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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 is disposed on a side opposite to the second roller with the first roller interposed between the second roller and the biasing member and biases the first roller toward the second roller; a transmission member that is disposed between the biasing member and the first roller, is restricted by the first roller from moving relative to the first roller in an intersecting direction intersecting a biasing direction of the biasing member and an axial direction of the first roller, and transmits a biasing force of the biasing member to the first roller; and an adjustment member that adjusts the biasing force applied by the biasing member to the first roller by causing the transmission member to approach or be separated from the first roller in the biasing direction.

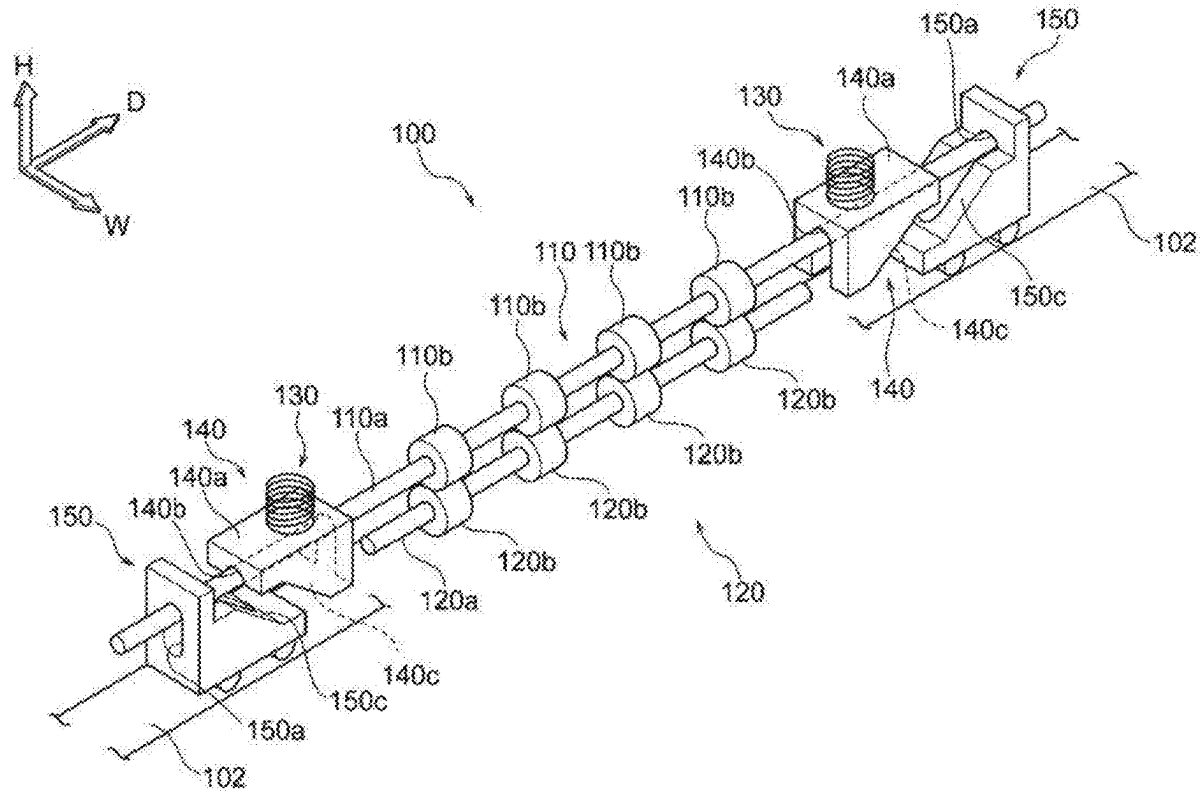
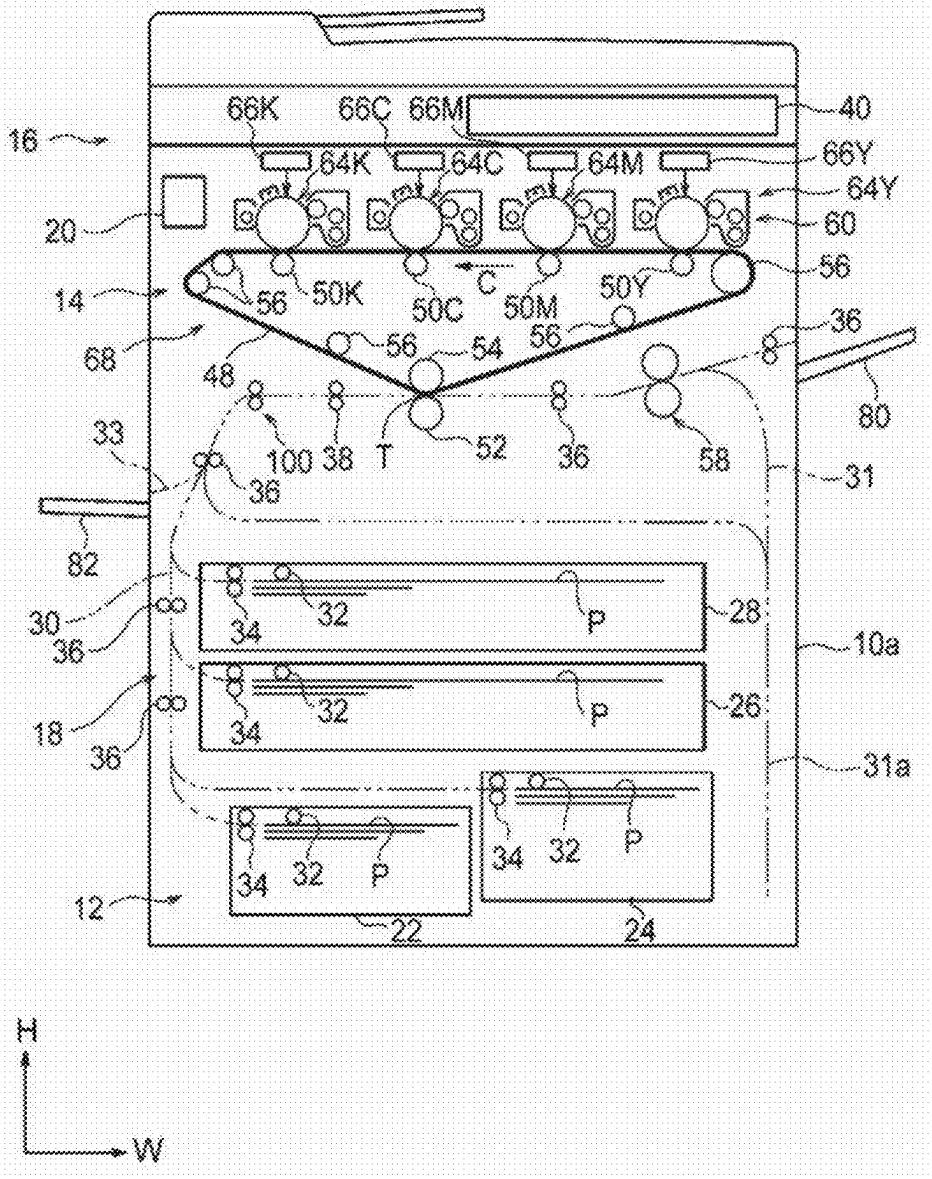


FIG. 1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66K
66C
66M
40
64K
64C
64M
66Y
64Y
20
60
56
14
50K
50C
C
50M
50Y
68
48
54
36
80
33
100
38
T
52
58
31
82
30
32
34
P
28
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18
26
31a
12
22
24
H
W

