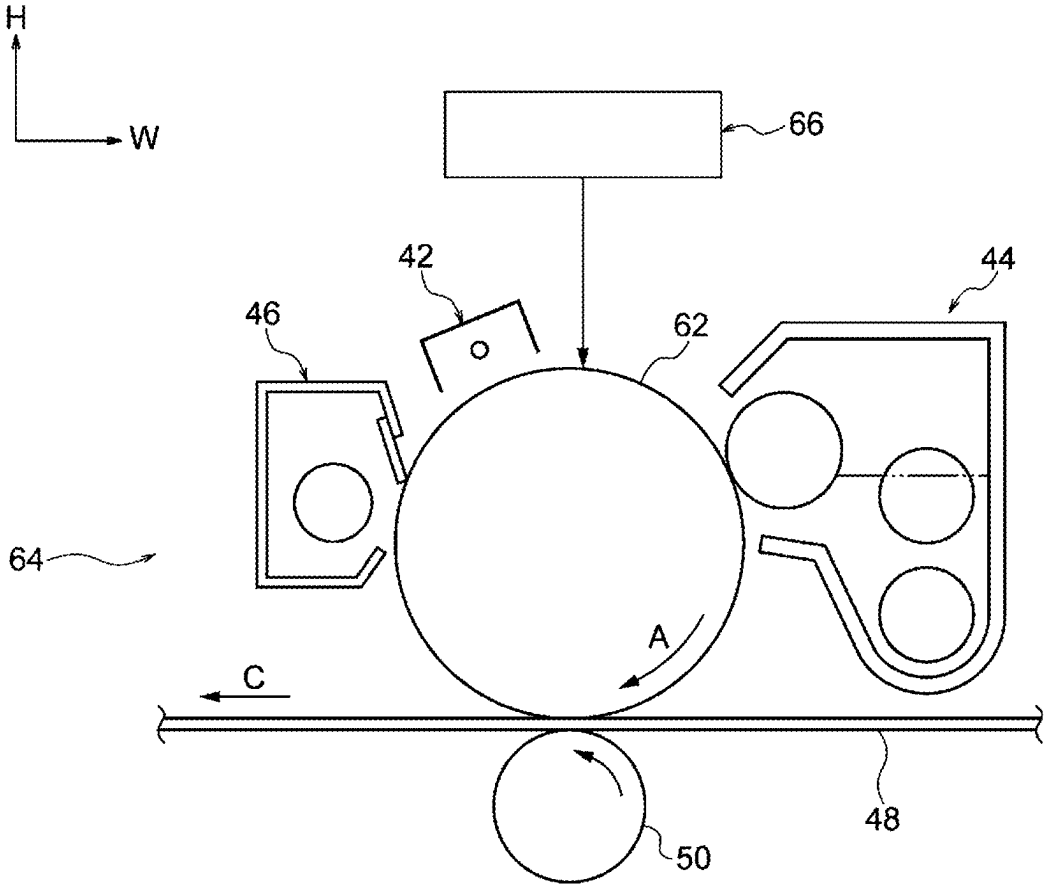
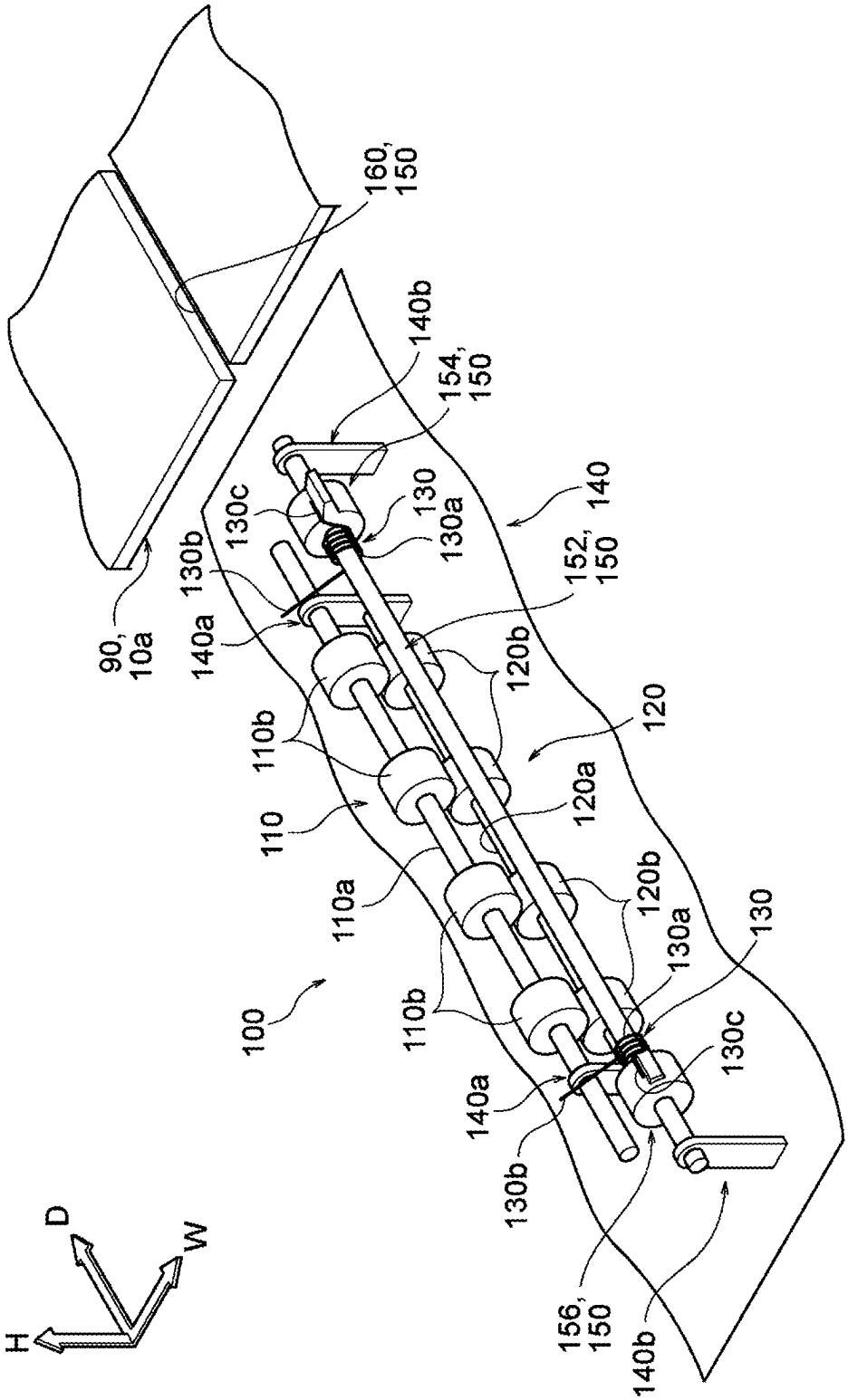


FIG. 3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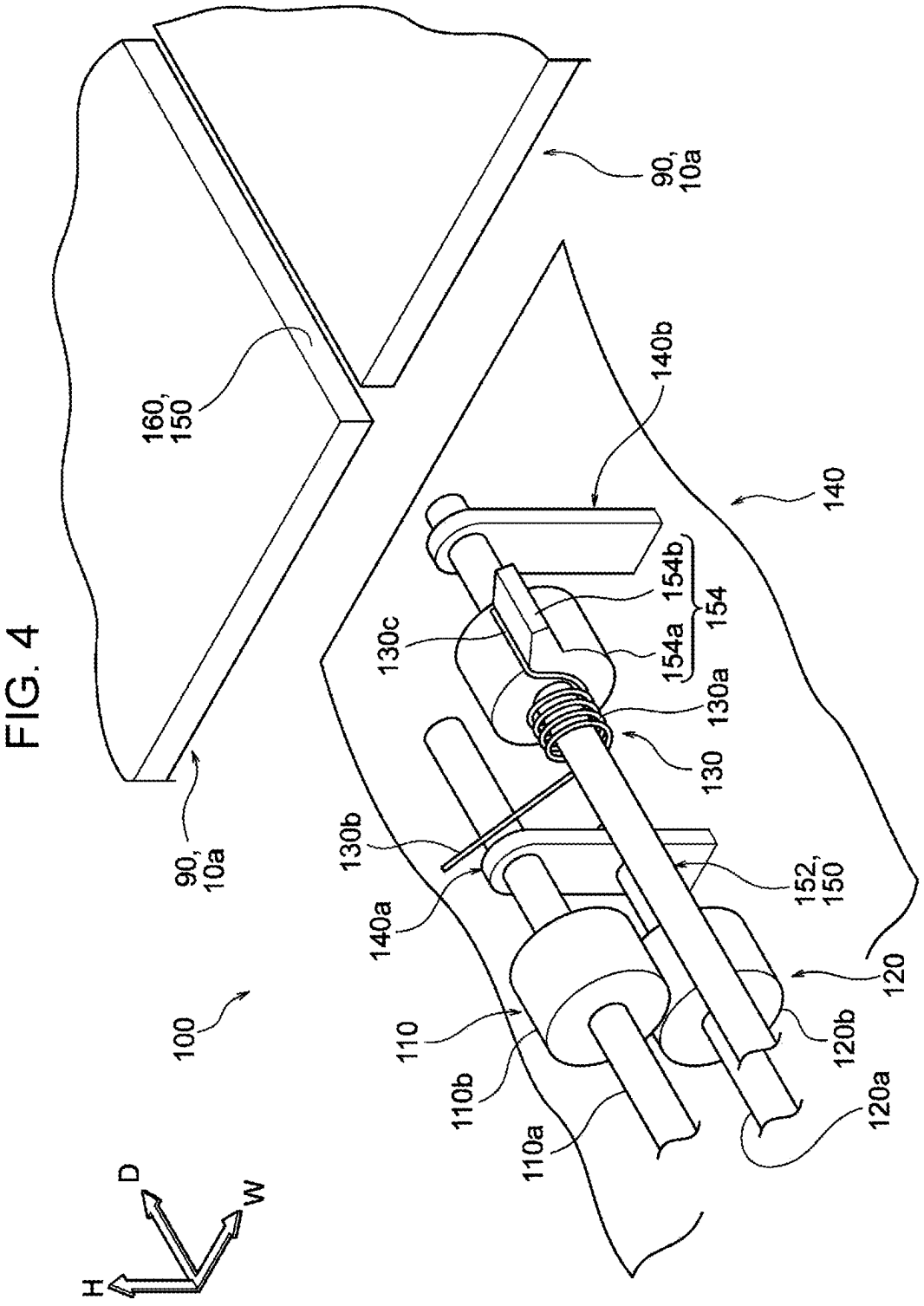
130c
130
130a
130b
140a
90, 10a
140
152, 150
120b
120
110b
110
120a
110a
100
130
130a
120b
110b
130c
140a
130b
156, 150
140b
D
W
H

FIG. 4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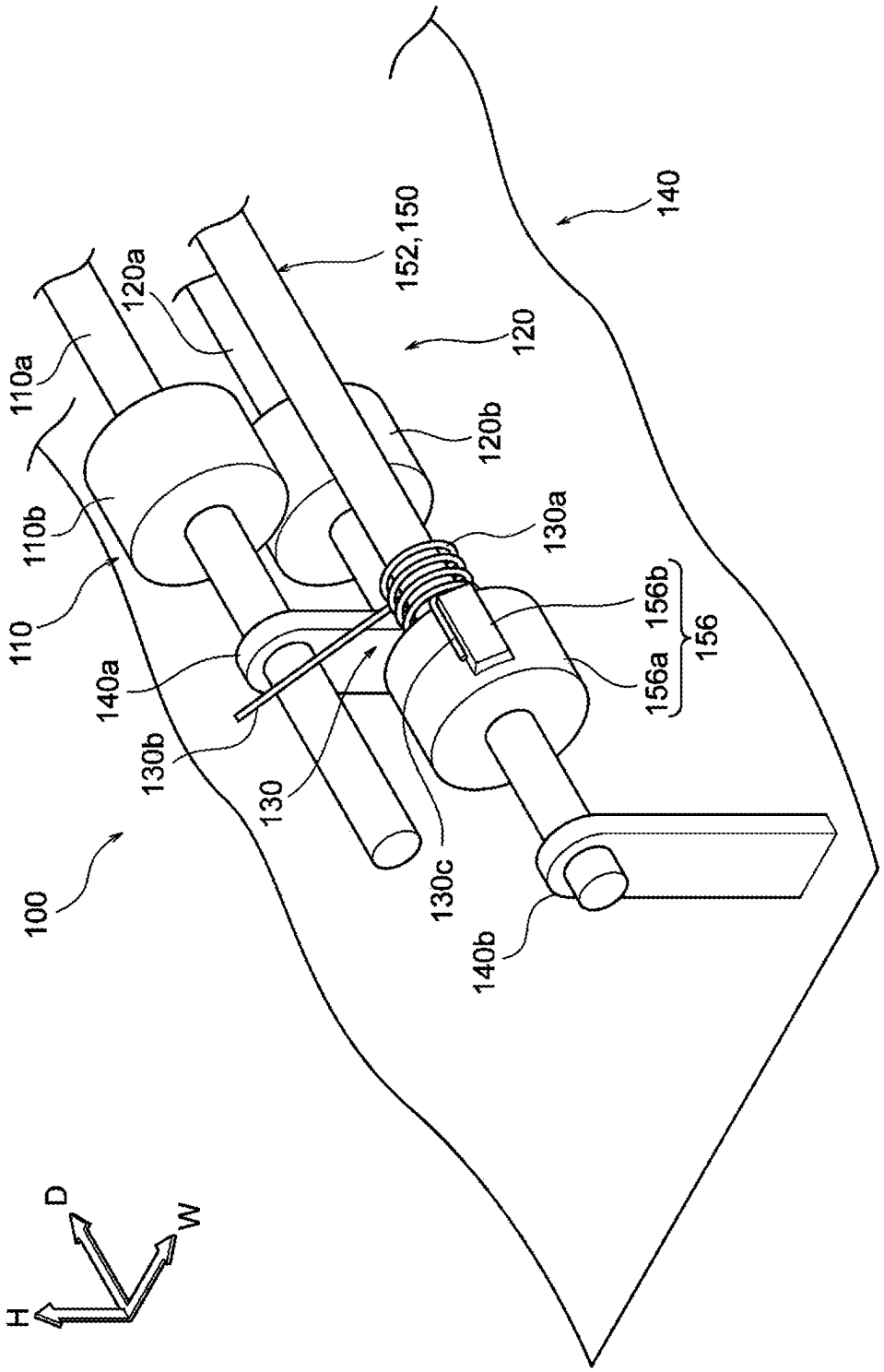
110
120b
110b
120a
110a
D
W
H