FIG. 2

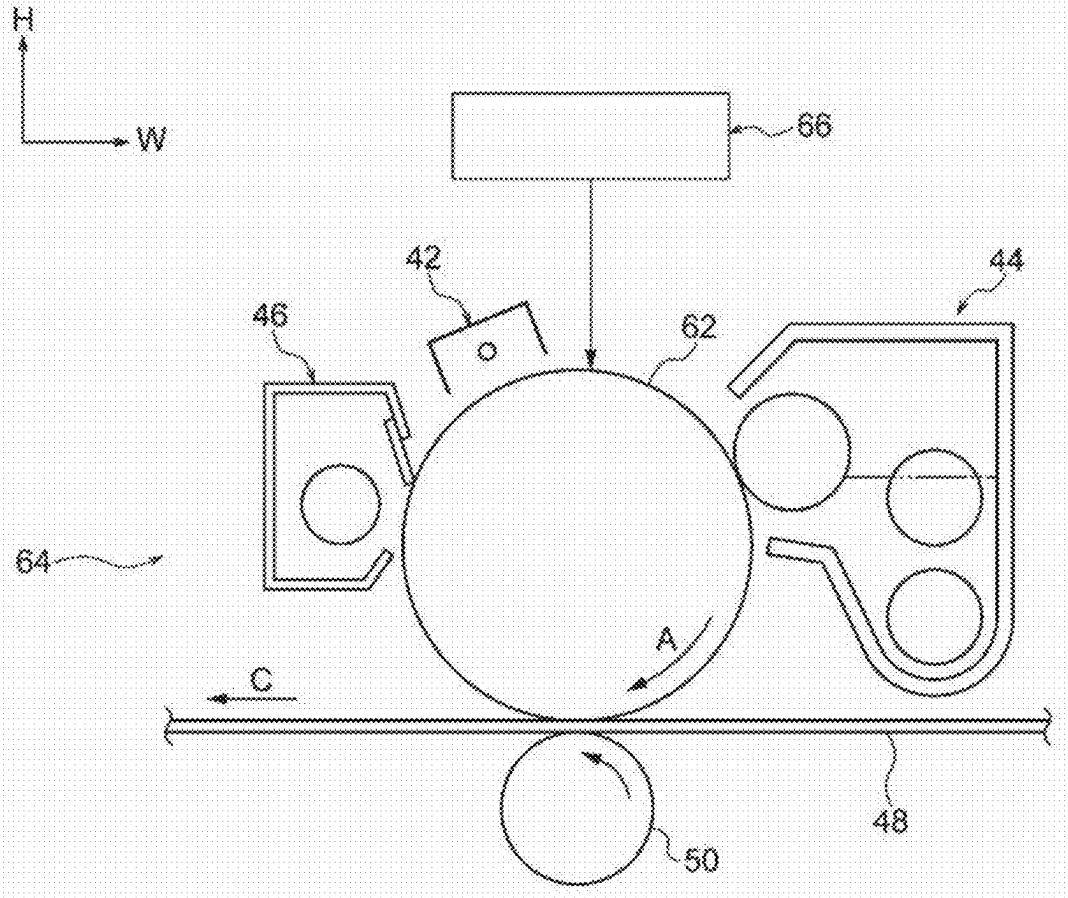
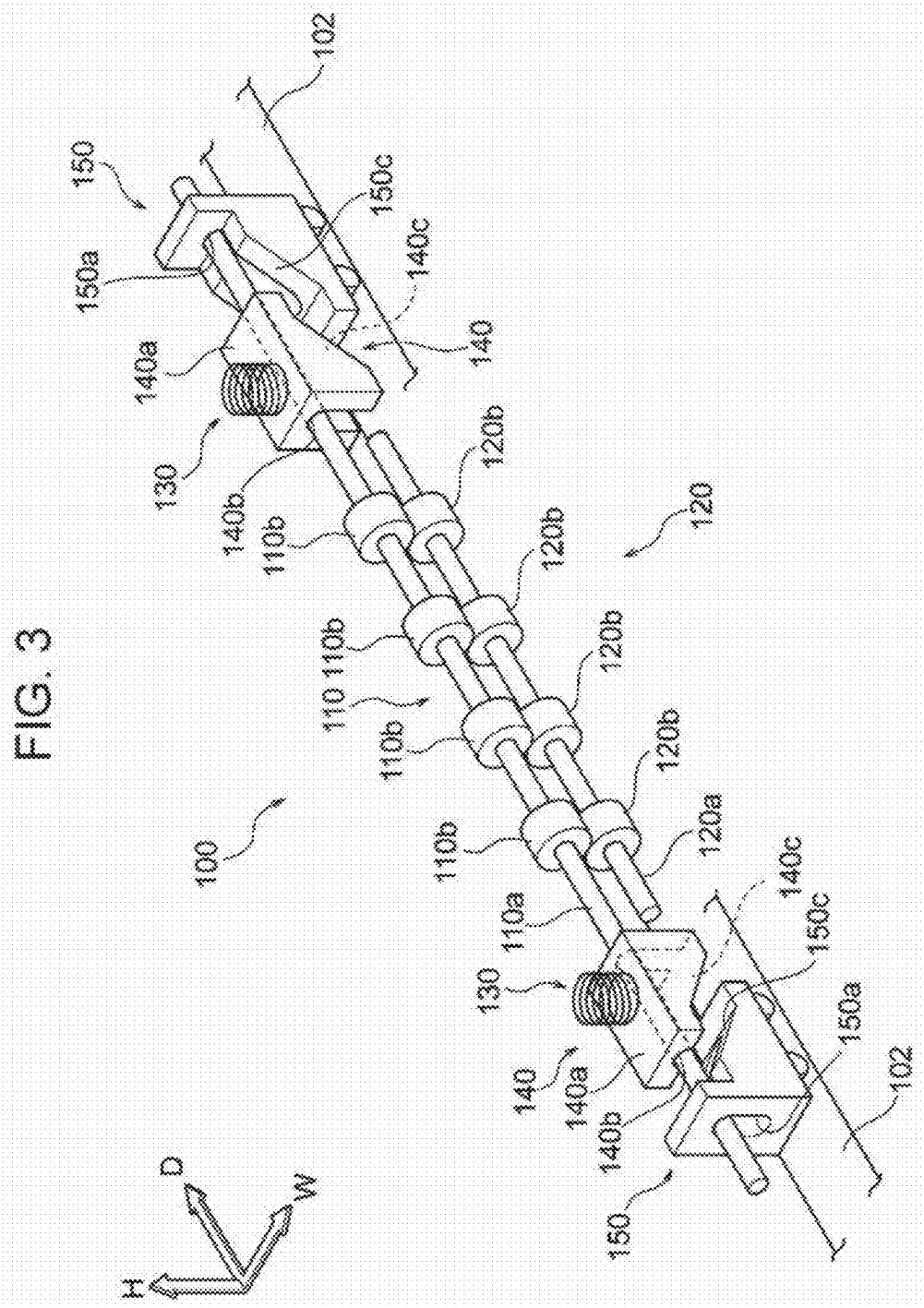


FIG. 3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150
150a
150c
140c
140a
140
130
140b
110b
120b
120
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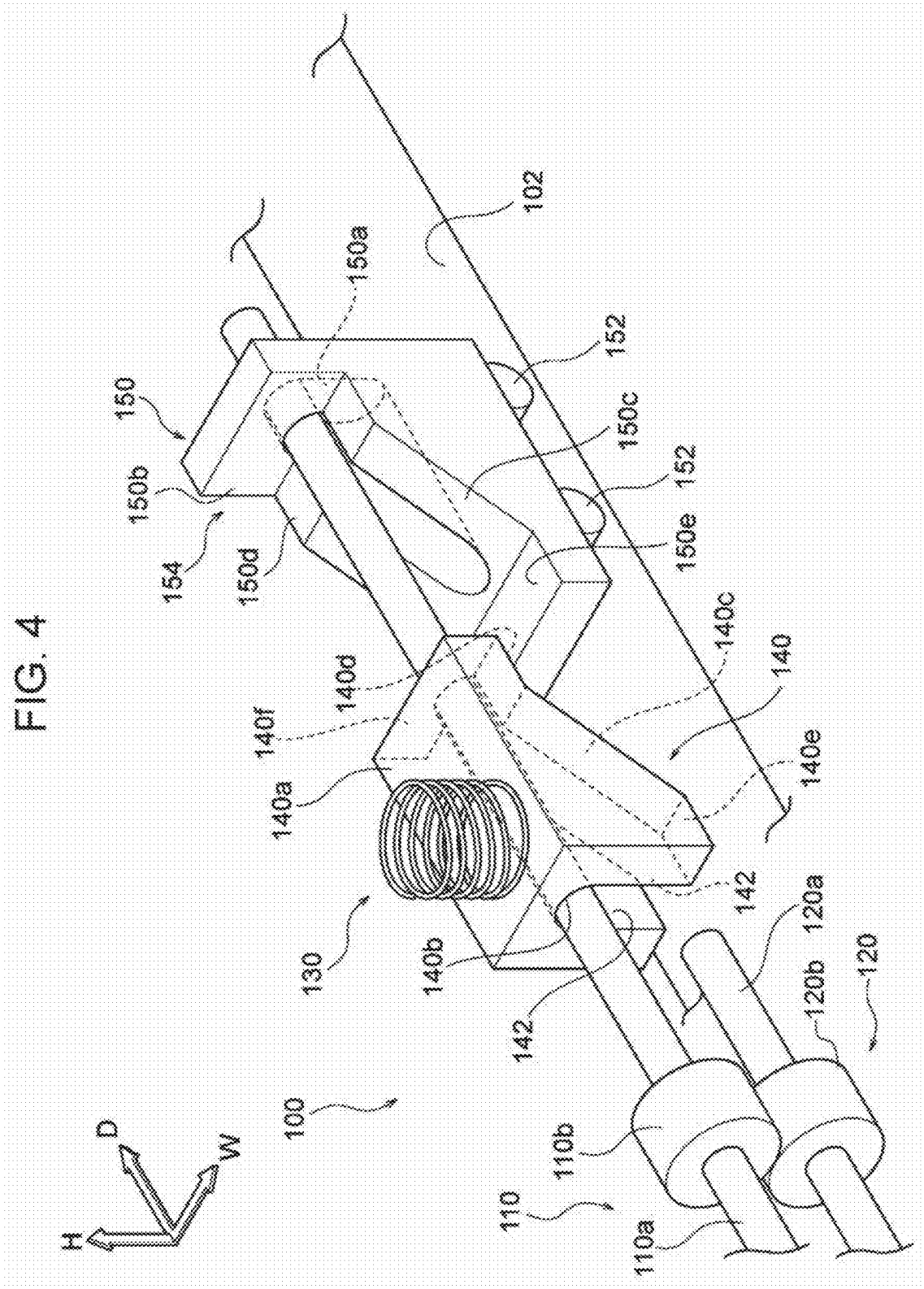
140p
H
D
W