FIG. 5


100
110
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120
120a
120b
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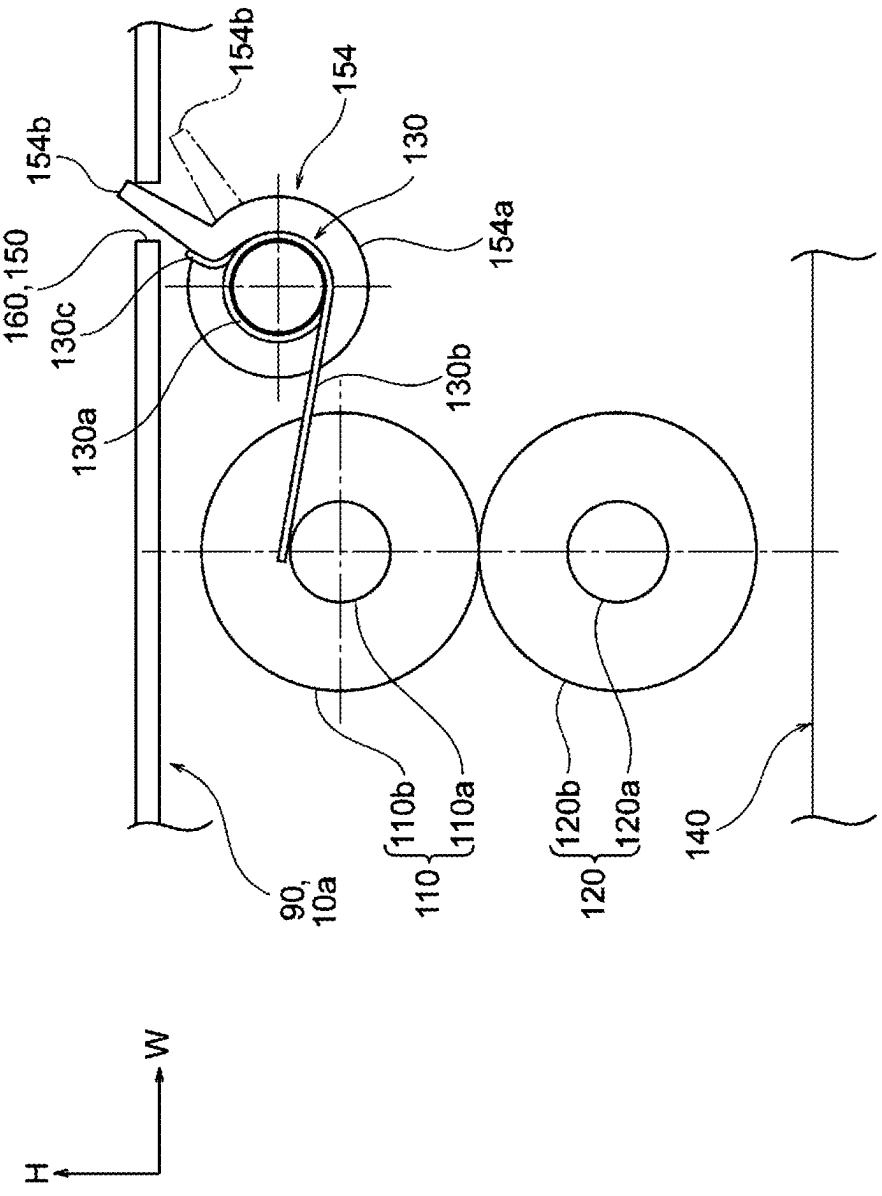
130c
140
140a
140b
152,150
156
156a
156b
D
W
H

FIG. 6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154b
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160,150
154a
130c
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90,
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110a
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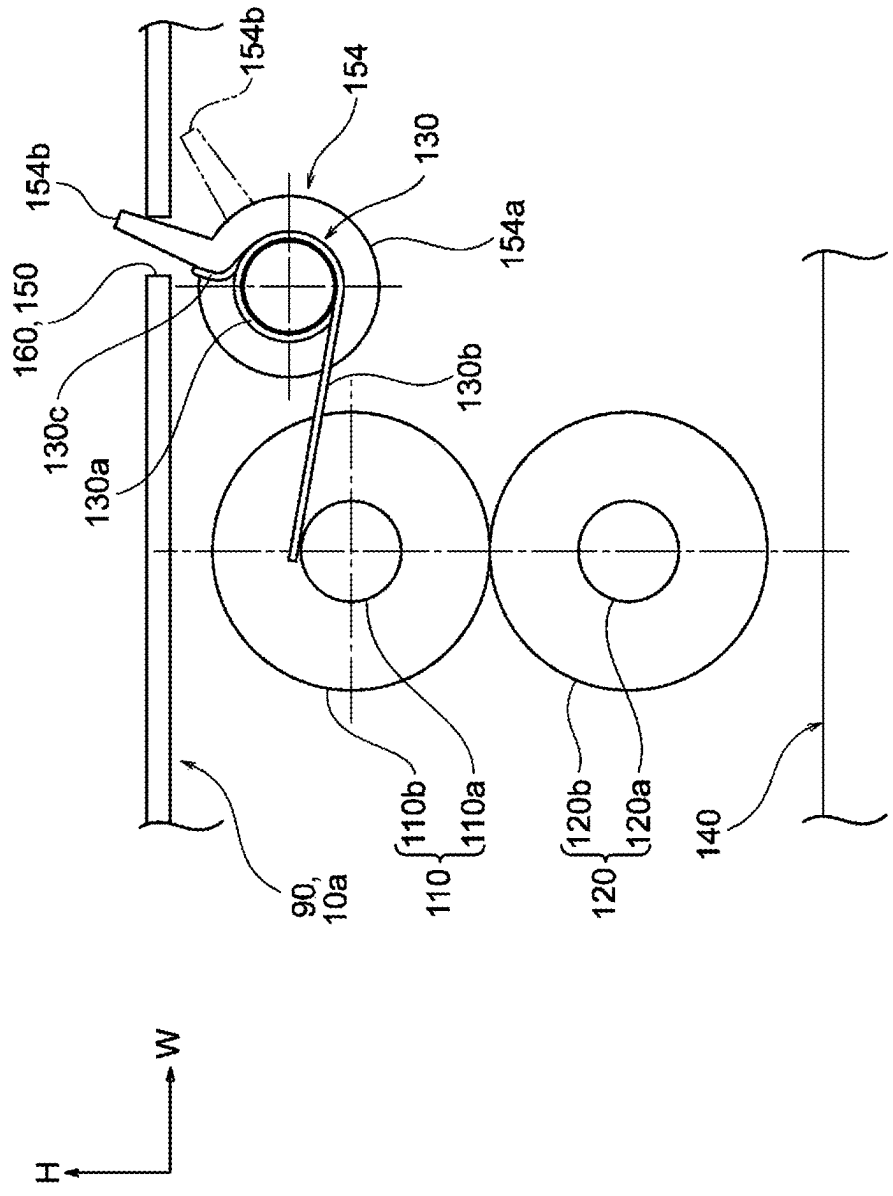
120a
120
140
W
H

FIG. 7


154b
154
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154b
154a
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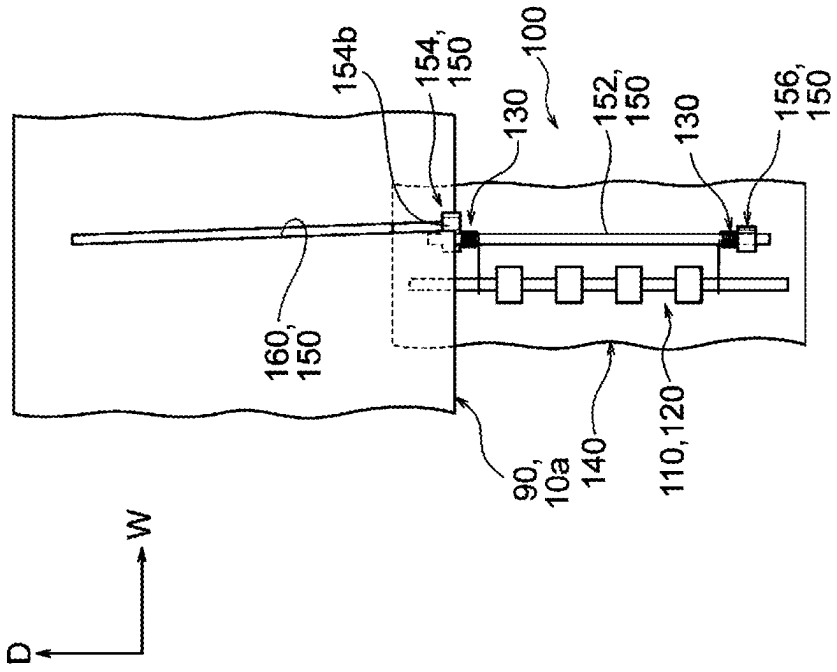
130c
130a
90, 10a
110b
110a
110
120b
120a
120
140
W
H

FIG. 8B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100
130
152, 150
130
156, 150
160, 150
90, 10a
140
110,120
W
D