FIG. 4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110a
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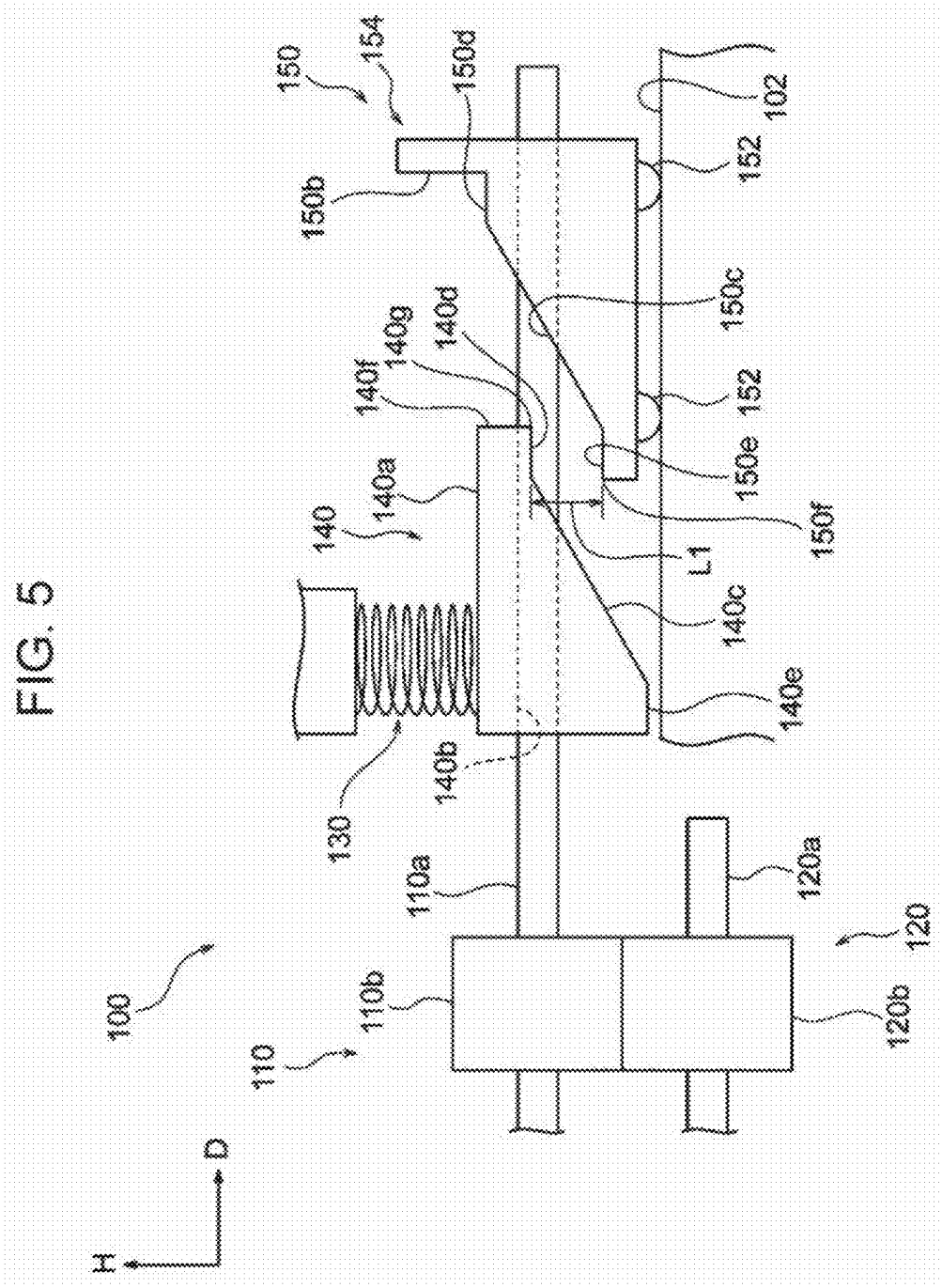
D
W

FIG. 5


150
154
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102
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D
H

FIG. 6

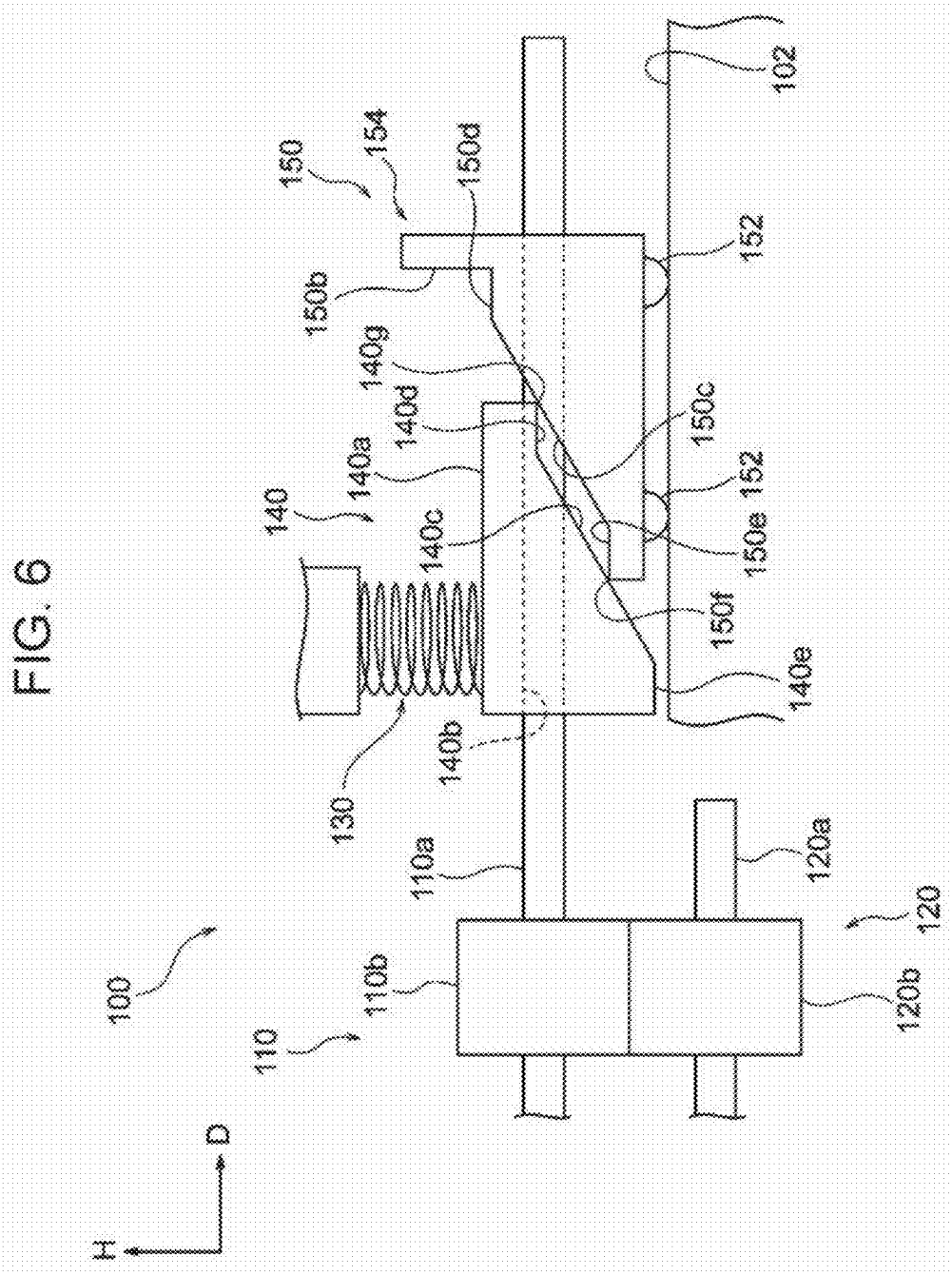
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FIG. 7