FIG. 8A

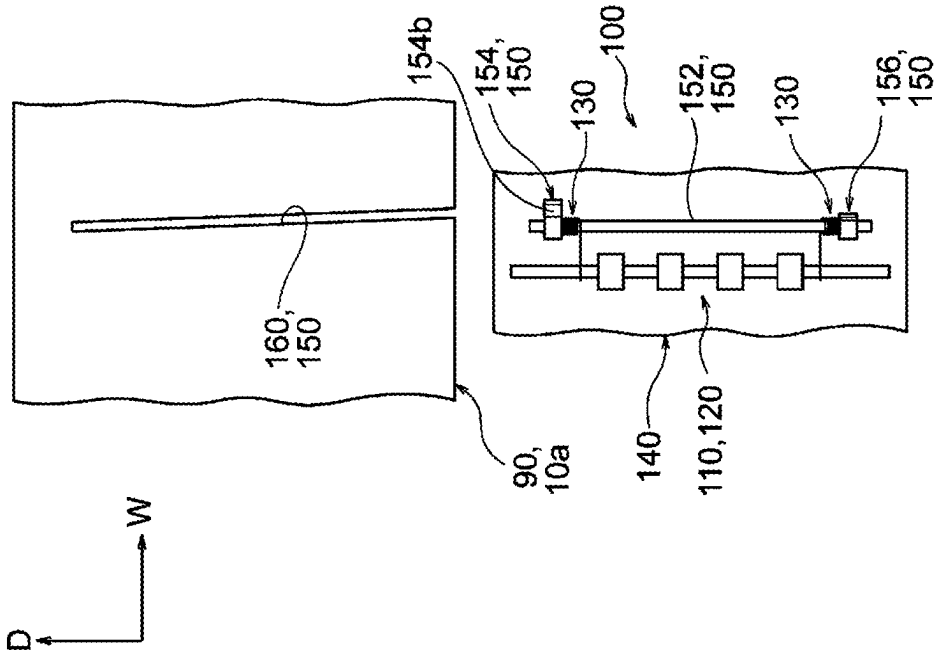

154b
154, 150
100
130
152, 150
130
156, 150
160, 150
90, 10a
140
110,120
W
D

FIG. 9B

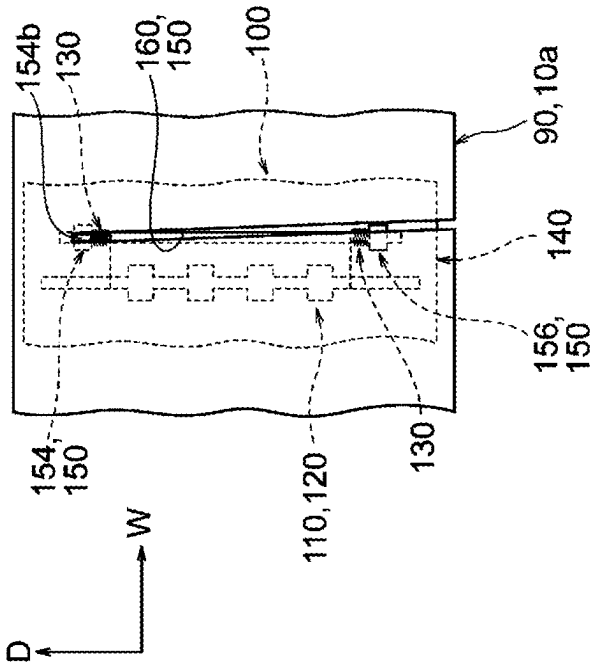
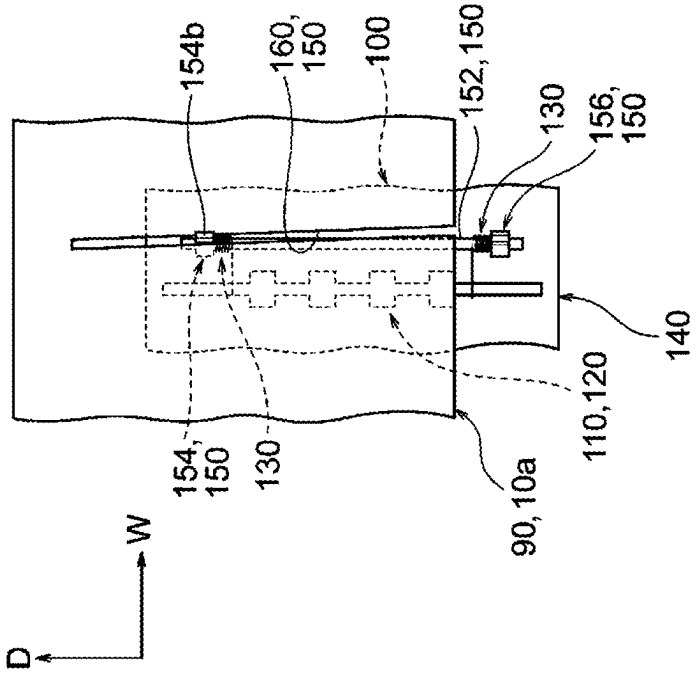

154b
130
160,
150
100
90, 10a
140
156,
150
154,
150
110,120
130
W
D

FIG. 9A


154b
160,
150
100
152, 150
130
156,
150
140
110,120
154,
150
130
90, 10a
W
D

MEDIUM CONVEYING DEVICE AND IMAGE FORMING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is based on and claims priority under 35 USC 119 from Japanese Patent Application No. 2024-023068 filed Feb. 19, 2024.

BACKGROUND

(i) Technical Field

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

(ii) Related Art

[0003] Japanese Unexamined Patent Application Publication No. 2014-148379 discloses a recording medium supply device in which a pressing member, disposed at one end portion of a first rotary arm, is configured to press against an uppermost surface of sheet-like recording media placed in a stacked state on a recording medium mounting portion. The recording medium supply device includes a first biasing unit that is movably disposed along a longitudinal direction of the first rotary arm. The first biasing unit applies a pressing force to the pressing member by biasing the first rotary arm in a rotating direction. By moving the first biasing unit, the pressing force applied to the pressing member can be changed.

SUMMARY

[0004] In the related art, in order to adjust the force with which a recording medium is nipped, a medium conveying device includes a biasing member and an adjustment member. The biasing member biases a first roller toward a second roller. The adjustment member adjusts a biasing force applied by the biasing member to the first roller.

[0005] Such a configuration is provided with an attachment member to which the first roller, the second roller, and the biasing member are attached. The attachment member is configured to be attached to and detached from a main body together with the first roller, the second roller, and the biasing member. With respect to the adjustment member, the adjustment of the biasing force applied by the biasing member to the first roller is completed by an independent operation different from a motion in which the first roller, the second roller, and the biasing member are mounted on the main body.

[0006] Aspects of non-limiting embodiments of the present disclosure relate to adjustment of a biasing force applied by a biasing member to a first roller in conjunction with a motion in which the first roller, a second roller, and the biasing member are mounted on a main body.

[0007] Aspects of certain non-limiting embodiments of the present disclosure overcome the above disadvantages and/or other disadvantages not described above. However, aspects of the non-limiting embodiments are not required to overcome the disadvantages described above, and aspects of the non-limiting embodiments of the present disclosure may not overcome any of the disadvantages described above.

[0008] According to an aspect of the present disclosure, there is provided a medium conveying device including: a first roller that is rotatably supported; a second roller that conveys a recording medium while nipping the recording medium between the first roller and the second roller; a biasing member that biases the first roller toward the second roller; an attachment member to which the first roller, the second roller, and the biasing member are attached, the attachment member being mounted on and dismounted from a main body together with the first roller, the second roller, and the biasing member; and an adjustment member that changes a posture of the biasing member in conjunction with mounting of the attachment member on the main body to adjust a biasing force applied by the biasing member to the first roller.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Exemplary embodiments of the present disclosure will be described in detail based on the following figures, wherein:

[0010] FIG. **1** is a configuration diagram schematically illustrating an image forming apparatus according to an exemplary embodiment of the present disclosure;

[0011] FIG. **2** is a configuration diagram schematically illustrating an image forming unit included in the image forming apparatus according to the exemplary embodiment of the present disclosure;

[0012] FIG. **3** is a perspective view illustrating an entire medium conveying device according to the exemplary embodiment of the present disclosure;

[0013] FIG. **4** is an enlarged perspective view illustrating a portion of the medium conveying device, according to the exemplary embodiment of the present disclosure, on a far side in a depth direction;

[0014] FIG. **5** is an enlarged perspective view illustrating a portion of the medium conveying device, according to the exemplary embodiment of the present disclosure, on a near side in the depth direction;

[0015] FIG. **6** is a front view used to describe a motion of the medium conveying device according to the exemplary embodiment of the present disclosure;

[0016] FIG. **7** is a front view used to describe a motion of the medium conveying device according to the exemplary embodiment of the present disclosure;

[0017] FIGS. **8**A and **8**B are motion diagrams illustrating a motion of the medium conveying device according to the exemplary embodiment of the present disclosure; and

[0018] FIGS. **9**A and **9**B are motion diagrams illustrating a motion of the medium conveying device according to the exemplary embodiment of the present disclosure.

DETAILED DESCRIPTION

[0019] Examples of a medium conveying device and an image forming apparatus according to an exemplary embodiment of the present disclosure will be described with reference to FIG. **1** to FIG. **9**. In each of the drawings, an arrow H indicates a vertical direction, that is, an up-down direction, an arrow W is orthogonal to the arrow H and indicates a horizontal direction, that is, a width direction, and an arrow D is orthogonal to the arrow H and the arrow W and indicates a horizontal direction, that is, a depth direction.

(Overall Configuration of Image Forming Apparatus **10**)

[0020] As illustrated in FIG. **1**, an image forming apparatus **10** includes a sheet accommodation section **12**, a main

operation section **14**, a document reading section **16**, and a display section **40** that are arranged in this order from the lower side to the upper side in the up-down direction. The image forming apparatus **10** further includes a conveying section **18** and a manager **20**. The conveying section **18** conveys sheet members P as recording media. The manager **20** manages the motion of each section.

[0021] The sheet accommodation section **12** accommodates the sheet members P. The main operation section **14** forms an image on each sheet member P conveyed from the sheet accommodation section **12**. The document reading section **16** reads an image on a document. The display section **40** shows a screen where a user interacts with the image forming apparatus **10** to exchange information.

[Sheet Accommodation Section **12**]

[0022] As illustrated in FIG. **1**, the sheet accommodation section **12** includes a first accommodation section **22**, a second accommodation section **24**, a third accommodation section **26**, and a fourth accommodation section **28** that are capable of accommodating sheet members P of different sizes. The first accommodation section **22**, the second accommodation section **24**, the third accommodation section **26**, and the fourth accommodation section **28** each include a feed roller **32** and a multi feeding prevention roller **34**. The feed roller **32** feeds the accommodated sheet members P one by one. The multi feeding prevention roller **34** conveys the fed sheet members P one by one to a conveying path **30** in the image forming apparatus **10**.

[Conveying Section **18**]

[0023] As illustrated in FIG. **1**, the conveying section **18** includes a plurality of conveying rollers **36** that receive sheet members P from the multi feeding prevention roller **34** and convey the sheet members P one by one along the conveying path **30**. The conveying section **18** further includes an alignment roller **38** disposed upstream of a transfer position T, which will be described later, in a conveying direction of the sheet members P (hereinafter, simply referred to as a "sheet conveying direction"). The alignment roller **38** temporarily stops each sheet member P, and feeds the sheet member P to a second transfer position at a predetermined timing. The conveying section **18** further includes a medium conveying device **100** that receives each sheet member P from the conveying rollers **36** and delivers the sheet member P to the alignment roller **38**.

[0024] An upstream portion of the conveying path **30** in the sheet conveying direction extends upward from below on one side in the width direction. A downstream portion of the conveying path **30** in the sheet conveying direction extends from one side to the other side in the width direction, and reaches a discharge section **80** through which the sheet members P are discharged to the outside of an apparatus main body **10***a*. The medium conveying device **100**, described above, is disposed at an end portion of a transition portion of the conveying path **30** where the conveying direction of the sheet members P changes. The medium conveying device **100** will be described in detail later.

[0025] A duplex conveying path **31** is connected to a downstream end portion of the conveying path **30** in the sheet conveying direction. Each sheet member P is conveyed and reversed along the duplex conveying path **31** so that an image is formed on the reverse side of the sheet member P.

[0026] The duplex conveying path **31** includes a switchback path **31***a*. Each sheet member P fed from the switchback path **31***a* is reversed upside down and is fed to an upper end portion of the upstream portion of the conveying path **30** in the sheet conveying direction.

[0027] A manual feed path **33** is connected to the upper end portion of the upstream portion of the conveying path **30** in the sheet conveying direction. A sheet member P supplied from a manual feed section **82** disposed outside the apparatus main body **10***a* is conveyed along the manual feed path **33**.

[Main Operation Section **14**]

[0028] As illustrated in FIG. **1**, the main operation section **14** includes an image forming section **60**, a transfer unit **68**, and a fixing device **58**. The image forming section **60** forms a toner image. The transfer unit **68** transfers the toner image onto each sheet member P. The fixing device **58** fixes the toner image formed on the sheet member P to the sheet member P.

[0029] Image Forming Section **60**

[0030] The image forming section **60** includes image forming units **64**K, **64**C, **64**M, and **64**Y that form toner images of black (K), cyan (C), magenta (M), and yellow (Y), respectively. In the following description, in a case where the image forming units **64**K, **64**C, **64**M, and **64**Y are not particularly distinguished from one another, K, C, M, and Y, each of which is added at the end of the reference numeral, may be omitted in some cases.

[0031] As illustrated in FIG. **2**, each image forming unit **64** includes a photoconductor drum **62**, a charger **42**, a developer **44**, and a cleaning member **46**. The photoconductor drum **62** has a cylindrical shape and rotates in a direction indicated by an arrow A in FIG. **2**. The charger **42** charges the photoconductor drum **62**. The developer **44** develops an electrostatic latent image, which will be described later, to visualize the electrostatic latent image as a toner image.

[0032] The image forming section **60** further includes exposure devices **66**K, **66**C, **66**M, and **66**Y (see FIG. **1**) each of which irradiates a corresponding one of the photoconductor drums **62** charged by the charger **42** with exposure light to form an electrostatic latent image.

[0033] In this configuration, the charger **42** charges the rotating photoconductor drum **62**, and the exposure device **66** irradiates the charged photoconductor drum **62** with exposure light to form an electrostatic latent image. In addition, the developer **44** develops the electrostatic latent image to visualize the electrostatic latent image as a toner image.

[0034] Transfer Unit **68**

[0035] As illustrated in FIG. **1**, the transfer unit **68** includes a transfer belt **48**, first transfer rollers **50**, and a second transfer roller **52**. The transfer belt **48** has an endless shape. Each first transfer roller **50** transfers a toner image from the corresponding photoconductor drum **62** (see FIG. **2**) onto the transfer belt **48**. The second transfer roller **52** transfers the toner images on the transfer belt **48** onto each sheet member P. The transfer unit **68** further includes an auxiliary roller **54** and a plurality of rollers **56**. The auxiliary roller **54** is disposed on a side opposite to the second transfer roller **52** with the transfer belt **48** sandwiched therebetween. The transfer belt **48** is wound around the plurality of rollers **56**.

[0036] The transfer belt **48** has a triangular shape with a vertex facing downward when viewed from the depth direction. The photoconductor drums **62** and the first transfer rollers **50** sandwich a base of the triangular shape of the transfer belt **48**. In addition, the second transfer roller **52** and the auxiliary roller **54** sandwich the vertex portion of the triangular shape of the transfer belt **48**.

[0037] One of the plurality of rollers **56** functions as a drive roller that drives the transfer belt **48** to move in a continuous loop in a direction indicated by an arrow C in FIG. **1**.

(Action of Image Forming Apparatus)

[0038] The image forming apparatus **10** forms an image in the following manner.

[0039] First, the chargers **42** for the respective colors illustrated in FIG. **2** uniformly negatively charge surfaces of the rotating photoconductor drums **62** for the respective colors at a predetermined potential. Subsequently, the exposure devices **66** (see FIG. **1**) for the respective colors irradiate the charged surfaces of the photoconductor drums **62** for the respective colors with exposure light to form electrostatic latent images on the basis of image data read by the document reading section **16** (see FIG. **1**).