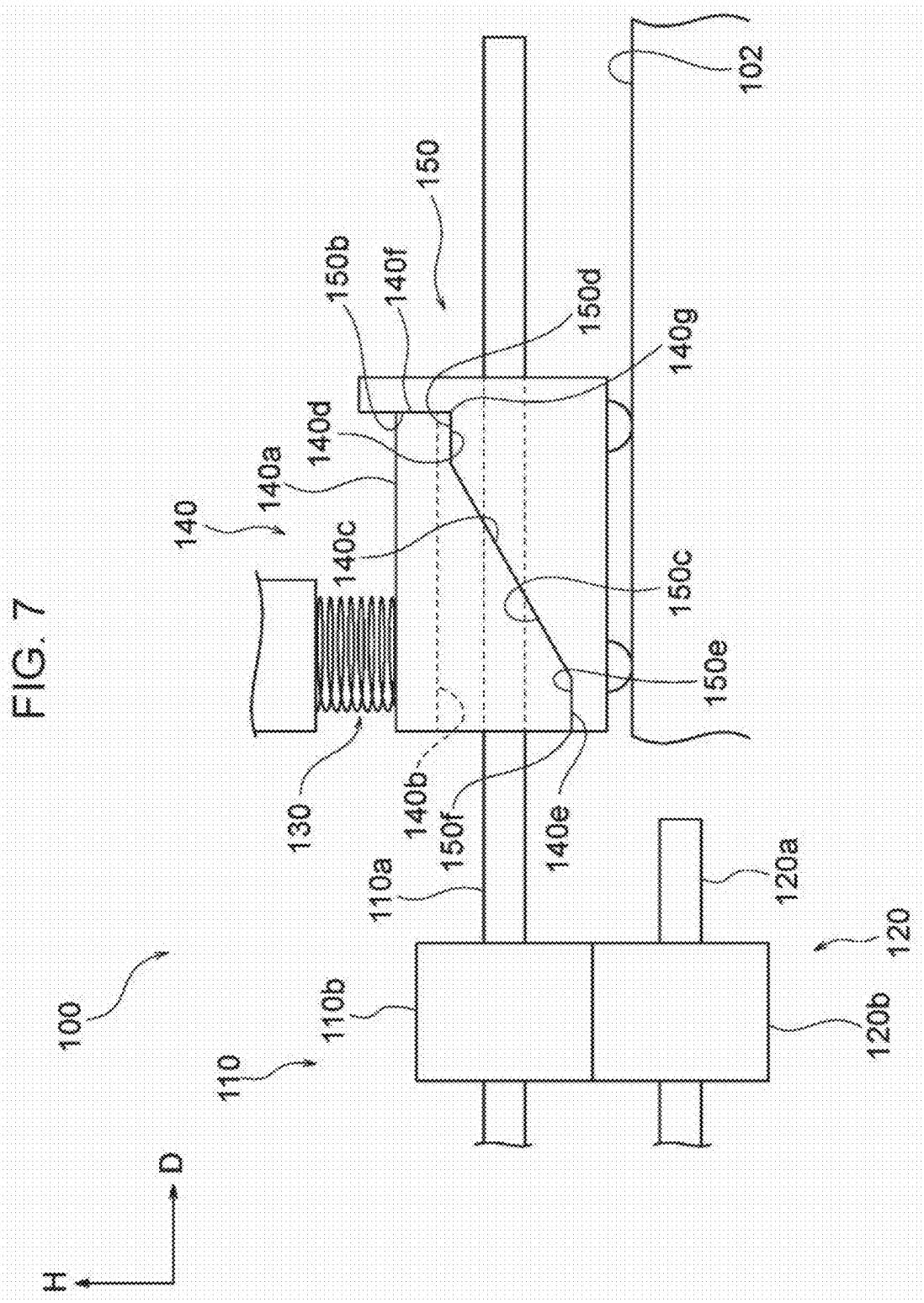
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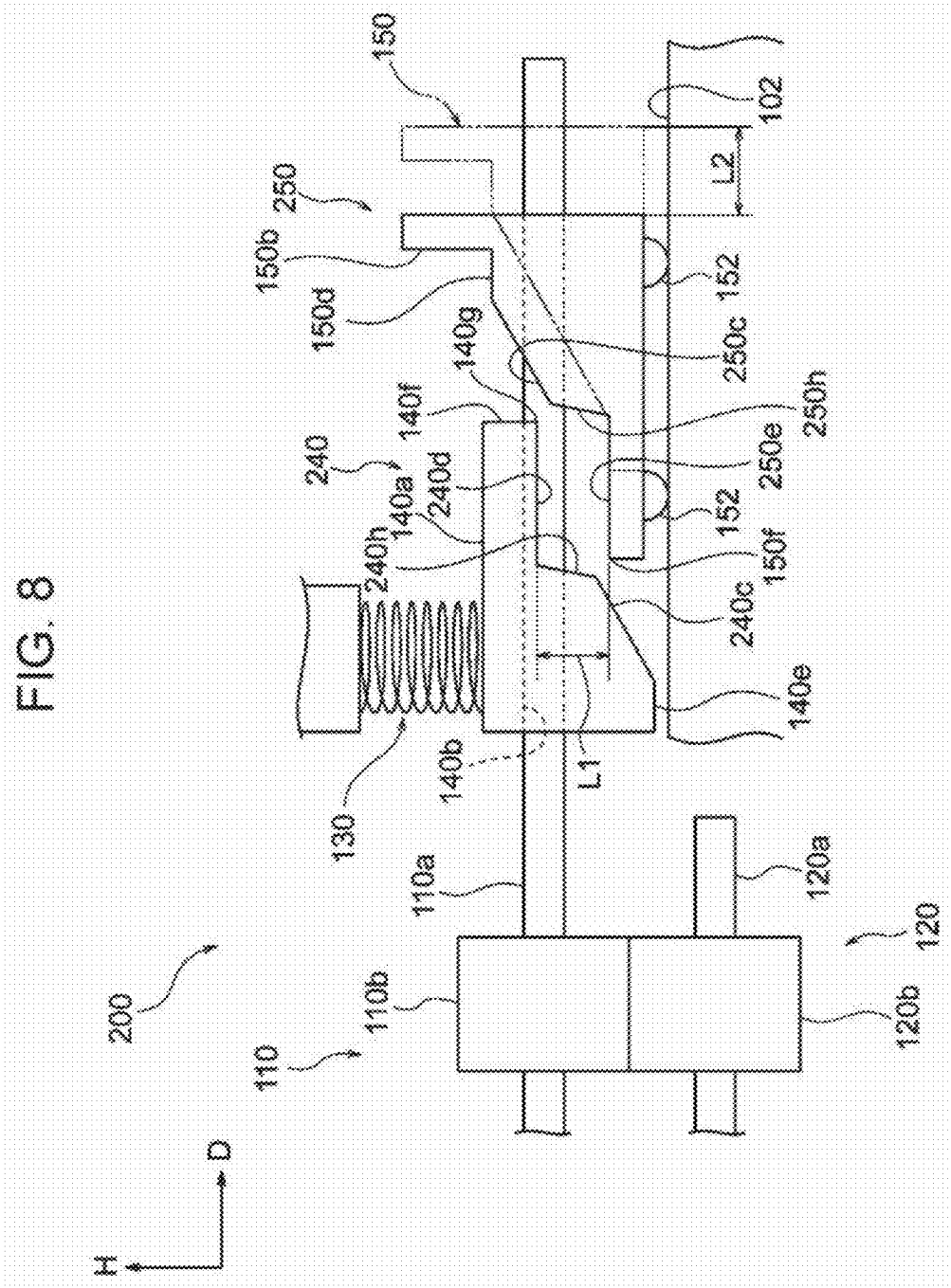
FIG. 8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130
140b
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110a
120a
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120b
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FIG. 9

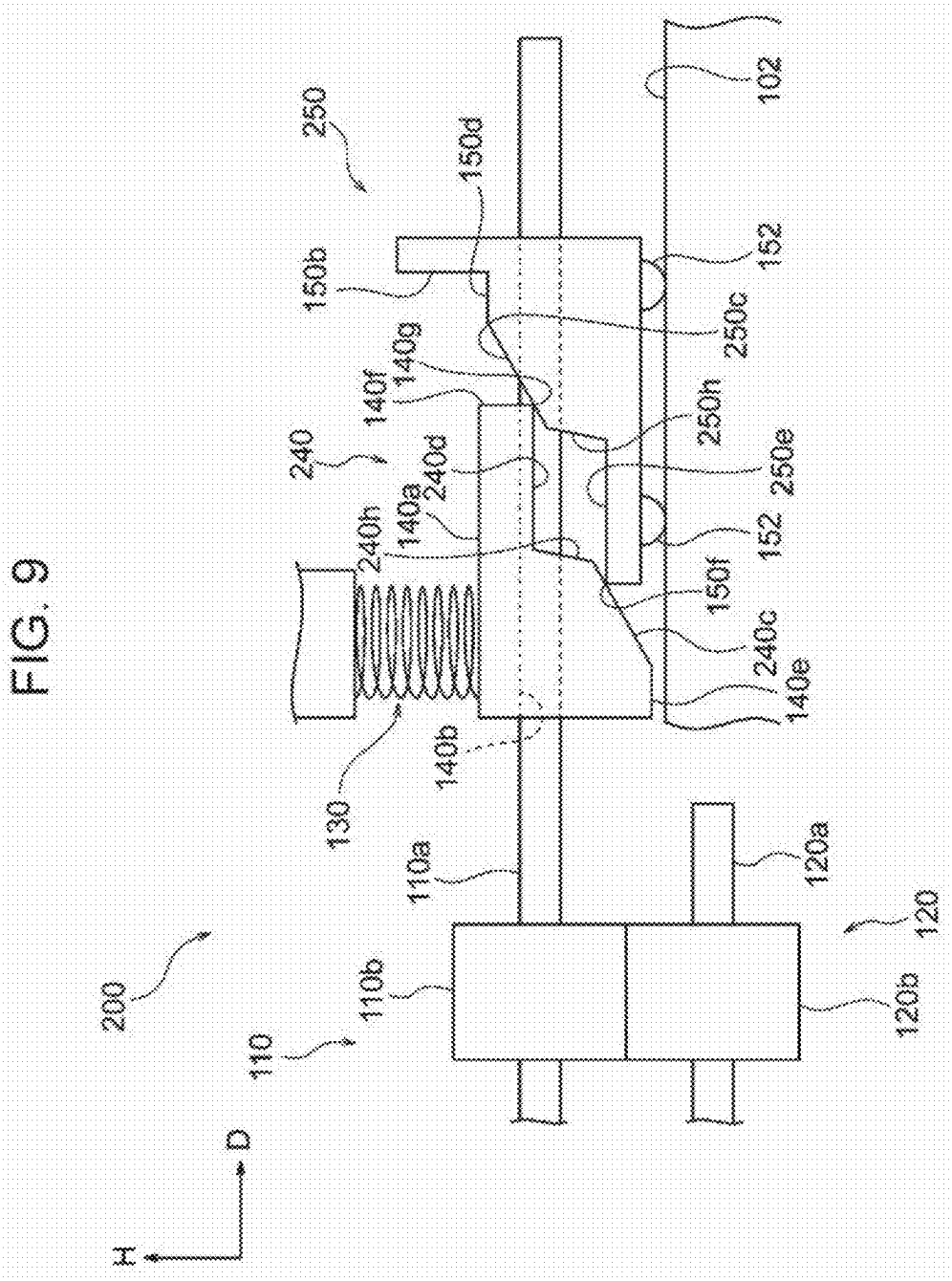
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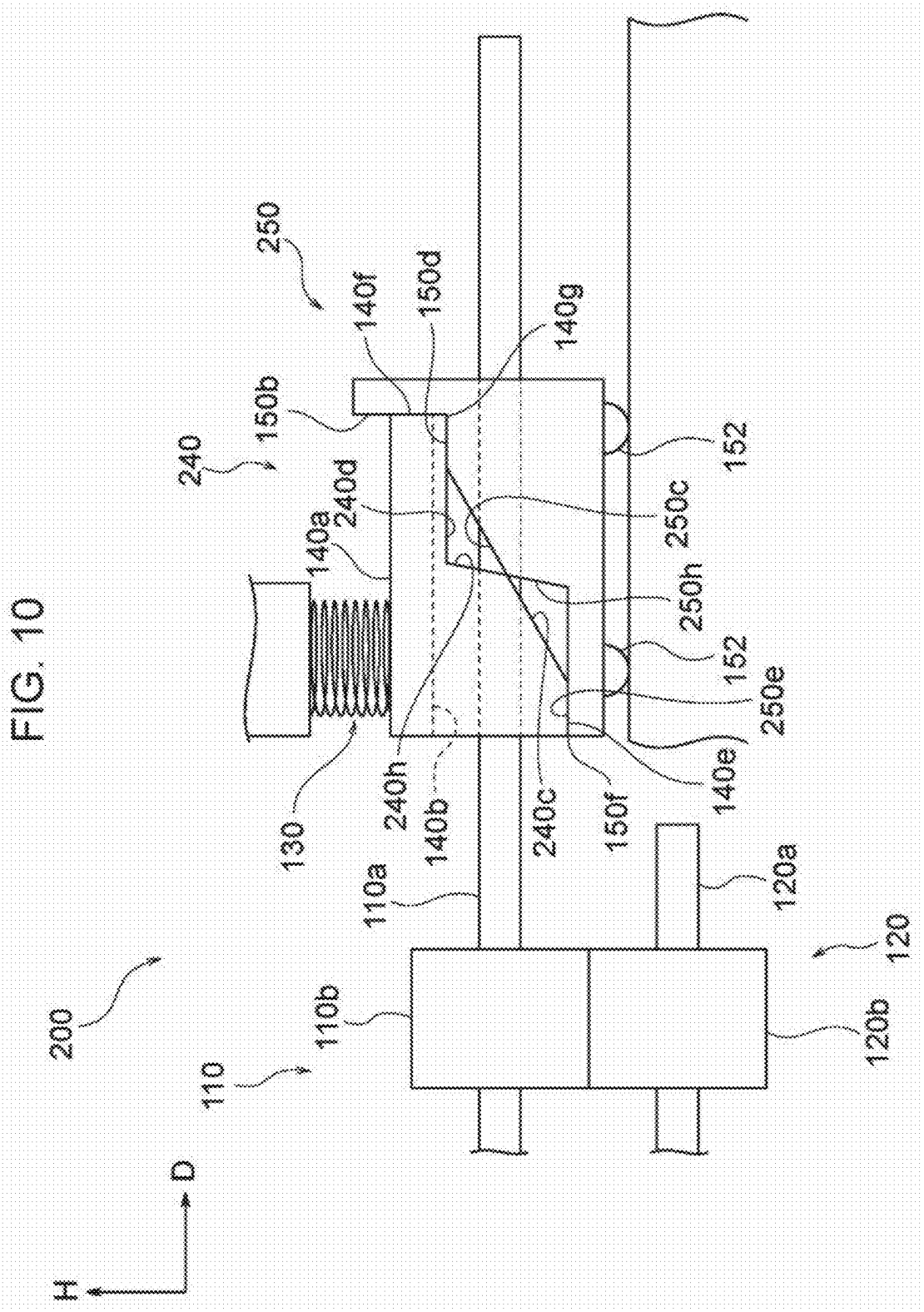
FIG. 10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# MEDIUM CONVEYING DEVICE AND IMAGE FORMING APPARATUS

## CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This application is based on and claims priority under 35 USC 119 from Japanese Patent Application No. 2024-023067 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 biasing member, a transmission member, and an adjustment member are provided. The biasing member biases a first roller toward a second roller. The transmission member is disposed between the biasing member and the first roller and transmits the biasing force of the biasing member to the first roller. The adjustment member adjusts the degree of the biasing force transmitted by the transmission member.

**[0005]** Specifically, the transmission member is disposed so as to come into contact with the first roller only from a biasing direction of the biasing member. In such a configuration, there are some cases where the transmission member may move relative to the first roller in an intersecting direction intersecting the biasing direction and an axial direction of the first roller.

**[0006]** Aspects of non-limiting embodiments of the present disclosure relate to suppressing a transmission member from moving relative to a first roller in an intersecting direction intersecting a biasing direction of a biasing member and an axial direction of the first roller, compared to a case where the transmission member is in contact with the first roller only from the biasing direction.

**[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 is disposed on a side opposite to the second roller with the first roller interposed between the second roller and the biasing member and biases the first roller toward the second roller; a transmission member that is disposed between the biasing member and the first roller, is restricted by the first roller from moving relative to the first roller in an intersecting direction intersecting a biasing direction of the biasing member and an axial direction of the first roller, and transmits a biasing force of the biasing member to the first roller; and an adjustment member that adjusts the biasing force applied by the biasing member to the first roller by causing the transmission member to approach or be separated from the first roller in the biasing direction.