[0040] As a result, the electrostatic latent images corresponding to the image data are formed on the surfaces of the photoconductor drums **62** for the respective colors. The developers **44** for the respective colors develop the electrostatic latent images to visualize the electrostatic latent images as toner images. The toner images formed on the surfaces of the photoconductor drums **62** for the respective colors are sequentially transferred onto the transfer belt **48** by the first transfer rollers **50**.

[0041] Each sheet member P, which is fed from one of the first accommodation section **22**, the second accommodation section **24**, the third accommodation section **26**, and the fourth accommodation section **28** illustrated in FIG. **1** to the conveying path **30** by the corresponding feed roller **32**, is fed to the transfer position T where the transfer belt **48** and the second transfer roller **52** are in contact with each other. When the sheet member P is conveyed between the transfer belt **48** and the second transfer roller **52** at the transfer position T, the toner images on the transfer belt **48** are transferred onto the sheet member P.

[0042] The fixing device **58** fixes the toner images transferred onto the sheet member P to the sheet member P. Then, the sheet member P to which the toner images have been fixed is discharged to the discharge section **80** disposed outside the apparatus main body **10***a*.

(Configuration of Main Part)

[0043] Next, the medium conveying device **100** will be described.

[0044] As illustrated in FIG. **1**, the medium conveying device **100** is disposed at the end portion of the transition portion of the conveying path **30** where the conveying direction of the sheet members P changes. In other words, when viewed from the depth direction, the medium conveying device **100** is disposed at a portion that connects a portion where the conveying path **30** is curved and a portion where the conveying path **30** extends in the width direction. Thus, the medium conveying device **100** is disposed at a portion where it is necessary for the medium conveying device **100** to increase a nipping force with respect to the recording medium when conveying thick paper and plain paper as the recording medium, and where, when conveying thin paper with a nipping force as that for thick paper and plain paper, wrinkles or roll marks are formed on the thin paper.

[0045] Most components of the medium conveying device **100** can be mounted on and dismounted from the apparatus main body **10***a* of the image forming apparatus **10** in the depth direction. Specifically, when a user opens an opening/closing cover (not illustrated) provided in the image forming apparatus **10** and pulls out the medium conveying device **100** to the near side in the depth direction, most components of the medium conveying device **100** are dismounted from the apparatus main body **10***a*.

[0046] FIG. **3** illustrates a state where the medium conveying device **100** is dismounted from the apparatus main body **10***a*. As illustrated in FIG. **3**, components of the medium conveying device **100** dismounted from the apparatus main body **10***a* include a pair of rollers **110** and **120**, and biasing members **130** that bias the roller **110** toward the roller **120**. In addition, components of the medium conveying device **100** dismounted from the apparatus main body **10***a* include an attachment member **140**, to which rollers **110** and **120** and the biasing members **130** are attached, and portions of adjustment member **150**. The attachment member **140** is mounted on and dismounted from the apparatus main body **10***a* together with the rollers **110** and **120** and the biasing members **130**. The adjustment member **150** adjusts a biasing force applied by the biasing members **130** to the roller **110**.

[Roller **110** and Roller **120**]

[0047] As illustrated in FIG. **3**, the roller **110** and the roller **120** are arranged in the up-down direction, and the roller **110** is disposed on the upper side with respect to the roller **120**. The medium conveying device **100** is configured to convey each recording medium while nipping the recording medium between the roller **110** and the roller **120**. The roller **110** is an example of a first roller, and the roller **120** is an example of a second roller.

[0048] Roller **110**

[0049] The roller **110** includes a shaft portion **110***a* extending in the depth direction and a plurality of roller portions **110***b* attached to the shaft portion **110***a*. An axial direction of the shaft portion **110***a* is aligned with the depth direction. Each roller portion **110***b* is made of an elastic material or a resin material and has a sleeve shape. In the present exemplary embodiment, as an example, four roller portions **110***b* are provided and attached to the shaft portion **110***a* at intervals in the depth direction. The roller **110** is supported by support portions **140***a* formed in the attachment member **140** so as to be movable in the up-down direction and rotatable about its axis. In this manner, the roller **110** functions as a driven roller.

[0050] Roller **120**

[0051] The roller **120** includes a shaft portion **120***a* extending in the depth direction and a plurality of roller portions **120***b* attached to the shaft portion **120***a*. An axial direction of the shaft portion **120***a* is aligned with the depth direction. Each roller portion **120***b* is made of an elastic material or a resin material and has a sleeve shape. In the present exemplary embodiment, as an example, four roller portions **120***b* are provided and attached to the shaft portion

120*a* at intervals in the depth direction. The roller **120** is supported by the support portions **140***a* formed in the attachment member **140** so as to rotate by a driving force transmitted from a driving source (not illustrated). In this manner, the roller **120** functions as a drive roller.

[Biasing Member **130**]

[0052] The biasing members **130** are torsion springs, each disposed at one of both end portions of the roller **110** in the depth direction, on the other side (right side in FIG. **3**) in the width direction with respect to the roller **110**. Each biasing member **130** includes a spiral portion **130***a* having a spiral shape, a first end portion **130***b*, and a second end portion **130***c*. The first end portion **130***b* protrudes from one end of the spiral portion **130***a* and presses against the roller **110**. The second end portion **130***c* protrudes from the other end of the spiral portion **130***a*.

[0053] An axial direction of the spiral portion **130***a* is aligned with the depth direction, and the first end portion **130***b* extends linearly and is in contact with the shaft portion **110***a* of the roller **110** from above.

[0054] In this configuration, each biasing member **130** biases the roller **110** toward the roller **120** from above in the up-down direction. The up-down direction is an example of a biasing direction.

[Adjustment Member **150**]

[0055] As illustrated in FIG. **3**, the adjustment member **150** includes a shaft portion **152** and support portions **154** and **156**. The shaft portion **152** extends along the axial direction (depth direction) of the roller **110**, and the spiral portions **130***a* are wound around the shaft portion **152**. The support portions **154** and **156** are each attached to the shaft portion **152** and support respective one of the second end portions **130***c*. The adjustment member **150** further includes a slit **160**. When the attachment member **140** dismounted from the apparatus main body **10***a* is mounted on the apparatus main body **10***a*, the slit **160** comes into contact with the support portion **154** and changes the posture of the support portion **154** to change the posture of the biasing members **130**. The apparatus main body **10***a* is an example of a main body.

[0056] Shaft Portion **152**

[0057] As illustrated in FIG. **3**, the shaft portion **152** is disposed on the other side in the width direction with respect to the roller **110**. The shaft portion **152** is supported by support portions **140***b* formed in the attachment member **140** so as to be rotatable about its axis.

[0058] Support Portions **154** and **156**

[0059] As illustrated in FIG. **3**, the support portion **154** is attached to a portion of the shaft portion **152** on the far side in the depth direction, and is disposed on the outer side of the spiral portion **130***a* in the depth direction. Here, the phrase "the outer side in the depth direction" refers to a side away from the center of the medium conveying device **100** in the depth direction.

[0060] As illustrated in FIG. **4**, the support portion **154** includes a sleeve portion **154***a* and a protruding portion **154***b*. The sleeve portion **154***a* has a sleeve shape that circumferentially covers the shaft portion **152**. The protruding portion **154***b* protrudes from the outer peripheral surface of the sleeve portion **154***a* in the radial direction of the shaft portion **152**. The support portion **154** is attached to the shaft portion **152** such that when the support portion **154** rotates in the circumferential direction of the shaft portion **152**, the shaft portion **152** also rotates.

[0061] In addition, the second end portion **130***c* of the biasing member **130** is caught on the protruding portion **154***b*. In a state where no external force is applied to the biasing member **130**, the protruding portion **154***b* is inclined with respect to the width direction such that the protruding portion **154***b* is located on a side opposite to the roller **110** with the shaft portion **152** interposed therebetween, and a distal end of the protruding portion **154***b* is located above a proximal end (see a two-dot chain line in FIG. **6**).