## 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 a first 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 first exemplary embodiment of the present disclosure;

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

**[0013]** FIG. **4** is an enlarged perspective view illustrating the medium conveying device according to the first exemplary embodiment of the present disclosure;

**[0014]** FIG. **5** is an enlarged front view illustrating the medium conveying device according to the first exemplary embodiment of the present disclosure;

**[0015]** FIG. **6** is an operation diagram used for describing an operation of the medium conveying device according to the first exemplary embodiment of the present disclosure;

**[0016]** FIG. **7** is an operation diagram used for describing an operation of the medium conveying device according to the first exemplary embodiment of the present disclosure;

**[0017]** FIG. **8** is an enlarged front view illustrating a medium conveying device according to a second exemplary embodiment of the present disclosure;

**[0018]** FIG. **9** is an operation diagram used for describing an operation of the medium conveying device according to the second exemplary embodiment of the present disclosure; and

**[0019]** FIG. **10** is an operation diagram used for describing an operation of the medium conveying device according to the second exemplary embodiment of the present disclosure.

## DETAILED DESCRIPTION

### First Exemplary Embodiment

**[0020]** Examples of a medium conveying device and an image forming apparatus according to a first exemplary embodiment of the present disclosure will be described with reference to FIG. **1** to FIG. **7**. 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**)

**[0021]** 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 operation of each section.

**[0022]** 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**]

**[0023]** 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**]

**[0024]** 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**.

**[0025]** 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.

**[0026]** 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.

**[0027]** 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.

**[0028]** 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**]

**[0029]** 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.

—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.

—Transfer Unit **68**—

**[0034]** 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**.

**[0035]** 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**.

**[0036]** 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)

**[0037]** The image forming apparatus **10** forms an image in the following manner.

**[0038]** 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**).

**[0039]** 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**.

**[0040]** 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.

**[0041]** 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)

**[0042]** Next, the medium conveying device **100** will be described.

**[0043]** 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.

**[0044]** 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** mounted on the apparatus main body **10***a* to the near side in the depth direction, the medium conveying device **100** is dismounted from the apparatus main body **10***a*.

**[0045]** 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**, the medium conveying device **100** includes a pair of rollers **110** and **120** arranged in the up-down direction, biasing members **130**, and transmission members **140**. The biasing members **130** bias the roller **110** toward the roller **120**. The transmission members **140** transmit the biasing force of the biasing members **130** to the roller **110**. The medium conveying device **100** further includes adjustment members **150** that adjust the biasing force, of the biasing members **130**, transmitted by the transmission members **140** to the roller **110** by causing the transmission members **140** to approach or be separated from the roller **110** in the up-down direction (biasing direction).

**[0046]** The biasing members **130**, the transmission members **140**, and the adjustment members **150** are each provided to form a pair and arranged symmetrically with respect to the center of the medium conveying device **100** in the depth direction. In the following description, the biasing member **130**, the transmission member **140**, and the adjustment member **150** disposed on the far side in the depth direction will be mainly described.

[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.

—Roller **110**—

**[0048]** 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 a support member (not illustrated) 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.

—Roller **120**—

**[0049]** 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.

**[0050]** The length of the shaft portion **120***a* of the roller **120** is shorter than the length of the shaft portion **110***a* of the roller **110**. In other words, both end portions of the shaft portion **110***a* of the roller **110** protrude in the depth direction from both end portions of the shaft portion **120***a* of the roller **120**. The roller **120** is configured 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**, Transmission Member **140**]

**[0051]** As illustrated in FIG. **3**, the biasing member **130** and the transmission member **140** are arranged in the up-down direction, and the biasing member **130** is disposed on the upper side with respect to the transmission member **140**.

**[0052]** The biasing member **130** is a compression coil spring disposed so as to extend in the up-down direction. An upper end of the biasing member **130** is supported by a support member (not illustrated). In this manner, the biasing direction of the biasing member **130** with respect to the roller **110** is aligned with the up-down direction.

**[0053]** The transmission member **140** is made of a resin material, and is disposed between the shaft portion **110***a* of the roller **110** and the biasing member **130**. The transmission member **140** has a rectangular shape extending in the up-down direction when viewed from the depth direction, and has a rectangular shape extending in the depth direction when viewed from the up-down direction.

**[0054]** Specifically, as illustrated in FIG. **4**, the transmission member **140** is formed with a contact surface **140***a* and a U-shaped groove **140***b*. The contact surface **140***a* is in contact with a lower end of the biasing member **130** and faces upward. The U-shaped groove **140***b* is an opening formed in the lower side when viewed from the depth direction and has a U-shape. The shaft portion **110***a* passes through the U-shaped groove **140***b*. The U-shaped groove **140***b* has a pair of sandwiching surfaces **142** that sandwich the shaft portion **110***a* from the width direction. The width direction is an example of an intersecting direction.

**[0055]** As described above, the shaft portion **110***a* passes through the U-shaped groove **140***b*. As a result, the transmission member **140** is restricted by the roller **110** from moving relative to the roller **110** in the intersecting direction (width direction) intersecting the biasing direction (up-down direction) of the biasing member **130** and the axial direction (depth direction).

**[0056]** Furthermore, as illustrated in FIG. **5**, the transmission member **140** is formed with an inclined surface **140***c*, a downward-facing surface **140***d*, and a downward-facing surface **140***e*. The inclined surface **140***c* is inclined with respect to the depth direction when viewed from the width direction. The downward-facing surface **140***d* is connected to an upper end of the inclined surface **140***c* and faces downward. The downward-facing surface **140***e* is connected to a lower end of the inclined surface **140***c* and faces downward. The inclined surface **140***c* is inclined with respect to the depth direction such that the inclined surface **140***c* faces outward in the depth direction with a portion on the inner side in the depth direction being lower than a portion on the outer side in the depth direction. The transmission member **140** is further formed with a depth surface **140***f* that is disposed between the contact surface **140***a* and the downward-facing surface **140***d* and faces the far side in the depth direction.

**[0057]** Furthermore, the transmission member **140** is restricted by a restricting member (not illustrated) from moving inward in the depth direction and from rotating about the circumferential direction of the shaft portion **110***a*.

**[0058]** Here, the phrase "outward in the depth direction" refers to a side facing opposite to the center of the medium conveying device **100** in the depth direction, while the phrase "inward in the depth direction" refers to a side facing the center of the medium conveying device **100** in the depth direction.

[Adjustment Member **150**]

**[0059]** The adjustment member **150** is made of a resin material, and is disposed on the outer side of the transmission member **140** in the depth direction as illustrated in FIGS. **3** and **4**. The adjustment member **150** has a rectangular shape extending in the up-down direction when viewed from the depth direction, and has a rectangular shape extending in the depth direction when viewed from the up-down direction.

**[0060]** Specifically, as illustrated in FIG. **4**, the adjustment member **150** is formed with a plurality of protrusions **152** protruding downward at four corners of the adjustment member **150**. The protrusions **152** are in contact with a guide surface **102** that is provided in the medium conveying device **100** and faces upward. Thus, the adjustment member **150** is supported on the guide surface **102**. The guide surface **102** is formed with a guide shape (not illustrated) that guides the movement of the adjustment member **150** in the depth direction. The depth direction is an example of the axial direction.

**[0061]** The adjustment member **150** is further formed with a through hole **150***a* and a protruding portion **154**. The through hole **150***a* has a slot shape that extends in the up-down direction and through which the shaft portion **110***a* passes. The protruding portion **154** protrudes upward with respect to the contact surface **140***a* of the transmission member **140** in the up-down direction. The protruding portion **154** of the adjustment member **150** is formed with a depth surface **150***b* facing inward in the depth direction.

**[0062]** As illustrated in FIG. **5**, the adjustment member **150** is further formed with an inclined surface **150***c*, an upward-facing surface **150***d*, and an upward-facing surface

**150***e*. The inclined surface **150***c* is inclined with respect to the depth direction when viewed from the width direction. The upward-facing surface **150***d* is connected to an upper end of the inclined surface **150***c* and faces upward. The upward-facing surface **150***e* is connected to a lower end of the inclined surface **150***c* and faces upward. The inclined surface **150***c* is an example of another inclined surface.

**[0063]** The inclined surface **150***c* is inclined with respect to the depth direction such that the inclined surface **150***c* faces inward in the depth direction with a portion on the inner side in the depth direction being lower than a portion on the outer side in the depth direction.