[0062] As illustrated in FIG. **3**, the support portion **156** is attached to a portion of the shaft portion **152** on the near side in the depth direction, and is disposed on the outer side of the spiral portion **130***a* in the depth direction.

[0063] As illustrated in FIG. **5**, the support portion **156** includes a sleeve portion **156***a* and a protruding portion **156***b*. The sleeve portion **156***a* has a sleeve shape that circumferentially covers the shaft portion **152**. The protruding portion **156***b* protrudes from the outer peripheral surface of the sleeve portion **156***a* in the radial direction of the shaft portion **152**. The support portion **156** is attached to the shaft portion **152** such that when the support portion **156** rotates in the circumferential direction of the shaft portion **152**, the shaft portion **152** also rotates.

[0064] In addition, the second end portion **130***c* of the biasing member **130** is caught on the protruding portion **156***b*. Here, the height of the protruding portion **156***b* is set much lower than the height of the protruding portion **154***b* (see FIG. **4**), and the protruding portion **156***b* has a height that only allows the protruding portion **156***b* to catch the second end portion **130***c* thereon. In other words, the height of the protruding portion **154***b* of the support portion **154** illustrated in FIG. **4** is much higher than the height of the protruding portion **156***b* illustrated in FIG. **5**.

[0065] Slit **160**

[0066] As illustrated in FIG. **3**, the slit **160** is formed in an inner cover **90** attached to the apparatus main body **10***a*. The slit **160** is an example of a contact portion.

[0067] The portion of the inner cover **90** in which the slit **160** is formed has a plate shape, and is disposed above the rollers **110** and **120** in a state where the medium conveying device **100** is mounted on the apparatus main body **10***a*.

[0068] The slit **160** is formed to penetrate through the inner cover **90** from the front surface to the rear surface. As illustrated in FIG. **8**A, the slit **160** is linear as viewed from above, extends in the depth direction, and is inclined with respect to the depth direction. Specifically, a near side portion of the slit **160** in the depth direction is located on the other side in the width direction relative to a far side portion of the slit **160** in the depth direction.

[0069] When the medium conveying device **100**, which is in a state of being dismounted from the apparatus main body **10***a*, is mounted on the apparatus main body **10***a*, a user inserts the protruding portion **154***b* into the slit **160** by pinching the protruding portion **154***b* of the support portion **154** illustrated in FIGS. **4** and **6**, and rotating the support portion **154** in the circumferential direction of the shaft portion **152**. On the other hand, when the medium conveying device **100**, which is in a state of being dismounted from the apparatus main body **10***a*, is mounted on the apparatus main body **10***a*, if no load is applied to the protruding portion **154***b* of the support portion **154**, the distal end of the protruding

portion **154***b* is located below a lower surface of the inner cover **90** (see the two-dot chain line in FIG. **6**).

[0070] The motion of the medium conveying device **100** when the user has inserted the protruding portion **154***b* into the slit **160** will be described together with the action described below.

(Action)

[0071] Next, the action of the medium conveying device **100** will be described.

[0072] As illustrated in FIG. **6**, in a case where the medium conveying device **100** conveys thin paper as a recording medium, a user positions the protruding portion **154***b* of the support portion **154** below the lower surface of the inner cover **90** without inserting the protruding portion **154***b* into the slit **160** (see the two-dot chain line in FIG. **6**).

[0073] With such an arrangement, the biasing force generated when the biasing member **130**, which is a torsion spring, is twisted in the circumferential direction of the shaft portion **152** is not applied to the roller **110**. Therefore, the force with which the recording medium is nipped between the roller **110** and the roller **120** becomes weaker. In this state, the medium conveying device **100** conveys thin paper as a recording medium.

[0074] On the other hand, in a case where the medium conveying device **100** conveys thick paper and plain paper as a recording medium, a user inserts the protruding portion **154***b* of the support portion **154** into the slit **160** as illustrated in FIG. **6** (see a solid line in FIG. **6**). Hereinafter, a motion in which a user inserts the protruding portion **154***b* into the slit **160** in a case where the protruding portion **154***b* is not inserted into the slit **160** in a state where the medium conveying device **100** is mounted on the apparatus main body **10***a* will be described.

[0075] First, the user dismounts the medium conveying device **100**, which has been mounted on the apparatus main body **10***a,* from the apparatus main body **10***a* (see FIG. **3**). Specifically, as illustrated in FIG. **3**, the user dismounts the medium conveying device **100** from the apparatus main body **10***a,* by moving the attachment member **140**, to which the rollers **110** and **120**, the biasing members **130**, and the like, are attached, to the near side in the depth direction.

[0076] Then, the user mounts the dismounted medium conveying device **100** on the apparatus main body **10***a* by moving the dismounted medium conveying device **100** to the far side in the depth direction. Specifically, the user inserts the protruding portion **154***b* into an inlet (the near side portion in the depth direction) of the slit **160** as illustrated in FIGS. **8**A and **8**B, by pinching the protruding portion **154***b* of the support portion **154** illustrated in FIGS. **4** and **6**, and rotating the support portion **154** in the circumferential direction of the shaft portion **152**.

[0077] Then, in a state where the protruding portion **154***b* is inserted into the inlet of the slit **160**, the user moves the attachment member **140**, to which rollers **110** and **120**, the biasing members **130**, and the like, are attached, to the far side in the depth direction as illustrated in FIGS. **8**B, **9**A, and **9**B. As a result, the medium conveying device **100** is mounted on the apparatus main body **10***a*.

[0078] Specifically, by moving the attachment member **140** to the far side in the depth direction, the support portion **154**, in which the protruding portion **154***b* inserted into the slit **160** is formed, also moves to the far side in the depth direction. As a result, the protruding portion **154***b* moves to one side in the width direction along the slit **160** that is inclined with respect to the depth direction.

[0079] When the protruding portion **154***b* moves to one side in the width direction, the support portion **154** rotates counterclockwise as illustrated in FIGS. **6** and **7**. When the support portion **154** rotates, the rotational force is transmitted to the support portion **156** via the shaft portion **152**, and the support portion **156** also rotates. Then, the rotation of the support portions **154** and **156** causes the pair of biasing members **130** to rotate in the circumferential direction of the shaft portion **152**.

[0080] As a result, the biasing members **130** bias the roller **110** toward the roller **120** via the first end portions **130***b,* and the force with which the recording medium is nipped between the roller **110** and the roller **120** increases. In other words, in the medium conveying device **100**, the biasing force applied when the biasing members **130** bias the roller **110** toward the roller **120** increases in conjunction with the mounting of the medium conveying device **100**, which is in a state of being dismounted from the apparatus main body **10***a,* on the apparatus main body **10***a*. In this state, the medium conveying device **100** conveys thick paper or plain paper as a recording medium.

(Recapitulation)

[0081] As described above, in the medium conveying device **100**, the biasing force applied when the biasing members **130** bias the roller **110** toward the roller **120** increases in conjunction with the mounting of the medium conveying device **100**, which is in a state of being dismounted from the apparatus main body **10***a,* on the apparatus main body **10***a*. In this manner, the biasing force applied by the biasing members **130** to the roller **110** is adjusted in conjunction with the motion in which the medium conveying device **100** is mounted on the apparatus main body **10***a*.

[0082] Furthermore, in the medium conveying device **100**, the slit **160** comes into contact with the protruding portion **154***b* of the support portion **154** and changes the posture of the support portion **154** to change the posture of the biasing members **130**. Thus, the posture of the biasing members **130**, which are torsion springs, are changed without using electric power, and the biasing force applied by the biasing members **130** to the roller **110** is adjusted by the adjustment member **150**.

[0083] Furthermore, in the medium conveying device **100**, the slit **160** comes into contact with the protruding portion **154***b* of the support portion **154** and changes the posture of the support portion **154**. Thus, operation is facilitated compared to a case where the slit comes into contact with a support portion that is a portion recessed in a radial direction of the shaft portion and changes the posture of the support portion.