**[0064]** In this configuration, the shaft portion **110***a* is in contact with the bottom of the U-shaped groove **140***b* of the transmission member **140** in a state where the adjustment member **150** is disposed at a first position away from the transmission member **140** in the depth direction (see FIG. **5**), and the biasing force of the biasing member **130** is transmitted to the roller **110**. Also, in this state, the upward-facing surface **150***e* of the adjustment member **150** and the downward-facing surface **140***d* of the transmission member **140** face each other in the up-down direction. The clearance in the up-down direction between the adjustment member **150** disposed at the first position and the transmission member **140** is a distance between the upward-facing surface **150***e* and the downward-facing surface **140***d*. In the present exemplary embodiment, the clearance is referred to as a clearance L**1**.

**[0065]** Then, when a user moves the adjustment member **150** disposed at the first position inward in the depth direction, as illustrated in FIGS. **5** and **6**, a distal end portion **150***f* of the upward-facing surface **150***e* of the adjustment member **150** comes into contact with the inclined surface **140***c* of the transmission member **140**. In addition, the inclined surface **150***c* of the adjustment member **150** comes into contact with a distal end portion **140***g* of the downward-facing surface **140***d* of the transmission member **140**. The distal end portion **150***f* is an example of a pressing portion, and the distal end portion **140***g* is an example of another pressing portion.

**[0066]** When the user further moves the adjustment member **150** inward in the depth direction, as illustrated in FIGS. **6** and **7**, the distal end portion **150***f* presses the inclined surface **140***c*, and the distal end portion **140***g* presses the inclined surface **150***c*. Thus, the transmission member **140** moves upward, away from the shaft portion **110***a* of the roller **110**. As a result, the adjustment member **150** is disposed at a second position, and the biasing force applied by the biasing member **130** to the roller **110** is not transmitted to the roller **110**.

**[0067]** In addition, in a state where the adjustment member **150** is disposed at the second position, the inclined surface **150***c* of the adjustment member **150** and the inclined surface **140***c* of the transmission member **140** are in surface contact with each other, and the upward-facing surface **150***e* of the adjustment member **150** and the downward-facing surface **140***e* of the transmission member **140** are in surface contact with each other. Furthermore, the upward-facing surface **150***d* of the adjustment member **150** and the downward-facing surface **140***d* of the transmission member **140** are in surface contact with each other, and the depth surface **150***b* of the adjustment member **150** and the depth surface **140***f* of the transmission member **140** are in surface contact with each other.

(Action)

**[0068]** Next, the action of the medium conveying device **100** will be described.

**[0069]** In a case where the medium conveying device **100** conveys thick paper or plain paper as a recording medium, the pair of adjustment members **150**, each arranged on one of both sides in the depth direction, are each disposed at the first position as illustrated in FIGS. **3** and **5**. With such an arrangement, the biasing force of the biasing members **130** is transmitted to the roller **110** by the transmission members **140**, and the force with which the recording medium is nipped between the roller **110** and the roller **120** increases. In this state, the medium conveying device **100** conveys thick paper or plain paper as a recording medium.

**[0070]** On the other hand, in a case where the medium conveying device **100** conveys thin paper as a recording medium, the medium conveying device **100** mounted on the apparatus main body **10***a* (see FIG. **1**) is pulled out to the near side in the depth direction by a user, and is dismounted from the apparatus main body **10***a*.

**[0071]** Then, as illustrated in FIGS. **5**, **6**, and **7**, the adjustment member **150** in a state of being disposed at the first position is moved inward in the depth direction by a user to the second position. In a state where the adjustment member **150** is disposed at the second position, the transmission member **140** has moved upward, away from the shaft portion **110***a* of the roller **110**. With such an arrangement, the biasing force applied by the biasing member **130** is not transmitted to the roller **110**. As a result, the force with which the recording medium is nipped between the roller **110** and the roller **120** becomes weaker compared to a case where the medium conveying apparatus **100** conveys thick paper and plain paper. In this state, the medium conveying device **100** conveys thin paper as a recording medium.

**[0072]** As described above, the medium conveying device **100** applies a strong nipping force to the recording medium in a case where the medium conveying device **100** conveys thick paper and plain paper as the recording medium, and applies a weaker nipping force to the recording medium in a case where the medium conveying device **100** conveys thin paper as the recording medium compared to the case where the medium conveying device **100** conveys thick paper and plain paper. With such a configuration, the formation of wrinkles or roll marks on thin paper is suppressed.

(Recapitulation)

**[0073]** As described above, in the medium conveying device **100**, the transmission member **140** is formed with the pair of sandwiching surfaces **142** that sandwich the shaft portion **110***a* from the width direction. With such a configuration, the transmission member **140** is suppressed from moving relative to the roller **110** in the intersecting direction (width direction) intersecting the biasing direction (up-down direction) and the axial direction (depth direction) of the roller **110** compared to a case where the transmission member is in contact with the roller only from the biasing direction (up-down direction) of the biasing member.

**[0074]** In the medium conveying device **100**, the transmission member **140** is formed with the pair of sandwiching surfaces **142** that sandwich the shaft portion **110***a* from the width direction. With such a configuration, the movement of the transmission member **140** is easily suppressed compared to a case where the movement of the transmission member

is suppressed by bringing a distal end of a protrusion formed in the transmission member into contact with the roller.

**[0075]** In addition, in the medium conveying device **100**, the pair of sandwiching surfaces **142** form portions of the U-shaped groove **140***b* that opens downward. With such a configuration, the assembly of the transmission member **140** to the roller **110** becomes easier compared to a case where an elongated hole has a pair of sandwiching surfaces.

**[0076]** In addition, in the medium conveying device **100**, by moving the adjustment member **150** inward in the depth direction (axial direction), the distal end portion **150***f* of the adjustment member **150** presses the inclined surface **140***c* of the transmission member **140**, and the transmission member **140** moves upward. With such a configuration, a load applied to the roller **110** in the width direction when the transmission member **140** is moved upward is reduced compared to a case where the distal end portion presses the inclined surface by moving the transmission member in the width direction (intersecting direction).

**[0077]** In addition, in the medium conveying device **100**, by moving the adjustment member **150** inward in the depth direction (axial direction), the distal end portion **150***f* of the adjustment member **150** presses the inclined surface **140***c* of the transmission member **140**, and the distal end portion **140***g* of the transmission member **140** presses the inclined surface **150***c* of the adjustment member **150**. Thus, the transmission member **140** moves upward. With such a configuration, the posture of the transmission member **140** that moves is stable compared to a case where the inclined surface is formed on only either the adjustment member or the transmission member.

**[0078]** In addition, in the image forming apparatus **10**, the movement of the transmission member **140** relative to the roller **110** is suppressed compared to a case where the image forming apparatus **10** includes a medium conveying device in which the transmission member is in contact with the roller only from the biasing direction of the biasing member. Thus, variation in the biasing force of the biasing member **130** on the roller **110** is suppressed.

## Second Exemplary Embodiment

**[0079]** Next, an example of a medium conveying device according to a second exemplary embodiment will be described with reference to FIGS. **8** to **10**. The second exemplary embodiment will mainly describe differences from the first exemplary embodiment.

**[0080]** As illustrated in FIG. **8**, a medium conveying device **200** according to the second exemplary embodiment includes the pair of rollers **110** and **120**, the biasing members **130**, and transmission members **240**. The biasing members **130** bias the roller **110** toward the roller **120**. The transmission members **240** transmit the biasing force of the biasing members **130** to the roller **110**. The medium conveying device **200** further includes adjustment members **250** that adjust the biasing force transmitted by the transmission members **240** to the roller **110**.

### [Transmission Member **240**]

**[0081]** As illustrated in FIG. **8**, the transmission member **240** is formed with an inclined surface **240***c* and a downward-facing surface **240***d*. The inclined surface **240***c* is inclined with respect to the depth direction when viewed from the width direction. The downward-facing surface **240***d* is connected to the distal end portion **140***g*. The transmission member **240** is further formed with a connection surface **240***h* with one end being connected to an upper end of the inclined surface **240***c* and the other end being connected to the downward-facing surface **240***d*.

**[0082]** The connection surface **240***h* has a larger inclination angle with respect to the depth direction than the inclined surface **240***c*. When the adjustment member **250** at the first position illustrated in FIG. **8** is moved inward in the depth direction, the distal end portion **150***f* of the adjustment member **250** comes into contact with the upper end portion of the inclined surface **240***c* and presses the inclined surface **240***c*.

### [Adjustment Member **250**]

**[0083]** As illustrated in FIG. **8**, the adjustment member **250** is formed with an inclined surface **250***c* and an upward-facing surface **250***e*. The inclined surface **250***c* is inclined with respect to the depth direction when viewed from the width direction. The upward-facing surface **250***e* is connected to the distal end portion **150***f*. The adjustment member **250** is further formed with a connection surface **250***h* with one end being connected to a lower end of the inclined surface **250***c* and the other end being connected to the upward-facing surface **250***e*.

**[0084]** The connection surface **250***h* has a larger inclination angle with respect to the depth direction than the inclined surface **250***c*. When the adjustment member **250** at the first position illustrated in FIG. **8** is moved inward in the depth direction, the distal end portion **140***g* of the transmission member **240** comes into contact with the lower end portion of the inclined surface **250***c* and presses the inclined surface **250***c*.

**[0085]** As described above, the transmission member **240** is formed with the connection surface **240***h* having a larger inclination angle than the inclined surface **240***c*, and the adjustment member **250** is formed with the connection surface **250***h* having a larger inclination angle than the inclined surface **250***c*. With such a configuration, in a state where the clearance L**1** is ensured in the up-down direction between the adjustment member **250** disposed at the first position and the transmission member **240**, the adjustment member **250** can be disposed on the inner side in the depth direction compared to the adjustment member **150** according to the first exemplary embodiment. In other words, the movement amount (stroke amount) of the adjustment member **250** from the first position to the second position can be made shorter, by a distance L**2**, illustrated in FIG. **8**, than the movement amount of the adjustment member **150** from the first position to the second position.

### (Action)

**[0086]** Next, the action of the medium conveying device **200** will be described.

**[0087]** In a case where the medium conveying device **200** conveys thick paper or plain paper as a recording medium, a pair of adjustment members **250**, each arranged on one of both sides in the depth direction, are each disposed at the first position as illustrated in FIG. **8**. With such an arrangement, the biasing force of the biasing members **130** is transmitted to the roller **110** by the transmission members **240**, and the force with which the recording medium is nipped between the roller **110** and the roller **120** increases.

In this state, the medium conveying device **200** conveys thick paper or plain paper as a recording medium.

**[0088]** On the other hand, in a case where the medium conveying device **200** conveys thin paper as a recording medium, the medium conveying device **200** mounted on the apparatus main body **10***a* (see FIG. **1**) is pulled out to the near side in the depth direction by a user, and is dismounted from the apparatus main body **10***a*.

**[0089]** Then, when a user moves the adjustment member **250** disposed at the first position inward in the depth direction, as illustrated in FIGS. **8** and **9**, the distal end portion **150***f* of the adjustment member **250** comes into contact with the upper end portion of the inclined surface **240***c* of the transmission member **240**. In addition, the lower end portion of the inclined surface **250***c* of the adjustment member **250** comes into contact with the distal end portion **140***g* of the transmission member **240**.

**[0090]** When the user further moves the adjustment member **250** inward in the depth direction, as illustrated in FIGS. **9** and **10**, the distal end portion **150***f* presses the inclined surface **240***c*, and the distal end portion **140***g* presses the inclined surface **250***c*. Thus, the transmission member **240** moves upward, away from the shaft portion **110***a* of the roller **110**. As a result, the adjustment member **250** is disposed at the second position, and the biasing force applied by the biasing member **130** is not transmitted to the roller **110**.

**[0091]** The present disclosure has been described in detail with respect to specific exemplary embodiments, but the present disclosure is not limited to the exemplary embodiments, 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 embodiments, the medium conveying devices **100** and **200** are used in the image forming apparatus **10**. However, the medium conveying devices **100** and **200** 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.

**[0092]** In the above-described exemplary embodiments, the roller **110** and the roller **120** are arranged in the up-down direction, but may be arranged in a direction other than the up-down direction.

**[0093]** In the above-described exemplary embodiments, the adjustment members **150** and **250** are moved. However, it is sufficient for the adjustment members **150** and **250** and the transmission members **140** and **240** to be moved relative to each other in the depth direction.

**[0094]** In the above-described exemplary embodiments, the transmission members **140** and **240** and the shaft portion **110***a* of the roller **110** are separated from each other in a state where the adjustment members **150** and **250** are moved to the second position, but may not be separated from each other. It is sufficient for the adjustment members **150** and **250** to adjust the degree of the biasing force transmitted by the transmission members **140** and **240**.

**[0095]** Although not particularly described in the above-described exemplary embodiments, displaying, on the display section **40** (see FIG. **1**), the type of paper of the recording medium to be used may accordingly allow a user to move the adjustment members **150** and **250**.

**[0096]** Although not particularly described in the above-described exemplary embodiments, 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**.

**[0097]** In the above-described exemplary embodiments, the transmission members **140** and **240** are each formed with the U-shaped groove **140***b* that has the pair of sandwiching surfaces **142** and opens downward. However, an elongated hole extending in the up-down direction may have a pair of sandwiching surfaces. In this case, the effect achieved by forming the U-shaped groove **140***b* is not achieved.

**[0098]** In the above-described exemplary embodiments, the inclined surface is formed on both the transmission members **140** and **240** and the adjustment members **150** and **250**. However, the inclined surface may be formed on either the transmission members **140** and **240** or the adjustment members **150** and **250**. In this case, the effect achieved by forming the inclined surface on both the transmission members **140** and **240** and the adjustment members **150** and **250** is not achieved.

**[0099]** In the above-described exemplary embodiments, the adjustment members **150** and **250** are moved in the depth direction (axial direction), but may be moved in the width direction, for example. In this case, the effect achieved by moving the adjustment members **150** and **250** in the depth direction (axial direction) is not achieved.

## APPENDIX

(((1)))

**[0100]** A medium conveying device comprising:

**[0101]** a first roller that is rotatably supported;

**[0102]** a second roller that conveys a recording medium while nipping the recording medium between the first roller and the second roller;

**[0103]** a biasing member that is disposed on a side opposite to the second roller with the first roller interposed between the second roller and the biasing member and biases the first roller toward the second roller;

**[0104]** a transmission member that is disposed between the biasing member and the first roller, is restricted by the first roller from moving relative to the first roller in an intersecting direction intersecting a biasing direction of the biasing member and an axial direction of the first roller, and transmits a biasing force of the biasing member to the first roller; and

**[0105]** an adjustment member that adjusts the biasing force applied by the biasing member to the first roller by causing the transmission member to approach or be separated from the first roller in the biasing direction.

(((2)))

**[0106]** The medium conveying device according to (((1))), wherein the transmission member is formed with a pair of sandwiching surfaces that sandwich the first roller from the intersecting direction.

(((3)))

**[0107]** The medium conveying device according to (((2))), wherein the transmission member is formed with a U-shaped groove that has the pair of sandwiching surfaces and opens in the biasing direction.

(((4)))

**[0108]** The medium conveying device according to any one of (((1))) to (((3))), wherein

**[0109]** the transmission member is formed with an inclined surface that is inclined with respect to the axial direction, and

**[0110]** the adjustment member is formed with a pressing portion that presses the inclined surface and causes the transmission member to be separated from the first roller when the adjustment member moves in the axial direction relative to the transmission member.

(((5)))

**[0111]** The medium conveying device according to (((4))), wherein

**[0112]** the adjustment member is formed with another inclined surface that is inclined with respect to the axial direction, and

**[0113]** the transmission member is formed with another pressing portion that presses the another inclined surface and causes the transmission member to be separated from the first roller when the adjustment member moves.

(((6)))

**[0114]** An image forming apparatus, comprising:

**[0115]** the medium conveying device according to any one of (((1))) to (((5))); and

**[0116]** 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 is disposed on a side opposite to the second roller with the first roller interposed between the second roller and the biasing member and biases the first roller toward the second roller;

a transmission member that is disposed between the biasing member and the first roller, is restricted by the first roller from moving relative to the first roller in an intersecting direction intersecting a biasing direction of the biasing member and an axial direction of the first roller, and transmits a biasing force of the biasing member to the first roller; and

an adjustment member that adjusts the biasing force applied by the biasing member to the first roller by causing the transmission member to approach or be separated from the first roller in the biasing direction.

**2**. The medium conveying device according to claim **1**, wherein the transmission member is formed with a pair of sandwiching surfaces that sandwich the first roller from the intersecting direction.

**3**. The medium conveying device according to claim **2**, wherein the transmission member is formed with a U-shaped groove that has the pair of sandwiching surfaces and opens in the biasing direction.

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

the transmission member is formed with an inclined surface that is inclined with respect to the axial direction, and

the adjustment member is formed with a pressing portion that presses the inclined surface and causes the transmission member to be separated from the first roller when the adjustment member moves in the axial direction relative to the transmission member.

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

the adjustment member is formed with another inclined surface that is inclined with respect to the axial direction, and

the transmission member is formed with another pressing portion that presses the another inclined surface and causes the transmission member to be separated from the first roller when the adjustment member moves.

**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.

* * * * *