[0084] In the medium conveying device **100**, the biasing members **130** are torsion springs each including the spiral portion **130***a* having a spiral shape, the first end portion **130***b,* and the second end portion **130***c*. The spiral portion **130***a* is disposed away from the roller **110** in an intersecting direction (width direction) intersecting the biasing direction (up-down direction) in which the biasing members **130** bias the roller **110** toward the roller **120** when viewed from the axial direction (depth direction) of the roller **110**. This prevents the enlargement of the device in the biasing direction compared to a case where the biasing member is

disposed on a side opposite to the roller **120** with the roller **110** interposed therebetween in the biasing direction (up-down direction).

[0085] In addition, in the medium conveying device **100**, by moving the second end portion **130***c* in the circumferential direction of the spiral portion **130***a*, the spiral portion **130** moves in the circumferential direction. Thus, the spiral portion **130***a* moves in the circumferential direction with a smaller force compared to a case where the spiral portion itself is moved in the circumferential direction.

[0086] In addition, in the image forming apparatus **10**, the operation is simplified compared to a case where the adjustment of the biasing force applied by the biasing members to the roller is completed only by an independent operation.

[0087] The present isclosure has been described in detail with respect to a specific exemplary embodiment, but the present disclosure is not limited to the exemplary embodiment, and it is apparent to those skilled in the art that the present disclosure can adopt various other exemplary embodiments within the scope of the present disclosure. For example, in the above-described exemplary embodiment, the medium conveying device **100** is used in the image forming apparatus **10**. However, the medium conveying device **100** may be used in a pre-processing device of the image forming apparatus, a post-processing device of the image forming apparatus, a ticketing machine that conveys and sells tickets, an ATM that conveys and dispenses or accepts bills, and the like.

[0088] In the above-described exemplary embodiment, the roller **110** and the roller **120** are arranged in the up-down direction, but may be arranged in a direction inclined with respect to the up-down direction.

[0089] Although not particularly described in the above-described exemplary embodiment, displaying the type of paper of the recording medium to be used on the display section **40** (see FIG. **1**) may accordingly allow a user to insert the protruding portion **154***b* into the slit **160**.

[0090] Although not particularly described in the above-described exemplary embodiment, in order to ensure a minimum nipping force for nipping the recording medium between the roller **110** and the roller **120**, an additional biasing member may be provided separately from the biasing members **130**.

[0091] In the above-described exemplary embodiment, the protruding portion **154***b* is moved by using the slit **160**, but may be moved by using a guide protrusion or the like.

[0092] In the above-described exemplary embodiment, the number of slits **160** is one, but a plurality of slits **160** may be provided. In this case, the biasing force generated by the biasing members **130** is adjusted in stages.

[0093] In the above-described exemplary embodiment, the number of biasing members **130** is two, but may be one, three, or more. In this case, it is desirable to arrange the biasing members **130** symmetrically with respect to the center of the roller.

[0094] In the above-described exemplary embodiment, the biasing members **130** are torsion springs, but may be coil springs. In this case, the effect achieved by the torsion spring is not achieved.

Appendix

(((1)))

[0095] A medium conveying device comprising:

[0096] a first roller that is rotatably supported;

[0097] a second roller that conveys a recording medium while nipping the recording medium between the first roller and the second roller;

[0098] a biasing member that biases the first roller toward the second roller;

[0099] an attachment member to which the first roller, the second roller, and the biasing member are attached, the attachment member being mounted on and dismounted from a main body together with the first roller, the second roller, and the biasing member; and

[0100] an adjustment member that changes a posture of the biasing member in conjunction with mounting of the attachment member on the main body to adjust a biasing force applied by the biasing member to the first roller.

(((2)))

[0101] The medium conveying device according to (((1))), wherein

[0102] the biasing member is a torsion spring including a spiral portion having a spiral shape, a first end portion, and a second end portion, the first end portion protrudes from one end of the spiral portion and presses against the first roller, and the second end portion protrudes from another end of the spiral portion, and

[0103] the adjustment member includes a shaft portion, a support portion, and a contact portion, the shaft portion extends along an axial direction of the first roller and the spiral portion is wound around the shaft portion, the support portion is attached to the shaft portion and supports the second end portion, and the contact portion is provided in the main body and when the attachment member dismounted from the main body is mounted on the main body, the contact portion comes into contact with the support portion and changes a posture of the support portion to change the posture of the biasing member.

(((3)))

[0104] The medium conveying device according to (((2))), wherein

[0105] the support portion is formed with a protruding portion that protrudes in a radial direction of the shaft portion and supports the second end portion, and

[0106] the contact portion comes into contact with the protruding portion and changes the posture of the support portion.

(((4)))

[0107] The medium conveying device according to (((1))), wherein

[0108] the biasing member is a torsion spring including a spiral portion having a spiral shape and a first end portion, the spiral portion is disposed away from the first roller in an intersecting direction intersecting a biasing direction in which the biasing member biases the first roller when viewed from an axial direction of the first roller, and the first end portion protrudes from one end of the spiral portion and presses against the first roller.

(((5)))

[0109] The medium conveying device according to (((4))), wherein

[0110] the biasing member includes a second end portion that protrudes from another end of the spiral portion, and

[0111] the adjustment member moves the second end portion in a circumferential direction of the spiral portion to move the spiral portion in the circumferential direction.

(((6)))

[0112] An image forming apparatus, comprising:

[0113] the medium conveying device according to any one of (((1)) to (5))); and

[0114] an image forming section that forms an image on a recording medium conveyed by the medium conveying device.

What is claimed is:

1. A medium conveying device comprising:

a first roller that is rotatably supported;

a second roller that conveys a recording medium while nipping the recording medium between the first roller and the second roller;

a biasing member that biases the first roller toward the second roller;

an attachment member to which the first roller, the second roller, and the biasing member are attached, the attachment member being mounted on and dismounted from a main body together with the first roller, the second roller, and the biasing member; and

an adjustment member that changes a posture of the biasing member in conjunction with mounting of the attachment member on the main body to adjust a biasing force applied by the biasing member to the first roller.

2. The medium conveying device according to claim **1**, wherein

the biasing member is a torsion spring including a spiral portion having a spiral shape, a first end portion, and a second end portion, the first end portion protrudes from one end of the spiral portion and presses against the first roller, and the second end portion protrudes from another end of the spiral portion, and

the adjustment member includes a shaft portion, a support portion, and a contact portion, the shaft portion extends along an axial direction of the first roller and the spiral portion is wound around the shaft portion, the support portion is attached to the shaft portion and supports the second end portion, and the contact portion is provided in the main body and when the attachment member dismounted from the main body is mounted on the main body, the contact portion comes into contact with the support portion and changes a posture of the support portion to change the posture of the biasing member.

3. The medium conveying device according to claim **2**, wherein

the support portion is formed with a protruding portion that protrudes in a radial direction of the shaft portion and supports the second end portion, and

the contact portion comes into contact with the protruding portion and changes the posture of the support portion.

4. The medium conveying device according to claim **1**, wherein

the biasing member is a torsion spring including a spiral portion having a spiral shape and a first end portion, the spiral portion is disposed away from the first roller in an intersecting direction intersecting a biasing direction in which the biasing member biases the first roller when viewed from an axial direction of the first roller, and the first end portion protrudes from one end of the spiral portion and presses against the first roller.

5. The medium conveying device according to claim **4**, wherein

the biasing member includes a second end portion that protrudes from another end of the spiral portion, and

the adjustment member moves the second end portion in a circumferential direction of the spiral portion to move the spiral portion in the circumferential direction.

6. An image forming apparatus, comprising:

the medium conveying device according to claim **1**; and

an image forming section that forms an image on a recording medium conveyed by the medium conveying device.

7. An image forming apparatus, comprising:

the medium conveying device according to claim **2**; and

an image forming section that forms an image on a recording medium conveyed by the medium conveying device.

8. An image forming apparatus, comprising:

the medium conveying device according to claim **3**; and

an image forming section that forms an image on a recording medium conveyed by the medium conveying device.

9. An image forming apparatus, comprising:

the medium conveying device according to claim **4**; and

an image forming section that forms an image on a recording medium conveyed by the medium conveying device.

10. An image forming apparatus, comprising:

the medium conveying device according to claim **5**; and

an image forming section that forms an image on a recording medium conveyed by the medium conveying device.

* * * * *